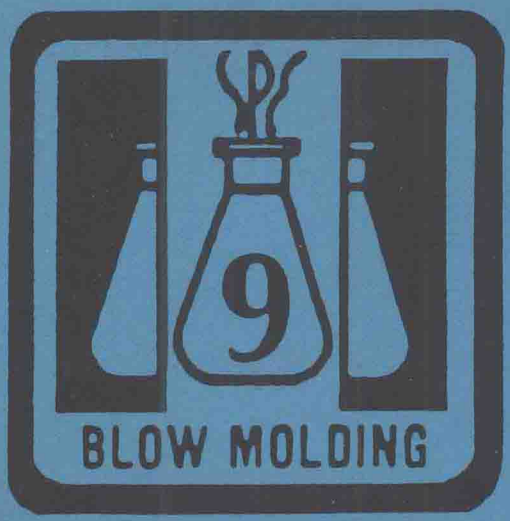
A GLIMPSE OF WHAT IS TO COME



IN BLOW MOLDING

9th ANNUAL HIGH PERFORMANCE BLOW MOLDING CONFERENCE

Sponsored by both the
Philadelphia Section
and
Blow Molding Division of
Society of Plastics Engineers

October 4-6, 1993

CHERRY HILL HYATT
Cherry Hill, NJ

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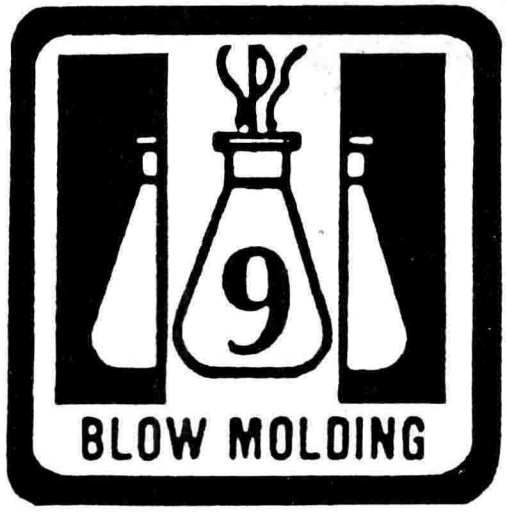

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a glimpse of what is coming in blow molding

U. S. BLOW MOLDING PATENTS: RECENT HISTORY

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CHERRY HILL, NEW JERSEY
OCTOBER 4,5 & 6, 1993

SOCIETY OF PLASTICS ENGINEERS
BLOW MOLDING DIVISION and THE PHILADELPHIA SECTION

MARILYN BAKKER

Marilyn Bakker has tracked plastic bottle developments since the 1970's. As principal of Technology Forecast since 1984, she has published many major multi-client studies on BLOW MOLDED BOTTLES, JARS, AND CANS. She is currently editor/publisher of a bimonthly newsletter, BOTTLEMAKING TECHNOLOGY AND MARKET NEWS.

She also authored studies on THE COMPETITIVE POSITION OF THE STEEL FOOD CAN, and served as editor-in-chief of the award winning WILEY ENCYCLOPEDIA OF PACKAGING TECHNOLOGY, published by John Wiley & Sons in 1986.

Previously associated with Sabre Associates Inc. and BCC Inc., she authored studies on plastic bottles and other packaging topics: Tamper-Evident Packaging; Plastics vs. Paper; Plastics vs. Paperboard; Plastic Films; Thin wall Injection Molding vs. Solid-Phase Pressure Forming; and Plastics in Distribution Packaging.

Beyond packaging, her other studies included: Plastics vs. Flat Glass; Plastics in Appliances; Competition/Substitution Between Plastics; Engineering Plastics; Structural Foam Molding; Reaction Injection Molding; Advanced Composites; High-Temperature Plastics. She wrote the article on Engineering Plastics for the Kirk-Othmer Encyclopedia of Chemical Technology, 3rd Edition.

U.S. Blow Molding Patents: Recent History

Marilyn Bakker, Principal
Technology Forecast, Westport CT USA
For presentation at the 9th Annual High-Performance Blow Molding Conference, October 1993

Since the theme of this conference is "A Glimpse of What is Coming," it is appropriate to look for trends in the recent patent literature.

The U.S. Patent Office issued 495 patents that mention blow molding in the first three years of the 1990s: 1990 (145), 1991 (191), and 1992 (159). This paper focusses not so much on the patents, but on the assignees. It is an informal overview of what the top assignees have been doing. No distinction is made here among composition, process, and design patents, and no mention is made of classes.

I. Three years of blow molding patents

Exhibit 1 lists the top assignees: those that were awarded at least eight patents in this time frame.

