PN-ADC-906

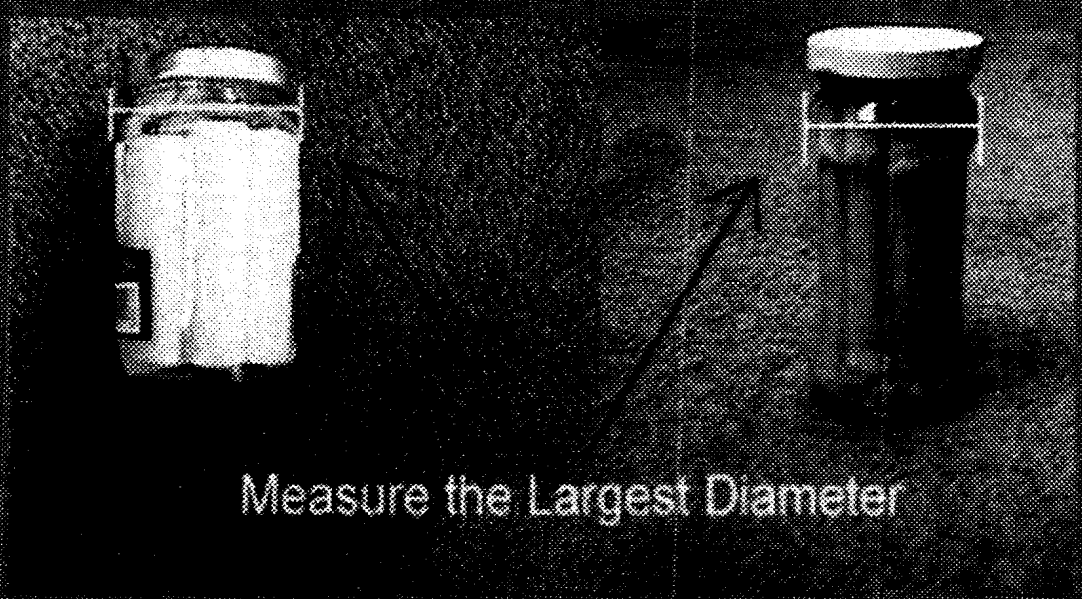
REPORTS PREPARED

BY

MR. ROD FROST

Better Process Control School & Glass Packaging/Processing

February 19 - March 8, 2001



Compiled by Agriculture Led Export Businesses
12 Dokki Street, 6th Floor
Dokki, Cairo
TEL 02-338-1445
FAX 02-748-0729
USAID Project No. 263-0264

Rod Frost

California Glass Company
155 98th Avenue
Oakland, CA 94603
TEL (510) 635-7700 FAX (510) 635-4288

Professional member of the Institute of Food Technologists (45 years). Has served in various national committees as Chair, as a Councilor for 25 years and all local offices including Chair

Employment History

1986 – Present - California Glass Company

Technical Service - Works with manufacturers to obtain products acceptable to company standards. Has worked with vendors from the USA, Canada, Mexico, The Netherlands, France, Italy, Germany, Austria, Norway, Venezuela, Taiwan, New Zealand and others. Visits customers and vendors to assist with manufacturing and production problems. California Glass is a major supplier of all types of glass and plastic containers and closures for the food and chemical industries.

April 1961 – March 1985 - Owens Illinois, Inc. (Retired)

1972 – 1985 – Manager Technical Services, Customer Packaging Service Department, Glass Container Division. Job specifications included:

1) Provides technical services and knowledge to food, beverage, beer, spirits and closure accounts where preservation of container contents is a prime consideration.

2) Analyze problems, processes, equipment, etc., using laboratory techniques and field investigations requiring knowledge of bacteriology, chemistry, physics, processing techniques, basic engineering and container and closure performance specifications.

3) Investigates customer complaints to determine cause where product failure is alleged.

4) Works closely with Principal Customer Service Engineers in investigating complaints, equipment failures, etc.

5) Investigate all customer problems relating to Owens-Illinois glass pressure packages.

6) Collaborates with Closure Engineering in planning, conducting, and evaluating test packs of products in customer's plants. Regularly visit customer's plants to observe processes and make recommendations concerning their operations.

AGRICULTURE-LED EXPORT BUSINESSES
(ALEB)

Scope of Work

#12, Dokki Street, 6th Floor, Dokki, Cairo, Egypt

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT — ABT ASSOCIATES, INC.

FDA SANCTIONED BETTER PROCESS CONTROL SCHOOL

Assignment: Task 2, Dr. Joseph Marcy, Dr. Rebeca Lopez-Garcia, Mr. Roderic Frost and Mr. Dennis Dignan
Level of Effort: Minimum, 10 days in country, 2 travel days, plus 5 days in the United States
Time In-Country - February 22 - March 3, 2001

Desired Professional Qualifications: The Center for Advanced Food Technology (CAFT) shall work with a recognized United States university to establish a Better Process Control School (BPCS) in Egypt. Instructors who have taught at past BPCS or who have expertise in the topics defined in the curriculum should be given consideration for the program. Instructors will be selected by the Task 2 leader and CAFT.

Education: A minimum of a B.S. degree in food science or a related discipline is preferred for all instructors. Proven practical experience may be substituted for educational requirements.

Language: There is no language requirement. A basic knowledge of Arabic would be useful, however.

Computer Literacy: Reporting requires a basic understanding of word processing and other programs. All reports are prepared in Microsoft Word 6.0 or higher.

Level of Effort and Duration of the Assignment: The assignment will consist of a week to ten days "in country", that is the duration of program for all instructors. Instructors will be compensated for preparation time in the United States (5 days). Development and implementation of the program through CAFT will take 5-6 months.

Background of Work: The Agriculture-Led Export Businesses project has been developed to increase exports of processed foods from private sector Egyptian food processors. Over the three year life of the project, the goal is to increase exports by some $10,000,000US. This will be accomplished through concerted efforts to enhance marketing, business and technical practices by exporters and potential exporters. The project also seeks to build alliances, links and associations to expand export businesses and improve the health and viability of the Egyptian food processing industry.

To compete in the international market place, especially in Europe, the United States or Japan, processors of frozen foods must be able to manufacture high quality products under the basic Good Manufacturing Practices described in Codex and other regulations, such as 21 CFR Part 110 in the United States. They must also be able to adequately document practices to assure safety, wholesomeness and quality. Processors wishing to distribute low-acid or acidified foods in hermetically sealed containers internationally need to take steps to assure that their products are safe. This program addresses these safety concerns. It is a mandatory program for all U.S. packers of low-acid and acidified canned foods, and those wishing to ship into the United States.

Work Activities: The objective of this task is to bring the second Food and Drug Administration (FDA) sanctioned Better Process Control School to Egypt. The ultimate goal will be a sustainable program within Egypt offered through a recognized food science department within the country.

The specific role of the instructors and partner shall be;

1. The Center for Advanced Food Technology shall work with the Food Processors Institute (FPI) and FDA to lay the ground work for the program. They shall submit quarterly reports on progress to the Task 2 leader.

2. CAFT and the Task 2 leader shall select speakers for the program.

3. CAFT shall make all purchases of materials from FPI required for the program.

4. CAFT shall coordinate travel for all instructors. The Task 2 leader shall make arrangements for them as "in country".

5. Instructors shall give the required lectures following FDA guidelines and assist with grading of examinations. They shall also work with students during the program.

Reporting: All reports shall be submitted in hard copy and electronically to Mr. Stier. Reports shall be prepared using MICROSOFT Word 6.0 or above in an arial font in an 11 pitch on size A4 paper.

Richard F. Stier
Director, Technical Services
Agricultural Led Export Business

Mr. Tarek Shata _____ Approved _____ Disapproved
CTO

Mr. Dennis Buda _____ Approved _____ Disapproved
COP

BPCS-02.doc
October 18, 2000, RFS

AGRICULTURE-LED EXPORT BUSINESSES (ALEB)

Scope of Work

#12, Dokki Street, 6th Floor, Dokki, Cairo, Egypt

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT — ABT ASSOCIATES, INC.

GLASS PACKAGING EXPERT

Assignment: Task 2, Mr. Rod Frost
Level of Effort: Minimum, 20 days in country, 2 travel days, plus 9 days in the United States
Time In-Country – February 21 – March 15, 2001 (approx)

Desired Professional Qualifications: The consultant shall have a practical understanding of packaging and processing foods in glass, plus a working knowledge of glass handling and evaluation. He or she must have worked in the private sector for at least ten (10) years. An understanding of the practical aspects of processing foods, both low-acid and acidified, in glass jars is a must. The consultant *must* know how to work with processors in a production environment to assure proper evaluation of operations. The consultant needs to understand basic food safety and sanitation practices for the food processing industry. He or she must also have demonstrated an ability to organize materials and present them in a classroom environment.

Education: A minimum of a B.S. degree in food science or a related discipline is preferred. Proven practical experience may be substituted for educational requirements.

Language: There is no language requirement. A basic knowledge of Arabic would be useful, however.

Computer Literacy: Reporting requires a basic understanding of word processing and other programs. All reports are prepared in Microsoft Word 6.0 or higher.

Level of Effort and Duration of the Assignment: The assignment will consist of a minimum of two in-country phases, each lasting 3-4 weeks each. There will time allocated (6 days) prior to each trip to prepare training materials and after the return to the United States. The time after the trip (maximum of 3 days) will be used for preparation of final reports. Final reports are due three weeks after departure from Egypt.

Background of Work: The Agriculture-Led Export Businesses project has been developed to increase exports of processed foods from private sector Egyptian food processors. Over the three year life of the project, the goal is to increase exports by some $10,000,000US. This will be accomplished through concerted efforts to enhance marketing, business and technical practices by exporters and potential exporters. The project also seeks to build alliances, links and associations to expand export businesses and improve the health and viability of the Egyptian food processing industry.

To compete in the international market place, especially in Europe, the United States or Japan, processors of frozen foods must be able to manufacture high quality products under the basic Good Manufacturing Practices described in Codex and other regulations, such as 21 CFR Part 110 in the United States. They must also be able to adequately document practices to assure safety, wholesomeness and quality. Products packaged in glass are perceived throughout the world as being of high quality because of the clarity of the glass package. The Industry Rapid Analysis (IRA), plus information gathered through other GTG partners, such as IESC, indicate that there is a need to upgrade the glass packaging and procesing industry here in Egypt.

Work Activities: The objective of this task is to enhance the quality and safety of foods being packaged in glass throughout Egypt. This shall be accomplished through working with the industry directly and in a classroom environment. There will be several visits as part of this project to work with processors and assess progress made by those visited on earlier trips.

The specific role of the consultant shall be;

1. Lecture in technical programs on specific topics in the areas of glass processing. The Task 2 leader will work with the consultant to develop the program. Time will be provided to prepare these materials prior to departure. Any materials previously developed by the consultant and used in the program shall be clearly marked that these are the property of the consultant and that permission for their use in this project only is granted to USAID and ALEB by the author.

2. Visit private sector processors packing in glass or expressing an interest in glass packing, evaluate practices and offer suggestions as to improving operations.

3. Visit private and public sector manufacturers of glass for the food industry. Evaluate manufacturing operations and their commitment to technical support and customer service.

4. Evaluate feasibility of establishing a glass packaging research facility at local universities of research centers.

5. Prepare trip reports for each site visit that includes recommendations for improvement. These will be shared with the client. Each trip report shall include a cover memorandum to the Task 2 leader that will not be included in the report to the client.

6. Recommend other "in country" activities once the consultant has gained an understanding of the situation.

7. Recommend to ALEB means to improve or modify programs.

8. Work with other Task Leaders while in country in the areas of marketing, business and association development as required.

9. Prepare a summary report at the end of the in-country portion of the project.

During the first visit, the consultant will focus on working with processors to evaluate and make recommendations for upgrading glass pack operations. The second visit will continue with this activity, but will also serve to evaluate progress in operations visited the first trip.

Reporting: All reports should be submitted in hard copy and electronically to Mr. Stier. Reports shall be prepared using MICROSOFT Word 6.0 or above in an arial font in an 11 pitch on size A4 paper. Trip reports should be prepared while in-country and submitted prior to departure. The summary report and all other reports shall be submitted within three weeks of the departure from Egypt.

Richard F. Stier
Director, Technical Services
Agricultural Led Export Business

Mr. Tarek Shata_____ _____
CTO Approved Disapproved

Mr. Dennis Buda_____ _____
COP Approved Disapproved

GLASS-02.doc
OCtober 24, 2000, RFS

REGISTRATION INFORMATION

Name _____

Title _____

Company _____

Address _____

_____

TEL _____

FAX _____

Email _____

Attendees may register by calling in or faxing this registration to ALEB. They may also register on-site. Please let us know if you plan to attend so that we can plan appropriately.

There will be a registration fee of 400LE for this program. Checks shall be made out to "Agriculture Led Export Businesses or ALEB. Registrants will receive a manual, coffee breaks morning and afternoon on each day and lunch each day.

For further details, contact:

Agriculture Led Export Businesses (ALEB)
12 Dokki Street
Dokki, Cairo, EGYPT
TEL 202-348-0728/338-1445
FAX 202-348-0729

Requirements for Certification

Each person planning to be certified as a supervisor of a special thermal processing system or systems must attend the lectures and pass the examinations for those specific subjects in addition to the lectures and examinations on the following subjects:

1. Food Microbiology of Canning
2. Food Container Handling
3. Food Plant Sanitation
4. Records for Production Protection
5. Principles of Thermal Processing
6. Process Room Instrumentation, Equipment, & Operation

Each person wishing to be certified only as a supervisor of container closure inspection is required to attend the lectures and be examined on the subjects in the first list above (except 6) and one or both of the following, depending upon the type of closure to be inspected:

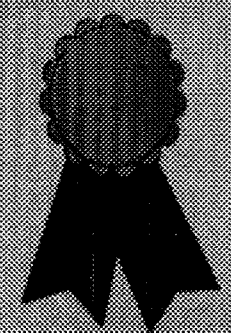
7. Closures for Metal Containers
8. Closures for Glass Containers

While it is not required that all participants attend all lectures on the subjects, we encourage attendees to do so. Any person who attends all lectures and passes the associated examinations will be certified as a supervisor for the operations covered by the examinations whether they will be working in these areas or not.

Certification

It is the responsibility of Virginia Polytechnic & State University to identify to the U.S. Food and Drug Administration the names and employers of those persons who satisfactorily complete this course of instruction and to identify which thermal processing systems and/or container closure operations have been completed. The unsatisfactory completion of any portion of the course will not be reported to the Food and Drug Administration. Certificates of completion will be prepared and mailed to each person who successfully completes the course.

BETTER PROCESS CONTROL SCHOOL



FDA/USDA APPROVED SCHOOL FOR PROCESSORS OF LOW-ACID & ACIDIFIED FOODS PACKAGED IN HERMETICALLY SEALED CONTAINERS

A PROGRAM SPONSORED BY THE DEPARTMENT OF NUTRITION & FOOD TECHNOLOGY (ALEXANDRIA), & VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY (BLACKSBURG, VA) & CO-SPONSORED BY AGRICULTURE LED EXPORT BUSINESSES PROJECT (ALEB) & THE CENTER FOR ADVANCED FOOD TECHNOLOGY

February 25 – March 1, 2001 at the Cairo Marriott, Zamalek – 9.00 AM

USAID PROJECT NO. 263-0264

BETTER PROCESS CONTROL SCHOOL

COURSE OUTLINE

Sunday, February 25

9:00 - 9:30 Registration
9:30 – 10:30 Objectives of the School – Dr. Dennis Dignan
10:30 – 1:00 Microbiology (incl. Exam) - Omara
1:00 -2:00 Lunch
2:00 -3:30 Acidified Foods (incl. Exam) - Omara
3:30 - 5:00 Container Handling (incl. Exam) Stier

Monday, February 26

9:00 - 11:00 Food Plant Sanitation (incl. Exam) Lopez- Garcia
11:00-1:00 Records for Product Protection (Exam) Ahmed
1:00-2:00 Lunch
2:00 - 3:00 Principles of Thermal Processing (Exam) Lopez-Garcia
3:00 – 5:00 Process Room Operations, etc. (Exam) Ismail

Tuesday, February 27

9:00-11:00 Still Retorts, Pressure Processing in Steam (Exam) Lopez-Garcia
11:00 - 1:00 Still Retorts, Pressure Processing with Overpressure Frost (Exam)
1:00- 2:00 Lunch
2:00- 4:00 Metal Closure (Exam) Marcy
4:00-6:00 Glass Closure (Exam) Frost
6:00 Retakes as needed

Wednesday, February 28

9:00- 11:00 Hydrostatic Retorts, Continuous Container Handling Marcy (Exam)
11:00- 1:00 Agitating Retorts, Continuous Container Handling Stier (Exam)
1:00 - 2:00 Lunch
2:00- 4:00 Agitating Retorts, Discontinuous Container Handling Marcy (Exam)
4:00-6:00 Aseptic Processing (Exam) Marcy
6:00 Retakes as needed

Thursday, March 1

9:00-11:00 Closure for Semi-rigid and Flexible Containers (Exam) Marcy
11:00- 1:00 Tutoring and Retakes as needed ALL FACULTY
1:00-2:00 Lunch
2:00-6:00 Process Filing Workshop All Faculty

Regarding Examinations

Experience with the Better Process Control Schools has shown that the examination on each subject covered in the course of instruction should be given immediately following the lecture and group discussion for that subject. For this reason, examinations will be given at appropriate intervals throughout the school and graded as quickly as possible so that students may be fully aware of their position.

FACULTY

- *Mr. Rod Frost, California Glass Company*
- *Dr. Hanaa Ismail, Dr. Adel Omara, & Dr. Mahmoud El Tawilah, Depart. of Nutrition & Food Technology, University of Alexandria*
- *Mr. Dennis Dignan, USFDA*
- Dr. Joseph Marcy, Virginia Polytechnic Institute & State University
- *Rebeca Lopez-Garcia, LOGRE International Food Science Consulting*
- *Mr. Richard Stier & Morad Ahmed, ALEB*

MORE INFORMATION CONTACT

Richard F. Stier
Director, Technical Service
Morad S. Ahmed
Co-Director, Technical Service
Agriculture Led Export Businesses (ALEB)
12 Dokki Street, 8th Floor
Dokki, Cairo
TEL 02-336-1445 (six lines)
FAX 02-348-0729
EMAIL rstier4@egyptonline.com
Morad@egyptonline.com

- February 25 – March 1, 2001 at the Cairo Marriott

REGISTRATION INFORMATION
GLASS II

Name _____

Title _____

Company _____

Address _____

_____

TEL _____

FAX _____

Email _____

Attendees may register by calling in or faxing this registration to ALEB. They may also register on-site. Please let us know if you plan to attend so that we can plan appropriately.

There will be a no registration fee for this program. Registrants will receive a course notebook, coffee breaks morning and afternoon on each day and a certificate of participation.

For further details, contact:

Agriculture Led Export Businesses (ALEB)
12 Dokki Street
Dokki, Cairo, EGYPT
TEL 202-348-0728/336-1446
FAX 202-348-0729

PACKAGING IN GLASS PART: WORKING WITH SERVICE FIRMS

A WORKSHOP IN A SERIES SPONSORED BY THE AGRICULTURE LED EXPORT BUSINESSES PROJECT (ALEB) CAIRO, EGYPT

THE CENTER FOR ADVANCED FOOD TECHNOLOGY PISCATAWAY, NJ, USA

USAID Project No. 263-0264

- February 20, 2001 at 10:00 at the ALEB Offices, Dokki, Cairo

PACKAGING IN GLASS PART II WORKSHOP WITH SERVICE FIRMS

INTRODUCTION

Glass is one of the most commonly used packaging materials for preserved foods. Glass packed products denote quality in that it allows the consumer to see what is in the container. There are many different styles and shapes of glass containers.

Any processor who commits to packaging in glass must make a commitment to quality and container handling. An integral part of this should be support from the glass supplier, a situation that is not too common in Egypt.

Mr. Rod Frost, an internationally known expert in glass, will present a programs on glass packaging on March 6, 2000 at the ALEB offices. Mr. Frost worked for Owens-Illinois for many years and is now working with the California Glass Company.

PROGRAM OUTLINE

The following topics will be addressed during the program:

- Introduction to Glass Making (Includes a video)
- What to Look for in a Glass Supplier
- Selecting the Proper Glass for Processing and Markets
- Processing Foods in Glass
- Glass Handling and Packing
- Examination of Glass for Integrity
- Specialty Glass

Mr. Frost will be arriving in Egypt in March to teach an FDA sanctioned Better Process Control School. He will also be visiting food processors packaging in glass. His mission will be to assist the processors with their concerns and to improve the quality of glass-packed products in Egypt.

INSTRUCTOR

Mr. Rod Frost
California Glass Company
155 – 96th Avenue
Oakland, CA 94603
TEL (510) 635-7700
FAX (510) 635-4236
EMAIL alglass.mis@worldnet.att.net

FOR MORE INFORMATION CONTACT:

Richard F. Stier
Director, Technical Services
Morad S. Ahmed
Co-Director, Technical Services
Agriculture Led Export Businesses
ALEB
12 Dokki Street, 6th Floor
Dokki, Cairo
TEL 02-348-0729/338-1445
FAX 02-348-0729
EMAIL rstier4@exportonline.com
Morad@exportonline.com

- February 20, 2001 at 10:00 at the ALEB Offices, Dokki, Cairo

ALEB Training Event Information

Course Name: **Better Process Control School 1**

Start Date: **25-Feb-2001**

Instructor: Frost, Ismail, Tawila, Dignan, Marcy, Garcia, etc.

Dates:

Date	Start Time	End Time	Location
25-Feb-2001	10:00 am	5:00 pm	Marriott Hotel
26-Feb-2001	10:00 am	5:00 pm	Marriott Hotel
27-Feb-2001	10:00 am	5:00 pm	Marriott Hotel
28-Feb-2001	10:00 am	5:00 pm	Marriott Hotel

Notes:

Attendees:

Name	Company	Paid	EAGA
Mr. Desouky Shehata	Americana Group - Egyptian Canning Co.	☐	☑
Mr. Mohamed Atef Mahmoud	Edfina Co. for Preserved Foods	☐	☐
Mr. Magdy Fahmy Mohamed	Enjoy - Nile Co. for Food Industries	☐	☑
Mr. Essam Sobh	Farm Frites - International Co. for Agricultural Development - Americana Group	☐	☑
Dr. Nadia Mokhtar	Food Technology Research Institute - FTRI	☐	☐
Dr. Ghada Moustafa Midany	Food Technology Research Institute - FTRI	☐	☐
Dr. Ashraf Ibrahim	Food Technology Research Institute - FTRI	☐	☐
Mr. Sameh Kassem	Greena for Food Production & Export S.A.E. (El Badrawi Group)	☐	☐
Mr. Amr Mostafa	Greena for Food Production & Export S.A.E. (El Badrawi Group)	☐	☐
Mr. Mohamed Gaber	Greena for Food Production & Export S.A.E. (El Badrawi Group)	☐	☐
Mr. Moustafa Mahmoud	Heinz - Cairo Food Industries - Americana Group	☐	☑
Ms. Mona El Bakery	Sekem - ISIS - Hator - Libra	☐	☑
Mr. Mahmoud Fatouh Al Sayed Allam	Viva - EDAFCO - Egyptian Dairy & Foodstuff	☐	☑

Number of Attendees: 13

ALEB Training Event Information

Course Name: **Packaging in Glass 2**

Start Date: **20-Feb-2001**

Instructor: Rod Frost

Dates:

Date	Start Time	End Time	Location
20-Feb-2001	3:00 pm	6:00 pm	ALEB Office

Notes:

Attendees:

Name	Company	Paid	EAGA
Mr. Modather A. Nour	Al Mostakbal Co. for Printing & Corrugated Board, S.A.E.	☐	☐
Dr. Mona Mohamed Abd El Magid	Cairo University, Faculty of Agriculture	☐	☐
Mr. Emad Aziz	Coca Cola	☐	☐
Mr. Mohamed Anani	Coca Cola	☐	☐
Mr. Abou El Ala Ahmed	Coca Cola	☐	☐
Mr. Abdallah Ahmed Eid	Coca Cola	☐	☐
Ms. Nadia Moustafa Afifi	Egyptian Export Promotion Center	☐	☐
Eng. Mohamed Fathy El Samahy	El Samahy Pickles - Continental Trade Company	☐	☐
Eng. Amgad Ahmed El Kady	Food Technology Research Institute - FTRI	☐	☐
Ms. Raux Delphine	French Trade Office	☐	☐
Mr. Abdel Razek Afifi Mohamed	International Trade Point of Egypt	☐	☐
Mr. Ahmed Hassan Ibrahim	International Trade Point of Egypt	☐	☐
Mr. Ismael Mostafa Ahmed	Ministry of Commerce	☐	☐
Mr. Mohamed Salwaa Salem Ibrahim	Nestle Co.	☐	☑
Mr. Mohamed Saleh Nigm	New Salheya Olive Oil Mill	☐	☐
Mr. Sanad Aly	New Salheya Olive Oil Mill	☐	☐
Mr. Ibrahim Ahmed Mohamedain	New Salheya Olive Oil Mill	☐	☐
Mr. Mohamed Farid Abd El Monem Farid	P & J (Paste & Juice) Co.	☐	☐
Mr. Medhat Amer Moussa Eissa	SONUT - Societe Nationale D'Industries Nutritive	☐	☑
Mr. Saad El Din Sayed Galal	The Nile Co. for Paper	☐	☐

Number of Attendees: 20

The Coca-Cola Bottling Companies of Egypt

The Technical Department

To:	**Richard F. Stier**	**From:**	**Khaled El-Korety**
Location:	**ALEB**	**Location:**	**ABI plant**
Fax:	**023480729**	**Fax:**	**034480057**
C.c.:	**Morad S. Ahmed** **Ihab Abdel-Rahman**	**Date:**	**12/3/01**

Subject: **The attendance names of Glass Packaging Work Shop**

Name of attendees

Plant Name	Attendee : Name / Title	
	QA Manager	QC Manager
ABI	Mohamed Hany Abed	Emad Shoukry
Tanta	Sayed Ismail	Refat El Sysy
CBI	Abdalla Eid	Emad Aziz
Kaliub	Mohamed Anani	Abo El Ala Ahmed
Mansoura	Amany Saafan	Awad El Emam
Zagazig	Maher Ismail	Samir Metwaly
Suez	Hassan Hamad	Mohamed Salah
Ismailia	-	Gamal Awad
Beni-Suef	-	Mahmoud Osman
Assuyt	-	Abd El Rahman Tawfik
Aswan	-	Fouad Said
Glass Plant	Name	Title
El-Nasr Glass	Mohamed Abel Gabber	QC Manager
	Rabeh Konsoa	Production Manager
MEG	Youssef Mohamed	Plant Manager
	Fathy Amin	QC Manager
Central Lab.	Name	Title
	Hesham El-Lamei	Packaging Manager
	Amina Mahmoud Hakam	Supplier Survey Manager
	Ahmed El-Assal	Raw Material Manager
Coca-Cola Egypt Head Quarter	Name	Title
	Ihab Abel-Rahman	Group QA Manager
	Akram El-Gabas	Packaging Manager
	Khaled El Korety	Quality System Manager

Chemist

Fathy Mohamed Amin

Quality Control Manager

Middle East Glass Manufacturing Company

asr City - 6 th Industrial Zone - P.O.Box : 2819 El Horria - Heliopolis
: 2624303 - 2624304 - 2624305 Fax.: 2624302 - Tlx.: 20534 MEG UN

Coca-Cola Egypt

Akram El Gabbas

Region Packaging Engineer

P.O. Box 7052, Eighth District, Free Zone, Nasr City, Cairo, Egypt 11471
Tel.: (20-2)271-8820 - Fax: (20-2)271-8828

TADI
MARIOUT
TDC

Ibrahim Boctor B.S. c. (Prod. Eng)
Member of the Board.

