



INTERNATIONAL APPLICATION PUBLISHED UNDE



(51) International Patent Classification 6 :	(11) 1
B29C 43/08 // B29L 31:56	A1

WO 9609153A1

(43) International Publication Date: 28 March 1996 (28.03.96)

(21) International Application Number: PCT/EP95/03644

(22) International Filing Date: 15 September 1995 (15.09.95)

(30) Priority Data:
B094A000410 19 September 1994 (19.09.94) IT

(71) Applicant (for all designated States except US): SACMI COOPERATIVA MECCANICI IMOLA S.C.R.L. [IT/IT]; Via Selice, 17/A, I-40026 Imola (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): ALIERI, Rodiero [IT/IT]; Via Liverani, 7, I-40026 Imola (IT).

(74) Agent: MODIANO, Guido; Modiano & Associati, Via Meravigli, 16, I-20123 Milan (IT).

(81) Designated States: AU, BR, CA, CN, JP, KR, MX, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published

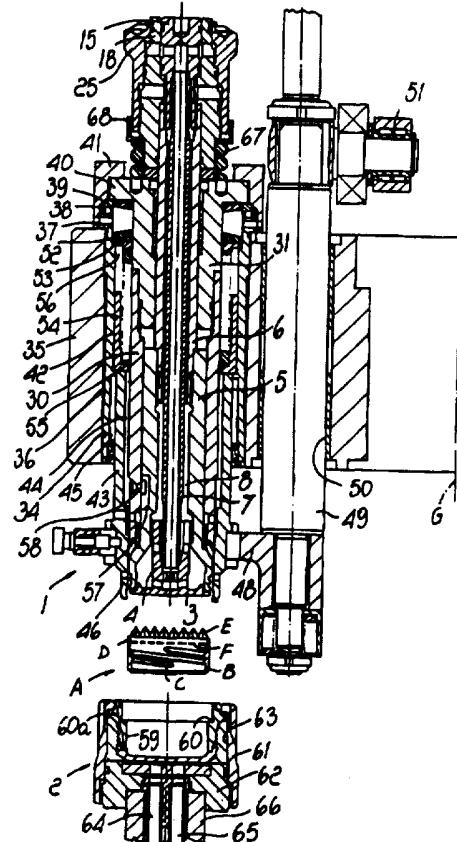
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: APPARATUS FOR MANUFACTURING ITEMS MADE OF PLASTICS, PARTICULARLY SCREW CLOSURES, BY PRESSURE MOLDING

(57) Abstract

Apparatus for manufacturing items made of plastics, particularly screw caps, by pressure molding, which comprises a carousel on which molding units are arranged, each molding unit comprising an upper plunger (3, 9) against which a half-mold (2) is hydraulically pushed. The half-mold defines a cavity inside which a dose of plastics (P) has been introduced. Separation elements (43, 49) for extracting the cap after its manufacture are associated with the plunger.



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.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

APPARATUS FOR MANUFACTURING ITEMS MADE OF PLASTICS,
PARTICULARLY SCREW CLOSURES, BY PRESSURE MOLDING

Technical Field

The present invention relates to an apparatus for manufacturing items made of plastics, particularly screw closures, by pressure molding.

Background Art

Methods and devices for the pressure molding of 5 closures constituted by a cup to be applied by screwing (screw caps) or by pressure (crown caps) on the mouth of containers are already known, for example from German publication no. 2,007,777, from European publication no. 162,456, and from US patents no. 2,155,316, 2,891,281, 10 4,343,754, and 4,497,765.

Conventional devices comprise a carousel that can rotate about a vertical axis and on which a plurality of molding units, mutually spaced by the same angle, are mounted. Each unit comprises an upper male half-mold that 15 is aligned with a lower female half-mold. A dose of semi-fluid plastic material is introduced in the female half-mold and is pressed by means of a relative motion of the two half-molds. In US prior patents no. 2,155,316 and no. 2,891,281 (hereinafter referenced as prior patents X), the 20 relative motion is produced by the hydraulic lifting of the female half-mold, whereas in the other prior patents (hereinafter termed prior patents Y) it is the male half-mold that is forced against the female half-mold by virtue of a mechanical movement produced by cam means.

