PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
B29C 49/58, 49/16, 49/18

A1

(11) International Publication Number: **WO 99/50047**

(43) International Publication Date: 7 October 1999 (07.10.99)

(21) International Application Number: PCT/IB98/00464

(22) International Filing Date: 30 March 1998 (30.03.98)

(71) Applicant *(for all designated States except US)*: TETRA LAVAL HOLDINGS & FINANCE S.A. [CH/CH]; 70, avenue du Général Guisan, P.O. Box 430, CH–1009 Pully (CH).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: FABOZZI, Thierry [CH/CH]; 38, rue de Monthoux, CH–1201 Genève (CH).

(74) Agent: MICHELI & CIE; 122, rue de Genève, Case postale 61, CH–1226 Thonex (CH).

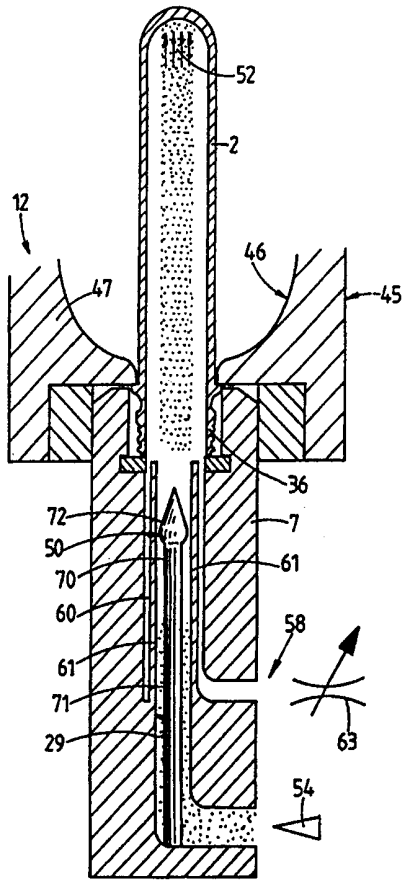
(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI (Utility model), GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: MACHINE FOR THE PRODUCTION OF RECEPTACLES OF PLASTIC MATERIAL

(57) Abstract

The machine for the production of receptacles of plastic material comprises a heating device and a blow molding device (12). The receptacles are produced from preforms (2) whose neck (36) is held by its outer surface in supports (7). In the blow molding device (12), a molding member (45) is disposed around the preform (2) and a blowing member (54) is applied against the support (7). A directional member (50) is arranged in a longitudinal passage (29) of support (7) and adapted to create a directed jet or flux of fluid under pressure generating a longitudinal stretching of the preform and of the receptacle in progress of formation. The fluid in excess can be released by exhaust means (58, 60). Because of these features, it is possible to obtain a very precise manufacturing of receptacles without the assistance of a drawing rod, a high cleanliness, even sterility of the produced receptacles and an uncomplicated structure and inexpensive construction of the machine.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

MACHINE FOR THE PRODUCTION OF RECEPTACLES OF PLASTIC MATERIAL

The present invention relates to a machine for the production of receptacles of plastic material comprising a frame and, arranged along a transport path, at least one heating device and a blow molding device, receptacles being formed from preforms disposed on supports having at least one longitudinal passage, the blow molding device comprising at least one blowing member adapted to introduce a fluid under pressure through said longitudinal passage into a heated preform disposed at least partially in a molding cavity of a molding member.

A machine of this type is described in document DE 27 42 693 C2 and comprises an introduction device in which preforms are disposed on spindles bearing on the internal surface of the neck of the preforms. The preforms are heated on a rotating wheel, taken up by a transfer wheel to be disposed with their spindel on a blowing wheel. In a drawblowing member asociated with the blowing wheel, a draw rod passes through the spindle to coact with the preform. Simultaneously, blowing air is introduced into the preform passing through the spindle. In this construction, the draw rod an the spindle are in contact with the internal surface of the preform, which is prejudicial from a point of view of cleanliness and sterility of the produced receptacles.

The present invention has for its objects to overcome these drawbacks and is characterized to this end by the

fact that it comprises at least one directional member adapted to canalize and direct the blowing fluid under pressure, said directional member being arranged at least partially inside the longitudinal passage of the support and being intended to create a directed jet or flux of blowing fluid generating an orientated stretching of the preform and of the receptacle in progress of formation.

Because of these features, it is possible to obtain a directed jet or flux of fluid under high pressure which permits an active stretching of the preform and of the receptacle in progress of formation. It is therefore possible to remove the drawing rods commonly used, which allows to obtain a high cleanliness and even sterility of the produced receptacles, whilst enjoying an excellent manufacturing precision. The flow rate of air or of blowing fluid is moreover high because of the absence of any drawing rod; a considerable manufacturing speed can thus be obtained.

Advantageously, said directional member is constituted by a variation of the section of said longitudinal passage.

This variation acts like an injection nozzle and permits thus an efficient stretching action whilst considerably simplifying the structure of the machine and lowering its cost price.

Favourably, said directional member is constituted by a constriction of said longitudinal passage adapted to create a reduction of the section of said longitudinal passage concentrating the flux of the fluid to the center

of said longitudinal passage.

Alternately, said directional member is constituted by a deflecting member axially arranged in the longitudinal passage so as to create an annular section for the flux of fluid.

By these features, a very precise and strong flux of blowing fluid can be obtained.

According to a very favorable embodiment, the machine comprises exhaust means adapted to provide an outflow of at least a part of the fluid injected or blown into the preform and/or the receptacle in progress of formation.

Because of these exhaust means, a very powerful flux of blowing fluid may be used given that the excess fluid can be released. A very favorable stretching effect may thus be obtained which prevails with respect to the expanding effect of the preform.

Very advantageously said exhaust means are connected to control means adapted to open and close them completely and/or partially.

It is thus possible to precisely control different stages of the development of the receptacle during its formation, which allows a high manufacturing quality, whilst enjoying an uncomplicated and inexpensive equipment.

According to a favorable embodiment, the blow molding device comprises at least one accompanying member mounted in a mobile manner at least partially in the molding cavity, said accompanying member comprising at least one portion adapted to coact with a part of the external surface of the preform or of the receptacle in progress of

formation so as to accompany and to guide the receptacle in process of formation during the blowing action, the accompanying member being associated to control means adapted to control its displacements.

These features still allow to improve the manufacturing precision, even in the case of plastic materials with an irregular and difficult expansion.