452 EL Horreya st. Roushdy
Alex.Egypt
Phone (++ 203) 4592286
Fax . (++203) 5430321
Mobile (++ 2012) 2166234
E. mail : hitady @ tecnine . com . eg.

Coca-Cola Bottling Company of Egypt

Ihab Abdel Rahman

Quality Assurance Manager

25, Ahmed Hoany St., Nasr City, Cairo, Egypt
Tel. : (202) 4045815 Fax: (202) 4018720 Mob. 012 / 3112478
P.O.Box 7108 Postal Code : 11371

Sonut

Société Nationale D'Industrie Nutritive S.A.E.

Mouna Elsaa
Quality Control Manager

Factory :
Sadat City - Regional Road
Tel. : (049) 602546
Fax : (049) 602531

The Coca-Cola Bottling Companies of Egypt

Khaled M. El Korety

Quality System Manager

P.O.Box 880, Alexandria
2169

E-mail : K_elkorety@tccbos.com

Tel.: (03) 4483414/88
Ext. : 3741
Mob. : 012 / 3795741
Fax. : 03 / 4480057

Coca-Cola Egypt

Sherif Tobala
Region Technical Manager

P.O.Box 7052, Eighth District, Free Zone, Nasr City, Cairo, Egypt 11471
Tel.: (20-2) 271-8820 - Fax : (20-2) 287-7620

TO: Rick Stier

FROM: Rod Frost

Trip Report:	HEINZ, 6th of October City February 20, 2001
For ALEB:	Rick Stier, Rod Frost
For Price Waterhouse:	David Neubert, Assessment Team
	HI TADI, Borg El Arab
For ALEB:	Rod Frost, Morad Ahmed
For Price Waterhouse:	David Neubert, Assessment Team
For Hi Tadi:	Mr. Ibrahim Boktor
	WADI FOODS, Cairo, Alex, Desert Road
For ALEB:	Rod Frost
For Price Waterhouse:	David Neubert, Assessment Team
	FARAGALLA, New Borg EL Arab City
For ALEB:	Rod Frost, Morad Ahmed
For Price Waterhouse:	David Neubert, Assessment Team
	SONUT, Sadat City
For ALEB:	Rod Frost
For Price Waterhouse:	David Neubert, Assessment Team
For Sonut:	Mousa Eissa, Quality Control Mgr.

Summary of Visits:

The plant visits made with the assessment team members having special interests were not conducive to productive discussions of problems we could help with. It does not appear possible to combine task evaluations and technical discussions in the same visits.

The various managers were generally friendly, although guarded with their answers to many questions that were difficult to answer or unreasonable to even discuss.

I tried to maintain a very low profile in these joint visits to prevent loosing the good relationships we have established in past visits.

April 4, 2001

Mr. Mohammed Aboul Ezz
Heinz Egypt
Industrial Zone No. 2
6th of October City

Dear Mohammed:

Many thanks to you and your colleagues for the hospitality extended to Rod Frost, David Nueberg and myself when we visited with you back in February. When we set the visit, I had hoped that Mr. Frost would have had unlimited time to work with your people on glass related issues. Unfortunately, the majority of the focus was on Mr. Nueberg's quest for information. We did learn a few things, however. For instance;

1. Glass Breakage Reduction – We were pleased to learn that you are saving approximately $60,000 per year due to reduced glass breakage as a result of Mr. Frost's advice.

2. Hot Sauce Issues – We also welcomed the news that Dr. Tom Butterworth's advice with regards to your hot sauce eliminated the problems with deposits in the neck of the bottle.

3. Grading – Finally, we were pleased to learn that Mr. Dennis Spink's grading workshop has helped you upgrade your field grading operations. We hope that the disk that Dr. Diane Barrett provided will help further upgrade field operations and lead to better yields.

Mohamed, it is a pleasure working with you and your people. We are glad that we have been able to help in the past and hope to continue to do so in the future. If there are any questions or we can provide any additional information, please let either Eng. Morad or myself know.

Finally, we are enclosing a copy of Mr. Frost's most recent presentation. If you would like a copy of the slides in Arabic to do in-house training, please let us know.

Thanks again.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

PACKAGING IN GLASS: A HIGH VALUE PACKAGE FOR WORLD MARKETS

Mr. Rod Frost
California Glass Company
Hayward, CA

WHAT MAKES GLASS STRONG!

- Round shape
- Even glass distribution
- Good surface treatment

WHAT MAKES A GLASS CONTAINER WEAK

- Sharp corners
- Uneven glass distribution
- Small contact areas
- Poor surface treatment
- No surface treatment
- Damage - i.e., scratches

GOOD & BAD SHAPES

- Good - Straight sides, good contact areas, low profile
- Bad - Tapered, oval, diamond, sharp contacts, tall profile

ADVANTAGES OF SURFACE TREATMENTS

- Retain strength of new container
- Reduce friction on line - low line pressure
- Prevent minor abuse (impacts)
- Reduce scratching
- Good label surface with tin + poly

GLASS MANUFACTURING SCHEDULES

- Long runs = high profits
- Working with manufacturers lowers their costs and yours

COST SAVINGS OF LONG RUNS

- Some "stock" items are less expensive because of long runs
- Work with manufacturer to make glass in "off" season, not during their "rush" times
- Negotiate warehouses costs -

COOPERATE

PRICING OF CONTAINERS

- Weight of glass
- Process used in forming
- Shape of container
- Cycle time of forming
- Length of production runs

STOCK CONTAINERS

- Long runs = lower costs
- Lighter weights = lower costs
- Advantages of frequent glass runs
- Available from "stock" inventory
- No warehousing charges

PRIVATE DESIGN MOLDS

- Requires close inventory
- Marketing tool
- Could (and probably is) more expensive than "stock"

BOTTLE CAPACITY CALCULATIONS

- Overflow vs. fillpoint capacity
- Headspace needed (weight vs. volume, etc)
- Manufacturing variations (tolerances)
- Filling machine variations
- Product variations (specific gravity, etc.)
- Dry products - Nuts, spices, snacks

TYPE OF SUBSTANCE TO BE PACKED

- Liquid - Hot fill, cold fill
- Dry
- Carbonated

PROCESS REQUIRED

- Hot fill and cool
- Cold fill & pasteurized
- Preservative
- High temperature retort

CHOOSING A CLOSURE

- Vacuum
- Pressure (crowns, roll-on, metal, etc)
- Metal (CT or Lug)
- Plastic
- Machine application
- Hand application

COLOR OF GLASS DESIRED

- Clear
- Amber - Light protective
- Green
- Blue
- Other

SPECIAL REQUIREMENTS

- Special shapes
- Pour out fitments
- Cost limits (competitive pricing)
- Design for vacuum machines
- Pressure limits

LABELING OR DECORATING PLANS

- Round, square, hex, tall, short
- ACL, decals, pressure sensitive labels

LEGAL RESTRICTIONS

- Standard capacities, e.g., wine @ 375 & 750 ml
- Label by weight or volume?
- Net or drained weight vs. total weight

PACKAGING FOR EXPORT

- Labeling requirements may vary in different countries
- Metric vs. English systems
- Consumers may want different sizes or different packages for their markets, e.g., TetraPak
- Test Marketing - Market research may be useful

BOTTLE BREAKAGE

- Quiet production lines
- Control of bottles on the line
- Surface treatment!!!
- Examine broken bottles to determine the reason for failure, than find the source of the damage.

PRODUCTION LINE PROBLEMS

- Control of containers at all times!
- Timing of conveyors and machines (minimum speeds)
- Proper maintenance of equipment (bolt heads, transfers)
- No glass to metal contacts
- Star-controls must be designed for each bottle!!! One size does not work for all

SUMMARY

- Work with your supplier
- It will save you both money
- Work with fellow glass packers to increase runs
- you are stronger together than alone

April 4, 2001

TEL 011-334-315
FAX 011-334-317

Mr. Paul Mueller
Golden State Foods – Egypt
Place 321, First Industrial
6th of October City

Dear Paul:

Many thanks to your staff for the hospitality extended to Rod Frost, David Nueberg and myself when we visited with you back in February. When we set the visit, I had hoped that Mr. Frost would have had unlimited time to work with your people on technical issues. Unfortunately, the majority of the focus was on Mr. Nueberg's quest for information. Mr. Frost expressed his frustration to me that he wasn't able to spend more "*quality time*" with the technical people. He was, however, very impressed with your operation. He also felt that the energy and obvious caring about their work of people like Sherif, Magdy and Yasser boded well for success.

This was my first visit to the plant, and I felt that it was quite useful in that I was able to learn first hand about the positive effects of what we have been doing. The benefits that were cited included the following;

1. Filtration Systems – The visit to the United States last June helped with implementation of a program to install filters and an air system that maintains positive pressure in the plant.

2. UV Light Systems – You are now using UV lights to treat air.

3. Commitment to a Pilot Facility – The visit to the CAFT FMT facility in Piscataway, New Jersey has provided the impetus to develop your own pilot facility.

4. HACCP – The ALEB HACCP classes have helped you upgrade your HACCP programs.

5. Pest Management – The pest management programs taught by Mr. Jim Bowyer and his visits have helped you upgrade your pest control programs. We were also told that improved pest management programs played a major role in your winning the contract with the Tricon Group in the Middle East. Congratulations on this. I would guess, from what Magdy said, that you are getting close to your first shipments.

6. Sensory Lab – Dr. Katie Feicht's workshop on sensory analysis has helped to "*put the wheels in motion*" to construct better facilities for doing sensory testing.

One area of concern was the quality of films that can be obtained locally. Mr. Bob Cirrito is in the country now, and may be able to help. Feel free to contact him via the ALEB offices or leave a message at the Marriott Hotel (735-8888).

The only suggestions that I would make would be;

- Placards – Mount wall placards above the traps in the plant so that it is easier to find them.

- Coving – This would be somewhat of a project, but if the wall/floor junctures in the processing area could be coved, cleanup might be a little easier.

Tell everyone, "*Thanks for their hospitality.*" It was a pleasure to visit (finally).

As always, should you have any questions or require any additional information, please do not hesitate to call Eng. Morad Ahmed or myself.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

April 5, 2001

Mr. Ahmed Megahid
Paste & Juice Company
4th Industrial Zone
Land 50A
P.O. Box 49
Sadat City

Dear Mr. Ahmed:

Many thanks to you and your colleagues for taking the time to work with Mr. Rod Frost and the assessment team during their visit in February. Mr. Frost was quite pleased to be able to "*get away*" from the discussions involving the assessment team and work directly with you. I have enclosed a copy of his report for your review. The majority of his suggestions dealt with improving glass quality. I have also enclosed a copy of the slides from the presentation that Mr. Frost gave on glass. If you would like a copy of these slides in Arabic for conducting your own in-house training programs, please let us know.

1. Brighter Lights Above Dump Station – The installation of brighter (and shielded) lights in this area would help your staff remove defects.

2. Inspection Station – Installation of a light inspection station after the dump station would allow staff to remove defects. These defects should be retained and returned to the glass manufacturer to determine why they are not "catching" these defects in their own operations.

3. Glass Surface Treatment – Paste & Juice must modify their specifications to include a surface treatment or coating. It will help reduce breakage in the glass manufacturer's operation and in your own plant.

4. Retention of Defective Bottles – Keeping defects will serve two purposes. They can be used to train your own staff on what is and is not acceptable, and, as noted above, can be returned to the manufacturer.

5. Reuse of Jars – Mr. Frost warns against the reuse of jars. This is a practice that could create problems if you do not control washing process.

It was also good to confirm the Mr. Frost's previous advice on the steam controls has been beneficial.

Thank you again for your time. We sincerely hope that you will find these suggestions to be useful. Should you have any questions or require any additional information, please do not hesitate to call Eng. Morad Ahmed or myself.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

TO: Rick Stier

FROM: Rod Frost

Trip Report: Paste & Juice, 4th Industrial Zone, Sudan St., Sadat City - February 21, 2001

For ALEB: Rod Frost
David Neubert - Price Waterhouse

For P & J: Ahmed Megahid, Quality Assurance Mgr.
Production Managers, et. al.

Summary of Visit:

This meeting was arranged for the assessment team to gather information. I was able to tour the production line and discuss several subjects with their quality and line personnel.

They have had many problems with glass defects that affect the vacuum sealing of their jars. Many of the defects they are receiving should be removed by the manufacturer before shipping. We discussed the types of inspection machines used in glass plants for selecting and removing defects.

I suggested they should discuss their poor quality problems with their suppliers and then insist on plant visits when their jars and bottles are being manufactured.

Saving defective bottles to discuss with their suppliers will help improve quality.

The installation of glass plant type selecting equipment would only delay putting the responsibility of providing good quality on the manufacturing plants, where it belongs.

We also discussed improved inspection and cleaning of empty containers in the line between the glass dumping table and the steam pre-heating tunnel. Brighter lights above pallets of empty glass and an inspection light station following the dump station when bottles are dry would enable the quality staff to remove many defective containers before they are filled.

These line changes would require moving some machinery and conveyors, however, the removal of containers with critical defects before they are filled will save money and improve the product quality.

The defects found in the incoming glass should be saved and returned to the glass plant to find out why they are not being removed in their production lines.

Summary of Visit (contd.)

Continued discussions between consumers and the glass manufacturers will improve quality!

I also suggested they request permanent glass surface treatment to reduce on line breakage and improved quality.

We also discussed their system of emptying jars of paste for QA samples, then rinsing the jars and placing them on pallet trays. The jars are used at the end of the shift. This system could result in problems if it is not controlled very carefully!

The line mechanic reported improved operation in their capping machine because of the modifications we made in the steam controls.

P & J needs a larger warehouse, they had production floor area full of finished product making clean up tasks difficult.

Their plant painting of ceilings and walls in production area has been completed, looking very nice.

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California Glass Company
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SUMMARY

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Agriculture - Led Export Businesses

Supporting Egypt's Processed Foods Export Industry

Abt

April 4, 2001

TEL 382-2425
FAX 383-0166

Mr. Moussa Essa
El Mansoureya Road, after Koki Park
Kerdasa Road
Sankarite Masr Building
Giza, Cairo

Dear Mr. Moussa:

Many thanks to you and your colleagues for the hospitality extended to Rod Frost and David Nueberg when we visited with you back in February. When we set the visit, I had hoped that Mr. Frost would have had unlimited time to work with your people on glass related issues. Unfortunately, the majority of the focus was on Mr. Nueberg's quest for information. Mr. Frost expressed his frustration to me that he wasn't able to spend more "*quality time*" with you and your technical people. He did, however, have an excellent meeting with the Coca Cola people, which helped to eliminate some of this frustration.

As always, should you have any questions or require any additional information, please do not hesitate to call Eng. Morad Ahmed or myself.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

12 Dokki Street, 6th Floor, Dokki, Giza12311, Egypt Tel: (202) 338-1445 (six lines) Fax: (202) 348-0729 E-mail: aleb@aleb.org
A USAID Funded Project, No. 263-0264 – Implemented by Abt Associates Inc.

April 4, 2001

Eng. Yasser Mohamed Fahmy
Wadi Food Processing
El Kodes El Sharif Street, #61
Mohandeseen, Cairo

Dear Eng. Fahmy:

Many thanks to you and your colleagues for the hospitality extended to Rod Frost and David Nueberg when we visited with you back in February. When we set the visit, I had hoped that Mr. Frost would have had unlimited time to work with your people on glass related issues. Unfortunately, the majority of the focus was on Mr. Nueberg's quest for information. Mr. Frost expressed his frustration to me that he wasn't able to spend more "*quality time*" with you and your technical people.

As always, should you have any questions or require any additional information, please do not hesitate to call Eng. Morad Ahmed or myself.

Thank you again for your hospitality.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: Files, M. Ahmed

Agriculture - Led Export Businesses

Supporting Egypt's Processed Foods Export Industry

Abt Associates Inc.

April, 20001

TEL 03-459-3190
FAX 03-459-2044

Mr. Adel Ismail
Faragalla Group
36 Kafr Abdou Street
Alexandria

Dear Mr. Adel:

Many thanks for the hospitality extended to Rod Frost, David Nuebert and Morad Ahmed when they visited with you back in February. When we set the visit, our hope was that Mr. Frost would have had unlimited time to work with you and your staff on technical issues. Unfortunately, the majority of the focus was on Mr. Nuebert's quest for information.

It was pleasant to learn that our consultants have been of value to Faragallah, especially the work that Dr. Katie Feicht has done with your bakery staff. We thank you for the letter confirming this.

Thank you again for the hospitality and continued support of the project. Should you have any questions or require any additional information, please let us know.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, File

12 Dokki Street, 6th Floor, Dokki, Giza12311, Egypt Tel: (202) 338-1445 (six lines) Fax: (202) 348-0729 E-mail: aleb@aleb.org
A USAID Funded Project, No. 263-0264 ~ Implemented by Abt Associates Inc.

April 5, 2001

Mr. Ibrahim Boctor
Member of the Board
Hi Tadi
452 El Horreya Street
Roushdy, Alexandria

Dear Mr. Boctor:

Many thanks to you for the hospitality extended to Rod Frost, David Nuebert and Morad Ahmed when they visited with you back in February. When we set the visit, our hope was that Mr. Frost would have had unlimited time to work with you and your technical people on glass related issues. Unfortunately, the majority of the focus was on Mr. Nuebert's quest for information. Our people did get a chance to take a short tour of the plant, however. This gave us an opportunity to see the new equipment and look at your operations, which Mr. Frost noted are much improved from his previous visit. His report is attached and includes the following suggestions.

1. Lighting – Mr. Frost suggests that the lighting be improved in the packing rooms. Improved lighting will allow your staff a better chance to detect foreign materials. It also makes the work place more pleasant for the workers.

2. Barrels for Storing Glass – You need to change your glass storage methods. Storage in the barrels will result in damage. In fact, as you can see from his report, Mr. Frost observed a number of broken jars. This creates several problems. The first is that you should never pack anything in a damaged bottle. Also, a bottle with a chipped finish will not hold vacuum. The greatest concern is that chips of glass could get into other bottles and make their way into finished product. Such a situation could result in someone being injured. Mr. Frosts suggests storing all jars on trays to prevent damage. We would also suggest that all glass be covered to minimize the potential for contamination.

3. Area Behind the Boiler – Housekeeping in this area should be improved. When trash and debris accumulate, one creates a situation that will attract and harbor pests.

Thank you again for your hospitality. Should you have any questions or require any aditional information, please feel free to contact Eng. Morad Ahmed or myself.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

TO: Rick Stier

FROM: Rod Frost

Trip Report: Hi Tadi, Borg El Arab, Alex
February 22, 2001

For ALEB: Rod Frost, Morad Ahmed

For Price Waterhouse: David Neubert

For Hi Tadi: Ibrahim Boktor

Summary of Visit:

The production area has improved their work stations, compared with our previous visits. The general conditions were better with improved sanitation in the aisles and packing areas.

The plant needs more light in the packing rooms, it is difficult to see any foreign material in the "dark".

Serious problems could result from their use of barrels to store used jars. I found a number of broken jars in the barrel with chipped finishes. These jars would not hold vacuum, and the glass fragments could find their way into finished product.

I suggested they use trays with all jars upright to avoid damage.

There was one pallet of bulk glass in the aisle storage area without a cover, which could easily be contaminated.

Areas behind plant near boiler could be a problem with contamination because of trash accumulation, oil on ground and floor and product in the gutters.

March 12, 2001

Mr. Akram El Gabbas
Quality Assurance Manager
Coca Cola Bottling Company of Egypt
P.O. Box 7052, 8th District, Free Zone
Nasr City, Cairo 11471

Dear Mr. Akram:

I would like to thank you and the entire group at Coca Cola and at Middle East Glass for providing us with the opportunity to work with you. Our hope is that by getting Middle East Glass involved more involved, they will pay more attention to the quality of what they produce, thereby benefiting the whole industry. As you will see from Mr. Frost's attached report, he really enjoyed doing the program. His report summarizes the workshop and many of the issues that were discussed. If you (or Middle East Glass) have made any changes or realized cost savings from Mr. Frost's visit, please let Engineer Morad Ahmed or myself know. This is one of the means by which we can evaluate the efficacy of the services provided by Technical Services.

Mr. Frost has also asked that I send you the enclosed photographs of breakage. He stated in his note to me that, "*They are good illustrations of the damage that we found in their (your) 1 liter Sprite bottles resulting from poor handling in their own plant and in the trade.*"

Thank you again for your support. Should you have any questions or require any additional information, please let us know.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: Files, Ahmed Morad, Ihab Abdel Rahman (Coca Cola)

TO: Rick Stier

FROM: Rod Frost

Trip Report: Glass School meeting with Coca Cola staff and Middle East Glass staff at the Coca Cola plant in Nasr City February 28, 2001

For ALEB: Rod Frost

For Coca Cola: Akram El Gabba, Region Packaging Eng. (Host and interpreter for group)
Ihab Abdel Rahman, Quality Assurance Mgr.
Khaled M. El Korety, Quality System Mgr.
Sherif Tobala, Region Technical Mgr.

For Middle East Glass Mfg. Co.: Fathy Mohamed Amin, Quality Control Mgr.

Summary of Visit:

This was a very good meeting with 28 people from quality and production departments of Coca Cola and Middle East Glass in their training room. We had an additional 12 people from their bottling lines for a walk-through in the plant.

We started the program at their request identifying the origin and cause of breakage in 5 cases (60 bottles) of their 1-liter returnable Sprite bottles. The Sprite bottle is very heavy at approximately 925 grams.

The most common reason for breakage in their samples was impact damage to the finish, shoulder or heel of the bottles. The damage is very likely the result of improper handling in the plant or in the trade.

Heavy returnable bottles with very thick walls are more prone to bruising when impacting other bottles than lighter weight bottles that are more flexible.

We had a very lively discussion on wall thickness as a cause of breakage. The Sprite bottles may have more glass in one side than the other. This does not result in failure or weakness unless the "thin" areas are below minimum specifications.

It is more difficult to blow a perfectly even distribution in these bottles than in lighter weight containers.

Summary: (contd.)

Some of the Coca Cola production staff thought the uneven wall thickness would result in low pressure failure or low energy impact failure. This is generally not the case; I found only one small area on the shoulder of one bottle that may have been considered thin.

We discussed in detail the possible reasons for the impact damage and I demonstrated by breaking some bottle finishes, shoulders and heels. I discussed possible handling problems that could result in shoulder damage, butterfly bruises followed by thermal extension of the break.

I showed the slides from the glass school and the GPI video of proper glass handling.

We had a number of discussions with individual staff members looking for information on specific problems. The following subjects were discussed in these meetings:

1. Problems with "tramp" glass in incoming new glass. This could be caused by slight overrun resulting in very small particles inside of bottles. Perhaps fire polishing should be tried.

2. Bottle rinsing - volume and pressure of water needed for complete rinsing. (6 to 10 oz. of water at 60 psi for each 10 fl.oz. capacity, and enough time for complete drain.)

3. Cap application torques needed for sealing pre-formed closures on glass with bulged finishes or finishes with fins over the thread.

4. Swabbing of molds, new mold materials.

5. Unfilled finishes - causing leakers.

6. Surface treatments - hot and cold.

7. Damaged threads.

8. Thermal breakage - following bruising.

9. Shoulder damage caused by rough handling.

10. Pressure breakage patterns

11. Stones or foreign materials in glass.

Summary: (contd.)

12. Conveyor line designs including dividers for 4 wide to 2 wide and transfers.

13. Conveyor maintenance problems.

14. Worn out bottom plates.

15. Damage to glass from ACL (applied color labeling) decorating oven being too hot.

16. ACL coatings inside of bottles.

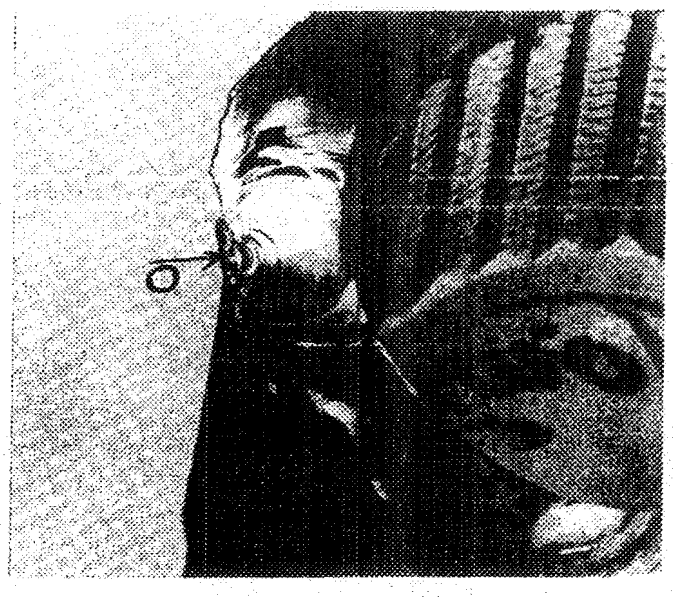
17. How to examine incoming glass for damage or defects.

18. Breakage patterns for bottom checks extended by thermal changes.

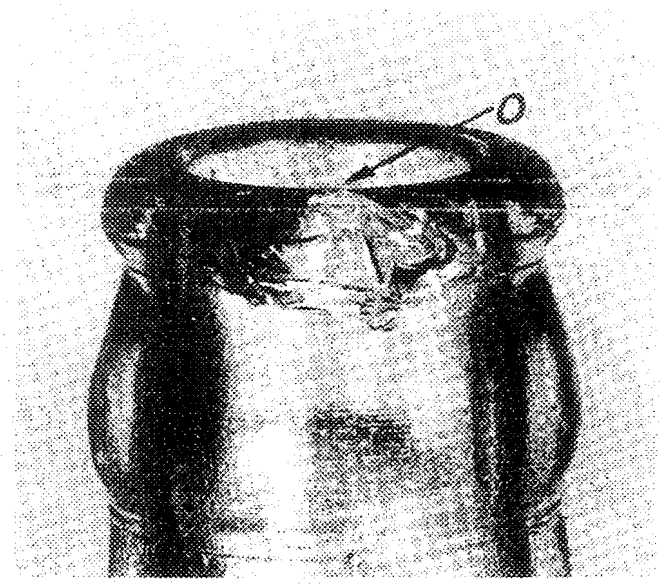
19. The use of black filter paper to evaluate glass particles in incoming bottles.

20. Problem of surface treatment possibly causing foaming when filling bottles. (This is not likely if the treatment is applied correctly - it could be many things.)