25 In the devices disclosed in prior patents X it is not possible to produce screw closures provided with a tamper-

- 2 -

proof ring. On the other hand, in the devices disclosed in prior patents Y, in order to allow the formation of the tamper-proof ring, the male half-mold has a composite structure, in which the elements must be movable in order 5 to be able to transmit the molding pressure and allow to remove the molded closure. Due to this reason, in devices disclosed in prior patents Y, the high stresses that occur during molding require the male half-molds to have a particularly strong structure to neutralize the unavoidable 10 deformations and mechanical tolerances that might compromise their perfect mating with the female half-molds. Furthermore, actuation elements are required to open the part of the mold that is meant to form the tamper-proof ring. This strong and complex structure, however, makes 15 replacement and calibration of the half-molds very difficult, especially when it is necessary to replace said half-molds to manufacture closures having a different shape.

Disclosure of the Invention

The principal aim of the present invention is to 20 provide an apparatus for producing screw caps with a tamper-proof ring, in which the pressing effect is assigned to the female half-mold, as in prior patents X, but the male half-mold is structured so as to allow to form the tamper-proof ring as in prior patents Y.

25 Within the scope of this aim, an object of the present invention is to provide an apparatus in which the half-molds can be easily replaced in relation to the characteristics of the closures to be manufactured.

This aim and this object are achieved with an

- 3 -

apparatus whose characteristics are defined in the appended claims.

Brief Description of the Drawings

Further particularities of the present invention will become apparent from the following description of a 5 preferred embodiment and of some variations, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a sectional elevation view of a molding unit, taken along a vertical plane, for forming a closure 10 with a tamper-proof ring;

figures 2 and 3 are two enlarged-scale views of details of figure 1;

figures 4, 5, 6, and 7 are views of further operating situations of the apparatus;

15 figure 8 is a sectional view of another type of closure;

figure 9 is a view of another embodiment of the mold for manufacturing the closure of figure 8;

figure 10 is a view of a further embodiment of the 20 mold;

figure 11 is a view of still another embodiment, related to the means for expelling the molded closure.

Ways of carrying out the Invention

With reference to figures 1-3, the apparatus is composed of a carousel that can rotate about a vertical 25 axis and supports, in its peripheral region, a plurality of units for molding closures made of plastics. Hereinafter, it is assumed that said closures are of the screw type with a tamper-proof ring that is adapted to clearly indicate

- 4 -

tampering of the containers to which the closures are to be applied.

Each unit is composed of an upper male half-mold, generally designated by the reference numeral 1, and of a 5 lower female half-mold, generally designated by the reference numeral 2.

The half-mold 1 comprises a pan 3 which is screwed into a sleeve 5 by means of a tubular tang 4 of said pan; the sleeve is in turn screwed on a tubular stem 6.

10 A tube 7 is hermetically inserted in the tubular tang 4 and, together with the tubular stem 6 and the sleeve 5, forms a cylindrical interspace 8. The sleeve 5 has, at its lower end, a wider portion 9 that is hermetically centered on the pan 3 and forms, together with the tubular tang 4, a 15 chamber 10 that is connected to the interspace 8 through openings 11 of the tubular portion. The chamber 10 is connected to the inside of the tube 7 by means of openings 12 and 13 formed in the region of the tubular tang 4 directly above the pan 3 and respectively in a diaphragm 14 20 of said tang.

The portion 9 of the sleeve 5 and the pan 3 form the plunger, which produces the internal ridges of the closure; in the illustrated example, said closure is constituted by a cap A composed of a cylindrical cup B that is provided 25 with an internal thread C and with a tamper-proof ring D that comprises a retention element constituted by a ring E that is folded along radial planes. The ring E tapers inward, forming an obtuse angle with the cylindrical wall of the cup B. In a separate production step, the tamper- 30 proof ring D, is made detachable from the cup B by a

perimetric score line F that allows it to separate when the cap is unscrewed from the container to which it has been applied. It should be noted that before putting the cap on the container, the retention ring E is folded towards the 5 inside the cup B so as to form an acute angle with the internal wall of said cap and so that it can engage, during application on the container, a collar or other undercut that is formed on the neck of the container directly below the cap screwing region.

10 The upper end of the tube 7 is hermetically inserted in a seat of an externally threaded cylindrical plug 15 in which radial openings 16 and 17 are formed at different levels. The plug 15 is screwed into the upper end of the tubular stem 6, so that the tube 7 is locked between the 15 plug 15 and the portion 4.

The plug 15 is hermetically accommodated in a sleeve 18, in the lower part of which the top of the tubular stem 6 is inserted. The sleeve 18 has an internal collar 19, which remains clamped between a shoulder 20 of the plug 15 20 and the upper edge of the stem 6, so that the sleeve 18 is also rigidly coupled to the stem 6 and follows its axial movements.