The invention also concerns a method of operating the machines cited hereabove and is characterized to this effect by the fact that during a first blowing stage, the exhaust means are activated by opening the control means so as to permit to exhaust at least partially the blowing fluid in order to obtain a stretching effect of the preform and by the fact that during a second blowing stage, said exhaust means are rendered at least partially inoperative by closing at least partially the control means so as to obtain the application of the wall of the receptacle in progress of formation against the molding cavity.

By this method including at least two successive stages, a controlled and symmetrical development of the receptacle can be obtained in an uncomplicated and inexpensive way.

Other advantages will become apparent from the features set forth in the dependent claims and the description setting forth the invention hereafter in more detail with the aid of drawings which represent schematically and by way of examples three embodiments and two variants.

Figure 1 is a perspective view of a machine for the production of receptacles of plastic material, according to the invention.

Figure 2 is a partial cross-sectional view of a carrier with two posible supports for preforms.

Figures 3 to 5 are cross-sectional views of a first embodiment in three successive stages of the developpment of the preform toward the formed receptacle.

Figures 6 to 8 represent cross-sectional views through a variant of the first embodiment in three successive stages.

Figure 9 is a cross-sectional view of a second embodiment and figure 10 a view of a variant thereof.

Figure 11 shows a third embodiment including external accompanying means.

With reference to figure 1, the machine for the production of receptacles in plastic material comprises a frame 1 on which the various devices and members of the machine are mounted in modular fashion. Preforms 2 for the receptacles to be produced are supplied by means of a double rail 3 forming an inclined plane to end in a inverting loading device 5, in which the preforms are inverted and disposed neck down on supports 7 carried by double carriers 8, each carrier carrying two supports 7.

The preforms are then heated in a heating device 10 and brought to a blow molding device 12. After their formation, the produced receptacles are raised from the support 7 in an inverting discharge device 14, from which they can be treated for their future utiliszation. Alternatively, the receptacles could also be brought on

the double carriers 8 to stations for sterilization, fillings, labelling, packaging, etc.

The empty supports 7 carried by the carriers 8 are then brought to the loading device 5 for the preforms. The whole sequence of operations is controlled by means of an electronic control unit 11.

With reference to figure 2, the carriers 8 are constituted by plates 16 of elongated rectangular shape with rounded ends comprising two bores 17 in which the supports 7 are held axially. The plates 16 rest laterally on a continuous guide track 20 comprising two lateral rails and mutually touch to form a closed circuit. The movement of the carriers 8 on the guide track is obtained by pressure by means of jacks (not shown).

Each support 7 comprises a tubular body 22 retained axially in a bearing 23 engaged in the bores 17 of the plate 16. The bearing 23 has an annular groove 24 adapted to coact with the rails of the guide track 20 to be there maintained. The plate 16 and the rails of the guide track 20 on which the plate 16 rests, are retained between two projections 26,27 of the bearing 23. This construction permits very rapid mounting of the carriers 8 and of the supports 7 on the guide track 20 and ensures excellent guidance and manintenance of the carriers 8 on the guide track 20.

The supports 7 are, at their lower end, secured to a drive pinion 28 adapted to coact with a belt or a drive chain provided at the heating device 10 to be driven in rotation about their central axis.

Each support 7 comprises a central passage or bore 29 having an important section for the blowing air or fluid used in the blow molding device 12. At its upper part, the support 7 has a second bore 35 adapted to receive the neck 36 of a preform 2 disposed neck down in the support 7. A sealing joint 39 is disposed between the tubular body 22 of the support 7, on the one hand, and the preform 2 on the other hand.

The upper portion 34 of the support 7 thus forms an external securement member 40 of the neck of the preform 2 whose internal surface remains entirely free.

It should be observed that the internal surfaces of the neck 36 of the preform 2 and of the central passage or bore are substantially aligned in order to form a continuous blow conduit of large section.

With reference to figures 1 and 3 to 5, a first embodiment of the blow molding device 12 comprises a molding member 45 including a certain number of molding cavities 46, preferably three. As the machine has preferably two juxtaposed blow molding devices 12, six receptacles disposed on three double carriers 8 can be produced simultaneously. Each molding member 45 is constituted by two half-molds 47. The lower portion of the two half-molds 47 coacts with the upper surface of the support 7 and/or with the neck 36 of the preform 2 to maintain the assembly in place during the operation of blow molding.

In the lower portion of each blow molding device 12 is arranged a blowing station comprising three blowing member 54 adapted to introduce the blowing fluid with high

flow rate into the preforms 2 and into the receptacles in progress of formation.

In order to obtain an efficient stretching of the preform without the assistance of a stretching rod which is detrimental to the cleanliness and the sterility of the produced receptacles, a directional member 50 is provided which is adapted to canalize and direct the blowing fluid under pressure, said directional member being arranged inside the longitudinal passage or bore 29 of the support 7.

This directional member 50 is adapted to create a directed jet or flux 52 of blowing fluid generating an orientated stretching of the preform 2 and of the receptacle in progress of formation. In the case of figures 3 to 8, this directional member 50 is constituted by a variation of the section of the central bore 29 of the support 7 which presents a constriction 51 adapted to concentrate the flux of fluid to the center of the bore. This directional member 50 thus forms an injection nozzle directing the fluid 52 at high speed vertically towards the bottom of the preform 2 which is actively stretched in a longitudinal direction. Said directional member 50 hence carries out also a guiding action accompanying the action of longitudinal stretching.

In a further stage shown in figure 4, the wall of the receptacle in progress of formation is laterally pushed to the exterior by expanding the receptacle until the wall is entirely applied against the internal wall of the molding cavity 46, as this is shown in figure 5.

The variant represented in figures 6 to 8 includes moreover exhaust means 58 adapted to provide an outflow of at least a part of the fluid injected into the preform and/or the receptacle in progress of formation. In this variant, the support 7 also comprises a longitudinal passage 29 including a constriction 51 having the function of directional member 50. This longitudinal passage 29 is surrounded by a cylindrical conduit 60 and separated from the latter by a cylindrical wall 61. On one side the cylindrical conduit 60 leads directly into the neck 36 of the preform and on the other side it is connected to control means 63, such as an electrovalve, adapted to control the complete and/or partial opening and closure of the exhaust means 58.

Thus during a first blowing stage, the exhaust means may be activated by opening the electrovalve 63 so as to permit to exhaust at least partially the blowing fluid introduced into the preform 2 at a high flow rate in order to obtain a stretching effect of the latter. The thrust effect with a vertically directed force due to the directional member 50 prevails in this stage with respect to an omnidirectional expansion.