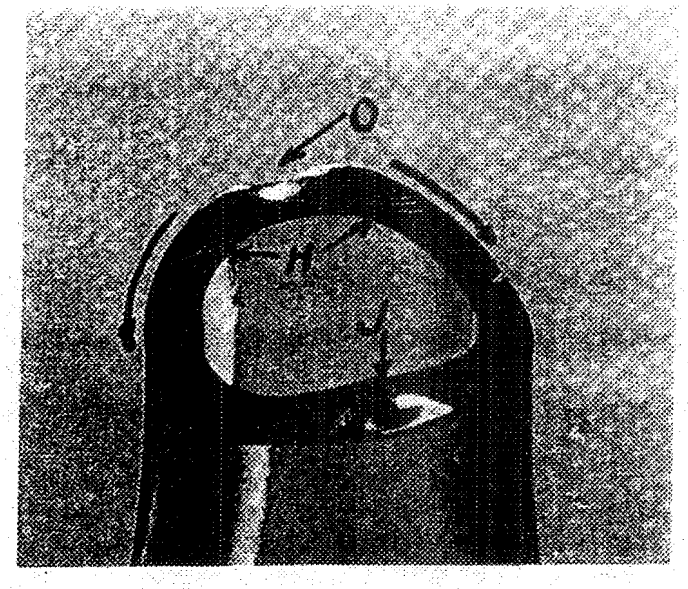
21. One interesting problem we discussed with MEG managers was a white powder found in wine as it was being filled. I believe from our conversation that the winery ran their filter too long, or had a break in the filter pads forcing filter aid into the finished product. I told him how to confirm this possibility.



UPWARD IMPACT UNDER FINISH OF DAIRY ORANGE JUICE BOTTLE Note origin (O) and wave fronts radiating from it.

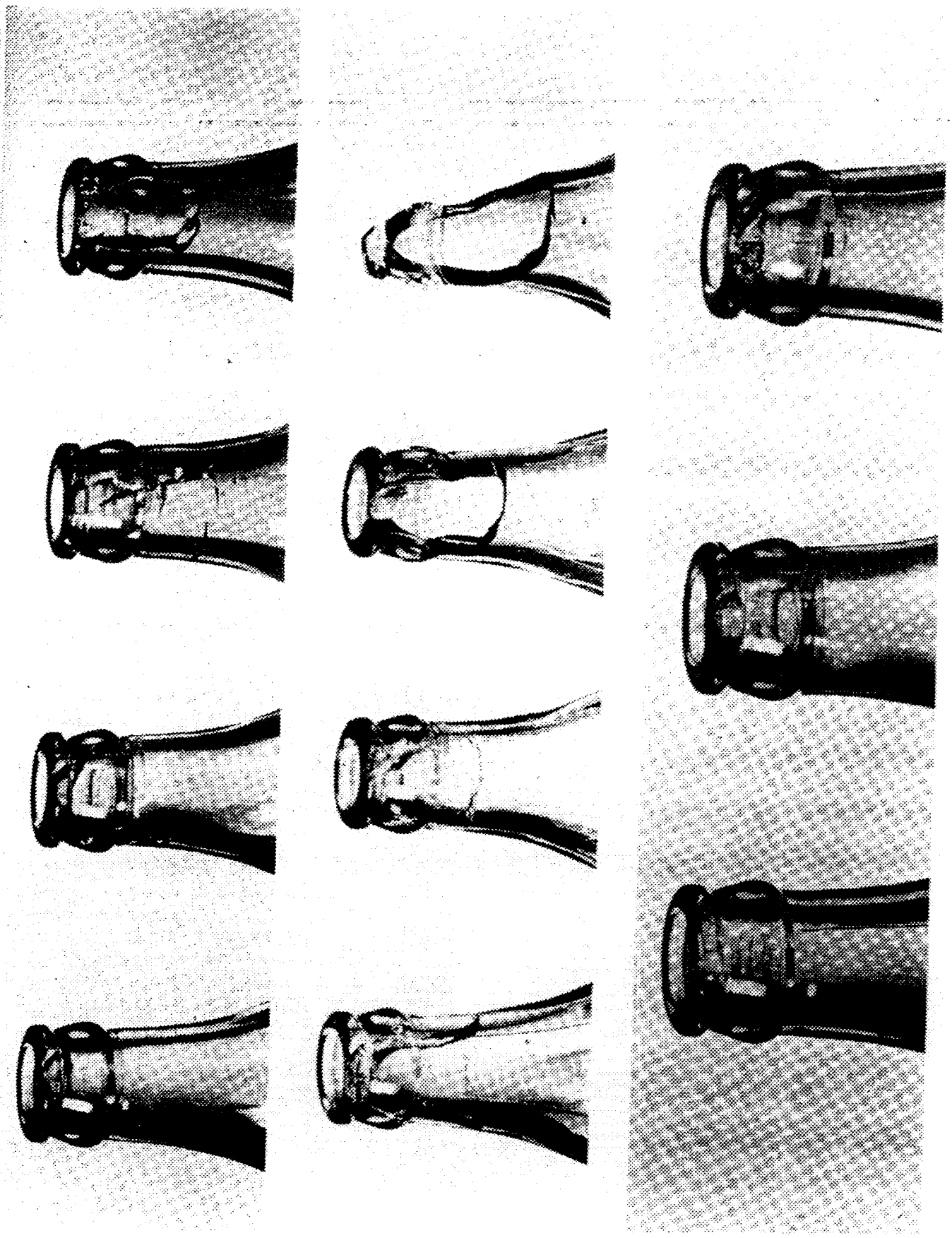


VERTICAL IMPACT FROM ABOVE FINISH. Origin marked by (O).

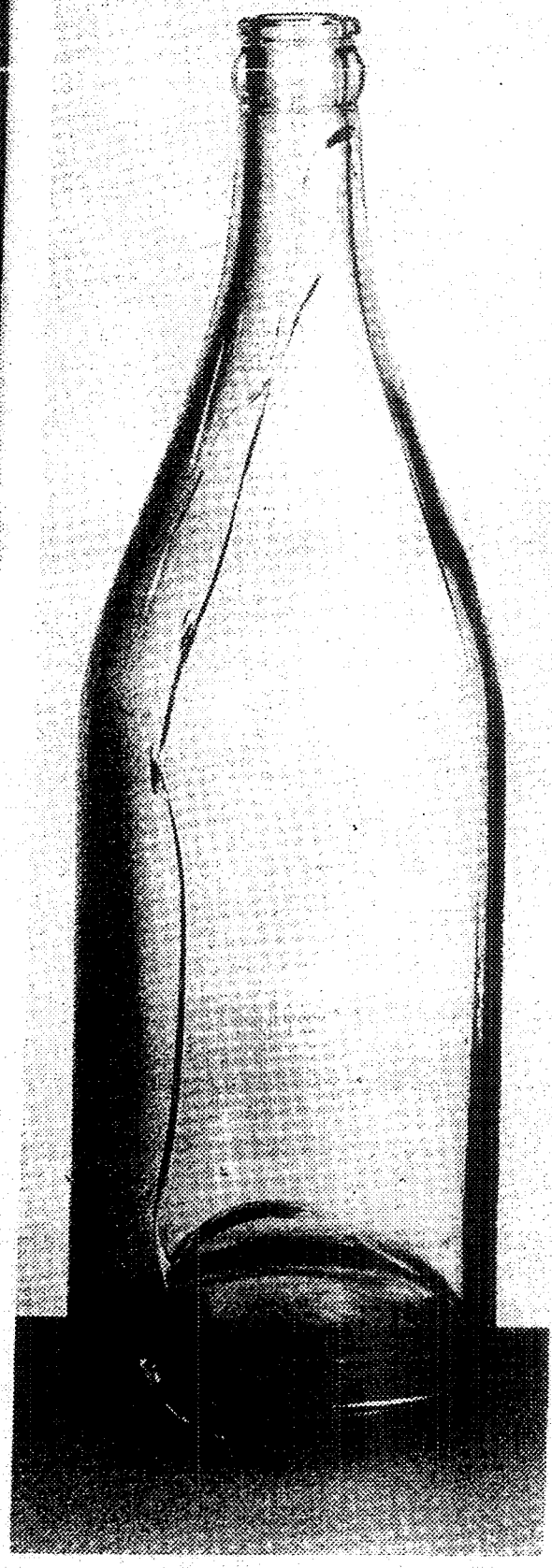


UPWARD IMPACT UNDER FINISH OF MILK BOTTLE. Origin is (O); "cat-whisker" development of hackle structure (H); and junction of two fissures (j). Direction of travel shown by arrows.

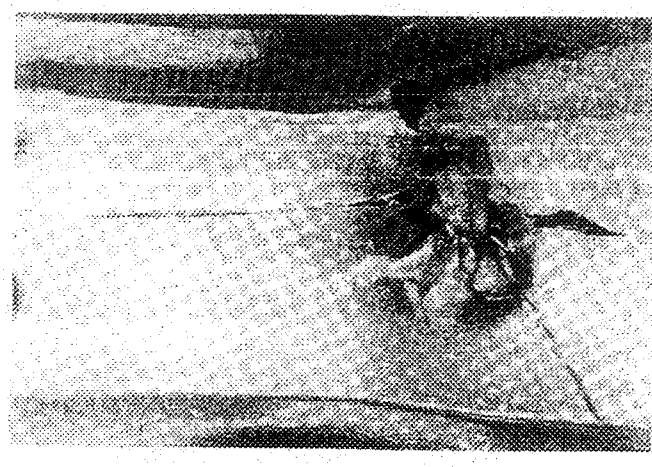
SIDEWAYS BLOW ON LOCKING RING AT FAULTY CROWN OPENER. Origin marked by (O). Note difference of position when compared to vertical impact.



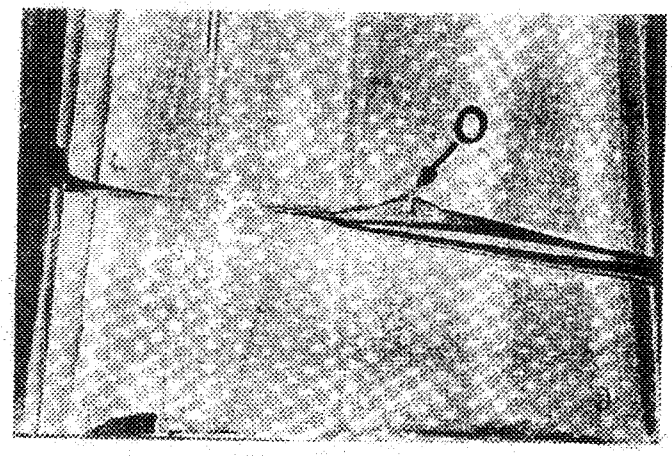
VERTICAL IMPACTS FROM ABOVE on finish. Note the difference in intensity in the two groups of 4 each.



TEMPERATURE SHOCK BREAKAGE. Abnormal because produced by severe shock. Normal breakage would be a straight line up sidewall.

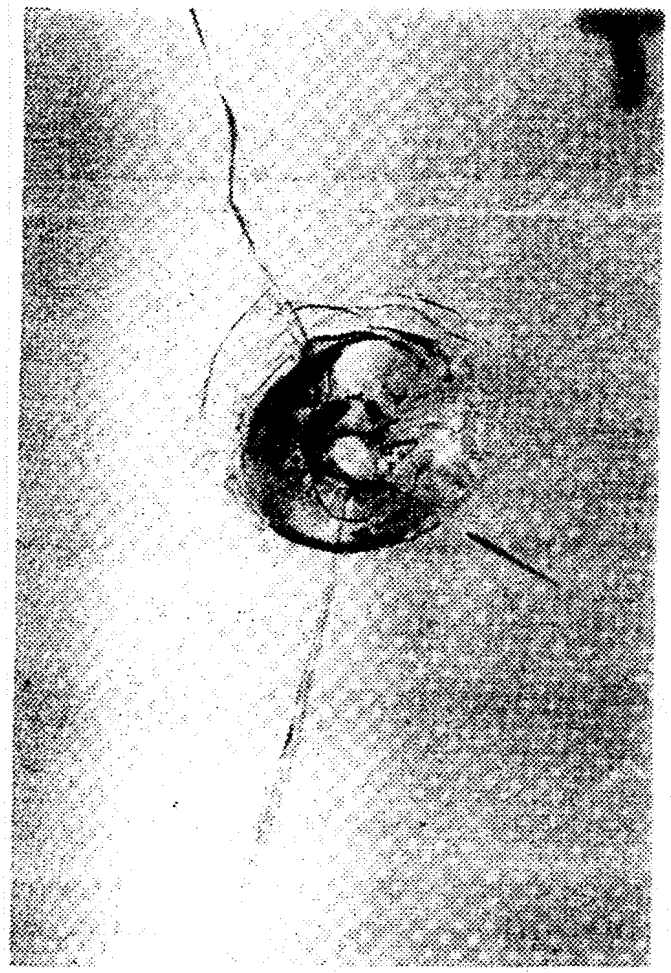


TEMPERATURE SHOCK. Fissures developed from unmelted batch material.

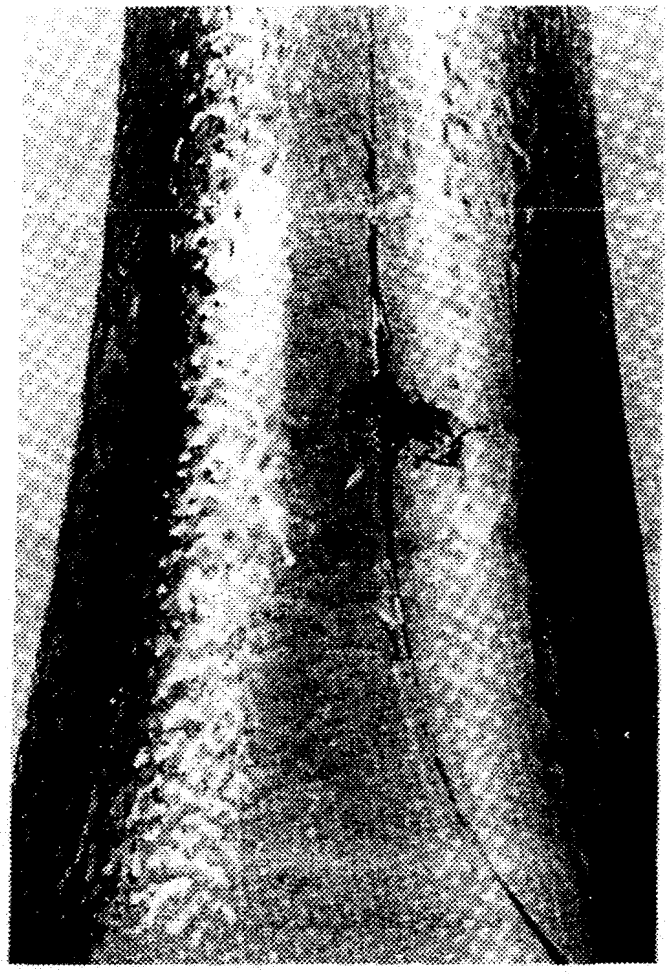


TEMPERATURE SHOCK OUTSIDE BRUISE. Discontinuity is best clue of presence of origin (O).

TEMPERATURE SHOCK AT BRUISED LETTER. Bruise and discontinuity at (O) in lower part of large letter C.



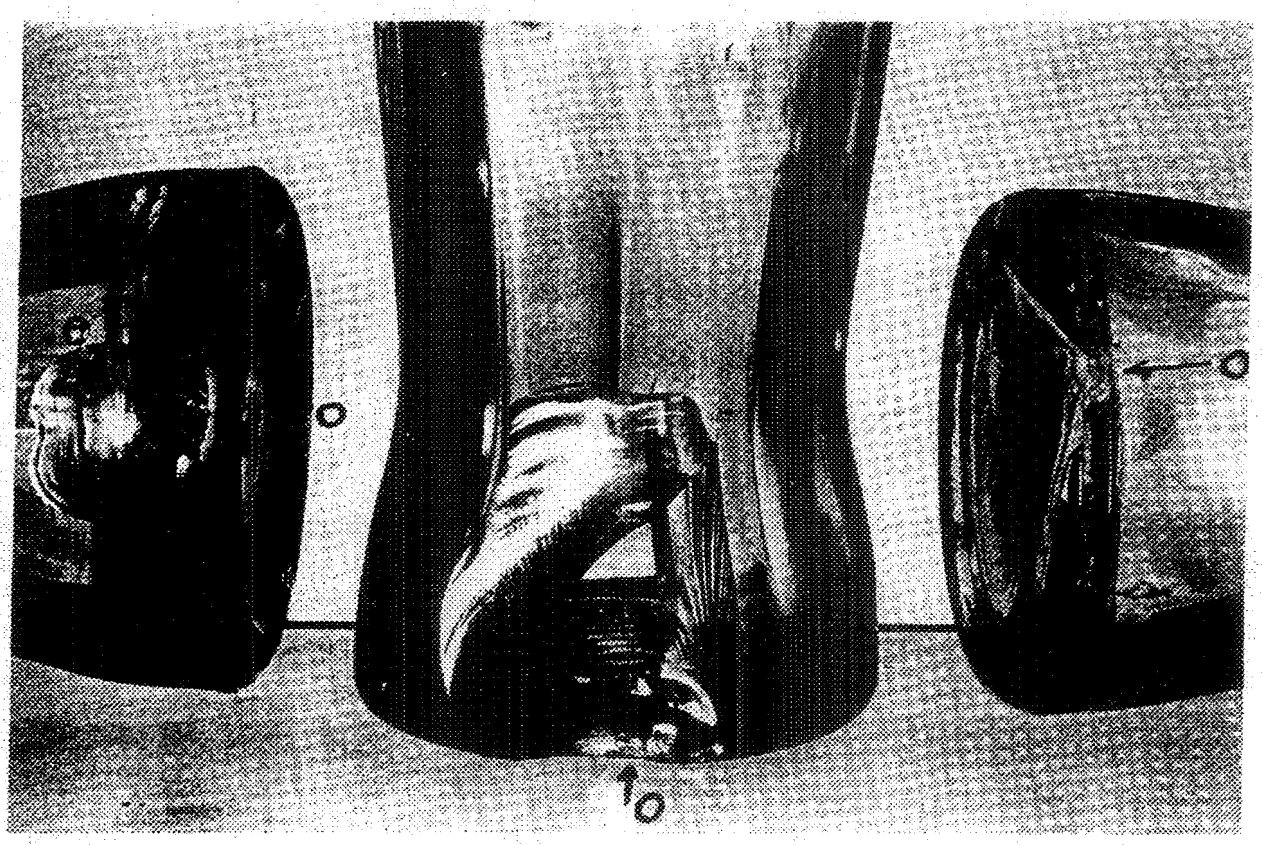
PERCUSSION CONE IN SIDEWALL. Radiating fissures are secondary breakages caused by temperature.



PERCUSSION CONE IN NECK. Vertical line is a secondary temperature break.

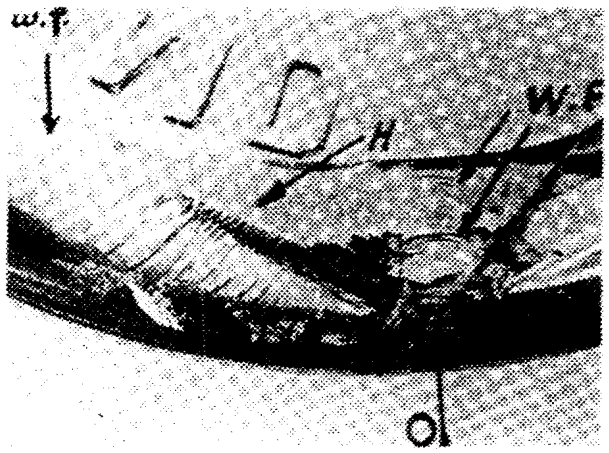
PERCUSSION CONES IN NECK OF BOTTLE

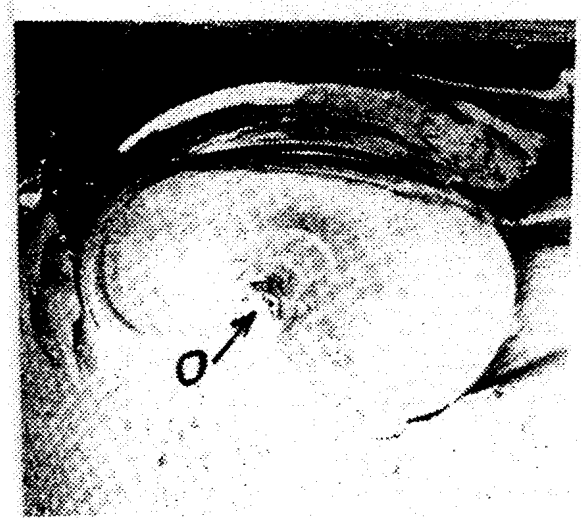
INJURIES AT HEEL. To the right is the effect of a heavy impact directly from below. The center is an extension of a percussion cone incompletely developed. Left is a pressure extension and "pressure loop" formation starting from a percussion cone; head of fissure "traveled on inside wall."

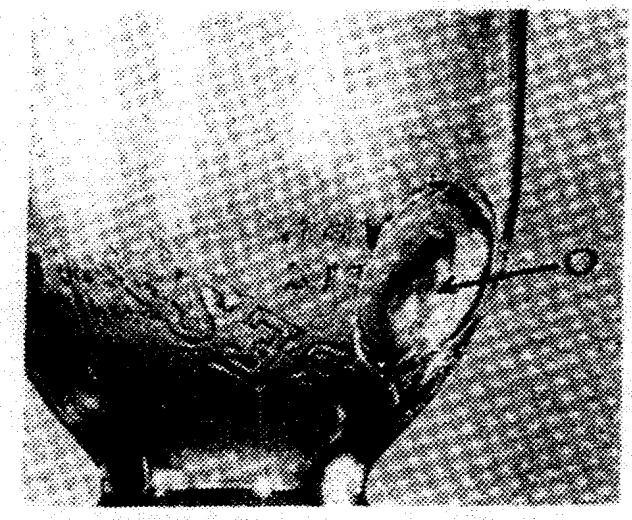


INJURIES AT THE HEEL OF THE BOTTLE. Center is an injury directly from below. Right and left are "spalls," or percussion cones from side impacts. The latter are sometimes called "conchoidal" fractures.

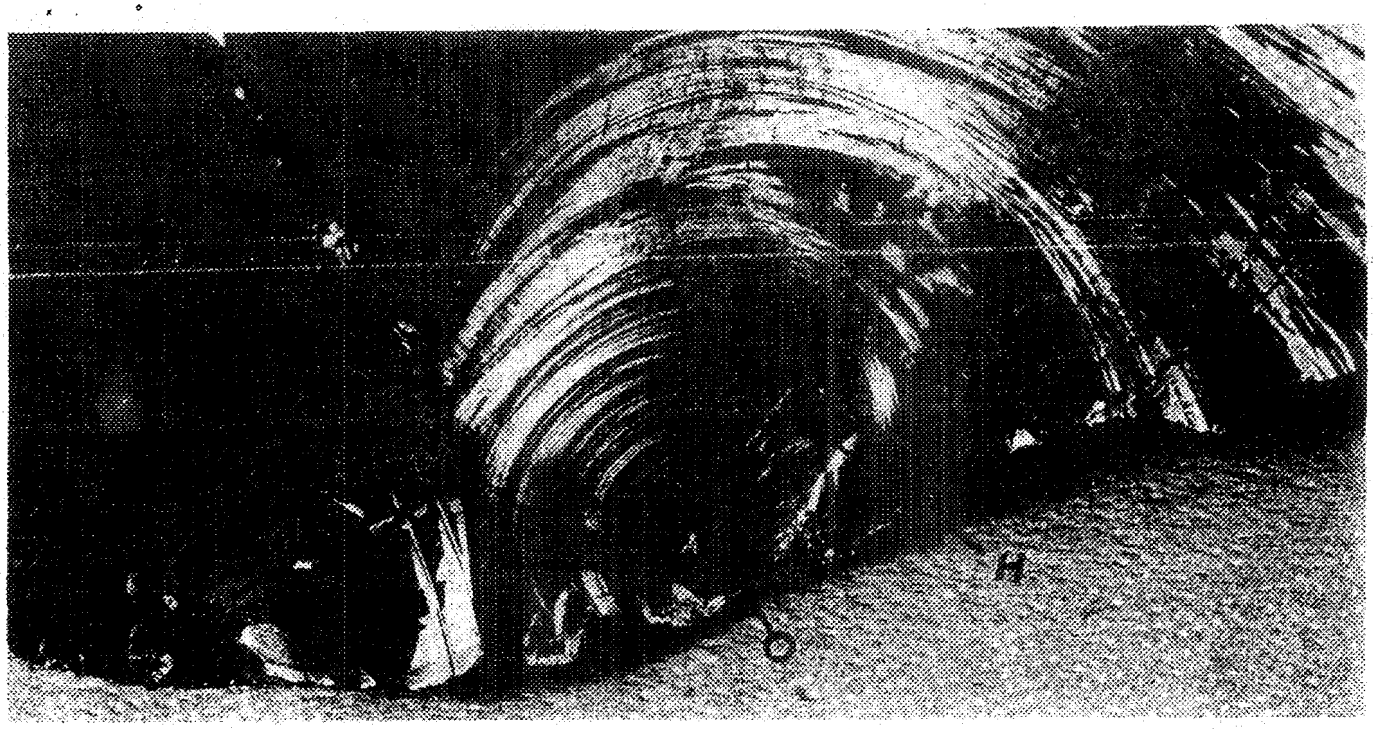
MULTIPLE STATE BREAK: Impact, percussion cone type, origin (O) at small button under letter "F", extended by temperature shock. Note smooth break in vicinity of percussion with beginning of violence shown by hackle structure (H). Final fissures extended both ways around bottle until joined. Feathers (F) denote slowing of violence at junction of fissures (J).
Below: Note wave fronts (W.F.) extending through glass wall, followed by hackle structure (H) and further wave fronts (wf) of break traveling on inside wall.