Exhibit 1. Top assignees, 1990-92

Assignee	#
Continental PET Technologies	20
Owens-Illinois Plastic Products	16
Hoover-Universal Inc.	14
DuPont de Nemours, EI & Co.	13
General Electric Co.	12
Graham Engineering Corp.	11
Nissei ASB Machine Co.	10
Mitsui Petrochemical	9
Yoshino Kogyosho Co. Ltd.	9
American National Can Co.	8

Two bottlemaking companies are at the top: Continental PET Technologies and Owens-Illinois Plastic Products. Bottlemaker and machinery-supplier Hoover-Universal (Johnson Controls) is #3. DuPont Company, a resin supplier, comes in as #4.

Exhibit 2 lists assignees with at least four patents, divided somewhat arbitrarily into two groups: companies concerned primarily with materials or machinery, and those that make bottles.

These counts are based strictly on assignee numbers: e.g. Sewell Plastics does not include one Constar patent; Graham Engineering does not include one Graham Packaging patent.

II. Materials and machinery patents

Here is a brief rundown of what these patents cover:

DuPont Company: PET, PBT, polyacetal, nylon, polyarylate, fluoropolymers. Also, direct fabrication of PET/elastomer blends.

General Electric Co.: polyphenylene ethers, polycarbonates, polyetherimide, polyesters with enhanced melt viscosity. Processing with thin-film resistance heaters, multilayer molds for smooth surfaces. A joint patent with Liqui Box Corp. covers a plastic bottle with reinforced concave bottom.

Nissei ASB Co.: one- and two-stage ISBM. Method of making container with grips and raised portions, heat-resistant PET, in-mold labeling (IML).

Mitsui Petrochemical: copolyesters, polypropylene. A method of PET molding, PEN bottles, multilayer PET bottles. Flat containers with varying wall thickness, drums made with split molds.

Dow Chemical Co.: MMA-BDS graft copolymers, fluorinated olefins, AN-EPDM-styrene, vinyl alcohol copolymers, multilayer reflective polymeric bodies, in-mold sulfonation.

Phillips Petroleum: Blow molded articles, EBM-PPS articles, article made by blow molding and compression molding, styrene/butadiene copolymers, gold-colored olefin product.

Krupp Kautex: Making multilayer parts, minimizing layer disturbances.

Brush, John D & Co.: Draped-parison blow-molding of rectangular box.

Husky Injection Molding Systems: Blow molding oven, aligning the parison, stretch rods.

III. Packaging patents

Exhibit 3 lists the patents issued to each of the top four packaging assignees. We are looking for trends here, and there are trends to be found in these portfolios.

Continental PET Technologies: They all pertain to PET bottles ... multilayer, hot-fill, refillable, oblong and oval containers.

Owens-Illinois Plastic Products: Half pertain to labeling, especially in-mold labeling (IML). Others pertain to draining and dispensing features.

Hoover-Universal Inc. (Johnson Controls): Most pertain to PET bottles: hot-fill, one-piece design, blowmolded base cup. Related to JCI's EBM machinery building: view stripe, IML.

Graham Engineering Corp.: Many pertain to aseptic bottles. Also, IML. (In the table, a Graham Packaging Co. patent is included as well.)

Other leading packaging assignees:

Yoshino Kogyosho Co.: multilayer PET; bottles with recesses/grooves; thin-wall ribbed bottle.

American National Can: six were issued in 1990 for injection molded and IBM multilayer articles.

Plastipak Packaging: IML, free-standing bottles.

Robbins, E.S.: various including containers with upper and lower sections of different thicknesses.

Sabel Plastechs: three pertain to EBM-PET; three to handles on stretch-blown bottles.

Sewell Plastics Inc.: calibrating blow pin, parison lubrication method, wide-stance footed bottle, and hot-fill PET. (A 1992 patent issued to Constar also pertains to hot-fill PET.)

Broadway Companies: one-piece PET bottle.

Liquid Container Corp.: all pertain to IML.

Procter & Gamble: drain-back spout, IBM/child resistance, bag-in-box composite container.

Sunbeam Plastics: three IBM, closure adaptor.

Toyo Seikan Kaisha Ltd.: various including heat-setting PET, and IML.

IV. Packaging patent trends

Heat stabilization of PET. Note the number of patents that refer to heat-setting or hot-fill in the 1990-92 collections of Continental PET Technologies and Hoover-Universal. As mentioned above, 1990-92 patents on this subject were also issued to Nissei ASB Co. and Sewell/Constar.

Not mentioned above, patents issued to Krupp Corpoplast, Sidel Inc. Toyo Seikan Kaisha, and Van Dorn Co. Also related to heat stability, the Mitsui Petrochemical patent on a PEN bottle.

Heat-stabilization is addressed in many patents that date back to the early 1980s. Prominent assignees have included Owens-Illinois and Yoshino Kogyosho.