When the receptacle in progress of formation has reached the top of the molding cavity 46, a second blowing stage begins during which the exhaust means 58 are rendered inoperative by closure of the electrovalve 63. The fluid introducted into the receptacle then expands the latter in a substantially omnidirectional manner (figure 7). When the wall of the receptacle is entirely applied against the molding cavity 46, the introduction of fluid

under pressure is stopped and the produced receptacle can be removed from the mold (figure 8).

It is possible to insert between the two stages an intermediate stage during which the control means 63 are activated so as to progressively diminuish the flow rate of the exhausted fluid or air. Thus there exists a gradual passage from a monodirectional stretching stage to a second omnidirectional expanding stage.

The embodiment shown in figure 9 is provided with a directional member 50 constituted by a deflecting member 70 axially arranged in the longitudinal passage 29 of support 7 so as to create an annular section 73 for the flux of fluid. This deflecting member is formed by a central rod 71 provided at its upper end and directed towards the preform 2 with a bulge 72 in the form of a bud.

This directional member 50 also allows to create a powerful flux of fluid directed vertically towards the bottom of preform 2 in order to stretch and guide the latter. The blow molding method remains otherwise the same as that described with reference to figures 3 to 5.

The variant shown in figure 10 is also provided with a deflecting member 70 with a central rod 71 and a bulge 72. Like the variant of figures 6 to 8, this variant is moreover fitted out with exhaust means 58 formed by a cylindrical conduit 60 separated by a wall 61 from the longitudinal passage 29 and connected to control means 63 formed by an electrovalve. The way of functionning of this variant is similar to that described with reference to figures 6 to 8.

In the embodiment shown in figure 11, the molding member 45 is moreover provided with an external accompanying member 79, in the form of a rod 80 mounted slidingly in a vertical direction in its upper part. This rod 80 coacts by means of its lower free end 81 with the apex of the preform 2 and with the receptacle in progress of formation and is connected at its other end to control means 82 adapted to control the movements of the rod 80 during the formation of the receptacle by blow molding and during the setting of a new preform 2 in the molding cavity 46. These control means 82 are constituted by a jack 83 comprising a piston 84 located in a fixed cylinder 85 provided with upper and lower chamber 86 and 87 adapted to be connected to sources of fluid under pressure through the conduits 88, 89. By adjusting adequately the pressures in the two chambers 86 and 87, the rod 80 can guide and direct precisely the preform and the receptacle in progress of formation which may thus expand in a symmetrical manner. At the end of the blow molding operation, the lower end 81 of the rod 80 is located at the same level as the edge of the upper surface 90 of the mold cavity 46.

Due to the action of said accompanying member 79 external to the preform and to the receptacle in progress of formation, it is possible to obtain receptacles of very high quality.

This external accompanying member 79 may not only have the function of guiding and externally centering the receptacles in progress of formation, but it may for certain applications participate actively to an external

drawing action of the preform. The accompanying member is provided to that effect with gripping means ensuring its fastening to the external surface of the preform. These gripping means may operate by adhesion under low pressure, by mechanical adhesion, by clamping, by gripping or by any other suitable means. This accompanying member with its gripping means may be displaced by control and driving means which may be pneumatic, hydraulic, electrical, magnetic and/or mechanical.

Thus the accompanying rod 80 may be hollow and may be put under low pressure by means of a pump 96 to which it is connected by a flexible conduit 97. The lower end 81 of rod 80 is applied on the apex of preform 2. Said lower end 81 may be completely open or comprise a wall provided with one or several perforations. Thus during molding, a low pressure or a partial vacuum is applied to the hollow rod 80 and the latter is lifted by the control means 82.

The apex of preform 2 sticking to the rod 80 because of the low pressure thus remains perfectly centered during the whole molding process. Moreover, the low pressure built up in rod 80 and the lifting action of the latter assist the molding process by a drawing action external to the preform and to the receptacle in progress of formation. The movement of rod 80 and the drawing action is made by means of the pneumatic jack 83 as described above or by any other suitable means. This embodiment is particularly advantageous for molding plastic material which may be prone to an irregular and/or difficult expansion during blow molding.

Of course, the embodiments described above are in no way limiting and can be the subject of all desirable modifications within the framework defined by claim 1. In particular, the directional member may have any other form and, instead of being integral with support 7, it could be movable. Thus it could for example be linked to the blowing member 54 and be completely or partially introduced into the longitudinal passage 29 in order to canalize efficiently the blowing fluid. The machine as a whole could present an entirely different arrangement. The support 7 and the molding member may have any different shape.

CLAIMS

1. Machine for the production of receptacles of plastic material comprising a frame (1) and, arranged along a transport path (20), at least one heating device (10) and a blow molding device (12), receptacles being formed from preforms (2) disposed on supports (7) having at least one longitudinal passage (29), the blow molding device (12) comprising means (54) adapted to introduce a fluid under pressure into a heated preform (2) disposed at least partially in a molding cavity (46) of a molding member (45), characterized by the fact that it comprises at least one directional member (50) adapted to canalize and direct the blowing fluid under pressure, said directional member being arranged at least partially inside the longitudinal passage (29) of the support (7) and being intended to create a directed jet or flux (52) of blowing fluid generating an orientated stretching of the preform (2) and of the receptacle in progress of formation.

2. Machine according to claim 1, characterized by the fact that said directional member (50) is constituted by a variation (51,70) of the section of said longitudinal passage (29).

3. Machine according to claim 2, characterized by the fact that said directional member is constituted by a constriction (51) of said longitudinal passage (29) adapted to create a reduction of the section of said

longitudinal passage concentrating the flux of the fluid ot the center of said longitudinal passage.

4. Machine according to claim 1 or 2, characterized by the fact that said directional member is constituted by a deflecting member (70) axially arranged in the longitudinal passage (29) so as to create an annular section (73) for the flux of fluid.

5. Machine according to claim 4, characterized by the fact that said deflecting member (70) is constituted by a central rod (71) provided at its end directed towards the preform with a bulge (72) in the form of a bud.

6. Machine according to one of the preceeding claims, charaterized by the fact that it comprises exhaust means (58) adapted to provide an outflow of at least a part of the fluid injected or blown into the preform (2) and/or the receptacle in progress of formation.