Radial openings 21 and 22 are formed in the sleeve 18 and are connected respectively to the openings 16 and 17 of 25 the plug 15 by means of annular grooves 23 and 24 that are formed between the plug 15 and the sleeve 18. A bush 25 is hermetically superimposed on the sleeve 18, and two grooves 26 and 27 are formed inside said bush; the first groove 30 mutually connects the openings 21 and the second groove mutually connects the openings 22. By means of connectors

- 6 -

(not shown in the drawing) applied to the bush 25, the grooves 26 and 27 are connected to the delivery and to the return of a coolant liquid which, through the tube 7, is conveyed into the chamber 10 to cool the plunger 3, 9 and 5 to harden the plastics of which the cap A is made. The liquid is then made to flow out of the chamber 10 through the openings 11 and the interspace 8 and outside from there through the openings 16 and 21.

The bush 25 is retained axially on the sleeve 18 by an 10 elastic ring 28 that engages an annular groove 29 of the sleeve 18.

The sleeve 5 is slidingly guided in a cylindrical jacket 30 that is rigidly coupled to a tubular element 31, in which the stem 6 slides, by means of a screw coupling.

15 The lower edge of the jacket 30 is internally provided with a conical chamfer 32 that is arranged axially opposite to a collar 33, by means of which the portion 9 is connected to the sleeve 5. The collar 33 is provided with a conical surface that is complementary to the surface of the 20 chamfer 32. Inside the jacket 30, proximate to the lower edge, there is a cylindrical seat 33a that forms a shoulder 33b and is closed towards the inside by the sleeve 5. The seat 33a accommodates a spacer ring 33c that is superimposed on the sleeve 5 and rests on a step 33d formed 25 at the top of the portion 9. As will become apparent hereinafter, the spacer 33c is sized so as to abut against the shoulder 33b during the molding of the cap, so as to form, between the chamfer 32 and the collar 33, a cavity that is meant to form the retention element E.

30 The jacket 30 and the element 31 are coaxial to a

respective cylindrical seat 34 of a supporting body that is part of the structure of the carousel. In practice, said body is constituted by a sort of rotatable drum 35, which is mounted on a vertical shaft whose axis G is the rotation 5 axis of the carousel.

A bush 36 is inserted in the seat 34 and abuts against the edge of the seat 34 with an annular lip 37. A spacer ring 39 rests on the annular ring 37 with the interposition of an elastic ring 38; the tubular element 31 in turn rests 10 on said spacer ring 39 by means of an external flange 40 of said tubular element 31. A retention element 41 engages on the flange 40 by means of screws (not shown in the drawing) and locks the element 31 and the bush 36, coaxially to each other and to the seat 34, on the upper face of the drum 35.

15 A cylindrical chamber 42 is formed between the bush 36 and the outer surface of the jacket 30 and of the element 31; a sleeve 43 extends inside said chamber from below and is guided axially on the jacket 30 by an internal bearing 44 and by an external bearing 45 in the bush 36.

20 The sleeve 43, at the level of the portion 9, ends with an annular segment or ring 46, whose inner edge is designated by the reference numeral 47. The ring 46 forms an interspace with the outer surface of the portion 9 for the molding of the ring D and of the cylindrical wall of 25 the cup B.

The sleeve 43, by means of an arm 48, is rigidly connected to a post or stem 49 that is parallel thereto. The post 49 is guided in a seat 50 of the drum 35 and is provided, at the top, with a roller 51 that follows a 30 circular cam that is rigidly coupled to the fixed structure

of the apparatus and is therefore stationary and lies concentrically to the rotation axis G of the carousel. The cam (not shown in the drawing) positively actuates the movements of the sleeve 43 in a downward direction only 5 over an angle that is sufficient to remove the closure formed by the plunger 3, 9; over the remaining angle of rotation, the sleeve 43 can move upward in contrast with elastic abutment means.

Said means are constituted by a plurality of 10 Belleville springs 52 that are interposed between the flange 40 of the tubular element 31 and a swivel ring 53 that rests on a tubular case 54 that is accommodated in the chamber 42. The case 54 has an internal lip 55 on which a cylindrical spring 56, adapted to act against the swivel 15 ring 53, rests.

In order to prevent the sleeve 5 from rotating with respect to the jacket 30, on the outside of the sleeve 5 there is an axial slot 57 in which a roller 58 slidably engages; said roller 58 protrudes towards the inside of the 20 jacket 30.