In-mold labeling. Note the number of label-related patents in the 1990-92 Owens-Illinois collection, and mention of IML in the Hoover-Universal and Graham lists as well. Mentioned above, Liquid Container, Toyo Seikan Kaisha, and Nissei ASB Co.

One-piece PET bottles. These are not always obvious in the titles. Note mention in the Continental PET, Hoover-Universal, Sewell, Plastipak, and Broadway patents. Not mentioned, patents issued to North American Container, Plasticon (Switzerland).

Multilayer PET. This is a hot topic today; partly with respect to barrier bottles, partly with respect to incorporation of post-consumer resin. In the 1990-92 crop of blowmolding patents, multilayer PET is addressed by Continental PET, Mitsui Petrochemical, and Yoshino Kogyosho. [The Husky injection molding patents that relate to Continental PET's technology are not included in the group of blow molding patents discussed here.]

In the first five months of 1993, two more heat-stabilization patents were issued to Nissei ASB Co. First Brands got an IML patent; and Constar and Yoshino both added to the list of one-piece PET patents.

V. Industrial patents

The patents provide evidence of blow molding's broad reach. Here is a glimpse of products discussed in 1990-92. They defy easy categorization, so they are listed alphabetically:

Air bag
Air bubbling bathtub mats
Air cleaner
Air cushion table game
Allergy-testing apparatus
Automobile bumpers
Automotive seat frame
Bag-tossing game
Bicycle stand
Box
Box, double-wall
Carrying case
Catheter balloon
Chain-saw case
Coffee carafe
Collapsible room structure
Convoluted boot and seal
Cowl and wiper arm assembly
Decoy
Dispensing systems
Disposable pump assembly
Double-wall pipe
Exercise platform
Filler pipe, fuel tank
Fuel tank
Golf bag cover
Golf club head
Heat-retentive server
High-pressure hose, fuel delivery
Highway barriers
Hog-scraper paddle
Hose reel assembly
Humidifier container
Hydrometer
Ironing board
Lavatory cabin
Marine propulsion device
Mattress or cushion spring array
Medical-device balloons
Modular dock bumper
Mower deck
Multi-compartment containers
Pallet container
Pick-up truck box
Picnic cooler
Plastic ladder
Playing stick
Pressing board
Radiolucent hospital bed surface
Refuse container and lid
Reverse osmosis water purification unit
Safety belt retractor
Seat assembly with integral fuel tank
Snow board
Speaker box
Swimming pool cover
Three-dimensional circuit substrate
Toy boat
Volumetric pipette
Wheel
Windshield wiper boot

Exhibit 2. ASSIGNEES WITH AT LEAST FOUR 1990-92 PATENTS

		1990	1991	1992	3-YR
TOTAL BLOW MOLDING PATENTS ->		145	191	159	495
MATERIALS, MACHINERY					
DuPont de Nemours, EI & Co	USA	5	0	8	13
General Electric Co.	USA	3	5	4	12
Nissei ASB Machine Co.	Japan	1	2	7	10
Mitsui Petrochemical	Japan	3	4	2	9
Dow Chemical Co.	USA	1	2	4	7
Phillips Petroleum Co.	USA	2	2	3	7
Krupp Kautex Maschinenbau	Germany	0	2	3	5
Brush, John D & Co Inc	USA	2	2	0	4
Husky Injection Molding Systems	Canada	1	1	2	4
CONSUMER PACKAGING					
Continental PET Technologies	USA	9	5	6	20
Owens-Illinois Plastic Products	USA	5	6	5	16
Hoover Universal Inc.	USA	6	4	4	14
Graham Engineering Corp.	USA	3	6	2	11
Yoshino Kogyosho Co Ltd	Japan	2	3	4	9
American National Can Co	USA	6	1	1	8
Plastipak Packaging	USA	2	3	2	7
Robbins, E.S.	USA	3	2	2	7
Sabel Plastechs Inc	USA	0	4	2	6
Sewell Plastics Inc.	USA	1	4	0	5
Broadway Companies	USA	1	2	1	4
Liquid Container Corp.	USA	2	2	0	4
Procter & Gamble Co.	USA	1	3	0	4
Sunbeam Plastics Corp.	USA	1	2	1	4
Toyo Seikan Kaisha Ltd	Japan	2	2	0	4