7. Machine according to claim 6, characterized by the fact that said exhaust means (58) are constituted by an annular cylindrical conduit (60) surrounding the longitudinal passage (29) and separated from the latter by a wall (61).

8. Machine according to one of the claims 6 or 7, characterized by the fact that said exhaust means (58) are connected to contol means (63) adapted to open and close them completely and/or partially.

9. Machine according to one of the preceeding claims, characterized by the fact that the blow molding device (12) comprises at least one accompanying member (79) mounted in a mobile manner at least partially in the molding cavity (46), said accompanying member (79) comprising at least one portion (81) adapted to coact with a part of the external surface of the preform (2) or of the receptacle in progress of formation so as to accompany and to guide the receptacle in progress of formation during the blowing action, the accompanying member (79) being associated to control means (82) adapted to control its displacements.

10. Machine according to claim 9, characterized by the fact that the accompanying member (79) is constituted by a rod (80) slidingly mounted in the upper part of the molding member (45) and comprising a lower portion (81) adapted to come into contact with the preform (2).

11. Machine according to one of the claims 9 or 10, characterized by the fact that the accompanying member (79) is adapted to produce an external drawing action on the preform (2) and/or on the receptacle in progress of formation and comprises gripping means (96) allowing its attachement to the external surface of the preform (2), these gripping means (96) being adapted to function by vacuum adherence, by mechanical adherence, by clamping, gripping or pinching.

12. Machine according to claim 11, characterized by the fact that the accompanying member (79) comprises at least one hollow part (80) which may be subjected to low pressure in order to constitute said gripping means, said hollow part (80) being adapted to come into contact with a part of the external surface of the preform (2) or of the receptacle in progress of formation in order to guide and draw by adherence the receptacle in progress of formation during the blowing operation.

13. Method of operating a machine according to one of the preceeding claims, characterized by the fact that a jet or a flux of blowing fluid (52) is directed inside the preform (2) or the receptacle in progress of formation by means of at least one directional member (50,70) arranged at least partially inside the longitudinal passage (29) of the support of the preform so as to obtain an orientated stretching of the preform (2) of the receptacle in progress of formation.

14. Method according to claim 13, for operating a machine according to claims 6 to 8, characterized by the fact that at least a part of the volume of fluid used for the stretching of the preform and of the receptacle in progress of formation is released through exhaust means (58).

15. Method for operating a machine according to claim 8, characterized by the fact that during a first blowing stage, the exhaust means (58) are activated by opening the

control means (63) so as to permit to exhaust at least partially the blowing fluid in order to obtain a stretching effect of the preform and by the fact that during a second blowing stage, said exhaust means (58) are rendered at least partially inoperative by closing at least partially the control means (36) so as to obtain the application of the wall of the receptacle in progress of formation against the molding cavity (46).