The lower half-mold 2 is composed of a bowl 59 that forms a cavity that allows to insert the ring 46 until it abuts against a shoulder 60 and closes the cap molding chamber. Holes 60a are formed in the wall of the bowl 59 25 and keep the cavity of the bowl connected to the outside to allow venting of the air that, during molding, has remained trapped in the mold.

By means of an external ring 61, the bowl 59 is locked against a disk 62 and together they form a chamber 63 that 30 is connected to a feed duct 64 and to a discharge duct 65

for a cooling liquid.

The ducts 64 and 65 run inside a hollow stem 66, on which the disk 62 is mounted. The hollow stem is guided in the structure of the apparatus coaxially to the plunger 3, 5 9 and is actuated by a respective hydraulic actuator so as to move the bowl 59 toward and away from the plunger 3, 9.

The operation of the described apparatus is as follows.

During the rotation of the carousel, a dose P of pasty 10 plastics is deposited in the cavity of the bowl 59. During this step, shown in figure 4, the bowl 59 is lowered with respect to the plunger 3, 9 which, by means of elastic means, is actuated into the position in which it stops against the lower end of the jacket 30. In the illustrated 15 example, the elastic means are constituted by a spring 67 that is interposed between the flange 40 and a thrust washer 68 that rests on an annular abutment 69 of the sleeve 18 and has an edge that is folded upward so as to enclose the base of the bush 25. The stationary cam that 20 controls the stroke of the stem 49 and therefore of the sleeve 43 is adjusted so that during this step the edge 47 of the ring 46 is at a lower level than the pan 3 of the plunger.

When the female half-mold 2 is raised hydraulically, 25 the ring 46 abuts against the shoulder 60 and the molding chamber, formed between the plunger 3, 9 and the bowl 59, closes.

Then the pressure applied to the lower half-mold 2 causes the gradual distribution of the plastics in the 30 molding chamber until it also fills the cavity for the

molding of the ring E, which is formed between the chamfer 32 and the collar 33. When the molding cavity has been filled, due to the incompressibility of the plastic material, the bowl 59 stops in the final position shown in 5 figure 5. In this position, the edge 47 of the ring 46 is at the level of the angle formed between the conical surface of the collar 33 and the cylindrical surface of the portion 9 and is therefore above the edge of the cup B from which the retention ring E protrudes.

10 When the plastics has reached an adequate hardening point, caused by the feeding of the coolant liquid into the chambers 10 and 63, so that plastic deformations are no longer to be feared, the descent of the bowl 59 is actuated (see figure 6). However, when the bowl 59 is spaced, the 15 cap A does not drop but remains attached only to the plunger 3, 9.

When the bowl 59 has moved away, the descent of the stem 49 is actuated; by dragging the sleeve 43 downward, due to the axial thrust of the edge 47 on the edge of the 20 cap A, said stem causes the separation of the cap from the plunger. The separation of the cap is allowed by the elastic properties of the material, which allows an elastic expansion of the cup B as a consequence of the disengagement of the thread C from the corresponding 25 grooves of the portion 9, whereas the retention ring E opens slightly so as to slide on the cylindrical wall of the portion 9. It should be noted that initially the cap, due to the friction with which it adheres to the plunger, 30 drags the plunger downward by a short extent and causes the spacing of the chamfer 32 from the collar 33. This spacing

allows the retention ring E to flex outward, facilitating the extraction of the cap from the plunger. When the cap has been extracted from the plunger, due to the elastic "memory" of the plastics the ring E regains its conical 5 shape that tapers towards the axis of the cap.

Meanwhile, the carousel has turned into a position in which the removed cap A drops onto a removal chute (not shown) that is interposed between the two half-molds 1 and 2. The described cycle is repeated, during one rotation of 10 the carousel, for each one of the molding units.

In practice, by providing a carousel with thirty-two molding units, the cap cooling step covers approximately 315°, whereas the operations for inserting the dose of plastics in the cavity of the bowl 59, cap molding, and cap 15 extraction are performed over the remaining 45°.

When the caps A exit from the apparatus, they are subjected to subsequent treatments. In particular, for the particular type of capsule A shown, the score line F is formed and the ring E is overturned inward so that said 20 ring E can act edgeways on the collar of the container to which the cap has been applied and withstand traction during unscrewing until the band D breaks along the score line F.