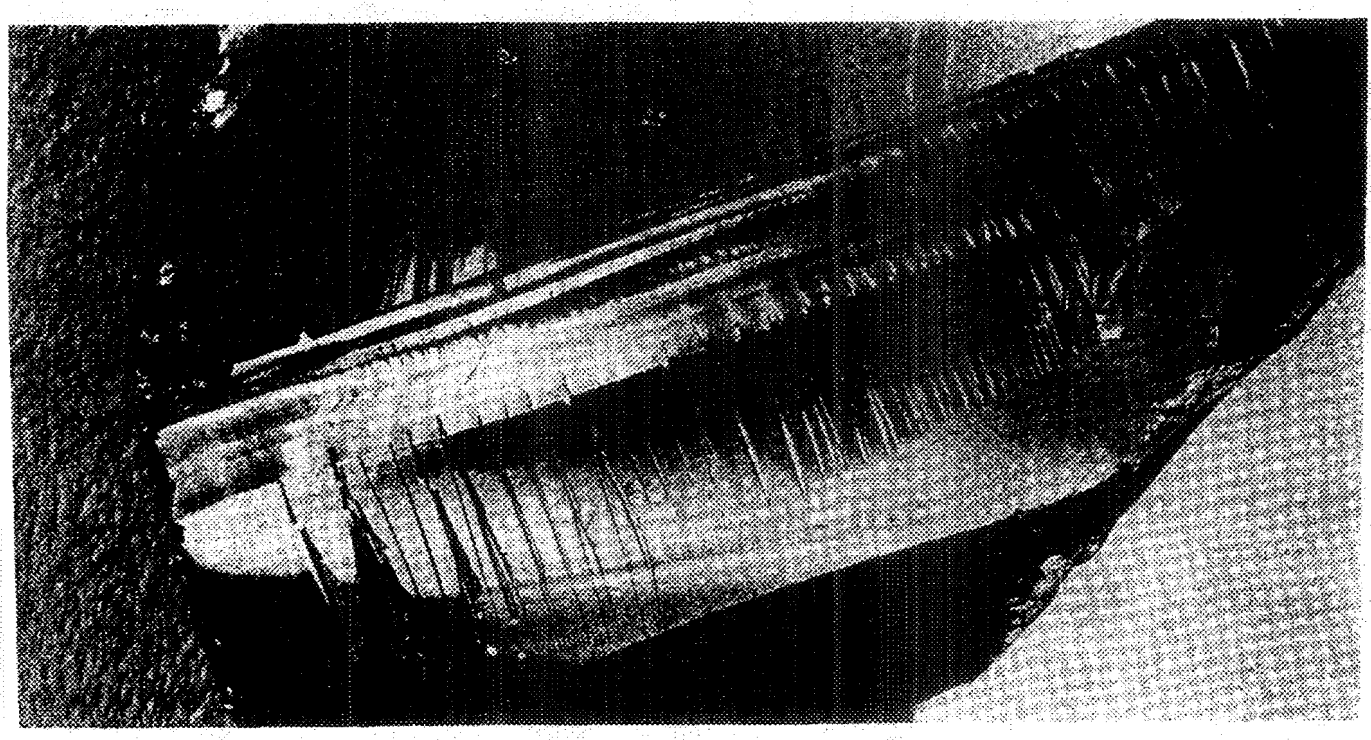




"DEAD ENDED" PERCUSSION CONES The illustrations show percussion cones, probably extended by temperature, in which the fissures reentered the outer surface. This has the effect of stabilizing the breakage with less probability of their further extension.



DEVELOPMENT OF WAVE FRONTS OR RIPPLE MARKS. This is from a block of glass and shows a typical conchoidal fracture. The concentric rings are wave fronts that show the radiating character of the fissure developing from a single point of origin (O). A few split wave fronts or hackle structures (sometimes called striations) are shown at (H).



SPLIT WAVE FRONTS. This is a block of glass showing the development from one edge, and melting into smooth glass before the opposite edge is reached, of split wave fronts or hackle structures. The fissure probably originated as a smooth break which penetrated part of the glass wall and then was increased in intensity and speed which brought about the split of the wave front and the formation of the hackle structure.

Rick –

Please forward these photos of glass breakage to Akram El Gaddar of Coca Cola – They are very good illustrations of some of the damage we found in their 1 Liter Sprite bottles from poor handling in their own plant and in the trade –

Best wishes to all.

Rob –

[redacted]

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April 5, 2001

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Mr. Ossama Wasfy
A & R Shorosh Company
14 Masnaa El Harir Street
Abbassia, Cairo

Dear Mr. Osaama:

Mr. Rod Frost was in Cairo in February and March of this year. He had hoped that you or someone else from Shorosh would attend the workshop he conducted so he could continue the discussions that you began last July. Unfortunately, you either did not hear about the workshop or were unable to attend. Mr. Frost did not forget about the promise that he made to you last summer with regards to drawings for the caps that you manufacture. We have, therefore, enclosed a set of those drawings which he sent me that he believes will be of value to the company.

Should you have any questions or require any additional information, please feel free to contact Eng. Morad or myself. You may also contact Mr. Frost directly via email at *cginfo@calglass-pcc.com*.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

[redacted]

TO: Rick

FROM: Rod Frost

Subject: Ali & Ramadan I. Shorosh Co.
Abbassia, Cairo

Information on glass finishes for lug closures (refer to my report of July 17, 2000)

Shorosh Contact:

Eng. Ossama Wasfy, Quality Technical Director

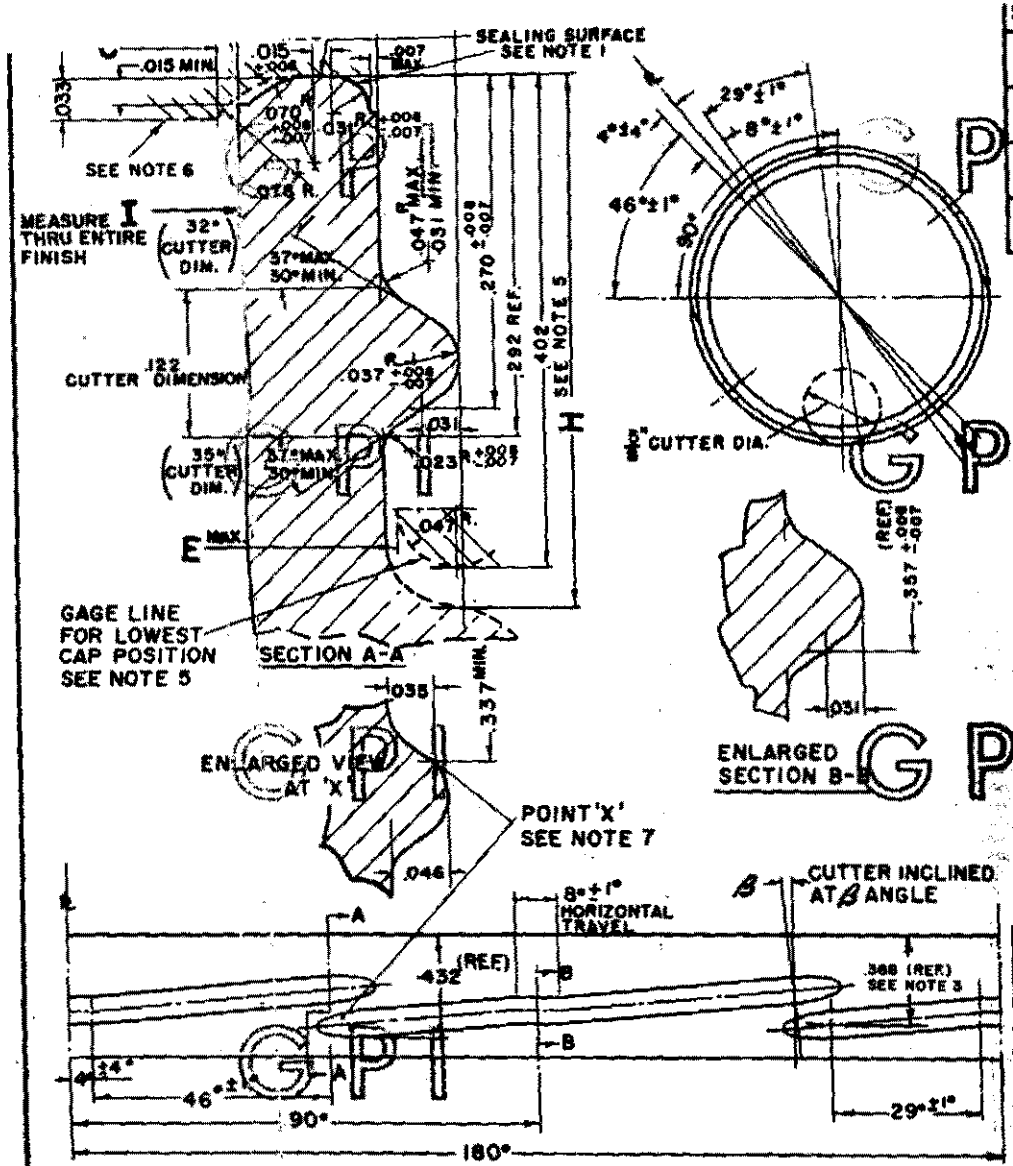
Please forward the attached information to Mr. Wasfy.

I have not been able to find any new drawings for these specifications, however, these measurements have not changed in years.

I had hoped he would be able to attend our glass school to discuss in more detail. They were apparently busy that day, so please forward with my best wishes.

Rod

Rod



SIZE	IDEAL	SEE NOTE 2 TOLERANCE	IDEAL	SEE NOTE 2 TOLERANCE	MIN.	SEE NOTE 6	HELIX ANGLE	THREADS PER INCH
63	2.320	±.017 ±.018	2.444	±.017 ±.018	1 53/64	2.062	5° 05'	1 1/2
66	2.433	±.017 ±.018	2.557	±.017 ±.018	1 15/16	2.175	4° 52'	1 1/2
70	2.591	±.017 ±.018	2.715	±.017 ±.018	2 5/64	2.333	4° 34'	1 1/2
77	2.854	±.017 ±.018	2.978	±.017 ±.018	2 23/64	2.596	4° 10'	1 1/2

NOTES:-

1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS. VARIATION OF .015 FLAT SHOULD NOT EXCEED CURVATURE OF A .093 RADIUS.
2. BEST SEALING RESULTS ARE OBTAINED WHEN GLASS FINISH IS ROUND AND TO THE DIAMETERS SHOWN IN COLUMNS HEADED 'IDEAL'. THE AVERAGE OF THE MAXIMUM AND MINIMUM EXTREMES OF THE 'E' AND 'T' DIAMETERS SHOULD BE AS CLOSE AS POSSIBLE TO DIMENSIONS SHOWN IN COLUMNS HEADED 'IDEAL'.
3. 'T' DIAMETER MUST BE MAINTAINED THROUGHOUT THREAD TRAVEL. REF. DEPTH .368
4. CONSTRUCTION IS IDENTICAL FOR ALL FOUR THREADS.
5. DOTTED CONTOUR IS OPTIONAL BUT MUST CLEAR CAP LIMITS SHOWN BY SHADED AREA ABOVE .402 DIMENSION.
6. SHADED AREA SHOWS CONTOUR TO BE CLEARED BY THE TOP OF THE GLASS FINISH FOR CORRECT SEALING RESULTS.
7. IN ORDER TO PROVIDE CAM-OFF ACTION FOR CAP REMOVAL TOP SURFACE OF TWO OPPOSING THREADS FROM POINT 'X' UPWARD ALONG HELIX ANGLE SHOULD BE SMOOTH AND SUBSTANTIALLY FILLED.

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Robert O. Hickins, CHAIRMAN
Howard M. Bailey, SECRETARY

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SUBCOMMITTEE ON DESIGN AND SPECIFICATIONS

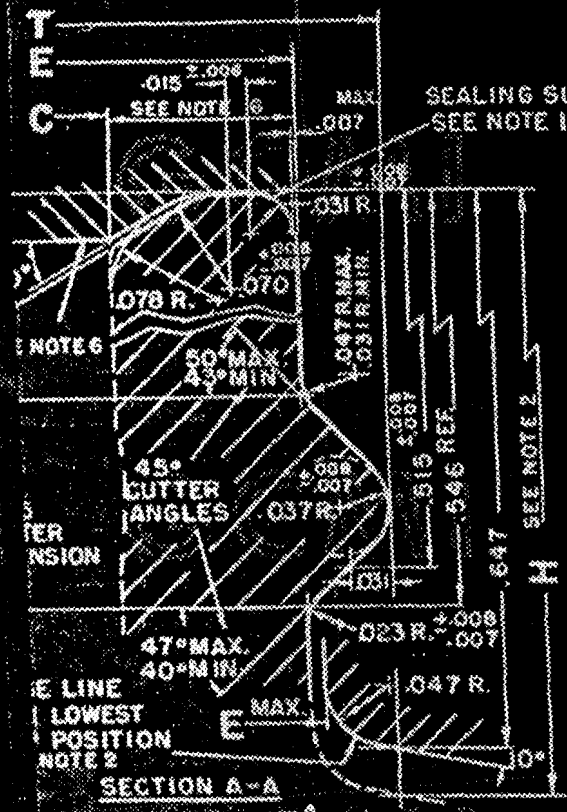
APPROVED FOR PUBLICATION: NOV. 9, 1988
SUPERSEDES DWG. NO. 20301

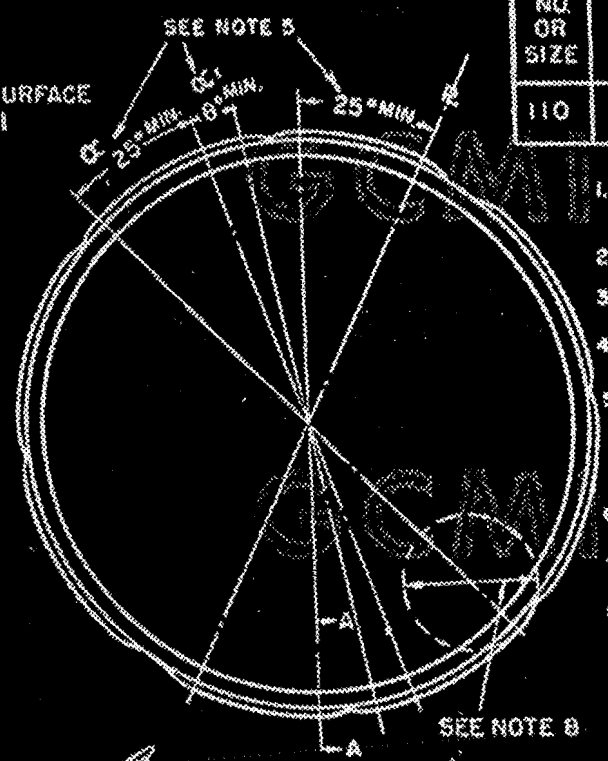
GLASS FINISH NUMBER **2030**

TOP SEAL VACUUM LUG FINISH
SIZES 63 THROUGH 77 (4 LEADS)

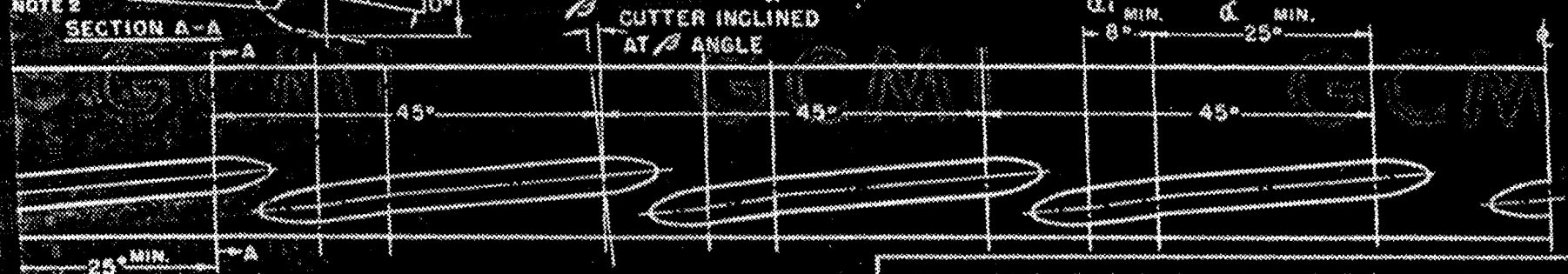
G.P.I. DWG. NO.
20302

NO. OR SIZE	E	T	C	β
110	4.141 ±.025	4.265 ±.025	3.871	4° 57'





1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS THAT WOULD PREVENT A TOP SEAL BEING MADE.
2. DOTTED CONTOUR IS OPTIONAL, BUT MUST CLEAR THE CAP LIMITS SHOWN BY SHADED AREA ABOVE .647 DIMENSION.
3. WHEN 'E' AND 'T' DIAMETERS ARE AT MAXIMUM, THEY MUST BE CONCENTRIC TO PREVENT POSSIBLE INTERFERENCE DURING CAP APPLICATION.
4. 'β' IS HELIX ANGLE AT PITCH DIAMETER. THE CUTTER IS INCLINED AT 'β' ANGLE FOR ALL THREADS AND ALL CUTS.
5. EIGHT LEAD THREAD – 7/8 THREAD PER INCH. ALL THREADS ARE 25° MIN. α TRAVEL AT 7/8 THREADS PER INCH FOR SEALING. 6 CAM-OFF THREADS ARE 25° MIN. α TRAVEL AT 7/8 THREADS PER INCH, THEN CHANGE TO 1/2 THREADS PER INCH FOR 8° MIN. α, TRAVEL HOLDING CUTTER INCLINATION AT β° ANGLE.
6. SHADED AREA SHOWS CONTOUR TO BE CLEARED BY THE TOP OF THE GLASS FINISH FOR CORRECT SEALING RESULTS.
7. MAINTAIN 'T' DIAMETER TO A DEPTH OF .572. FROM .572 TO .641 'T' DIAMETER MAY BE BELOW MINIMUM BUT NOT OVER MAXIMUM.
8. START AND END OF THREADS CONFORM TO 1" CUTTER DIAMETER EXCEPT WHERE RIFFLING IS REQUIRED TO PERMIT MOLD OPENING.



180° DEVELOPMENT

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APPROVED OCT. 23, 1968

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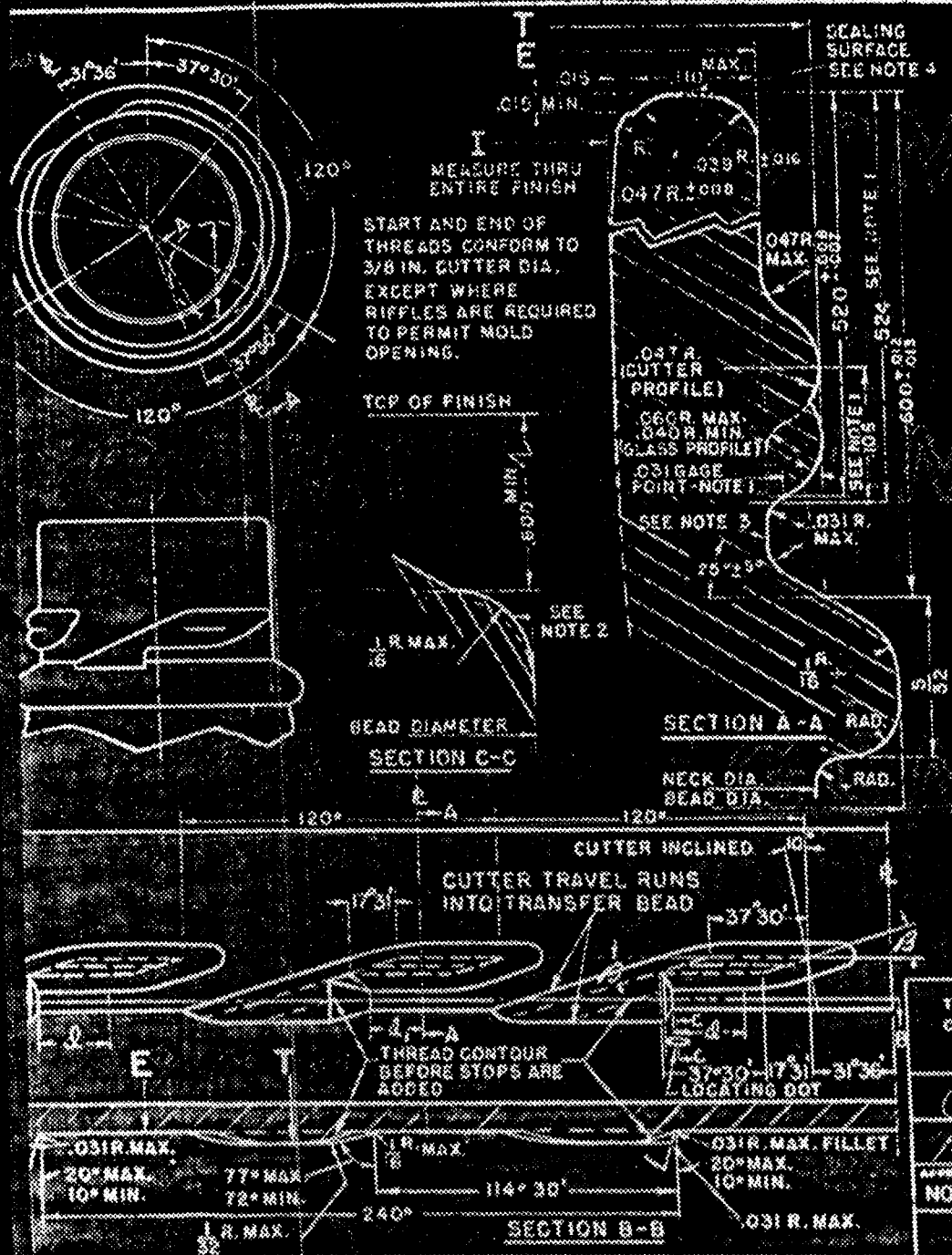
COMMITTEE ON STANDARDS FOR FINISHES

STANDARD GLASS FINISH NO. 2070

GCMI DWG. NO.

TOP SEAL VACUUM LUG FINISH



SIZE	E	T	I MIN.	∅	THREADS PER INCH	MIN. CHORD d	MIN. CHORD d_1
27	.915 +.012 −.013	1.009 +.012 −.013	13/32	18°19'	1	.186	.143
30	1.035 +.012 −.013	1.129 +.012 −.013	3/4	16°24'	1	.214	.165
33	1.127 +.012 −.013	1.221 +.012 −.013	51/64	15°10'	1	.235	.182
38	1.368 ±.015	1.462 ±.015	15/16	12°41'	1	.290	.226

1. THE .108 DISTANCE IS NOT CRITICAL FOR CAP FUNCTION BUT IS SUGGESTED FOR MOLD MAKER'S GUIDANCE. THE .524 DISTANCE IS THE THREAD ROOT DEPTH TO PROVIDE .520 DEPTH AT GAGE LINE.
2. LOCATING DOT REMAINS VISIBLE AFTER CAP APPLICATION SHOWING POSITION OF STOP. DOT SHOULD NOT VIOLATE .600 MIN. DEPTH OR BEAD DIAMETER.
3. 'E' DIAMETER MUST BE MAINTAINED DOWN TO FILLET AT TRANSFER BEAD.
4. SEALING SURFACE MUST BE SMOOTH AND FREE OF DEFECTS THAT WOULD PREVENT A VACUUM SEAL BEING MADE, OR INTERFERE WITH ROTATION OF CLOSURE.
5. MAINTAIN 'T' DIAMETER TO A DEPTH OF .535. FROM .535 TO .600, 'T' DIAMETER MAY BE LESS THAN MINIMUM BUT NOT GREATER THAN MAXIMUM.

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CHAIRMAN

SECRETARY

APPROVED NOV. 8, 1972 SUPERSEDES DWG. NO. 20601

ADOPTED AS A RECOMMENDED STANDARD BY

GLASS CONTAINER MANUFACTURERS INSTITUTE, INC.

DESIGN AND SPECIFICATIONS COMMITTEE

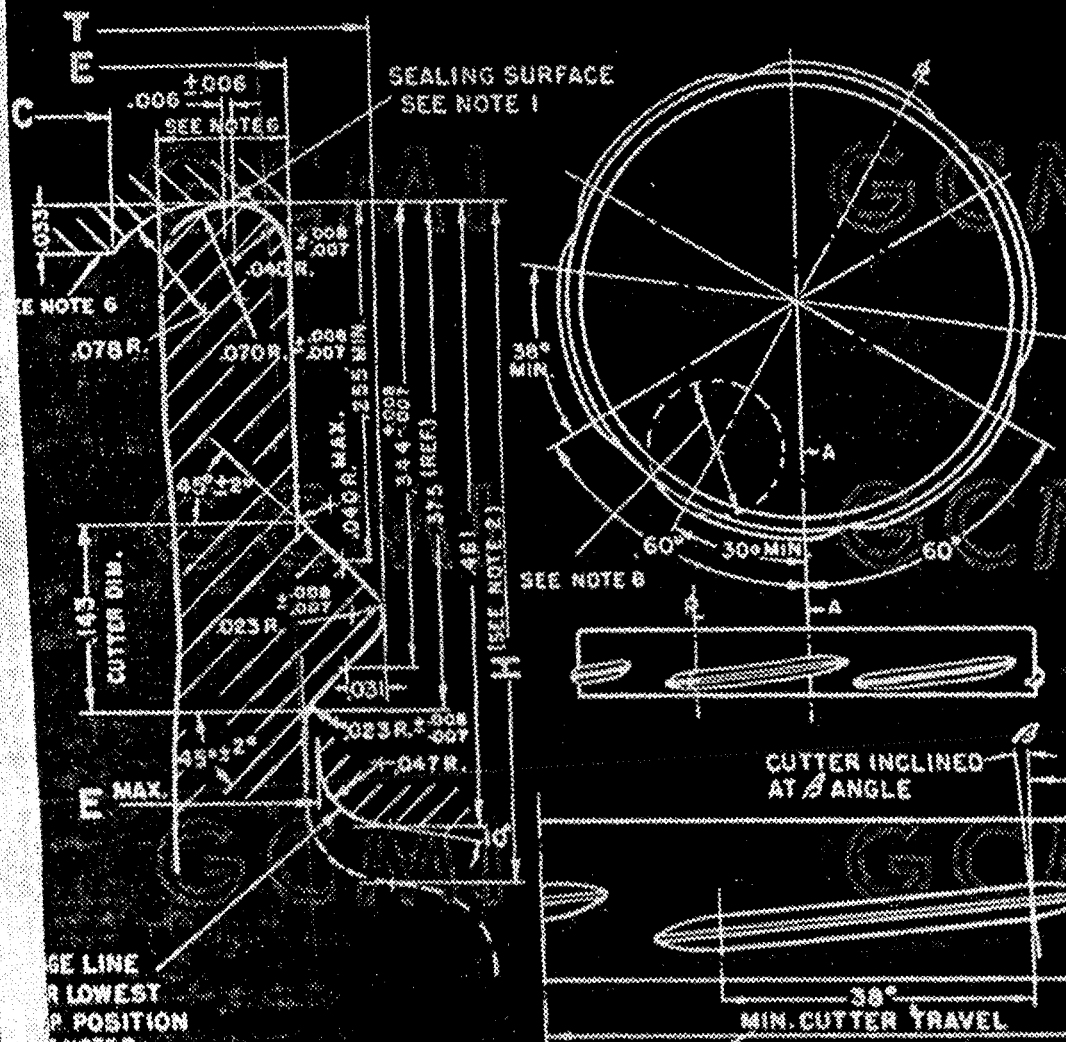
STANDARD GLASS FINISH NO. 2060

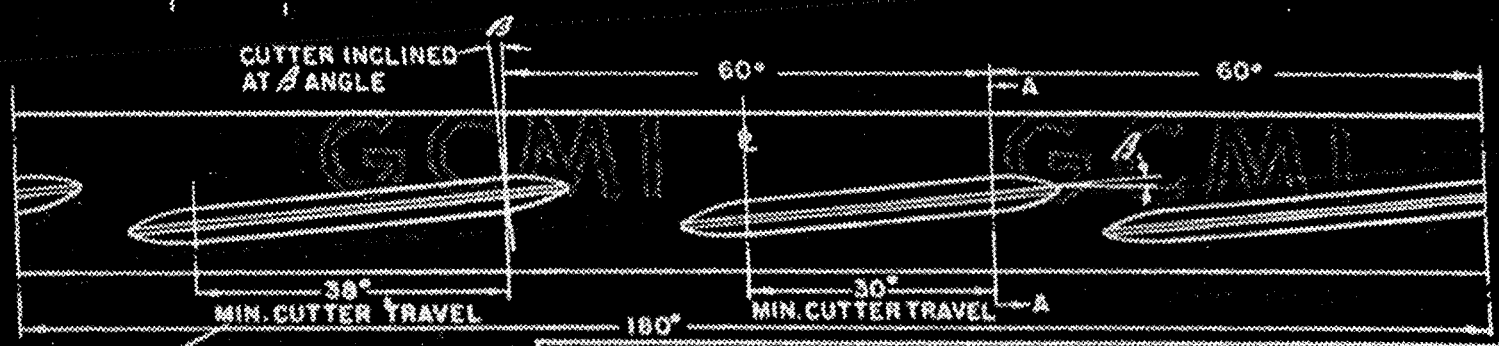
TOP SEAL VACUUM LUG FINISH, DEEP
SIZES 27 THROUGH 38

GCMI DWG. NO.