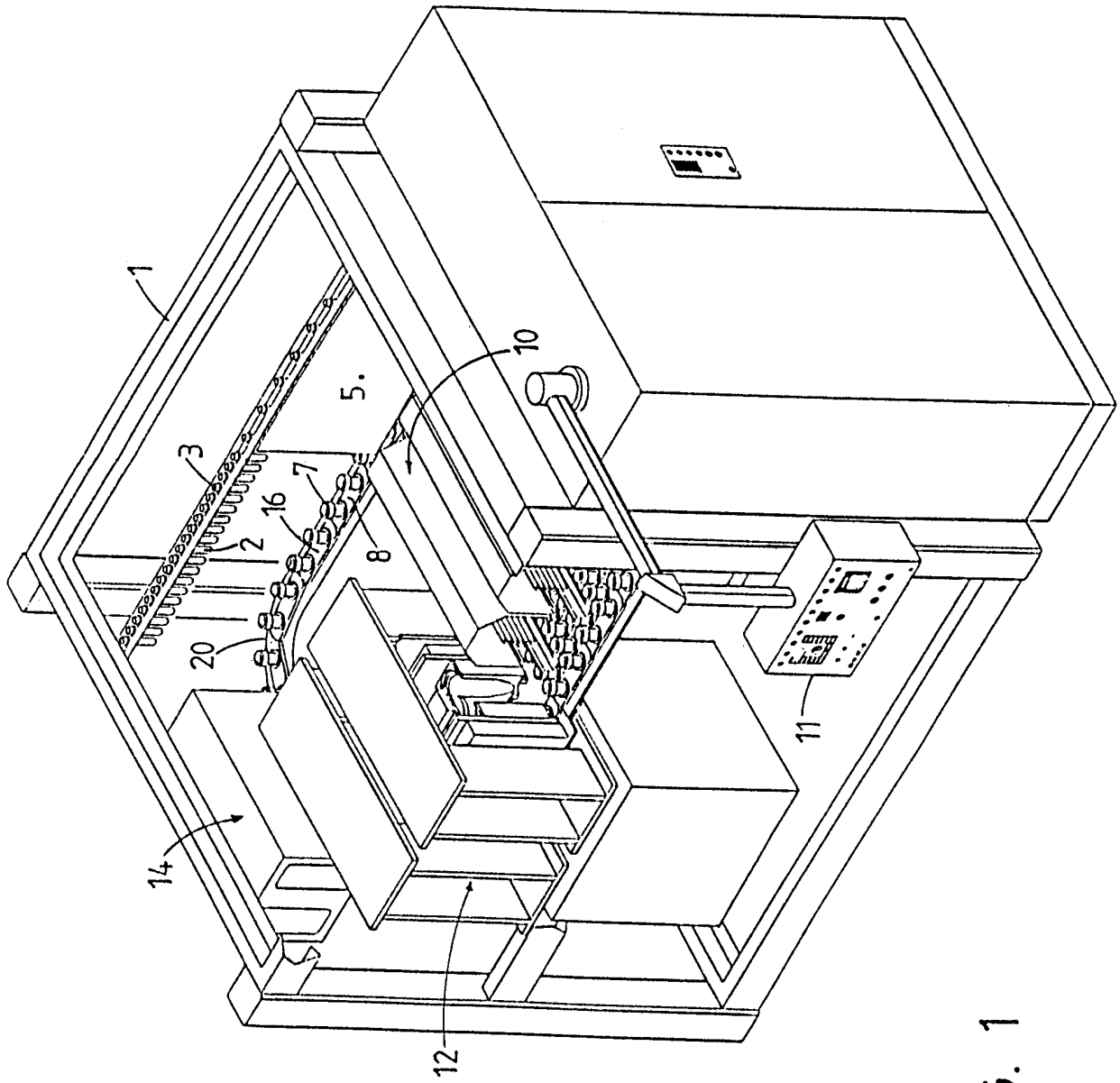


FIG. 1

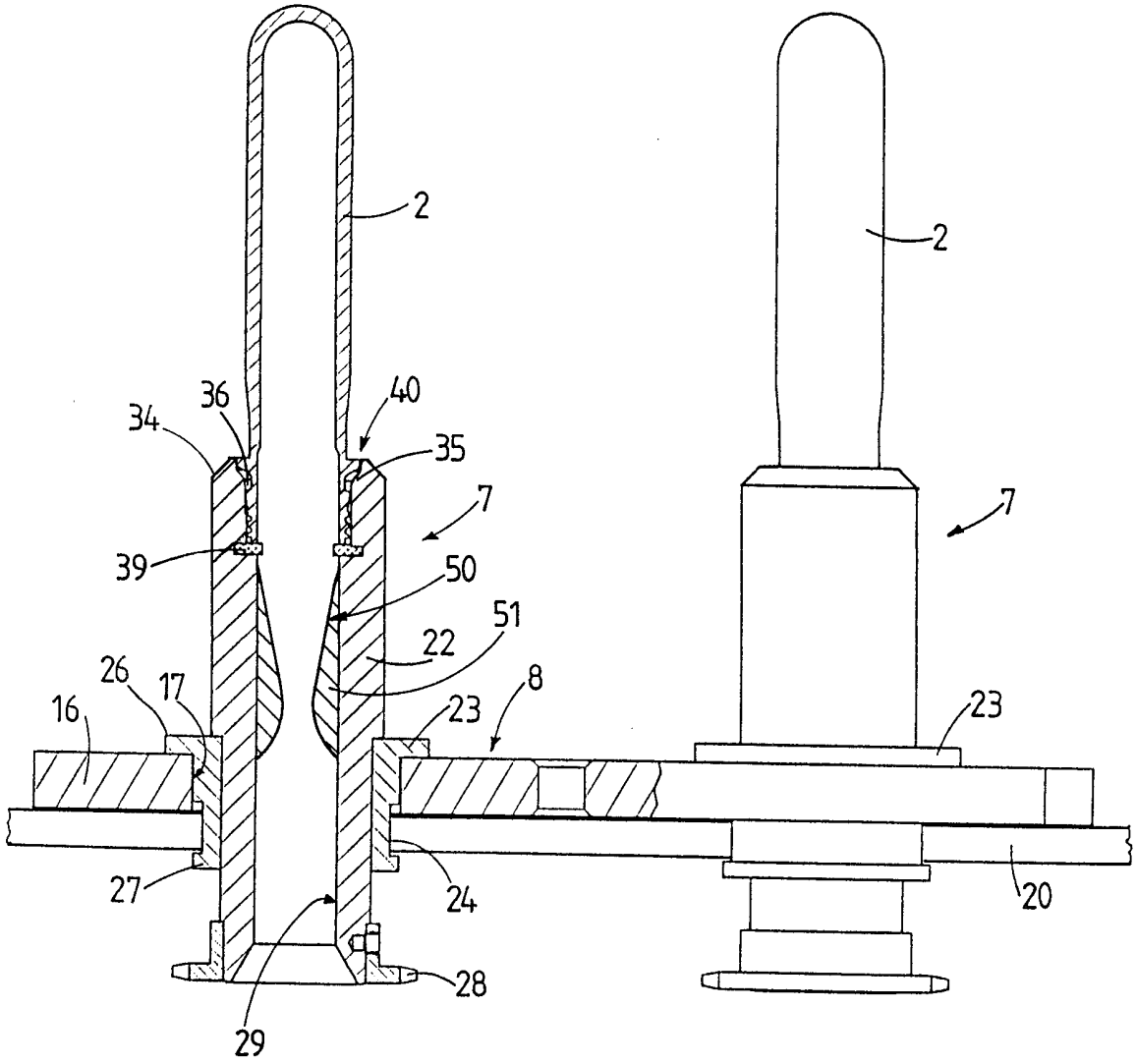


FIG. 2

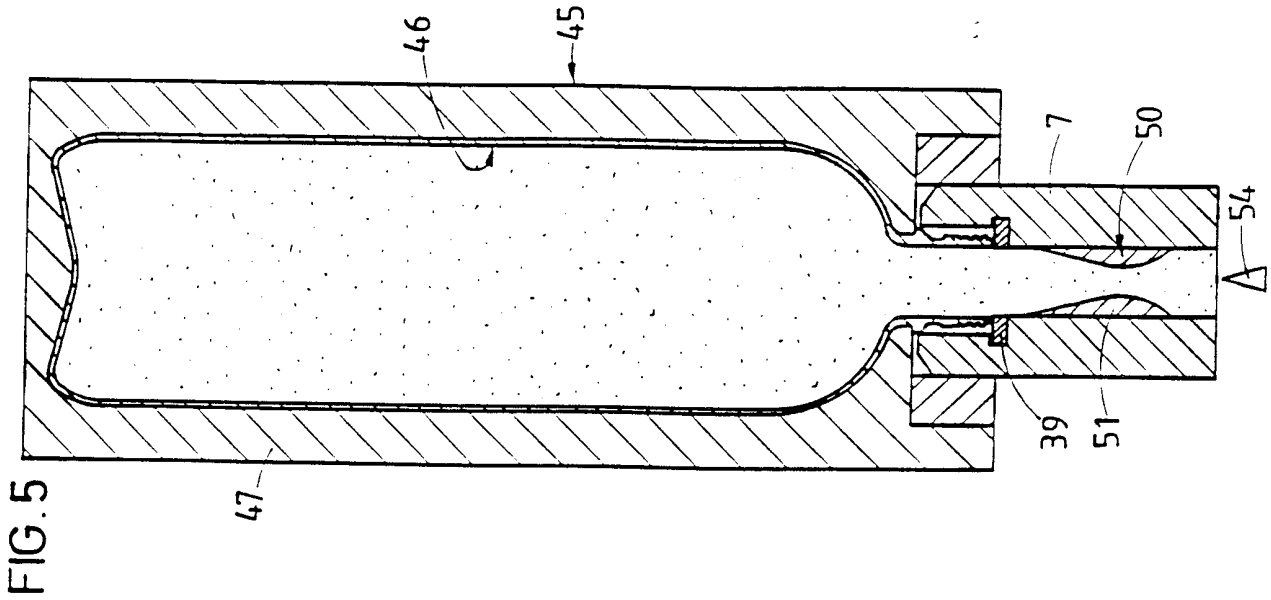


FIG. 5

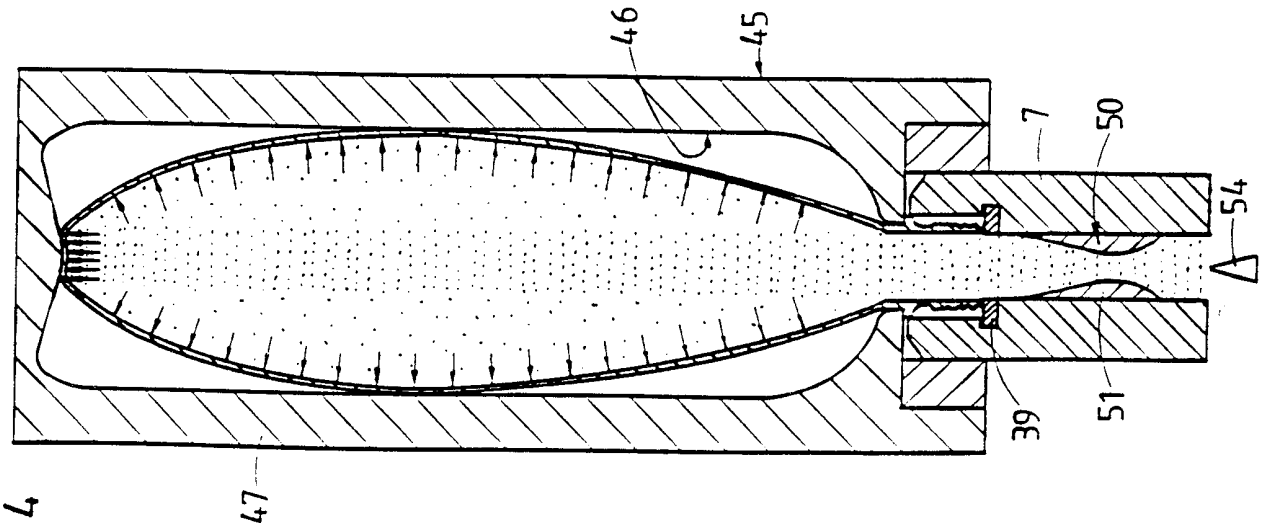


FIG. 4

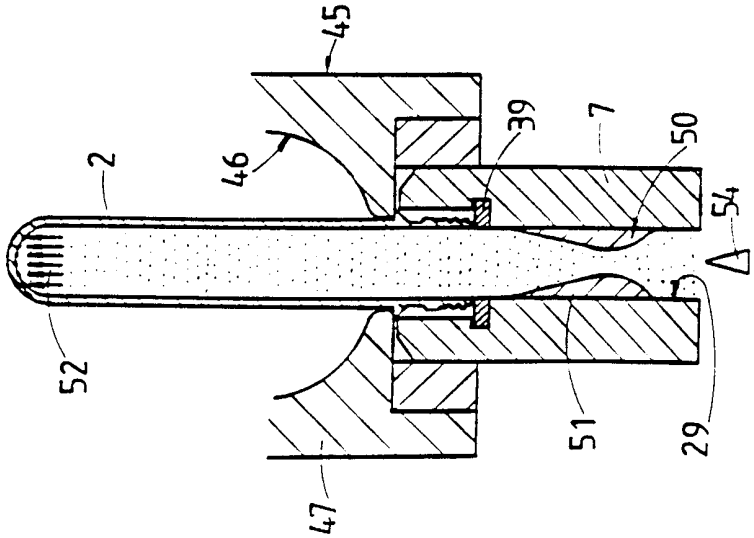


FIG. 3

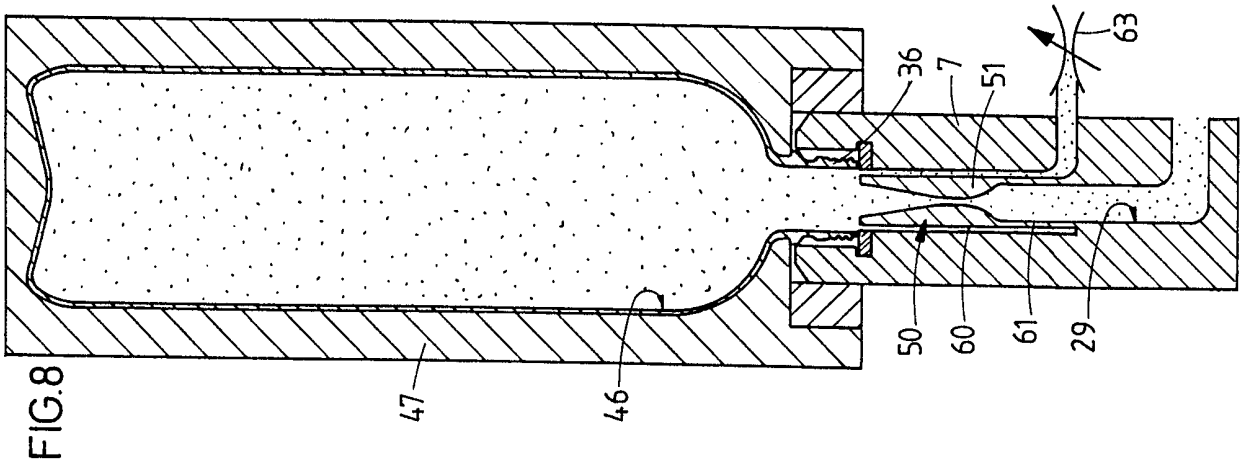


FIG.8

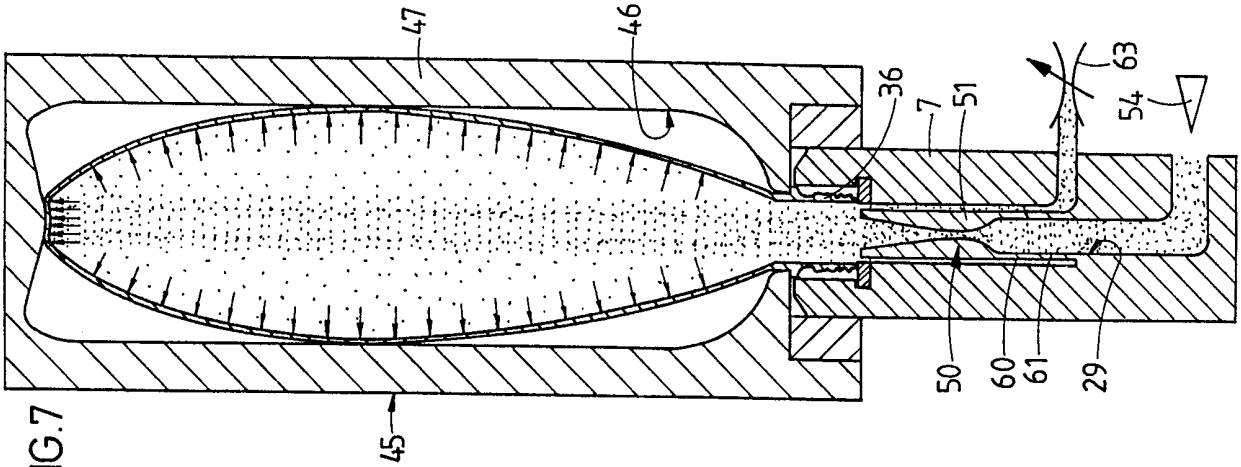


FIG.7

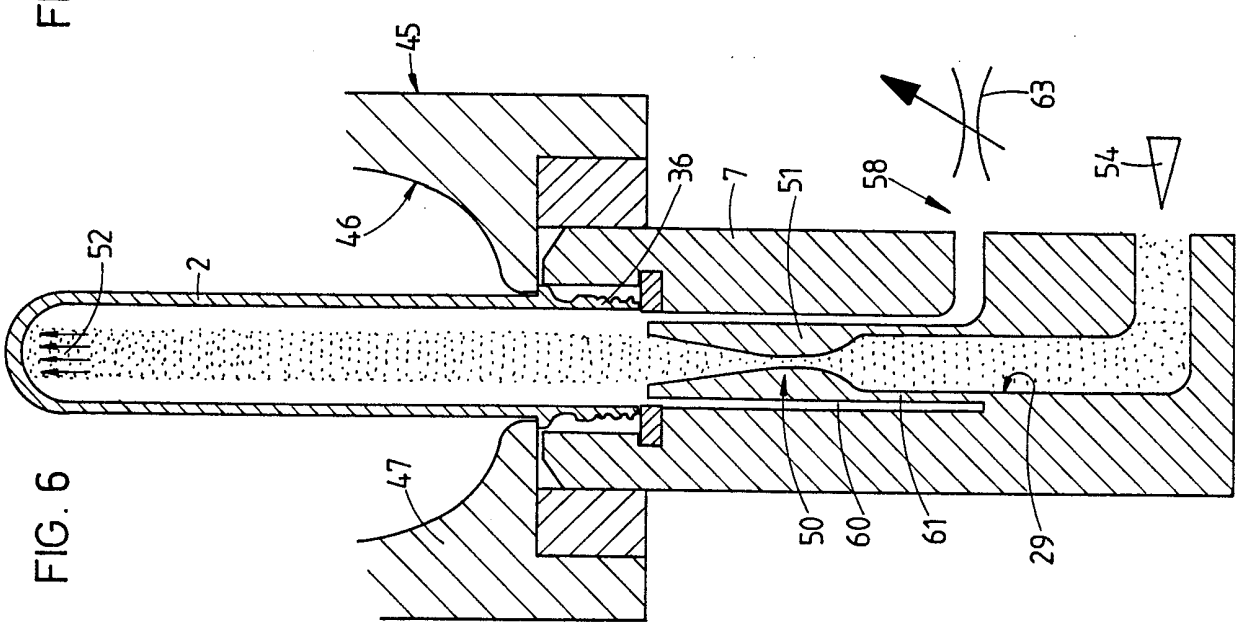


FIG. 6

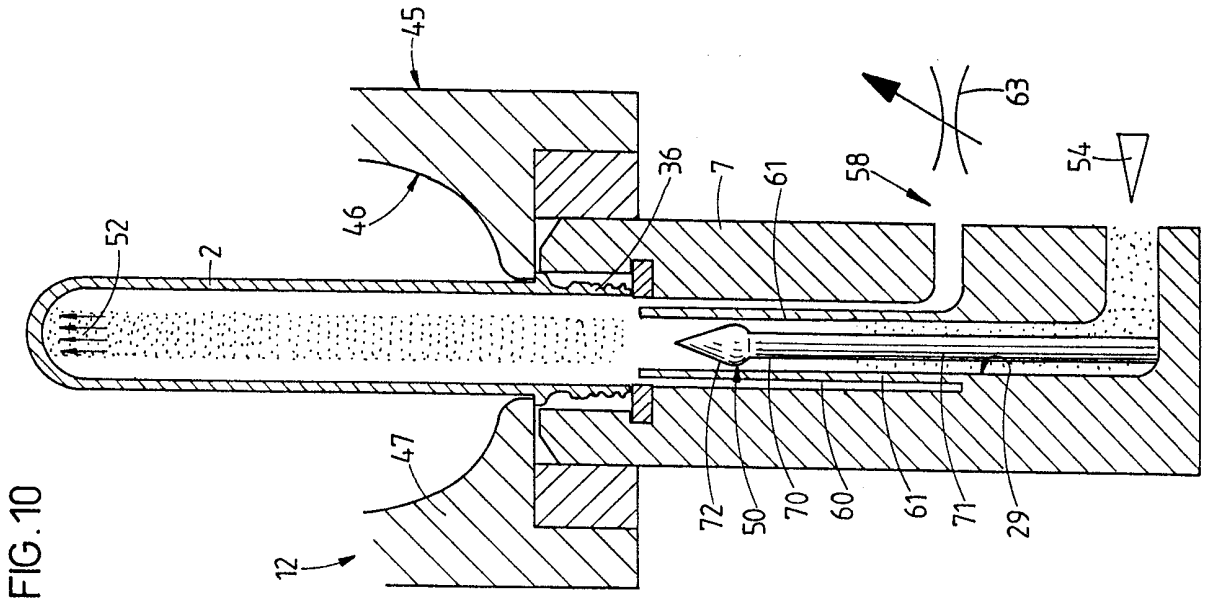

45
63
36
7
61
58
54
46
52
2
72
50
70
60
61
71
29
47
12

FIG. 10

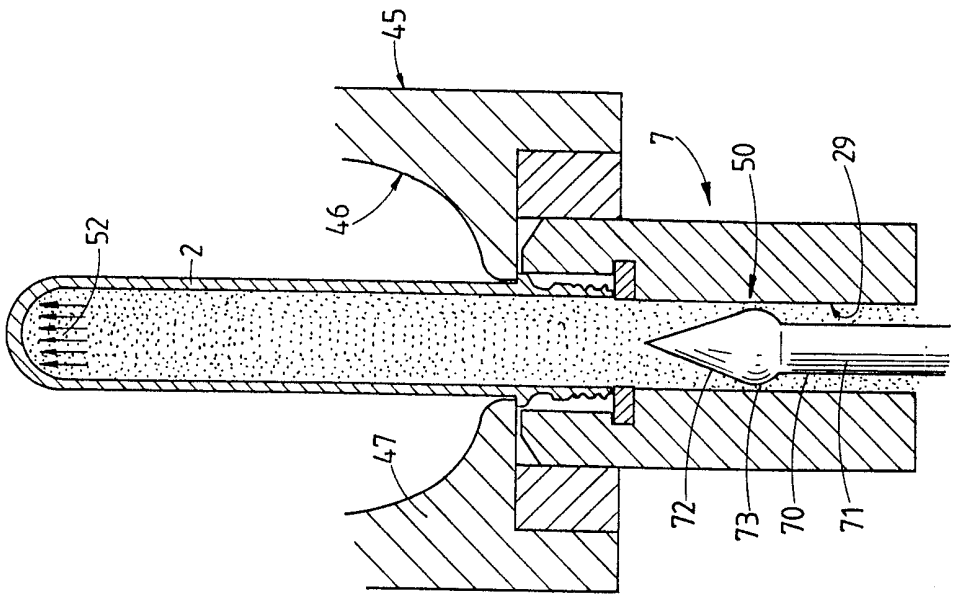
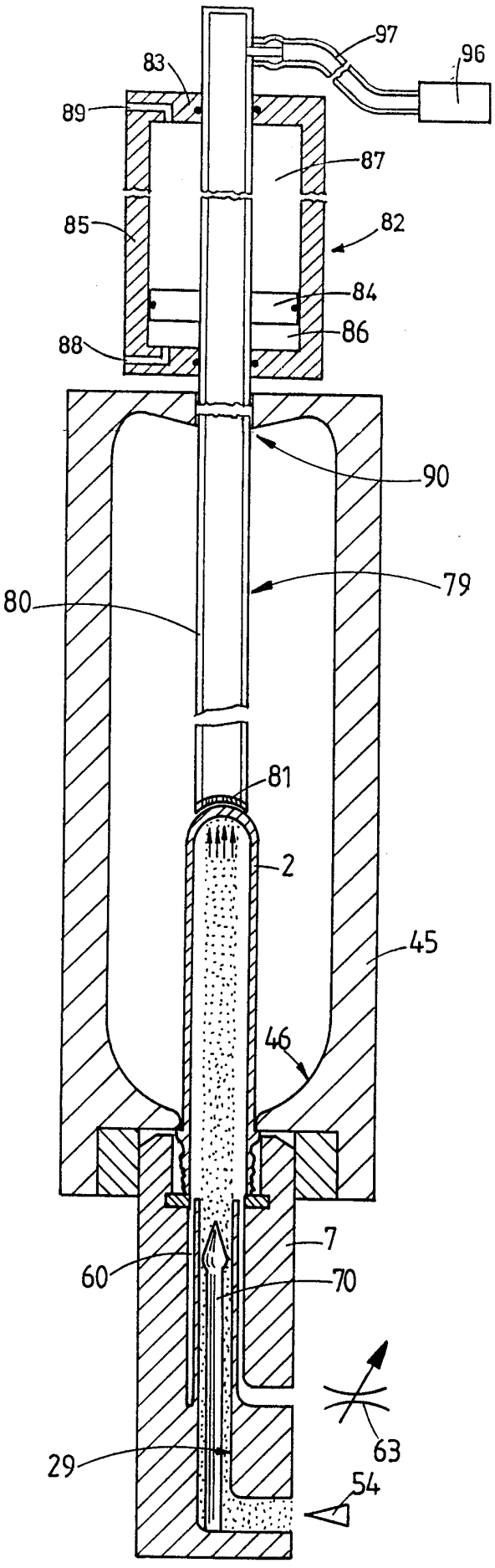

45
7
50
29
46
52
2
47
72
73
70
71

FIG. 9

FIG.11



INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/IB 98/00464