A substantial advantage of the described apparatus is 25 the fact that during molding the pressure on the plungers 3, 9 is discharged onto the drum 35 by means of the spacer ring 33c and the elements 30, 31, and 41. Accordingly, the rod members constituted by the sleeve 5 and by the tubular stem 6 do not have to withstand high axial loads and can be 30 made smaller than the equivalent elements of conventional

devices, in which compression is achieved by actuating the plungers with respect to a stationary bowl 59 by means of an actuation cam that is concentric to the rotation axis of the carousel. In conventional devices, the equivalent rod 5 members in fact must withstand not only the considerable molding pressure but also the lateral stresses that arise from the tangential components that are caused by the engagement of the rod members on the profile of the actuation cam. The rod members of the described apparatus, 10 that is to say, the sleeve 5 and the tubular stem 6, can therefore be lighter and constructively simpler due to the absence of elements that are forced to follow the actuation cam. This leads to easier assembly and simplifies the operations for replacing the molds when it is necessary to 15 produce closures having another shape and a different tamper-proof ring.

Another substantial advantage is constituted by the fact that the spacing of the conical surfaces 32 and 33 occurs automatically during the expulsion of the closure 20 and is not actuated by cam means.

Figure 8 is a view of an embodiment of a cap in which the retention elements are constituted by a plurality of flaps H that are molded so as to form an acute angle with the internal wall of the cup. To produce such a cap, it is 25 sufficient to provide, instead of the collar 33 that has a conical surface, a groove 70 that has a V-shaped cross-section with a conical internal surface that flares upward and, at the lower end of the jacket 30, an edge with a conical outer surface 71 that tapers downward at an angle 30 that is identical to the angle of the groove 70, so as to

mate exactly with it. Recesses 72 are formed in the conical outer surface of the edge 71 to form the flaps H during molding. The method of operation of the apparatus is the same, with the difference that during the closure of the 5 mold the edge 47 of the ring 46 can descend below the upper edge of the portion 9 by an extent thereof that is defined by an internal step 73 that forms the edge of the cap during the molding of said cap. When the sleeve 43 is actuated downward, the step 73, by engaging against the 10 edge of the cap, can extract said cap from the portion 9, while the cap remains attached to the ring 43 by means of the ring D. The subsequent upward motion of the sleeve 43 causes, by contrast against the pan 3 of the plunger, the folding of the flaps H towards the inside of the cap and 15 the final expulsion thereof.

In a further embodiment of the apparatus, shown in figure 10, the internal shoulder of the bowl 59, instead of having a flat step, can have a spherical shape 74 that is adapted to avoid the stagnation thereon of any fragments of 20 plastics during dosage. Of course, in this case the lower end of the ring 46 also has a spherical shape 75 that is complementary to the shape of the shoulder 74.

Another embodiment of the apparatus, shown in figure 11, uses compressed air, controlled by a valve, to 25 facilitate the extraction of the caps from the plunger 3, 9. For this purpose, there is a channel 76 that runs axially in the wall of the end portion 9, of the jacket 30, and of the tubular element 31 and leads outside at the bottom through an outlet 77 that is constituted by a space 30 formed between the lower edge of the portion 9 and the pan

- 14 -

3. In an upward region, the channel 76 leads into a hole 78 that is connected to a source of compressed air. A piston 79 can slide in the hole 78, and a pin 80 acts on said piston; said pin is guided in a bush 81 that is fixed in 5 the hole 78. A screw 82 can act on the pin 80 and is screwed into an arm 83 that protrudes from a swivel ring 84 that is retained between the spring 67 and the ring 68. The piston 79 acts as a shutter that opens and closes the compressed-air delivery toward the outlet 77 in step with 10 the cycle of the apparatus, so as to send compressed air inside the cap as soon as the lower half-mold has moved away from the plunger 3, 9. The feeding of compressed air inflates the cap and partially spaces the thread C from the portion 9, reducing the resistance of the cap to expulsion 15 during the subsequent descent of the ring 46.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other 20 technically equivalent ones.

In practice, the materials employed, as well as the shapes and the dimensions, may be any according to the requirements without thereby abandoning the scope of the protection of the claims that follow.