20602

NO. OR SIZE	E	T	C	β
89	3.363 ±.017 -.018	3.487 ±.017 -.018	3.105	5° 19'





1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS THAT WOULD PREVENT A TOP SEAL BEING MADE.
2. DOTTED CONTOUR IS OPTIONAL, BUT MUST CLEAR CAP LIMITS SHOWN BY SHADED AREA ABOVE .461 DIMENSION.
3. WHEN 'E' AND 'T' DIAMETERS ARE AT MAXIMUM, THEY MUST BE CONCENTRIC TO PREVENT POSSIBLE INTERFERENCE DURING CAP APPLICATION.
4. 'β' IS HELIX ANGLE AT PITCH DIAMETER. THE CUTTER IS INCLINED AT 'β' ANGLE.
5. SIX LEAD THREAD – ONE THREAD PER INCH. 30° MINIMUM TRAVEL ON PARTING LINE THREADS, 38° MINIMUM TRAVEL ON THE OTHER FOUR THREADS.
6. SHADED SECTION SHOWS CLOSURE POSITION. TOP RING CONTOUR AT THIS SECTION MUST CLEAR THE LIMITS SPECIFIED.
7. MAINTAIN 'T' DIAMETER TO A DEPTH OF .400. FROM .400 TO .467 'T' DIAMETER MAY BE BELOW MINIMUM BUT NOT OVER MAXIMUM.
8. START AND END OF THREADS CONFORM TO 1" CUTTER DIAMETER - EXCEPT WHERE RIFFLING IS REQUIRED TO PERMIT MOLD OPENING.

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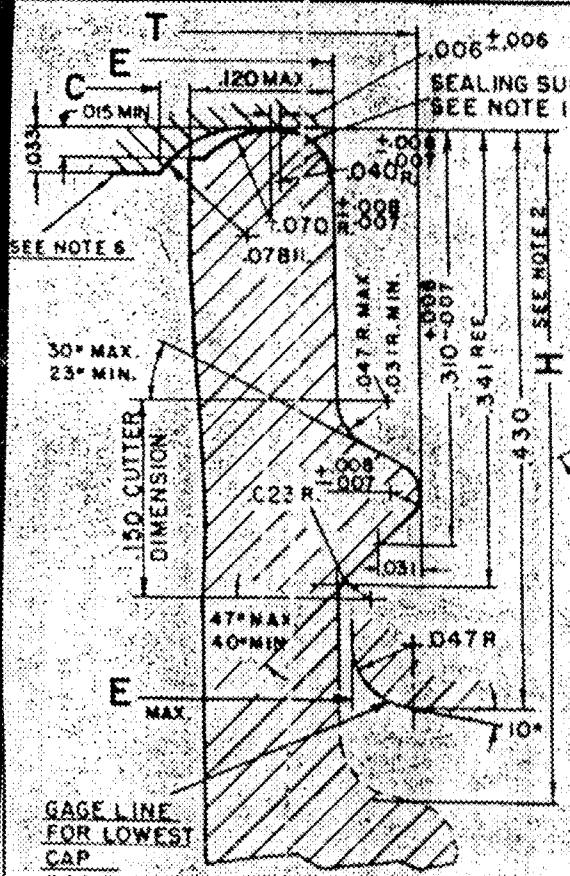
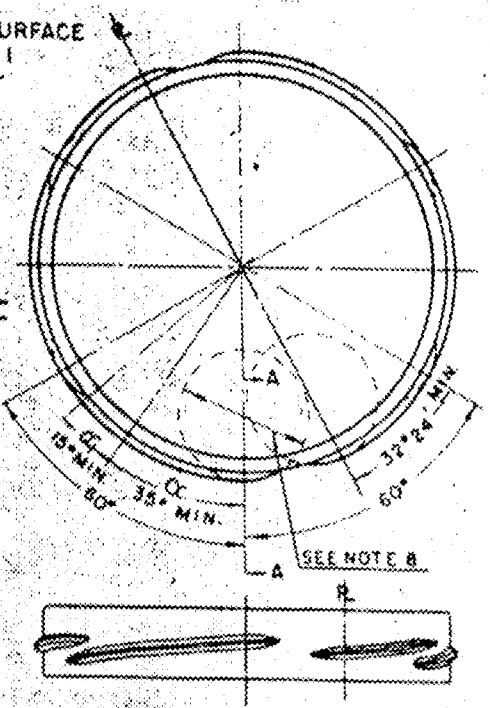
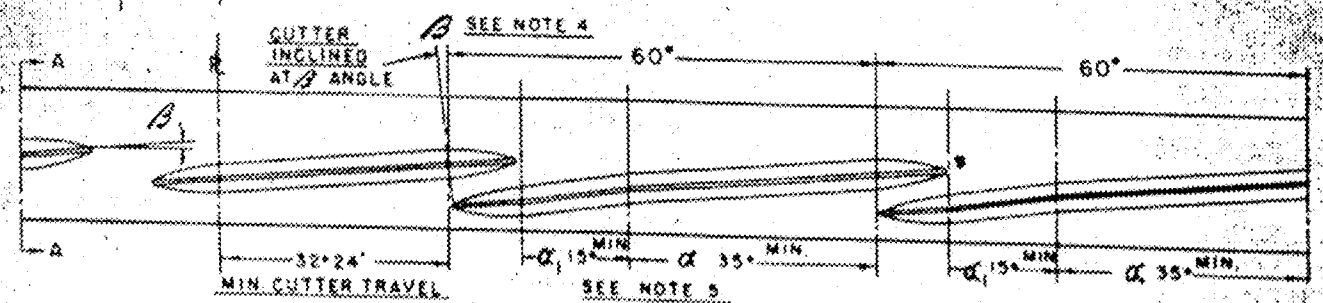


SECTION A–A



NO. OR SIZE	E	T	C	β
77	2.854 +.017 −.018	2.978 +.017 −.018	2.596	4° 59'
82	3.056 +.017 −.018	3.180 +.017 −.018	2.798	4° 40'

1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS THAT WOULD PREVENT A TOP SEAL BEING MADE.
2. DOTTED CONTOUR IS OPTIONAL, BUT MUST CLEAR THE CAP LIMITS SHOWN BY SHADED AREA ABOVE .430 DIMENSION.
3. WHEN 'E' AND 'T' DIAMETERS ARE AT MAXIMUM, THEY MUST BE CONCENTRIC TO PREVENT POSSIBLE INTERFERENCE DURING CAP APPLICATION.
4. β IS HELIX ANGLE AT PITCH DIAMETER. THE CUTTER IS INCLINED AT β ANGLE FOR ALL THREADS AND ALL CUTS.
5. SIX LEAD THREAD – 1 1/4 THREADS PER INCH.
   STANDARD CONSTRUCTION OF ALL FOUR LONG THREADS IS 35° MINIMUM α TRAVEL AT 1 1/4 THREADS PER INCH, THEN CHANGE TO 3/4 THREADS PER INCH FOR 15° MINIMUM α_1 TRAVEL HOLDING CUTTER INCLINATION AT β.
6. SHADED SECTION SHOWS CLOSURE POSITION. TOP RING CONTOUR AT THIS SECTION MUST CLEAR THE LIMITS SPECIFIED.
7. MAINTAIN "T" DIAMETER TO A DEPTH OF .367. FROM .367 TO .436 "T" DIAMETER MAY BE BELOW MINIMUM BUT NOT OVER MAXIMUM.
8. START AND END OF THREADS CONFORM TO 1" CUTTER DIAMETER EXCEPT WHERE RIFFLING IS REQUIRED TO PERMIT MOLD OPENING.



180° DEVELOPMENT

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W. T. Anderson
D. A. Teitelbaum

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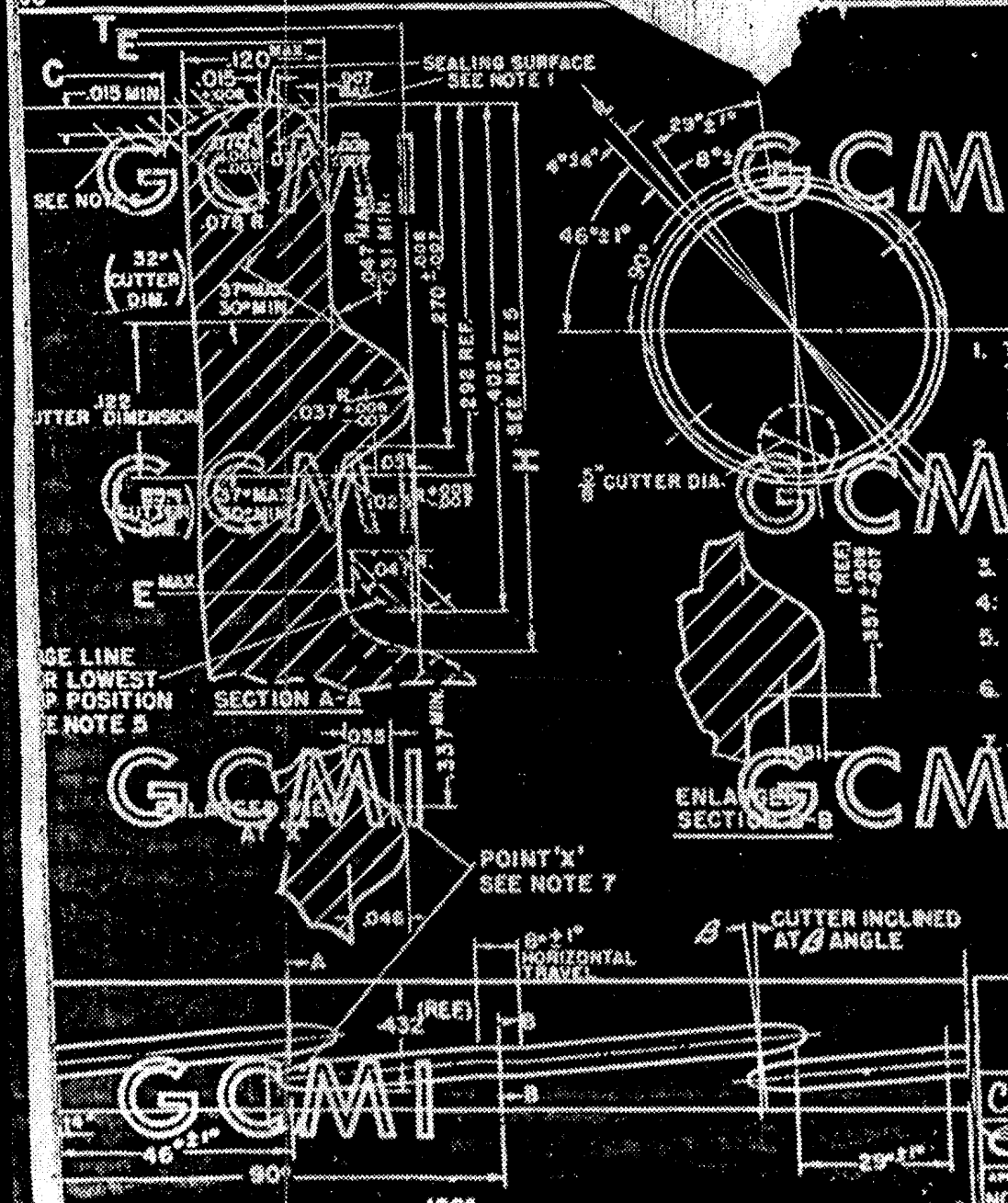
SUBCOMMITTEE ON DESIGN AND SPECIFICATIONS

APPROVED		GLASS FINISH NUMBER	G.P.I. DWG. NO.
SEPT. 9, 1981	20401	2040	20402

TOP SEAL VACUUM LUG FINISH
SIZE 77 & 82 (6 LEADS)



NO. OR SIZE	E SEE NOTE 2 IDEAL	E TOLERANCE	T SEE NOTE 2 IDEAL	T TOLERANCE	C SEE NOTE 7	β HELIX ANGLE	THREADS PER INCH
63	2.320	±.017 -.018	2.444	±.017 -.018	2.062	5° 05'	1 1/2
66	2.433	±.017 -.018	[illegible]	±.017 -.018	[illegible]	4° 52'	1 1/2
70	2.591	±.017 -.018	2.715	±.017 -.018	2.333	4° 34'	1 1/2
77	2.854	±.017 -.018	2.978	±.017 -.018	2.596	4° 10'	1 1/2

NOTES:-

1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS. VARIATION OF .015 FLAT SHOULD NOT EXCEED CURVATURE OF A .093 RADIUS.
2. BEST SEALING RESULTS ARE OBTAINED WHEN GLASS FINISH IS ROUND AND TO THE DIAMETERS SHOWN IN COLUMNS HEADED 'IDEAL'. THE AVERAGE OF THE MAXIMUM AND MINIMUM EXCESSES OF 'E' AND 'T' DIAMETERS SHOULD BE AS CLOSE AS POSSIBLE TO DIMENSIONS SHOWN IN COLUMNS HEADED 'IDEAL'.
3. 'T' DIAMETER MUST BE MAINTAINED THROUGHOUT THREAD TRAVEL. REF. DEPTH .360
4. CONSTRUCTION IS IDENTICAL FOR ALL FOUR THREADS.
5. DOTTED CONTOUR IS OPTIONAL BUT MUST CLEAR CAP LIMITS SHOWN BY SHADED AREA ABOVE .402 DIMENSION.
6. SHADED AREA SHOWS CONTOUR TO BE CLEARED BY THE TOP OF THE GLASS FINISH FOR CORRECT SEALING RESULTS.
7. IN ORDER TO PROVIDE CAM-OFF ACTION FOR CAP REMOVAL, TOP SURFACE OF TWO OPPOSING THREADS FROM POINT 'X' ALONG HELIX ANGLE SHOULD BE SMOOTH AND SUBSTANTIALLY FLAT.

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C. M. Brandt
Chairman

APPROVED NOV. 20, 1963

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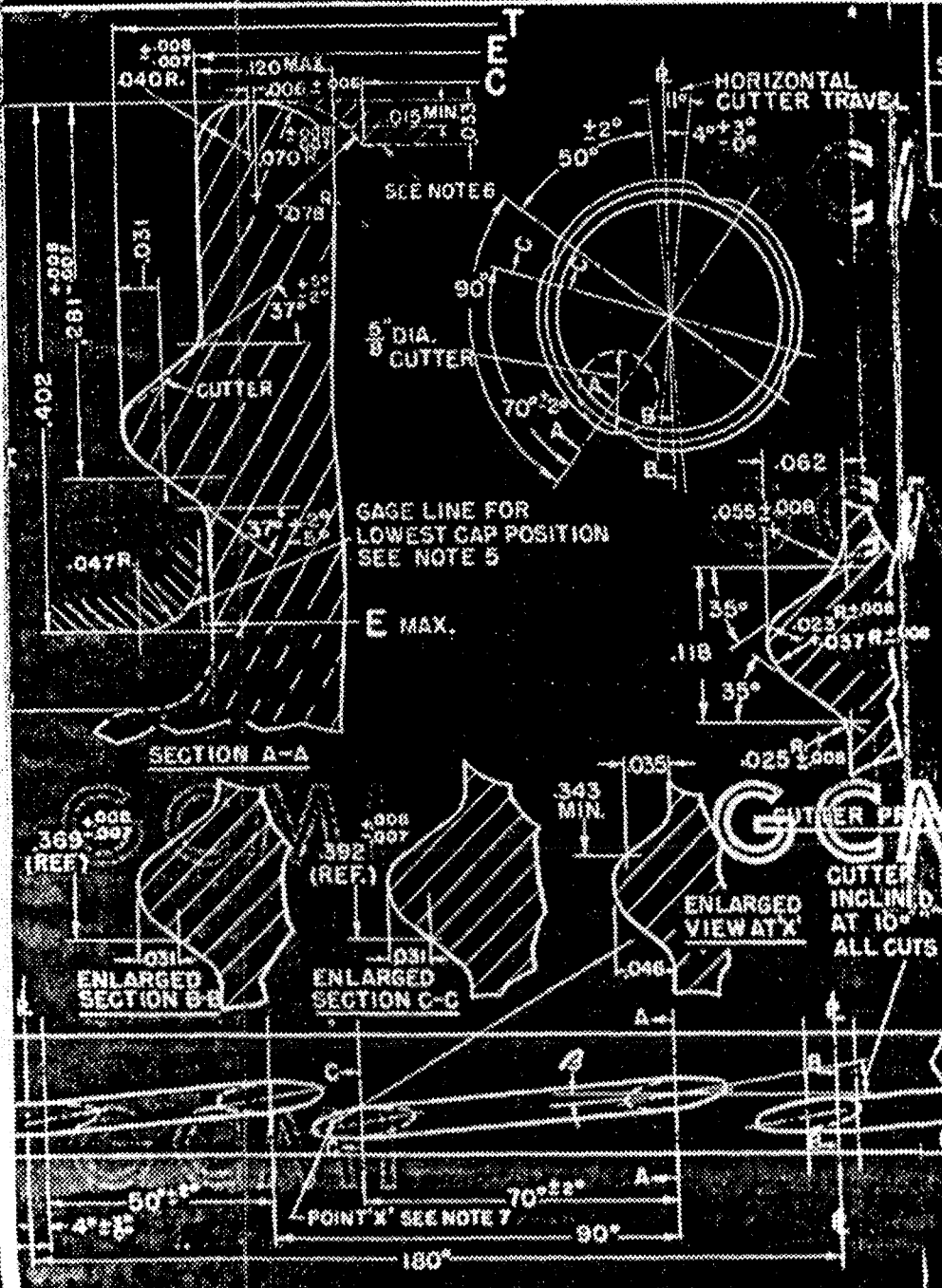
COMMITTEE ON STANDARDS FOR FINISHES

STANDARD GLASS FINISH NO. 2030

GCMI DWG. NO. 20300

TOP SEAL MACHINE BASIC FINISH



NO. OR SIZE	E SEE NOTE 2		T SEE NOTE 2		C SEE NOTE 6	β HELIX ANGLE	THREADS PER INCH
	IDEAL	TOLERANCE	IDEAL	TOLERANCE			
53	1.921	±.015	2.045	±.015	1.663	5° 14'	$1\frac{3}{4}$
58	2.075	±.015	2.199	±.015	1.811	4° 52'	$1\frac{3}{4}$

NOTES:—

1. THIS IS A TOP SEAL FINISH AND PROPER FUNCTION OF CLOSURE REQUIRES THAT THE SEALING SURFACE BE FREE OF CRIZZLES, CHECKS, DIPS AND OTHER SUCH DEFECTS.
2. BEST SEALING RESULTS ARE OBTAINED WHEN GLASS FINISH IS ROUND AND TO THE DIAMETERS SHOWN IN COLUMNS HEADED 'IDEAL'. THE AVERAGE OF THE MAXIMUM AND MINIMUM EXTREMES OF THE 'E' AND 'T' DIAMETERS SHOULD BE AS CLOSE AS POSSIBLE TO DIMENSIONS SHOWN IN COLUMNS HEADED 'IDEAL'.
3. WHEN 'E' AND 'T' DIAMETERS ARE AT MAXIMUM, THEY MUST BE CONCENTRIC TO PREVENT INTERFERENCE DURING CAP APPLICATION.
4. 'T' DIAMETER MUST BE MAINTAINED THROUGHOUT THREAD TRAVEL.
5. DOTTED CONTOUR IS OPTIONAL BUT MUST CLEAR CAP LIMITS SHOWN BY SHADED AREA ABOVE .402 DIMENSION.
6. SHADED AREA SHOWS CONTOUR TO BE CLEARED BY THE TOP OF THE GLASS FINISH FOR CORRECT SEALING RESULTS.
7. IN ORDER TO PROVIDE CAM-OFF ACTION FOR CAP REMOVAL TOP SURFACE OF TWO OPPOSING THREADS FROM POINT 'X' UPWARD ALONG HELIX ANGLE SHOULD BE SMOOTH AND SUBSTANTIALLY FILLED.

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APPROVED APR. 26, 1963

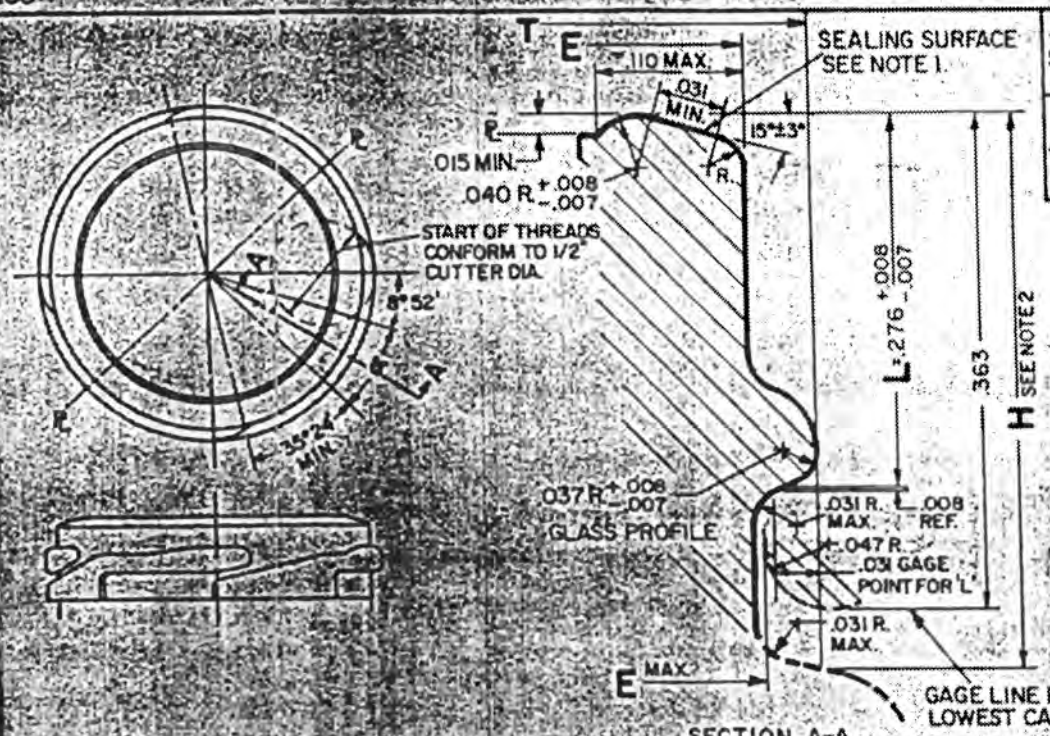
SUPERSEDES DWG. NO.

ADOPTED AS A STANDARD BY
GLASS CONTAINER MANUFACTURERS INSTITUTE, INC.
COMMITTEE ON STANDARDS FOR FINISHES

STANDARD GLASS FINISH NO. 2020

TOP SEAL VACUUM LUG FINISH
SIZES 53 AND 58

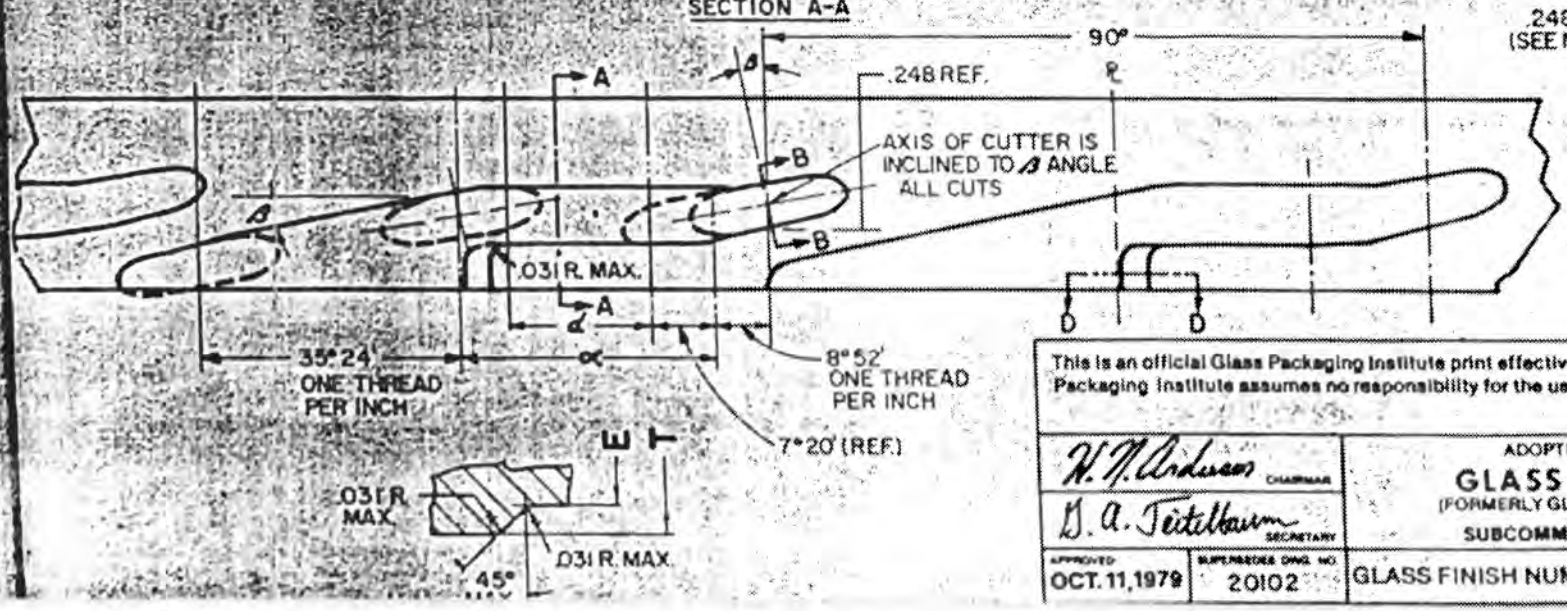
GCMI DWG. NO.
20200

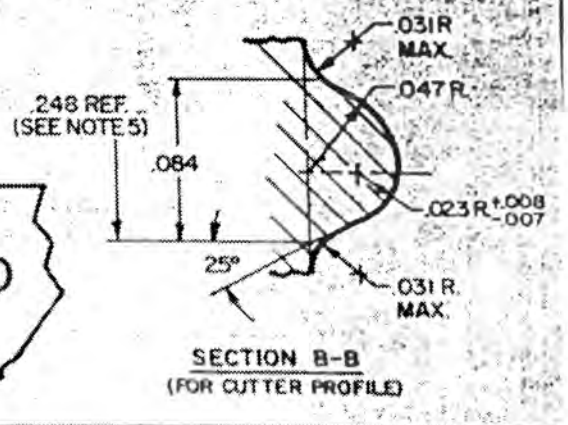


SIZE	T	E	NO. OF LEADS	THREADS PER INCH	α	MIN. α CHORD	β
43	1.594 ± .015	1.500 ± .015	4	1	32°	.265	11° 38'
48	1.794 ± .015	1.700 ± .015	4	1	31°	.285	10° 20'

NOTES:

1. SEALING SURFACE MUST BE FREE FROM DEFECTS THAT WOULD PREVENT A VACUUM SEAL BEING MADE.
2. 'H' DIMENSION OPTIONAL BUT SHOULDER MUST CLEAR CAP LIMITS SHOWN.
3. WHEN 'E' AND 'T' DIAMETERS ARE AT MAXIMUM, THEY MUST BE CONCENTRIC TO PREVENT POSSIBLE INTERFERENCE DURING CAP APPLICATION.
4. MAINTAIN 'T' DIAMETER TO A DEPTH OF .325. FROM .325 TO .360 'T' DIAMETER MAY BE BELOW MINIMUM BUT NOT OVER MAXIMUM.
5. CONSTRUCTION DIMENSION SHOWN FOR REFERENCE, IN IRON, AT START OF THREAD.