Exhibit 3. Patents issued to top-four 1990-92 assignees

ASSIGNEE	PATENT #	ABBREVIATED TITLE
Continental PET Technologies	4910054	Preform, reinforced container base ...
	4923723	Multi-layer preform ...
	4927680	Preform and method of forming
	4928835	IM preform, method of treating same, and container
	4936473	Hot-fill product container, multilayer wall structure
	4954376	Two-material 3-5 layer preform
	4966543	Vented recyclable multilayer barrier container, apparatus
	4979631	Vented recyclable multilayer barrier container
	4980100	Vented recyclable multilayer barrier container, apparatus
	4990301	IM multilayer preforms, method and apparatus
	5032341	Two-material 3-5 layer preform, method of forming
	5049345	Multilayer preform, method of forming
	5066528	Refillable PET ctnr and preform
	5077111	Recyclable multilayer preform and container
	5092475	Reinforced and paneled hot-fill container
	5098274	IM multilayer preforms, apparatus
	5101990	Oblong or oval containers, stretch blow molding
	5104706	Preform for hot-fill pressure container
	5158817	Oblong or oval containers, method of forming base section
	5160059	Reinforced container base and forming method
Owens-Illinois Plastic Products	4890768	Self-draining ctnr
	4904324	IML, multilayer label, method of applying
	4911635	Applying labels to BM articles, apparatus
	4917592	Applying labels to BM articles, apparatus
	4930668	Dispensing package for dispensing liquids
	4983349	Applying labels to BM articles
	4989757	Ctnr with self-draining feature
	5011720	Multilayer ctnrs, method
	5032344	IML, method of applying labels in molds
	5044922	IML, method of applying labels in molds
	5060830	Dispensing package for dispensing liquids
	5079057	IML during blow molding, multilayer label
	5082439	IML- method of applying labels in molds
	5086937	Lightweight bottle, compression molded handle
	5087406	Multilayer plastic container with handle, method
	5114659	One-piece self-draining container, BM method

continued ->

Exhibit 3. continued

ASSIGNEE	PATENT #	ABBREVIATED TITLE
Hoover Universal Inc.	4890994	Parison with view stripe, apparatus for forming parison
	4892205	Concentric ribbed preform and bottle
	4919284	Ctnr with ring-stabilized base
	4940403	Multilayer BM, dual-parison extrusion head
	4955492	Bottle with reinforcing ring encircling bottle base
	4961701	Bottle base cups, apparatus for forming [BM]
	4993566	Hot-fill PET ctnr, spiral ctnr base structure
	4993567	Hot-fill PET ctnr, involute embossment base structure
	5005716	Hot-fill PET ctnrs
	5071015	BM PET ctnr with ribbed base structure
	5122327	Hot-fill [PET] ctnr, reversely oriented
	5141120	Hot-fill [PET] ctnr, vacuum collapse pinch grip
	5141121	Hot-fill [PET] ctnr, vacuum collapse surfaces in hand grips
	5169653	IML, label-transfer mechanism
Graham Engineering Corp.	4946366	Aseptic bottles, needle assembly
	4948356	Sealing BM bottle, tooling
	4950153	BM apparatus
	5022544	Sealed bottle
	5037684	BM aseptic bottle and method
	5054267	BM bottle, sealing apparatus
	5054272	BM bottle, method for sealing
	5068075	BM aseptic bottles, method
	5071037	BM bottle with integral pour spout
	5104306	IML apparatus with rotary label transfer
	5121913	IML apparatus and method
Graham Packaging Corp.	5165558	Dispenser and measuring cup

RETEC

a glimpse of what is coming in blow molding

ISO 9000 AND THE PLASTICS INDUSTRY - WHAT DOES THE FUTURE HOLD?

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CHERRY HILL, NEW JERSEY
OCTOBER 4,5 & 6, 1993

SOCIETY OF PLASTICS ENGINEERS
BLOW MOLDING DIVISION and THE PHILADELPHIA SECTION

JOHN S. LOWMAN

JOHN S. LOWMAN is owner of JOHN LOWMAN QUALITY a consulting firm specializing in Total Quality Management, Total Quality Control, IS09000 implementation, Statistical Process Control, Experimental Design, Team Based Organization and People Involvement. John has extensive experience in Process and Systems Modeling. Team Building, Problem Solving Techniques and Productivity Improvement. He has developed and conducted public seminars and numerous in-house workshops in the above topics.

Mr. Lowman is a Fellow in the American Society for Quality Control, is a Certified Quality Engineer and a Registered Professional Engineer. He holds bachelor degrees in Music and Mathematics; Masters degrees in Mathematics and Operations Research and has completed all course work for the Ph.D. in Industrial and Systems Engineering. He is currently writing his dissertation on the factors which influence successful teams.

He is a retired Lt. Colonel with 32 years service in the Arkansas and Alabama National Guard.

He has over 25 years experience in Quality related activities.

JOHN LOWMAN QUALITY has acted as consultant to numerous organizations such as:

Silgan Plastics	AMOCO
Wolverine Tube	Dana Corporation
Monsanto	Cerro Wire
3M	American Fructose
Bush Industries	NGK Metals
Mead Corporation	Clorox
Van Air Systems	Helene Curtis
Bamsi	TapeMark Inc.

Mr. Lowman has traveled to Japan several times to study Japanese quality and management systems.