- 15 -

CLAIMS

1 1. Apparatus for manufacturing items made of plastics,
2 particularly screw caps (A) provided with a tamper-proof
3 ring (D) with retention elements (E) that are adapted to
4 engage below a collar of the containers to which they have
5 been applied, by means of pressure-molding units that are
6 arranged on a carousel that rotates about a vertical axis
7 (G) and comprise an upper male half-mold (1) and a lower
8 female half-mold (2), said half-molds being aligned along a
9 vertical axis that is parallel to the rotation axis of said
10 carousel, characterized in that said female half-mold (2)
11 comprises a bowl (59) that forms a cavity provided with an
12 annular shoulder (60), and in that said male half-mold (1)
13 comprises: a cylindrical jacket (30), which is fixed to the
14 structure (35) of the rotating carousel and is coaxial to
15 the sliding axis of the female half-mold (2); a sleeve
16 (43), which is guided on said jacket (30) and has a lower
17 annular segment (46) that is adapted to engage in said bowl
18 (59); a plunger (3, 9), which is guided in said jacket (30)
19 and is actuated by elastic means (67) in a raised stroke
20 limit position; means being also provided for the
21 hydraulic actuation of said female half-mold (2) from a
22 lowered position for receiving a dose (P) of plastic
23 material that is sufficient to form a closure (A), to a
24 raised position, in which said annular segment (46) of said
25 sleeve (43) enters said bowl (59) until it abuts against
26 said annular shoulder (60) and forms, together with said
27 plunger (3, 9), the closure molding chamber; said plunger
28 (3, 9) and said jacket (30) being provided with surfaces

29 (32, 33) that are axially mutually opposite to form the
30 retention elements (E) of said tamper-proof ring (D); means
31 (48-51) being provided for the actuation of said sleeve
32 (43); elastic abutment means (52) being also provided and
33 being adapted to allow the upward stroke of the female
34 half-mold (2), so that the said female half-mold, by means
35 of compression of said dose (P) of plastics, causes the
36 compression of said dose of plastics until it occupies all
37 of the molding chamber, and so as to lower said sleeve (43)
38 after the downward stroke of the female half-mold (2), so
39 as to act axially on the closure (A) to mutually space said
40 surfaces (32, 33) in contrast with the action of said
41 elastic means (67) and to remove said closure from said
42 plunger (3, 9).

1 2. Apparatus according to claim 1, characterized in
2 that said plunger (3, 9) comprises a sleeve (5) that is
3 guided in said tubular jacket (30) and has an end portion
4 (9) whose outside diameter is greater than that of said
5 sleeve (5) so as to form a collar (33) that is axially
6 opposite to the end (32) of said jacket (30).

1 3. Apparatus according to claim 1 or 2, characterized
2 in that the oppositely arranged surfaces of said jacket
3 (30) and of said collar (33) are shaped so as to create
4 recesses for molding the retention elements (E) of said
5 tamper-proof ring (D).

1 4. Apparatus according to claim 3, characterized in
2 that said surfaces (32, 33) are conical.

1 5. Apparatus according to claim 3, characterized in
2 that said annular segment (46) has an end that forms an
3 internal edge (47) which forms the edge of the closure when

4 said lower half-mold (2) is in raised position.

1 6. Apparatus according to claim 1, characterized in
2 that said annular segment (46) has an internal step (73)
3 that forms the edge of the closure in the raised position
4 of said lower half-mold (2).