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GLASS PACKAGING INSTITUTE

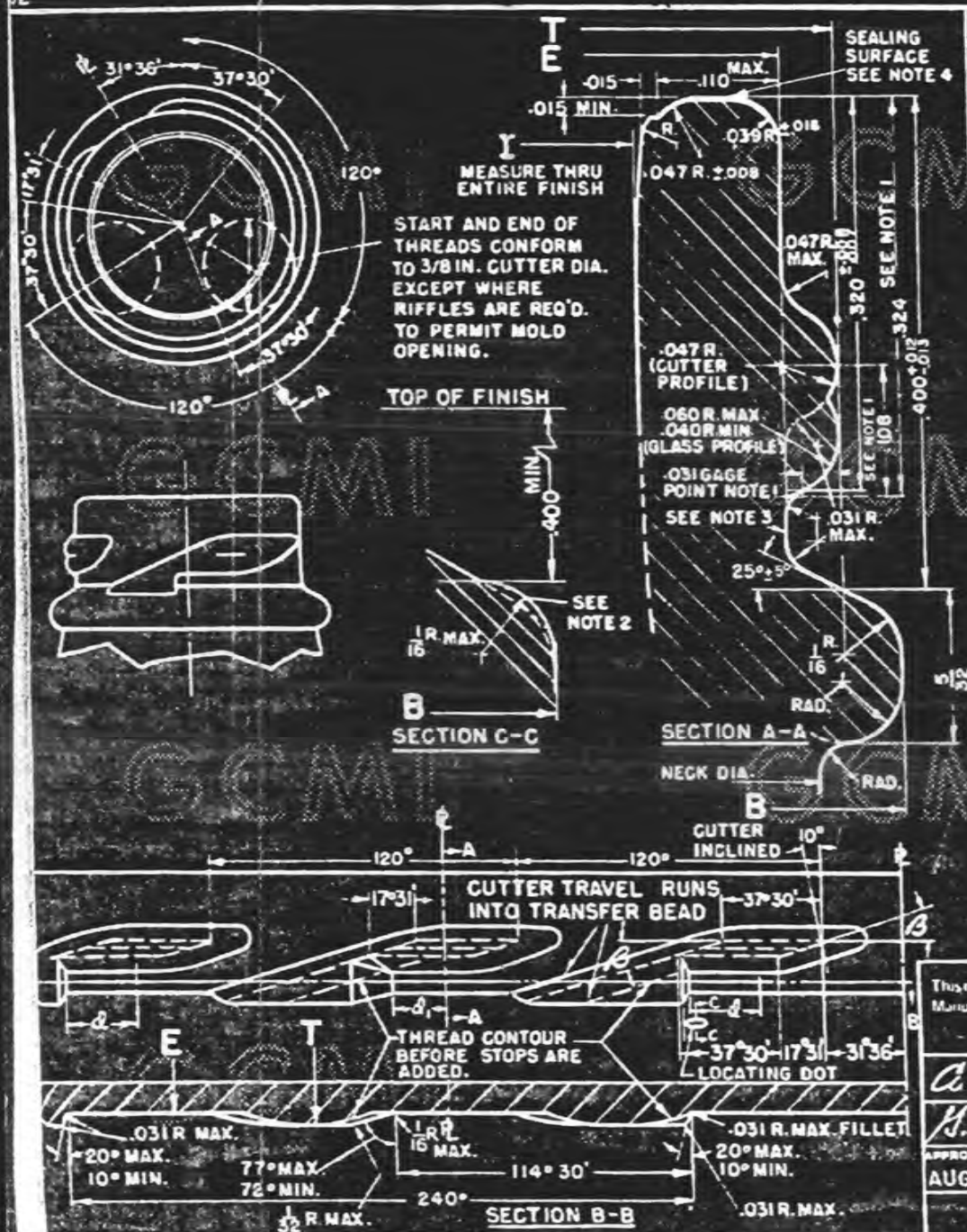
(FORMERLY GLASS CONTAINER MANUFACTURERS INSTITUTE)

SUBCOMMITTEE ON DESIGN AND SPECIFICATIONS

APPROVED	SUPERSEDES DWG. NO.	GLASS FINISH NUMBER	G.P.I. DWG. NO.
OCT. 11, 1979	20102	2010	

201

SIZE	E	T	I MIN.	B	β	THDS. PER INCH	MIN. CHORD α	MIN. CHORD α1
27	.915 ±.012 .013	1.009 ±.012 .013	19/32	1.125 ±.015	18°18'	1	.186	.143
38	1.368 ±.015	1.462 ±.015	15/16	1.628 ±.015	12°41'	1	.290	.226



1. THE .108 DISTANCE IS NOT CRITICAL FOR CAP FUNCTION BUT IS SUGGESTED FOR MOLD MAKER'S GUIDANCE. THE .324 DISTANCE IS THE THREAD ROOT DEPTH TO PROVIDE .320 DEPTH AT GAGE LINE.
2. LOCATING DOT REMAINS VISIBLE AFTER CAP APPLICATION, SHOWING POSITION OF STOP. DOT SHOULD NOT VIOLATE .400 MIN. DEPTH OR BEAD DIAMETER.
3. 'E' DIAMETER MUST BE MAINTAINED DOWN TO FILLET AT TRANSFER BEAD.
4. SEALING SURFACE MUST BE SMOOTH AND FREE OF DEFECTS THAT WOULD PREVENT A VACUUM SEAL BEING MADE, OR INTERFERE WITH ROTATION OF CLOSURE.
5. MAINTAIN 'T' DIAMETER TO A DEPTH OF .335. FROM .335 TO .400, 'T' DIAMETER MAY BE LESS THAN MINIMUM BUT NOT GREATER THAN MAXIMUM.

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DESIGN AND SPECIFICATIONS COMMITTEE

APPROVED AUG. 15, 1972 | SUPERSEDES DWG. NO. 20001 | RECOMMENDED GLASS FINISH NO. 2000 | GCMI DWG. NO. 20002

TOP SEAL VACUUM LUG FINISH, REGULAR
SIZES 27 THROUGH 38

August 18, 2000

TEL 589-7560
FAX 591-4373

Mr. Gharib Awad
A & R Shorosh Company
14 Masnaa El Harir Street
Abbassia, Cairo

Dear Mr. Gharib:

I would like to thank you and Eng. Ossama for taking the time to work with Mr. Rod Frost during his July 17 visit. He enjoyed the visit and was very impressed with the quality and efficiency of your operation. I sincerely hope that you found the discussions useful. There are very few people who know more about glass, glass processing and glass sealing than Mr. Frost.

I have attached a copy of his report. As you can see, he is working to obtain prints for the sizes of the closures that Shorosh manufactures. He will forward these as soon as possible.

I know that Mr. Frost would welcome a visit by you or Eng. Ossama. Should you have plans to visit the United States, ALEB can help arrange a visit with Mr. Frost at the California Glass Company. Having a chance to work one-on-one with Mr. Frost at the company could be very beneficial.

Should you have any questions or require any additional information, please feel free to contact Eng. Morad or myself.

Thank you again for your hospitality.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files

TO: Rick Stier

FROM: Rod Frost

Trip Report: Ali & Ramadan I. Shorosh Co.
Abbassia, Cairo, July 17, 2000

For ALEB: Rod Frost

For Shorosh: Gharib Awad, Sales & Marketing Manager
Eng. Ossama Wasfy, Quality Technical Director

Summary of Visit:

The Shorosh Company was established in 1906. They manufacture a very wide range of products including all types of tin cans, hinged boxes, nails, tacks, polish and shoe laces. A tour of their large plant is a great surprise in each room with something interesting at every turn!

The reason for our visit was to discuss their closure manufacturing line. They have a very nice metal decorating plant making all types of tinplate boxes for tea, cookies, waste baskets, trays. Their four color presses can decorate the closures for companies such as P and J and Vitrec.

The German-made machines for making the closures are state-of-the-art! They have very good quality control testing stands for measuring the cap shells and the finished closures.

The caps are decorated on flat sheets with two and four color presses. The sheets are fed into a stamping press operating with a sheet positioning system cutting 360 caps per minute. The shells are conveyed by air (cups-up) to the plastisol lining machine, then conveyed through two baking, curing ovens and then to the final "bumping" unit that folds in the lugs on the closure.

Ossama was very happy to learn how to evaluate the closures and the glass they are used on.

We discussed: methods of measuring lug position, security, vacuum, how vacuum is formed, what the steam manifold does, capper adjustments, problems of tilted caps, over-tightened caps, loose caps, High "S" dimensions, Low "S", steam heating of closures prior to capping.

Summary of Visit: Shorosh Company

They do not have drawings of the glass finishes their closures are designed for. This is a very serious problem because the glass companies always tell them they are "within normal specifications". Without the critical drawings it is not possible to prove who is right.

I am working with a local glass company to obtain prints for the sizes of closures Shorosh manufactures. (30, 38, 53, 58, 63, 66, 82 mm) This information is difficult to obtain because the glass companies like to keep very tight control for the same reasons the Egyptians do. I will forward prints as soon as possible.

April 5, 2001

TEL 02-416-3628
FAX 02-416-3618

Mr. Sameh Kassem
Greena for Food Production & Export S.A.E.
278 Corniche Avenue, 6th Floor
Stanley Beach
Alexandria

Dear Mr. Sameh:

I would like to thank you and your colleagues for joining us at the Better Process Control School at the end of February. I hope that what you learned will be useful in the future. During the course of the school, you had a discussion with Mr. Rod Frost on spoilage problems that you have experienced with the 60 mL pouch of tomato paste that you are having manufactured. He has summarized that discussion and offered several suggestions for improving operations. He has also enclosed an engineering diagram of a similar system with which he has worked in the United States. Please remember, however, that it is very, very difficult to troubleshoot a problem without seeing the actual operation. Having been involved with hundreds of such investigations, you learn that it is often the most insignificant thing, which causes the problem.

If you haven't already done so, may I also suggest that you have a competent testing laboratory conduct a spoilage evaluation on any product that you find has spoiled to determine what organisms are causing the problem. The pouches should be opened aseptically and the contents cultured into acid media. A copy of the chapter "Examination of Canned Foods" from the Association of Official Analytical Chemists Bacteriological Analytical Manual is enclosed for reference. You will also find a list of websites that will provide you with additional information on thermal processing.

Thanks again for joining us in Cairo in February. Should you have any questions or require any additional information, please feel free to contact either Eng. Morad Ahmed or myself.

Sincerely yours,

Richard F. Stier
Director, Technical Services

cc: M. Ahmed, Files Kareem Bishara (Greena in Heliopolis), Ahmed Tarek Shahoine (Industria)

[redacted]

TO: Rick Stier

FROM: Rod Frost

Trip Report: Greena For Food Production & Export S.A.E.
68 El Merghani St., Heliopolis, Cairo
March 1, 2001

Discussion of pasteurizing-cooling tunnel design at the BPCS school in Cairo
March 1, 2001

For ALEB: Rod Frost, Dr. Joe Marcy

For Greena: Mr. Sameh Kassem
Mr. Amr Mostafa
Mr. Mohamed Gaber

Summary:

Greena packs a 60 ml pouch of tomato paste which they pasteurize in steam at 95 degrees C with a holding time of 4 to 9 minutes. The pouches are then air cooled with 6 degrees C circulating air.

They have experienced some problems with spoilage in a small number of pouches. They had even more problems when they used a cool water spray for cooling.

I do not know the design details of their tunnel as their descriptions of the inside were vague.

It is possible they are having trouble separating the steam cooking area from the cooling area. I have worked on a number of tunnels and have found it useful to have movable bulkheads at the infeed and discharge openings and at the end of the steam section. It is also necessary to have adjustable vent pipes for each area to balance the pressures of the chambers.

The vents are necessary to prevent the cold air from blowing into the steam chamber, steam blowing into the production room, or steam blowing into the cooling air.

The pouches should be in a single layer with no overlap, therefore, the movable bulkheads should be set high enough to clear the thickest pouch.

The steam section of the tunnel may have a pan holding about 4 inches of water to maintain an even temperature regardless of the number of pouches in the tunnel.

Summary: (contd.)

The steam may be injected into the water directly to provide uniform temperatures of 95 degrees C. If only steam is used without the water, it is more difficult to control temperatures because the pouches will deflect the steam, especially if only a partial load is run.

I don't know the size of their pasteurizing tunnel. If they have any detail prints that could be sent by e-mail I would be glad to look them over for comments.

The cooling air is normally controlled to provide dry pouches a few degrees above room temperature to prevent condensation.

THERMAL PROCESSING REFERENCE SITES

GOVERNMENT	
AOAC Bacteriological Analytical Manual	http://www.cfsan.fda.gov/~ebam/bam-toc.html
California Cannery Inspection Program	http://www.dhs.cahwnet.gov/ps/fdb/HTML/Food/indexcan.htm
Canadian Food Inspection Agency	www.cfia-acia.agr.ca
European Union on Line	http://europa.eu.int
Food and Agriculture Organization	http://www.fao.org
National Center for Food Safety & Technology	http://www.iit.edu/~ncfs/
United States Food & Drug	www.fda.gov
US FDA - Thermal Processing Regulations	http://vm.cfsan.fda.gov/~acrobat/cfr113pdf
US FDA - Acidified Food Regulations	http://vm.cfsan.fda.gov/~acrobat/cfr114pdf
US FDA - Instructions for Filing	http://vm.cfsan.fda.gov/~comm/lacf-s1.html
US FDA - Bad Bug Book	http://www.cfsan.fda.gov/~mow/intro.html
United States Department of Agriculture	http://www.usda.gov
ASSOCIATIONS & OTHER REFERENCES	
Campden & Chorleywood Food Research	www.campden.co.uk
Canning & Filling Magazine	www.canningandfilling.com
Central Tecnologie Nacional de la Conserves	www.ctnc.es
Food Processors Institute	www.fpi-food.org
Institute for Thermal Processing Specialists	http://www.itps.org
National Food Processors Association	http://www.nfpa-food.org
Temperature Indicators	http://www.temperature-indicators.co.uk/retort.htm

U.S. Food & Drug Administration
Center for Food Safety & Applied Nutrition

Bacteriological Analytical Manual *Online*

January 2001

Chapter 21A
Examination of Canned Foods

Authors

(Return to Table of Contents)

The incidence of spoilage in canned foods is low, but when it occurs it must be investigated properly. Swollen cans often indicate a spoiled product. During spoilage, cans may progress from normal to flipper, to springer, to soft swell, to hard swell. However, spoilage is not the only cause of abnormal cans. Overfilling, buckling, denting, or closing while cool may also be responsible. Microbial spoilage and hydrogen, produced by the interaction of acids in the food product with the metals of the can, are the principal causes of swelling. High summer temperatures and high altitudes may also increase the degree of swelling. Some microorganisms that grow in canned foods, however, do not produce gas and therefore cause no abnormal appearance of the can; nevertheless, they cause spoilage of the product.

Spoilage is usually caused by growth of microorganisms following leakage or underprocessing. Leakage occurs from can defects, punctures, or rough handling. Contaminated cooling water sometimes leaks to the interior through pinholes or poor seams and introduces bacteria that cause spoilage. A viable mixed microflora of bacterial rods and cocci is indicative of leakage, which may usually be confirmed by can examination. Underprocessing may be caused by undercooking; retort operations that are faulty because of inaccurate or improperly functioning thermometers, gauges, or controls; excessive contamination of the product for which normally adequate processes are insufficient; changes in formulation or handling of the product that result in a more viscous product or tighter packing in the container, with consequent lengthening of the heat penetration time; or, sometimes, accidental bypassing of the retort operation altogether. When the can contains a spoiled product and no viable microorganisms, spoilage may have occurred before processing or the microorganisms causing the spoilage may have died during storage.

Underprocessed and leaking cans are of major concern and both pose potential health hazards. However, before a decision can be made regarding the potential health hazard of a low-acid canned food, certain basic information is necessary. Naturally, if *Clostridium botulinum* (spores, toxin, or both) is found, the hazard is obvious. Intact cans that contain only mesophilic, Gram-positive, sporeforming rods should be considered underprocessed, unless proved otherwise. It must be determined that the can is intact (commercially acceptable seams and no microleaks) and that other factors that may lead to underprocessing, such as drained weight and product formulation, have been evaluated.

The preferred type of tool for can content examination is a bacteriological can opener consisting of a puncturing device at the end of a metal rod mounted with a sliding triangular blade that is held in place by a set screw. The advantage over other types of openers is that it does no damage to the double seam and therefore will not interfere with subsequent seam examination of the can.

Table 1. Useful descriptive terms for canned food analysis.

Exterior can condition	Internal can condition
leaker	normal
dented	peeling
rusted	slight, moderate or severe etching
buckled	slight, moderate or severe blackening
paneled	slight, moderate or severe rusting
bulge	mechanical damage

Micro-leak test	Product odor	Product liquor
packer seam	putrid	cloudy
side panel	acidic	clear
side seam	butyric	foreign
cut code	metallic	frothy
pinhole	sour	
	cheesy	
	fermented	
	musty	
	sweet	
	fecal	
	sulfur	
	off-odor	

Solid product	Liquid product	Pigment	Consistency
digested	cloudy	darkened	slimy
softened	clear	light	fluid
curdled	foreign	changed	viscous
uncooked	frothy		ropy
overcooked			

Flat - a can with both ends concave; it remains in this condition even when the can is brought down sharply on its end on a solid, flat surface.
Flipper - a can that normally appears flat; when brought down sharply on its end on a flat surface, one end flips out. When pressure is applied to this end, it flips in again and the can appears flat.
Springer - a can with one end permanently bulged. When sufficient pressure is applied to this end, it will flip in, but the other end will flip out.
Soft swell - a can bulged at both ends, but not so tightly that the ends cannot be pushed in somewhat with thumb pressure.
Hard swell - a can bulged at both ends, and so tightly that no indentation can be made with thumb pressure. A hard swell will generally "buckle" before the can bursts. Bursting usually occurs at the double seam over the side seam lap, or in the middle of the side seam.

The number of cans examined bacteriologically should be large enough to give reliable results. When the cause of spoilage is clear-cut, culturing 4-6 cans may be adequate, but in some cases it may be necessary to culture 10-50 cans before the cause of spoilage can be determined. On special occasions these procedures may not yield all the required information, and additional tests must be devised to collect the necessary data. Unspoiled cans may be examined bacteriologically to determine the presence of viable but dormant organisms. The procedure is the same as that used for spoiled foods except that the number of cans examined and the quantity of material subcultured must be increased.

A. Equipment and materials

1. Incubators, thermostatically controlled at 30, 35, and 55°C
2. pH meter, potentiometer
3. Microscope, slides, and coverslips
4. Can opener, bacteriological can opener, and can punch, all sterile
5. Petri dishes, sterile
6. Test tubes, sterile
7. Serological pipets, cotton-plugged, sterile
8. Nontapered pipets, cotton-plugged (8 mm tubing), sterile
9. Soap, water, brush, and towels, sterile and nonsterile
10. Indelible ink marking pen
11. Diamond point pen for marking cans
12. Examination pans (Pyrex or enamel baking pans)

B. Media and reagents

1. Bromcresol purple (BCP) dextrose broth (M27)
2. Chopped liver broth (M38) or cooked meat medium (CMM) (M42)
3. Malt extract broth (M94)
4. Liver-veal agar (without egg yolk) (LVA) (M83)
5. Acid broth (M4)
6. Nutrient agar (NA) (M112)
7. Methylene blue stain (R45), crystal violet (R16), or Gram stain (R32)
8. Sabouraud's dextrose agar (SAB) (M133)
9. 4% Iodine in 70% ethanol (R18)

C. Can preparation

Remove labels. With marking pen, transfer subnumbers to side of can to aid in correlating findings with code. Mark labels so that they may be replaced in their original position on the can to help locate defects indicated by stains on label. Separate all cans by code numbers and record size of container, code, product, condition, evidence of leakage, pinholes or rusting, dents, buckling or other abnormality, and all identifying marks on label. Classify each can according to the descriptive terms in Table 1. Before observing cans for classification, make sure cans are at room temperature.

D. Examination of can and contents

Classification of cans. **NOTE**: Cans must be at room temperature for classification.

1. **Sampling can contents**

   a. **Swollen cans**. Immediately analyze springers, swells, and a representative number (at least 6, if available) of flat and flipper cans. Retain examples of each, if available, when reserve portion must be held. Place remaining flat and flipper cans (excluding those held in reserve) in incubator at 35°C. Examine at frequent intervals for 14 days. When abnormal can or one becoming increasingly swollen is found, make note of it. When can becomes a hard swell or when swelling no longer progresses, culture sampled contents, examine for preformed toxin of *C. botulinum* if microscopic examination shows typical *C. botulinum* organisms or Gram-positive rods, and perform remaining steps of canned food examination.

   b. **Flat and flipper cans**. Place cans (excluding those held in reserve) in incubator at 35°C. Observe cans for progressive swelling at frequent intervals for 14 days. When swelling occurs, follow directions in I-a, above. After 14 days remove flat and flipper cans from incubator and test at least 6, if available. (It is not necessary to analyze all normal cans.) Do not incubate cans at temperatures above 35°C. After incubation, bring cans back to room temperature before classifying them.

2. **Opening the can**. Open can in an environment that is as aseptic as possible. Use of vertical laminar flow hood is recommended.

   a. **Hard swells, soft swells, and springers**. Chill hard swells in refrigerator before opening. Scrub entire uncoded end and adjacent sides of can using abrasive cleanser, cold water, and a brush, steel wool, or abrasive pad. Rinse and dry with clean sterile towel. Sanitize can end to be opened with 4% iodine in 70% ethanol for 30 min and wipe off with sterile towel. **DO NOT FLAME**. Badly swollen cans may spray out a portion of the contents, which may be toxic. Take some precaution to guard against this hazard, e.g., cover can with sterile towel or invert sterile funnel over can. Sterilize can opener by flaming until it is almost red, or use separate presterilized can openers, one for each can. At the time a swollen can is punctured, test for headspace gas, using a qualitative test or the gas-liquid chromatography method described below. For a qualitative test, hold mouth of sterile test tube at puncture site to capture some escaping gas, or use can-puncturing press to capture some escaping gas in a syringe. Flip mouth of tube to flame of Bunsen burner. A slight explosion indicates presence of hydrogen. Immediately turn tube upright and pour in a small amount of lime water. A white precipitate indicates presence of CO_2. Make opening in sterilized end of can large enough to permit removal of sample.

   b. **Flipper and flat cans**. Scrub entire uncoded end and adjacent sides of can using abrasive cleanser, warm water, and a brush, steel wool, or abrasive pad. Rinse and dry with clean sterile towel. Gently shake cans to mix contents before sanitizing. Flood end of can with iodine-ethanol solution and let stand at least 15 min. Wipe off iodine mixture with clean sterile towel. Ensure sterility of can end by flaming with burner in a hood until iodine-ethanol solution is burned off, end of can becomes discolored from flame, and heat causes metal to expand. Be careful not to inhale iodine fumes while burning off can end. Sterilize can opener by flaming until it is almost red, or use separate presterilized can openers for each can. Make opening in sterilized end of can large enough to permit removal of sample.

3. **Removal of material for testing**. Remove large enough portions from center of can to inoculate required culture media. Use sterile pipets, either regular or wide-mouthed. Transfer solid pieces with sterile spatulas or other sterile devices. Always use safety devices for pipetting. After removal of inocula, aseptically transfer at least 30 ml or, if less is available, all remaining contents of cans to sterile closed containers, and refrigerate at about 4°C. Use this material for repeat examination if needed and for possible toxicity tests. This is the reserve sample. Unless circumstances dictate otherwise, analyze normal cans submitted with sample organoleptically and physically (see 5-b, below), including pH determination and seam teardown and evaluation. Simply and completely describe product appearance, consistency, and odor on worksheet. If analyst is not familiar with decomposition odors of canned food, another analyst, preferably one familiar with decomposition odors, should confirm this organoleptic evaluation. In describing the product in the can, include such things as low liquid level (state how low), evidence of compaction, if apparent, and any other characteristics that do not appear normal. Describe internal and external condition of can, including evidence of leakage, etching, corrosion, etc.

4. **Physical examination**. Perform net weight determinations on a representative number of cans examined (normal and

abnormal). Determine drained weight, vacuum, and headspace on a representative number of normal-appearing and abnormal cans (1). Examine metal container integrity of a representative number of normal cans and all abnormal cans that are not too badly buckled for this purpose (see Chapter 22). **CAUTION**: Always use care when handling the product, even apparently normal cans, because botulinal toxin may be present.

5. **Cultural examination of low-acid food (pH greater than 4.6).** If there is any question as to product pH range, determine pH of a representative number of normal cans before proceeding. From each container, inoculate 4 tubes of chopped liver broth or cooked meat medium previously heated to 100°C (boiling) and rapidly cooled to room temperature; also inoculate 4 tubes of bromcresol purple dextrose broth. Inoculate each tube with 1-2 ml of product liquid or product-water mixture, or 1-2 g of solid material. Incubate as in Table 2.

Table 2. Incubation times for various media for examination of low acid foods (pH > 4.6).