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B29C49/58 B29C49/16 B29C49/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical. search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate. of the relevant passages	Relevant to claim No.
X	FR 2 405 809 A (AIR LIQUIDE) 11 May 1979 see figures 1-3	1-4,6-8, 13-15
X	WO 97 13632 A (COLLOMBIN ANDRE M ;TETRA LAVAL HOLDINGS & FINANCE (CH)) 17 April 1997 see column 3, line 1 - line 6; figures see column 9, line 25 - column 10, line 24	1,2,4,5, 13
A	EP 0 734 836 A (YOSHINO KOGYOSHO CO LTD) 2 October 1996 see figure 1	1-3
A	FR 89 219 E (P. NATAT) 28 August 1967 see figure	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents. such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 November 1998	03.03.99

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	KOSICKI, T

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/IB 98/00464

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category ˘	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 004 805 A (GILDEMEISTER CORPOPLAST GMBH) 11 April 1979 cited in the application see figures -----	1

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

rnational application No.
PCT/ IB 98/ 00464

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. claims 1-8,13-15
2. claims 1,9-12

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8,13-15

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir ational Application No
PCT/IB 98/00464

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2405809 A	11-05-1979	NONE	
WO 9713632 A	17-04-1997	AU 6887396 A	30-04-1997
		EP 0854780 A	29-07-1998
EP 0734836 A	02-10-1996	JP 7290562 A	07-11-1995
		AU 682961 B	23-10-1997
		AU 2353195 A	29-11-1995
		US 5711913 A	27-01-1998
		CA 2166202 A	09-11-1995
		CN 1128004 A	31-07-1996
		WO 9529804 A	09-11-1995
FR 89219 E	28-08-1967	NONE	
GB 2004805 A	11-04-1979	DE 2742693 A	05-04-1979
		FR 2403878 A	20-04-1979
		JP 1380863 C	28-05-1987
		JP 54093062 A	23-07-1979
		JP 61045524 B	08-10-1986
		US 4214860 A	29-07-1980