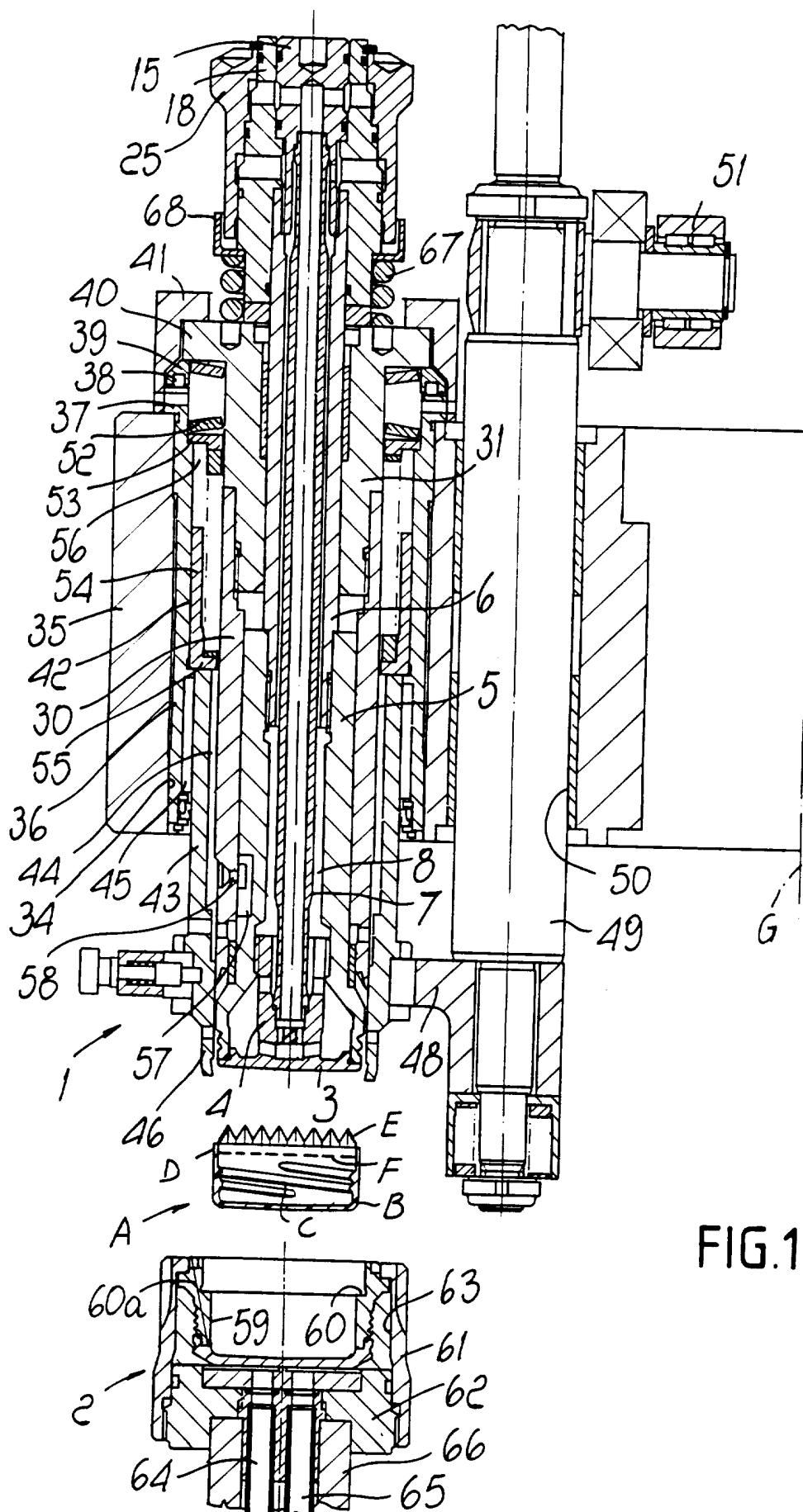
1 7. Apparatus according to one or more of the preceding
2 claims, characterized in that said shoulder (60) of said
3 bowl (59) and the lower end of said annular segment (46)
4 have mating and rounded abutment surfaces.

1 8. Apparatus according to one or more of the preceding
2 claims, characterized in that said bowl (59) is locked, by
3 means of an external ring (61), against a disk (62) mounted
4 at the end of a stem (66) that is actuated hydraulically.

1 9. Apparatus according to one or more of the preceding
2 claims, characterized in that chambers (10, 63) are formed
3 in said plunger (3, 9) and around said bowl (59) and are
4 connected to ducts (7, 8, 64, 65) for feeding and
5 discharging a coolant liquid.

1 10. Apparatus according to claim 1, characterized in
2 that said sleeve (43) is connected, by means of an arm
3 (48), to a post (49) that is guided in said carousel and is
4 controlled by a stationary actuation cam.

1 11. Apparatus according to one or more of the
2 preceding claims, characterized in that it comprises a
3 channel (76) that has an inlet connected to a source of
4 compressed air and an outlet (77) that leads outside said
5 end portion (9) of said plunger, said channel (76) being
6 controlled by a valve (78-80) so as to control the feeding
7 of compressed air inside said molded closure when the lower
8 half-mold (2) has moved away from said plunger (3, 9).