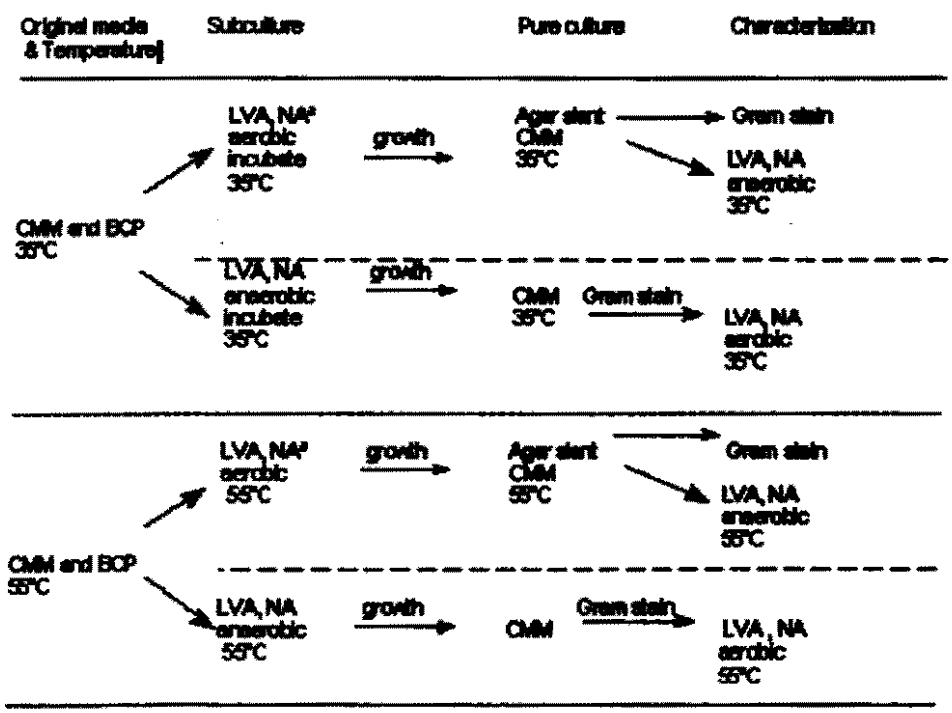
Medium	No. of tubes	Temp. (°C)	Time of incubation (h)
Chopped liver (cooked meat)	2	35	96-120
Chopped liver (cooked meat)	2	55	24-72
Bromcresol purple dextrose broth	2	55	24-48
Bromcresol purple dextrose broth	2	35	96-120

After culturing and removing reserve sample, test material from cans (other than those classified as flat) for preformed toxins of *C. botulinum* when appropriate, as described in Chapter 17.

a. **Microscopic examination.** Prepare direct smears from contents of each can after culturing. Dry, fix, and stain with methylene blue, crystal violet, or Gram stain. If product is oily, add xylene to a warm, fixed film, using a dropper; rinse and stain. If product washes off slide during preparation, examine contents as wet mount or hanging drop, or prepare suspension of test material in drop of chopped liver broth before drying. Check liver broth before use to be sure no bacteria are present to contribute to the smear. Examine under microscope; record types of bacteria seen and estimate total number per field.

b. **Physical and organoleptic examination of can contents.** After removing reserve sample from can, determine pH of remainder, using pH meter. **DO NOT USE pH PAPER.** Pour contents of cans into examination pans. Examine for odor, color, consistency, texture, and overall quality. **DO NOT TASTE THE PRODUCT**. Examine can lining for blackening, detinning, and pitting.

Table 3.Schematic diagram of culture procedure for low-acid canned foods



[a] LVA, liver-veal agar; NA, nutrient agar; CMM, cooked meat medium; BCP, bromcresol purple dextrose broth.

Table 4. Incubation of acid broth and malt extract broth used for acid foods (pH 4.6)

Medium	No. of tubes	Temp. (°C)	Time of incubation (h)
Acid broth	2	55	48
Acid broth	2	30	96
Malt extract broth	2	30	96

Table 5. Pure culture scheme for acid foods (pH 4.6).

Original Media	Subculture		Pure culture		Characterization
Acid broth Malt extract broth 30°C	NA, SAB[a] aerobic 30°C	growth	Agar slant		Gram stain
			Acid broth Malt extract broth 30°C		NA, SAB anaerobic 30°C
	NA, SAB anaerobic 30°C	growth	Acid broth Malt extract broth 30°C	Gram stain	NA, SAB aerobic 30°C
Acid broth 55°C	NA aerobic 55°C	growth	Agar slant Acid broth		Gram stain
					NA anaerobic, 55°C
	NA anaerobic 55°C	growth	Acid broth 55°C	Gram stain	NA aerobic, 55°C

[a] NA, nutrient agar; SAB, Sabouraud's dextrose agar.

E. Cultural findings in cooked meat medium (CMM) and bromcresol purple dextrose broth (BCP)

Check incubated medium for growth at frequent intervals up to maximum time of incubation (Table 2). If there is no growth in either medium, report and discard. At time growth is noted streak 2 plates of liver-veal agar (without egg yolk) or nutrient agar from each positive tube. Incubate one plate aerobically and one anaerobically, as in schematic diagram (Table 3). Reincubate CMM at 35°C for maximum of 5 days for use in future toxin studies. Pick representatives of all morphologically different types of colonies into CMM and incubate for appropriate time, i.e., when growth is sufficient for subculture. Dispel oxygen from CMM broths to be used for anaerobes but not from those to be used for aerobes. After obtaining pure isolates, store cultures to maintain viability.

1. **If mixed microflora is found only in BCP**, report morphological types. If rods are included among mixed microflora in CMM, test CMM for toxin, as described in Chapter 17. If Gram-positive or Gram-variable rods typical of either *Bacillus* or *Clostridium* organisms are found in the absence of other morphological types, search to determine whether spores are present. In some cases, old vegetative cells may appear to be Gram-negative and should be treated as if they are Gram-positive. Test culture for toxin according to Chapter 17.

Table 6. Classification of food products according to acidity

Low acid--pH greater than 4.6	Acid pH 4.6 and below
Meats	Tomatoes
Seafoods	Pears
Milk	Pineapple
Meat and vegetable Mixtures and "specialties"	Other fruit
Spaghetti	
Soups	Sauerkraut
Vegetables	Pickles
Asparagus	
Beets	Berries
Pumpkin	
Green beans	Citrus
Corn	
Lima beans	Rhubarb

Table 7. Spoilage microorganisms that cause high and low acidity in various vegetables and fruits

Spoilage type	pH groups	Examples
Thermophilic		
Flat-sour	≥5.3	Corn, peas
Thermophilic[a]	≥4.8	Spinach, corn
Sulfide spoilage[a]	≥5.3	Corn, peas
Mesophilic		
Putrefactive anaerobes[a]	≥4.8	Corn, asparagus
Butyric anaerobes	≥4.0	Tomatoes, peas
Aciduric flat-sour[a]	≥4.2	Tomato juice
Lactobacilli	4.5-3.7	Fruits
Yeasts	≤3.7	Fruits
Molds	≤3.7	Fruits

[a] The responsible organisms are bacterial sporeformers.

Table 8. Spoilage manifestations in low-acid products

Group of organisms	Classification	Manifestations
Flat-sour	Can flat	Possible loss of vacuum on storage
	Product	Appearance not usually altered; pH markedly lowered, sour; may have slightly abnormal odor; sometimes cloudy liquor
Thermophilic anaerobe	Can swells	May burst
	Product	Fermented, sour, cheesy or butyric odor
Sulfide spoilage	Can flat	H_2S gas absorbed by product
	Product	Usually blackened; rotten egg odor
Putrefactive anaerobe	Can swells	May burst
	Product	May be partially digested; pH slightly above normal; typical putrid odor
Aerobic sporeformers	Can flat or swollen	Usually no swelling, except in cured meats when nitrate and sugar present; coagulated evaporated milk, black beets

Table 9. Spoilage manifestations in acid products		
Type of organism	**Classification**	**Manifestation**
Bacillus thermoacidurans (flat, sour tomato juice)	Can flat	Little change in vacuum
	Product	Slight pH change; off-odor
Butyric anaerobes (tomatoes and tomato juice)	Can swells	May burst
	Product	Fermented, butyric odor
Nonsporeformers (mostly lactic types)	Can swells	Usually burst, but swelling may be arrested
	Product	Acid odor

Table 10. Laboratory diagnosis of bacterial spoilage		
	Underprocessed	**Leakage**
Can	Flat or swelled; seams generally normal	Swelled; may show normal defects[a]
Product appearance	Sloppy or fermented	Frothy fermentation; viscous
odor	Normal, sour or putrid, but generally consistent from can to can	Sour, fecal; generally varying from can to can
pH	Usually fairly constant	Wide variation
Microscopic and cultural	Cultures show sporeforming rods only	Mixed cultures, generally rods and cocci; only at usual temperatures
	Growth at 35 and/or 55°C. May be characteristic on special growth media, e.g., acid agar for tomato juice. If product misses retort completely, rods, cocci,yeast or molds, or any combination of these may be present.	
History	Spoilage usually confined to certain portions of pack	Spoilage scattered
	In acid products, diagnosis may be less clearly defined; similar organisms may be involved in understerilization and leakage.	

[a] Leakage may be due not to can defects but to other factors, such as contamination of cooling water or rough handling, e.g., can unscramblers, rough conveyor system.

Table 11. pH range of a few selected commercially canned foods			
Food	**pH range**	**Food**	**pH range**
Apples, juice	3.3 - 3.5	Jam, fruit	3.5 - 4.0
Apples, whole	3.4 - 3.5	Jellies, fruit	3.0 - 3.5
Asparagus, green	5.0 - 5.8	Lemon juice	2.2 - 2.6
Beans		Lemons	2.2 - 2.4
Baked	4.8 - 5.5	Lime juice	2.2 - 2.4
Green	4.9 - 5.5	Loganberries	2.7 - 3.5
Lima	5.4 - 6.3	Mackerel	5.9 - 6.2
Soy	6.0 - 6.6	**Milk**	
Beans with pork	5.1 - 5.8	Cow, whole	6.4 - 6.8
Beef, corned, hash	5.5 - 6.0	Evaporated	5.9 - 6.3
Beets, whole	4.9 - 5.8	Molasses	5.0 - 5.4
Blackberries	3.0 - 4.2	Mushroom	6.0 - 6.5
Blueberries	3.2 - 3.6	Olives, ripe	5.9 - 7.3
Boysenberries	3.0 - 3.3	Orange juice	3.0 - 4.0
Bread		Oysters	6.3 - 6.7

White	5.0 - 6.0	Peaches	3.4 - 4.2
Date and nut	5.1 - 5.6	Pears (Bartlett)	3.8 - 4.6
Broccoli	5.2 - 6.0	Peas	5.6 - 6.5
Carrot juice	5.2 - 5.8	Pickles	
Carrots, chopped	5.3 - 5.6	Dill	2.6 - 3.8
Cheese		Sour	3.0 - 3.5
Parmesan	5.2 - 5.3	Sweet	2.5 - 3.0
Roquefort	4.7 - 4.8	Pimento	4.3 - 4.9
Cherry juice	3.4 - 3.6	Pineapple	
Chicken	6.2 - 6.4	Crushed	3.2 - 4.0
Chicken with noodles	6.2 - 6.7	Juice	3.4 - 3.7
Chop suey	5.4 - 5.6	Sliced	3.5 - 4.1
Cider	2.9 - 3.3	Plums	2.8 - 3.0
Clams	5.9 - 7.1	Potato salad	3.9 - 4.6
Cod fish	6.0 - 6.1	Potatoes	
Corn		Mashed	5.1
Cream style	5.9 - 6.5	White, whole	5.4 - 5.9
On-the-cob	6.1 - 6.8	Prune juice	3.7 - 4.3
Whole grain		Pumpkin	5.2 - 5.5
Brine-packed		Raspberries	2.9 - 3.7
Vacuum-packed	6.0 - 6.4	Rhubarb	2.9 - 3.3
Crab apples, spiced	3.3 - 3.7	Salmon	6.1 - 6.5
Cranberry		Sardines	5.7 - 6.6
Juice	2.5 - 2.7	Sauerkraut	3.1 - 3.7
Sauce	2.3	Juice	3.3 - 3.4
Currant juice	3.0	Shrimp	6.8 - 7.0
Dates	6.2 - 6.4	Soups	
Duck	6.0 - 6.1	Bean	5.7 - 5.8
Figs	4.9 - 5.0	Beef broth	6.0 - 6.2
Frankfurters	6.2 - 6.2	Chicken noodle	5.5 - 6.5
Fruit cocktail	3.6 - 4.0	Clam chowder	5.6 - 5.9
Gooseberries	2.8 - 3.1	Duck	5.0 - 5.7
Grapefruit		Mushroom	6.3 - 6.7
Juice	2.9 - 3.4	Noodle	5.6 - 5.8
Pulp	3.4	Oyster	6.5 - 6.9
Sections	3.0 - 3.5	Pea	5.7 - 6.2
Grapes	3.5 - 4.5	Spinach	4.8 - 5.8
Ham, spiced	6.0 - 6.3	Squash	5.0 - 5.8
Hominy, lye	6.9 - 7.9	Tomato	4.2 - 5.2
Huckleberries	2.8 - 2.9	Turtle	5.2 - 5.3
		Vegetable	4.7 - 5.6
Strawberries	3.0 - 3.9	Miscellaneous products	
Sweet potatoes	5.3 - 5.6	Beers	4.0 - 5.0
Tomato juice	3.9 - 4.4	Ginger ale	2.0 - 4.0
Tomatoes	4.1 - 4.4	Humans	
Tuna	5.9 - 6.1	Blood plasma	7.3 - 7.5
Turnip greens	5.4 - 5.6	Duodenal contents	4.8 - 8.2
Vegetable juice	3.9 - 4.3	Feces	4.6 - 8.4
Vegetables, mixed	5.4 - 5.6	Gastric contents	1.0 - 3.0
Vinegar	2.4 - 3.4	Milk	6.6 - 7.6
Youngberries	3.0 - 3.7	Saliva	6.0 - 7.6

	Spinal fluid	7.3 - 7.5
	Urine	4.8 - 8.4
	Magnesia, milk of	10.0 -10.5
	Water	
	Distilled, CO_2	6.8 - 7.0
	Mineral	6.2 - 9.4
	Sea	8.0 - 8.4
	Wine	2.3 - 3.8

2. **If no toxin is present**, send pure cultures for evaluation of heat resistance to Cincinnati District Office, FDA, 1141 Central Parkway, Cincinnati, OH 45202, if cultures meet the following criteria:

   - Cultures come from intact cans that are free of leaks and have commercially acceptable seams. (Can seams of both ends of can must be measured; visual examination alone is not sufficient.)

   - Two or more tubes are positive and contain similar morphological types.

3. **Examination of acid foods (pH 4.6 and below) by cultivation**. From each can, inoculate 4 tubes of acid broth and 2 tubes of malt extract broth with 1-2 ml or 1-2 g of product, using the same procedures as for low-acid foods, and incubate as in Table 4. Record presence or absence of growth in each tube, and from those that show evidence of growth, make smears and stain. Report types of organisms seen. Pure cultures may be isolated as shown in Table 5.

F. Interpretation of results (see Tables 6-11)

1. The presence of only sporeforming bacteria, which grow at 35°C, in cans with satisfactory seams and no microleaks indicates underprocessing if their heat resistance is equal to or less than that of *C. botulinum*. Spoilage by thermophilic anaerobes such as *C. thermobutylicum* may be indicated by gas in cooked meat at 55°C and a cheesy odor. Spoilage by *C. botulinum*, *C. sporogenes*, or *C. perfringens* may be indicated in cooked meat at 35°C by gas and a putrid odor; rods, spores, and clostridial forms may be seen on microscopic examination. Always test supernatants of such cultures for botulinal toxin even if no toxin was found in the product itself, since viable botulinal spores in canned foods indicate a potential public health hazard, requiring recall of all cans bearing the same code. Spoilage by mesophilic organisms such as *Bacillus thermoacidurans* or *B. coagulans* and/or thermophilic organisms such as *B. stearothermophilus*, which are flat-sour types, may be indicated by acid production in BCP tubes at 35 and/or 55°C in high-acid or low-acid canned foods. No definitive conclusions may be drawn from inspection of cultures in broth if the food produced an initial turbidity on inoculation. Presence or absence of growth in this case must be determined by subculturing.

2. Spoilage in acid products is usually caused by nonsporeforming lactobacilli and yeasts. Cans of spoiled tomatoes and tomato juice remain flat but the products have an off-odor, with or without lowered pH, due to aerobic, mesophilic, and thermophilic sporeformers. Spoilage of this type is an exception to the general rule that products below pH 4.6 are immune to spoilage by sporeformers. Many canned foods contain thermophiles which do not grow under normal storage conditions, but which grow and cause spoilage when the product is subjected to elevated temperatures (50-55° C). *B. thermoacidurans* and *B. stearothermophilus* are thermophiles responsible for flat-sour decomposition in acid and low-acid foods, respectively. Incubation at 55°C will not cause a change in the appearance of the can, but the product has an off-odor with or without a lowered pH. Spoilage encountered in products such as tomatoes, pears, figs, and pineapples is occasionally caused by *C. pasteurianum*, a sporeforming anaerobe which produces gas and a butyric acid odor. *C. thermosaccolyticum* is a thermophilic anaerobe which causes swelling of the can and a cheesy odor of the product. Cans which bypass the retort without heat processing usually are contaminated with nonsporeformers as well as sporeformers, a spoilage characteristic similar to that resulting from leakage.

3. A mixed microflora of viable bacterial rods and cocci usually indicates leakage. Can examination may not substantiate the bacteriological findings, but leakage at some time in the past must be presumed. Alternatively, the cans may have missed the retort altogether, in which case a high rate of swells would also be expected.

4. A mixed microflora in the product, as shown by direct smear, in which there are large numbers of bacteria visible but no growth in the cultures, may indicate precanning spoilage. This results from bacterial growth in the product before canning. The product may be abnormal in pH, odor, and appearance.

5. If no evidence of microbial growth can be found in swelled cans, the swelling may be due to development of hydrogen by chemical action of contents on container interiors. The proportion of hydrogen varies with the length and condition of storage. Thermophilic anaerobes produce gas, and since cells disintegrate rapidly after growth, it is possible to confuse thermophilic spoilage with hydrogen swells. Chemical breakdown of the product may result in evolution of carbon dioxide. This is particularly true of concentrated products containing sugar and some acid, such as tomato

paste, molasses, mincemeats, and highly sugared fruits. The reaction is accelerated at elevated temperatures.

6. Any organisms isolated from normal cans that have obvious vacuum and normal product but no organisms in the direct smear should be suspected as being a laboratory contaminant. To confirm, aseptically inoculate growing organism into another normal can, solder the hole closed, and incubate 14 days at 35°C. If any swelling of container or product changes occur, the organism was probably not in the original sample. If can remains flat, open it aseptically and subculture as previously described. If a culture of the same organism is recovered and the product is normal, consider the product commercially sterile since the organism does not grow under normal conditions of storage and distribution.

Headspace Gas Determination by Gas-Liquid Chromatography

Nitrogen, the principal gas normally present in canned foods during storage, is associated with lesser quantities of carbon dioxide and hydrogen. Oxygen included in the container at the time of closure is initially dissipated by container corrosion and/or product oxidation. Departure from this normal pattern can serve as an important indication of changes within the container, since the composition of headspace gases may distinguish whether bacterial spoilage, container corrosion, or product deterioration is the cause of swollen cans (2). Use of the gas chromatograph for analyzing headspace gases of abnormal canned foods has eliminated the possibility of false-negative tests for different gases. It has also allowed the analyst to determine the percentage of each gas present, no matter what the mixture is. By knowing these percentages, the analyst can be alerted to possible can deterioration problems or bacterial spoilage. A rapid gas-liquid chromatographic procedure is presented here for the determination of carbon dioxide, hydrogen, oxygen, nitrogen, and hydrogen sulfide from the headspace of abnormal canned foods.

The analysis of 2352 abnormal canned foods, composed of 288 different products by a gas-liquid chromatography showed viable microorganisms in 256 cans (3). Analysis of this data showed that greater than 10 percent carbon dioxide in the headspace gas was indicative of microbial growth. Although greater than 10 percent carbon dioxide is found in a container, long periods of storage at normal temperatures can result in autosterilization and absence of viable microorganisms. Carbon dioxide my be produced in sufficient quantities to swell the container. Storage at elevated temperatures accelerates this action. Hydrogen can be produced in cans when the food contents react chemically with the metal of the seam (3).

A. Equipment and materials

1. Fisher Model 1200 Gas Partitioner, with dual thermal conductivity cells and dual in-line columns. Column No. 1 is 6-1/2 ft x 1/8 inch, aluminum packed, with 80-100 mesh Columpak™ PQ. Column No. 2 is 11 ft x 3/16 inch, aluminum packed, with 60-80 mesh molecular sieve 13X (Fig. 1).

   NOTE: Other gas chromatograph instruments equipped with the appropriate columns, carrier gas, detector and recorder or integrator may also be suitable for this analysis.

   Operating conditions: column temperature, 75°C; attenuation, 64/256; carrier gas, argon, with in-let pressure of 40 psig; flow rate, 26 ml/min through gas partitioner and 5 ml/min through flush line; bridge current, 125 mA; column mode, 1 & 2; temperature mode, column; injector temperature, off.

   NOTE: Installation of flush system. Injection of gas samples through either sample out port or septum injection port may lead to damaged filaments in detector and excessive accumulation of moisture on columns due to bypassing the sample drying tube. To avoid this, make all injections in the sample in port. To avoid cross-contamination, install a flush line off the main argon line (Fig. 2), and flush sample loop between injections.

2. Strip chart recorder, with full scale deflection and speed set at 1 cm/min, 1 mv

3. Can puncturing press (Fig. 3)

4. Sterile stainless steel gas piercers (Fig. 4)

5. Miniature inert valve, with 3-way stopcock and female luer on left side (Popper & Sons, Inc., 300 Denton Ave., New Hyde Park, NY 11040), or equivalent (Fig. 5)

6. Plastic disposable 10-50 ml syringes, with restraining attachment for maximum volume control (Fig. 6). Syringes may be reused.

7. Gas chromatograph and caps, for capping syringes (Alltech Associates, Inc., 202 Campus Drive, Arlington Heights, IL 60004), or equivalent (Fig. 6)

8. Beaker, 1 liter, glass or metal

9. Plastic gas tubing, 3 ft x 1/8 inch id, for exhaust tubing

10. Soap solution, for detecting gas leaks ("SNOOP" Nuclear Products Co., 15635 Saranac Road, Cleveland, OH 44110), or equivalent

11. Small pinch clamp, to weigh down exhaust tubing in beaker

12. Nupro Valve, flow-regulating valve for flush line, 1/8 inch, Angle Pattern Brass (Alltech), or equivalent (Fig. 2)

13. Silicone rubber tubing, seamless, red, autoclavable, 1/8 inch bore x 3/16 inch wall thickness (Arthur H. Thomas Co., Vine St. at 3rd, Philadelphia, PA), or equivalent

B. Calibration of gas chromatograph

Calibration gases of known proportions are commercially available. Construct calibration curves from analysis of pure gases and at least 2-3 different percentage mixtures of gases. Plot linear graph of various known concentrations of each gas as peak height (mm) vs percent gas (Fig. 7).

C. Preparation of materials

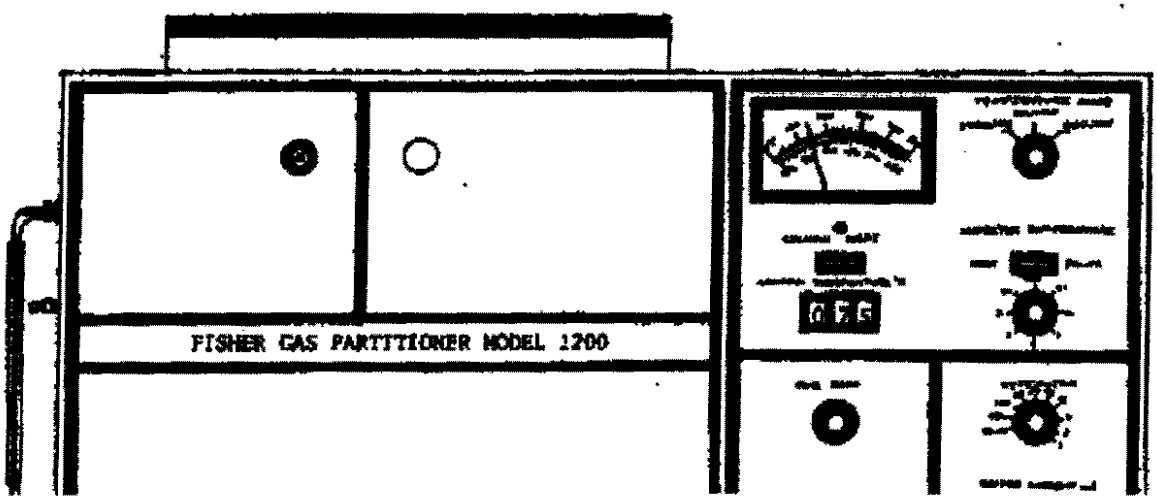
Prepare gas collection apparatus as illustrated in Figs. 8 and 9. Adjust height of gas collection apparatus to height of can to be examined. Attach male terminal of miniature valve to female Luer-Lok terminal mounted on top of brass block on can-puncturing press. Attach one end of gas exhaust tubing to female terminal of miniature valve. Attach small pinch clamp to other end of gas exhaust tubing and place in beaker partially filled with water. Attach disposable syringe to other female Luer-Lok terminal on miniature valve. Turn 2-way plug so that gas entering from piercer will flow toward disposable syringe. Place sterile gas piercer in position on male terminal mounted on bottom of brass block on can-puncturing press.

D. Collection of headspace gas

Place can under gas press (cans to be cultured should first be cleaned and sterilized). Lower handle until gas piercer punctures can and seals. Hold in position until adequate volume of gas has been collected (minimum of 5 ml); then turn 2-way plug to release excess gas through exhaust tubing. Release handle, remove syringe, and cap immediately. Identify syringe appropriately.

E. Injection of gas into gas chromatograph

Turn on gas chromatograph and recorder. Let stabilize for about 2 h. Make sure flush line is attached and gas sampling valve is open to allow flushing of sample loop. Turn on chart drive on recorder. Remove flush line, uncap, and immediately attach syringe to Sample-In Injection Port. Inject 5-10 ml of gas and immediately close gas sampling valve. Remove syringe and cap. Reattach flush line onto Sample-In Port and open gas sample valve to allow flushing of system before next injection. Observe chromatogram and switch attenuation from 64 to 256 after carbon dioxide peak has been recorded and returned back to base line. This allows hydrogen peak to be retained on scale. After hydrogen peak returns to base line, switch attenuation back to 64. After instrument has separated gases (about 6 min), determine retention time and peak height for each gas recovered from unknown sample and percent determined from standard graph by comparing retention times and peak heights with known gases, usually associated with headspace gases from abnormal canned food products. Mount chromatogram on mounting paper and identify properly as in Fig. 10. For each sample examined, inject control gases for each type of headspace gas recovered.



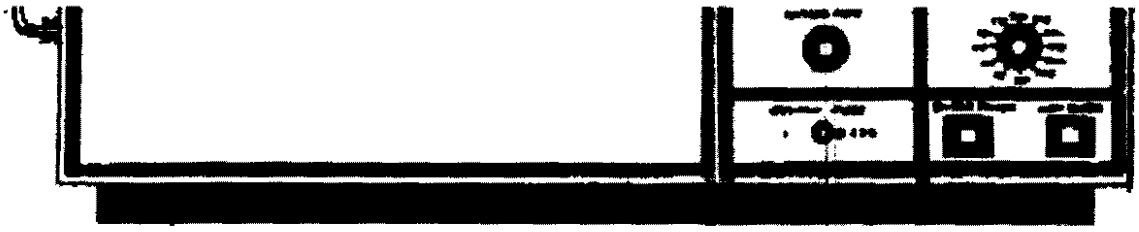


Figure 1. Fisher Model 1200 gas partitioner.

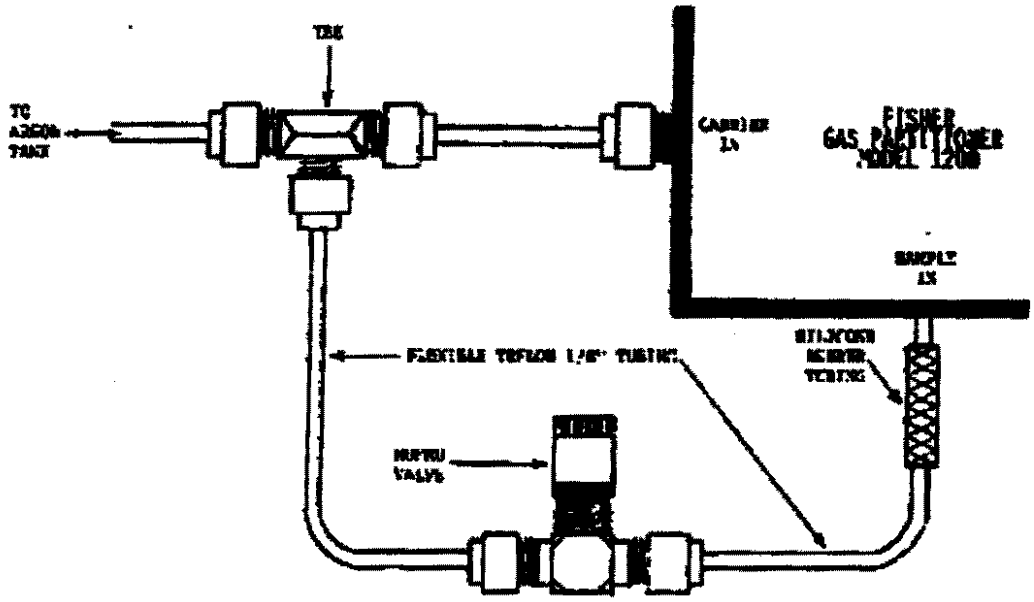
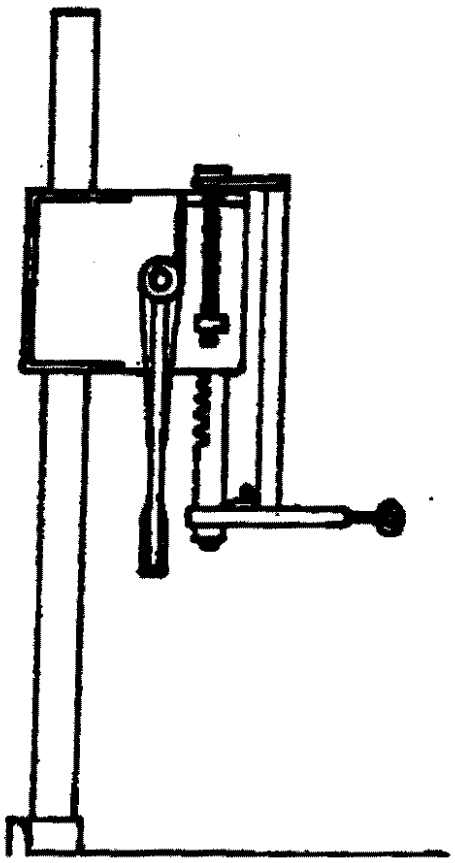


Figure 2. Flush System.



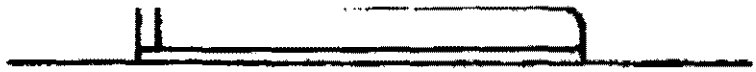


Figure 3. Can puncturing press.

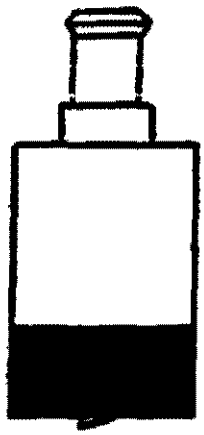


Figure 4. Stainless steel gas piercer.

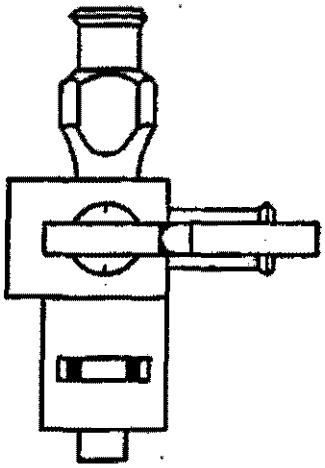


Figure 5. Miniature inert valve.

Gas Chromatograph End Cap

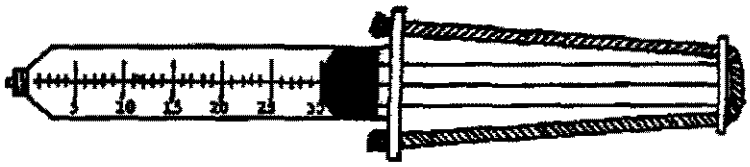


Figure 6. Plastic disposable syringe with restraining attachment.

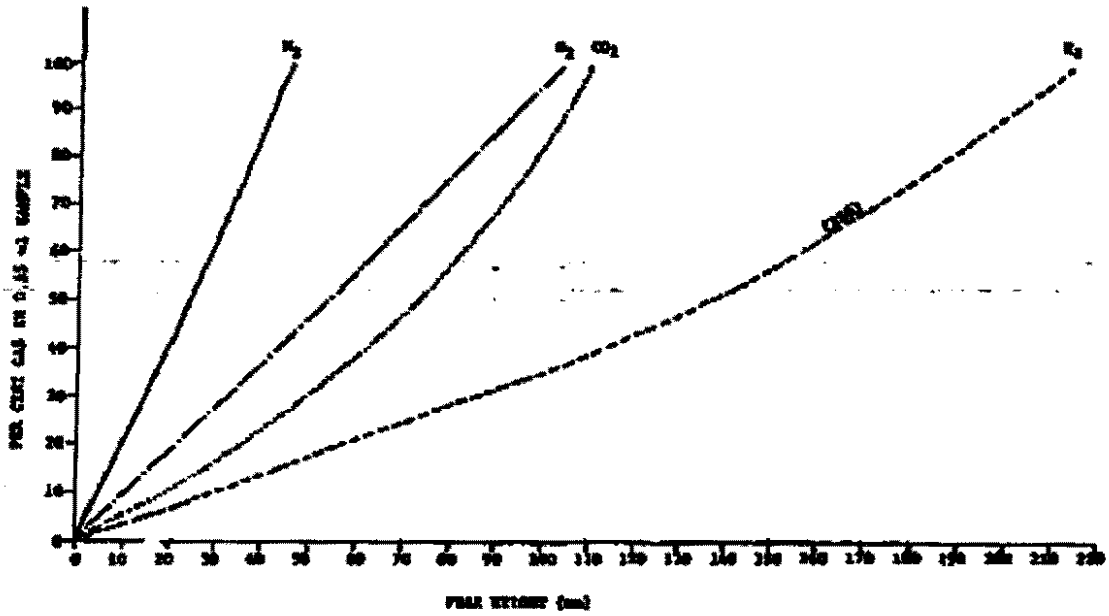


Figure 7. Calibration graph for gas chromatography of headspace gas, using pure and unknown mixtures.

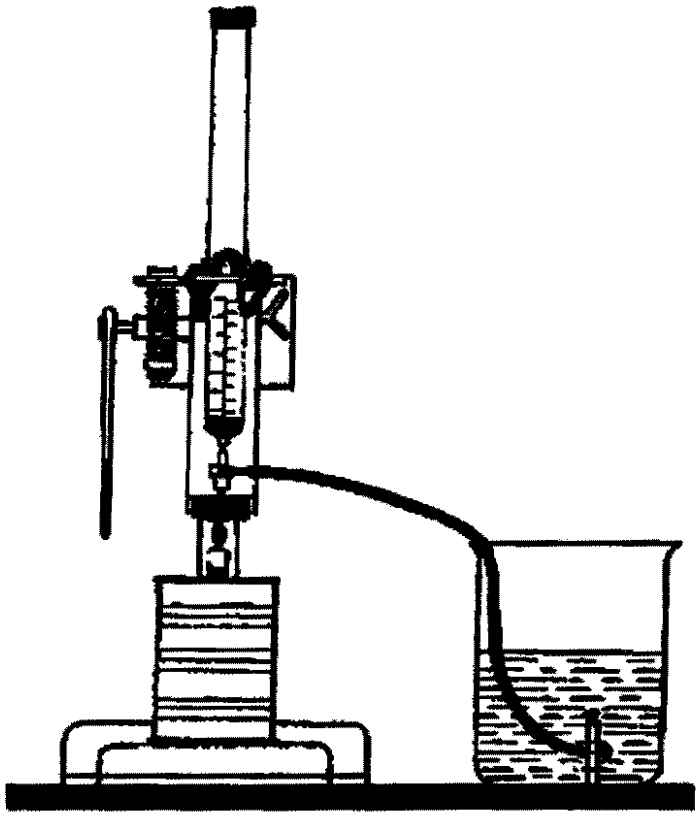


Figure 8. Gas collection apparatus.

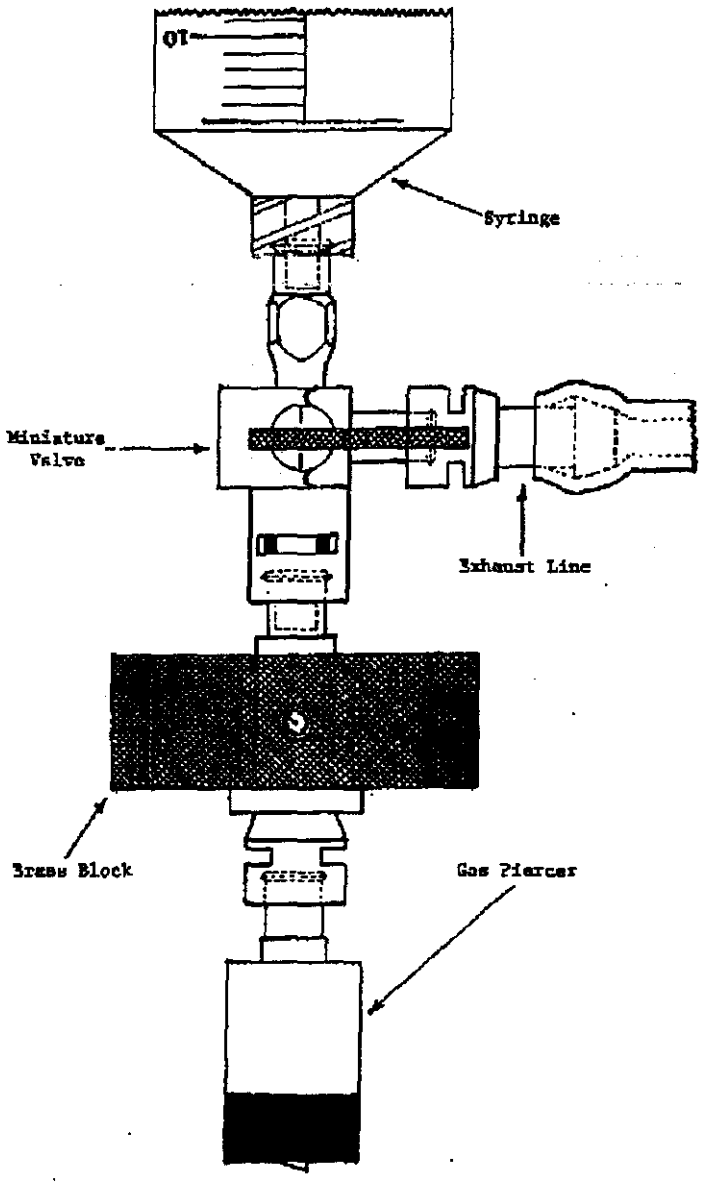
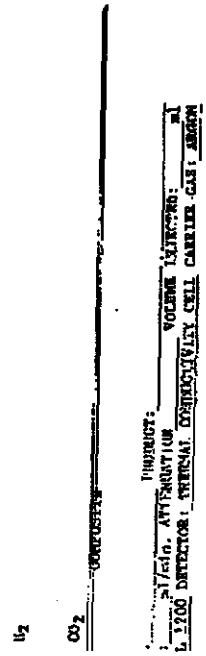


Figure 9. Gas collection apparatus (detail).



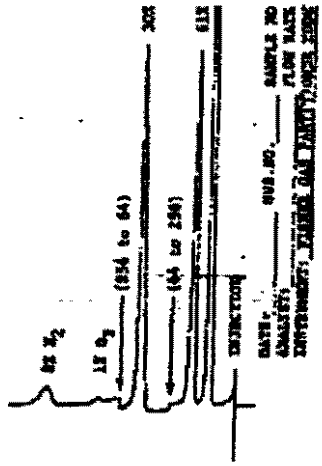


Figure 10. Gas chromatograph of headspace gas.

References

1. Association of Official Analytical Chemists. 1990. Official Methods of Analysis, 15th ed. AOAC, Arlington, VA.

2. Vosti, D.C., H.H. Hernandez, and J.G. Strand. 1961. Analysis of headspace gases in canned foods by gas chromatography. Food Technol. 15:29-31.

3. Landry, W.L., J.E. Gilchrist, S. McLaughlin, and J.T. Peeler 1988. Analysis of abnormal canned foods. AOAC Abstracts.

Hypertext Source: Examination of Canned Foods, Bacteriological Analytical Manual, 8th Edition, Revision A, 1998. Chapter 21A.
Authors: Warren L. Landry, Albert H. Schwab, and Gayle A. Lancette

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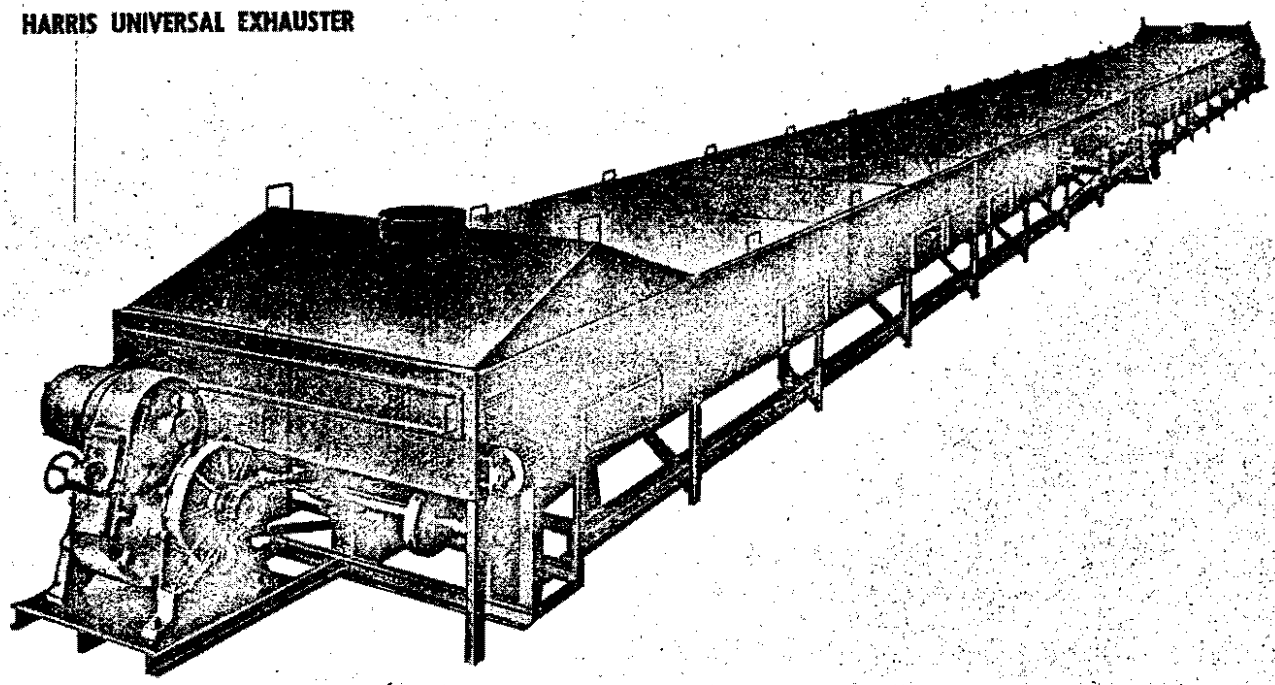
Hypertext updated by kwg 2001-JAN-05

This drawing should help in answering questions on cookers — They work fine — The movable baffle described in my report will separate the "cook" unit from the "cooling" section — This is for a large unit — so Athena can use the ideas on a smaller scale. —

HARRIS UNIVERSAL EXHAUSTER



The design of the Harris Universal Exhauster and its unique conveyor system, the Harris "Walking Beam" incorporates three savings formerly unheard of in processing equipment; savings in maintenance and operating costs; savings in floor space. Your plant and processing engineers will be quick to see the advantages.

United Welding & Manufacturing Company will be happy to show further, how you can profit from this equipment. In your inquiry, state container, product, process time.

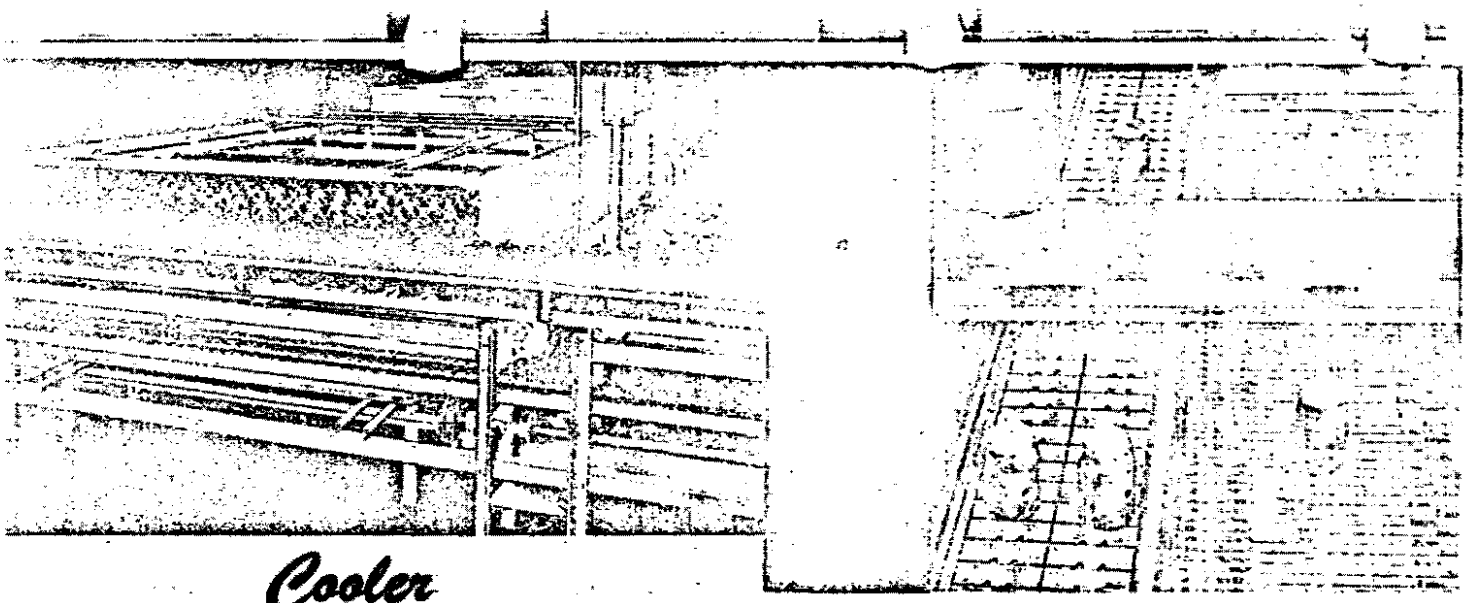
The Harris "Walking Beam" Conveyor System used on the Harris Exhauster loads the equipment to 100% of the processing area—and keeps it loaded. There are no pulleys, chains, guides or pusher bars to take up space. The entire load moves at once and travels safely, without banging, jamming or damage to the product.

GENERAL SPECIFICATIONS

Type	Walking Beam
Conveyor	¼" x 1½" Steel bar grill
Body	⅜" Plate steel
Cover	14 ga. Sheet steel
Water seal	yes
Steam manifold	yes
Automatic Loading Conveyor	Wire belt
Automatic Discharge Conveyor	Wire belt
Inside widths	4'0, 6' and 8'
Inside lengths	As required
Outside widths	Inside plus 2"
Outside lengths	Inside plus 4'0
Size cans	2" to 7" dia. up to 10" high
Grease points	None in processing area
Usable area	100%

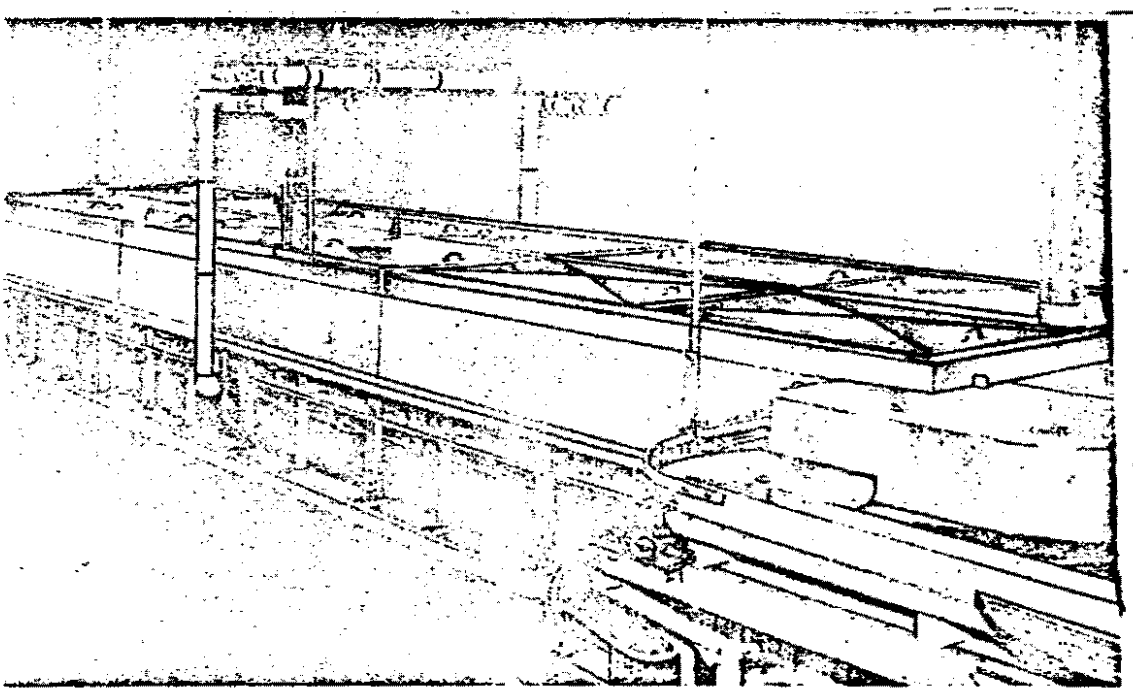
The Harris Universal Exhauster can be built in any combination of materials; i.e. milled steel, stainless, brass or aluminum.

Special units can be supplied to your specifications



Cooler

Dastrainer



Exhaust Box or Cooker

10/6/65

STEAM & WATER EXHAUST BOX

Dwg. #WPL-4913

The schematic drawing illustrates general construction of a continuous feed and discharge steam and water exhaust box for foods in glass jars. The basic illustrations are listed as follows:

1). Side view: A drawing showing adjustable legs and cross supports, metal plate sides, removable covers supported in a water seal trough, a woven wire mesh belt, a water pan under the belt, between the sides and infeed and discharge belt pulleys, a steam exhaust vent stack, and a vari-speed motor drive.

2). Entrance end elevation: A drawing showing enclosed infeed conveyor, look-in hinged gates semi water tight and vent stack. This end is to be enclosed as tight as possible to prevent steam vapor escape into the packing room area and to take greatest advantage of the steam heating feature provided.

3). Section A-A: A drawing showing a side view of the mesh belt wear strips, the water pan, the steam infeed manifold, the pipe coupling for draining water, and the pipe coupling for overflow water.

4). Chain support diagram: A drawing showing steel wear strips alternately spaced every three feet. The spacing as shown provides for uniform heat distribution up through the belt as well as for uniform mesh belt wear.

5). Steam piping diagram: A drawing showing the steam discharge headers capped on the ends. The spacing and steam supply pipes should be centrally spaced so as to provide an equal amount of steam pressure at the ends as well as at the infeed positions. Steam valves and pressure regulators should be provided for uniform distribution and heating throughout the entire surface area.

The water level in the pan should be approximately two inches below the top of the mesh belt with the steam headers one inch below the water level. The steam outlet holes are directed horizontally and spaced opposite on three inch centers as shown, for uniform heating.

6). Water seal: The section illustrates a method of providing a water seal trough on the sides and spaced on three foot centers horizontally. The covers are removable, except where the vent is located, and are shown with approximately a two degree slope in cross section to carry steam condensate to the water seal trough. This provides a constant water seal and minimizes the possibility of drippage into the open containers passing through.

General:

The length and width as shown is 30' - 0" by 6' - 0". These dimensions are determined by the production capacity required and the desired exhaust temperature of the product. Heating time can be determined by laboratory test in which the product with hot syrup is placed approximately 2" over hot water at low level in a deep pot, partially covered, maintaining the water temperature at approximately 206° F. to 208° F. Product temperatures should be checked at intervals until the desired exhaust temperature is reached.

The exhaust vent to atmosphere may be from eight inches in diameter to twenty inches in diameter, depending on the size of the exhaust box and the relative humidity of the atmosphere. It might be advisable, where humidity varies greatly, to install an oversize vent pipe with a damper or baffle which could be regulated to the existing conditions.

The woven wire mesh belt should be of small enough wire and spacing to form a stable carrying surface for the containers to be handled. Manufacturers of this material can provide this information. The preference of material, galvanized iron or stainless steel, will be an economic factor. Stainless steel will out perform and outlast galvanized iron, especially where products being processed are high in acid content. The head pully should be rubber lined or rubber vulcanized to provide good belt tracking and alignment. A belt takeup should also be provided since mesh belt will stretch when new, sometimes to a point where a short section must be removed to insure a good pull. Belt manufacturers can provide the information for drive and takeup specifications.

Materials:

Standard channel shapes, angle iron, pipe, or rectangular tubing can be used for the basic framework construction. The side and end body material can be steel plate between #10 gauge to #7 gauge thick. The removable covers should be of lighter weight materials approximately #14 gauge steel or aluminum.

Operation:

The water pan should be filled to overflow with hot water and steam turned on until 206° - 208° F. water is reached. The motor power should not be turned on until the belt and wear strips are moistened with steam vapors. Operating the conveyor belt dry will have greater friction than operating wet and will cause more belt and wear strip wear, shortening their life. The water seal trough should also be filled with water before starting the operation.