2/8

FIG.2

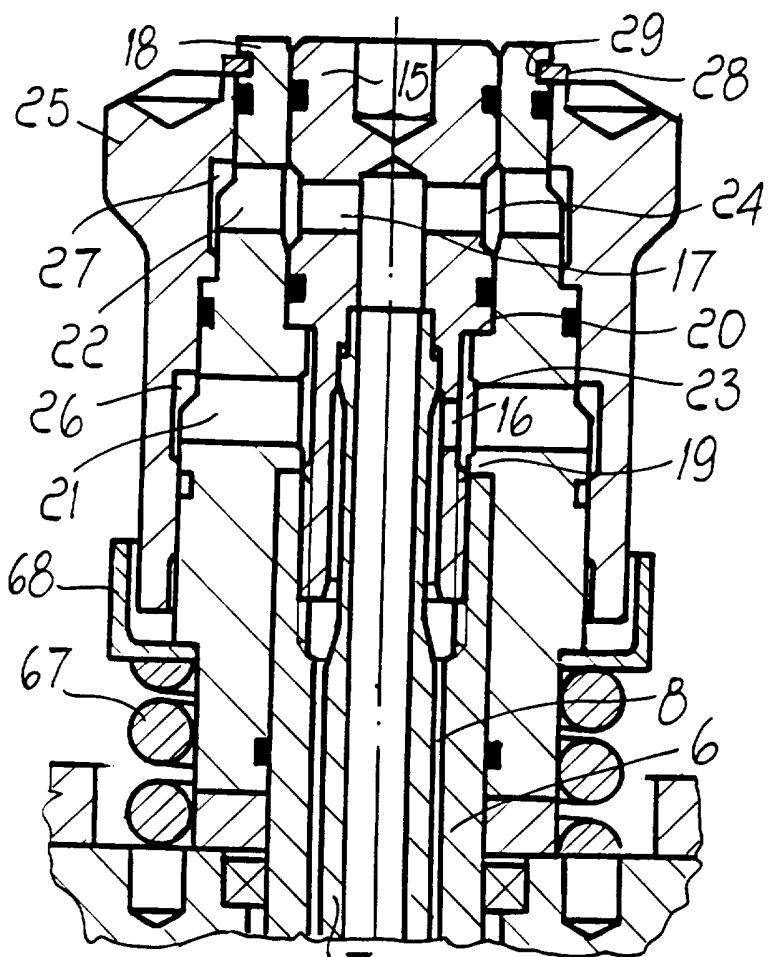
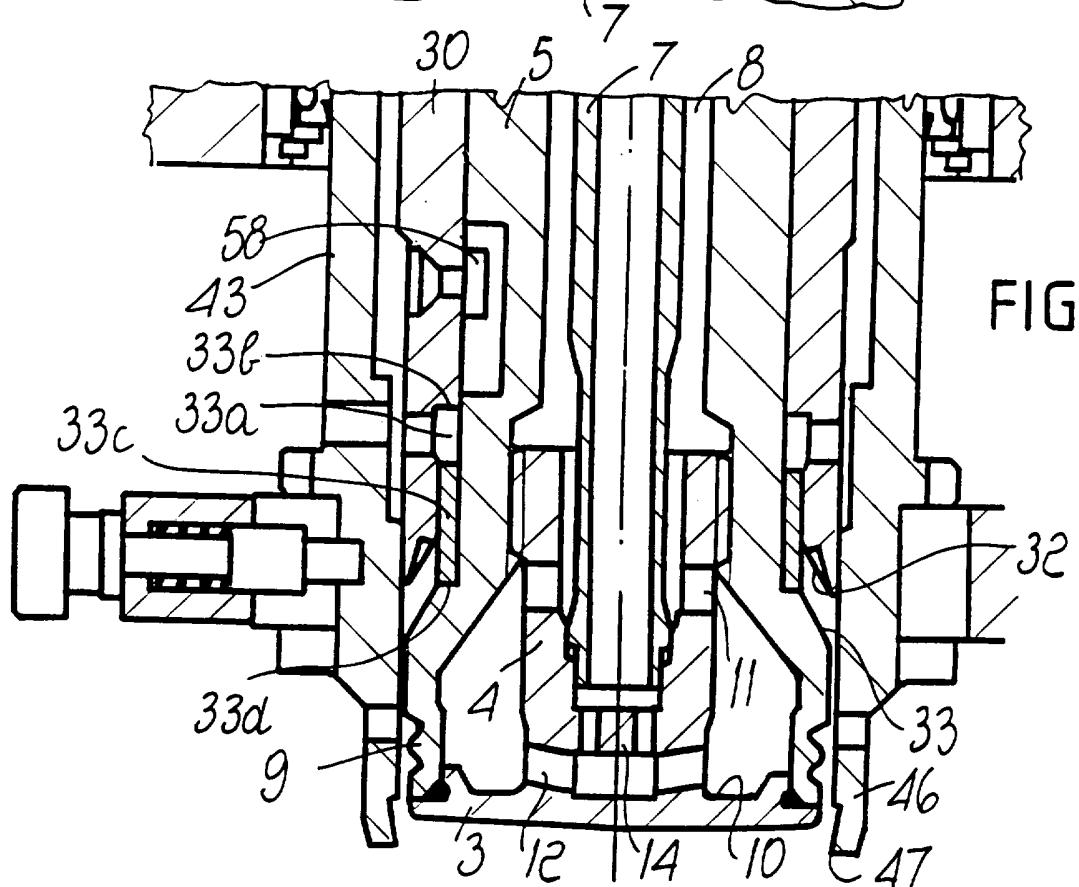
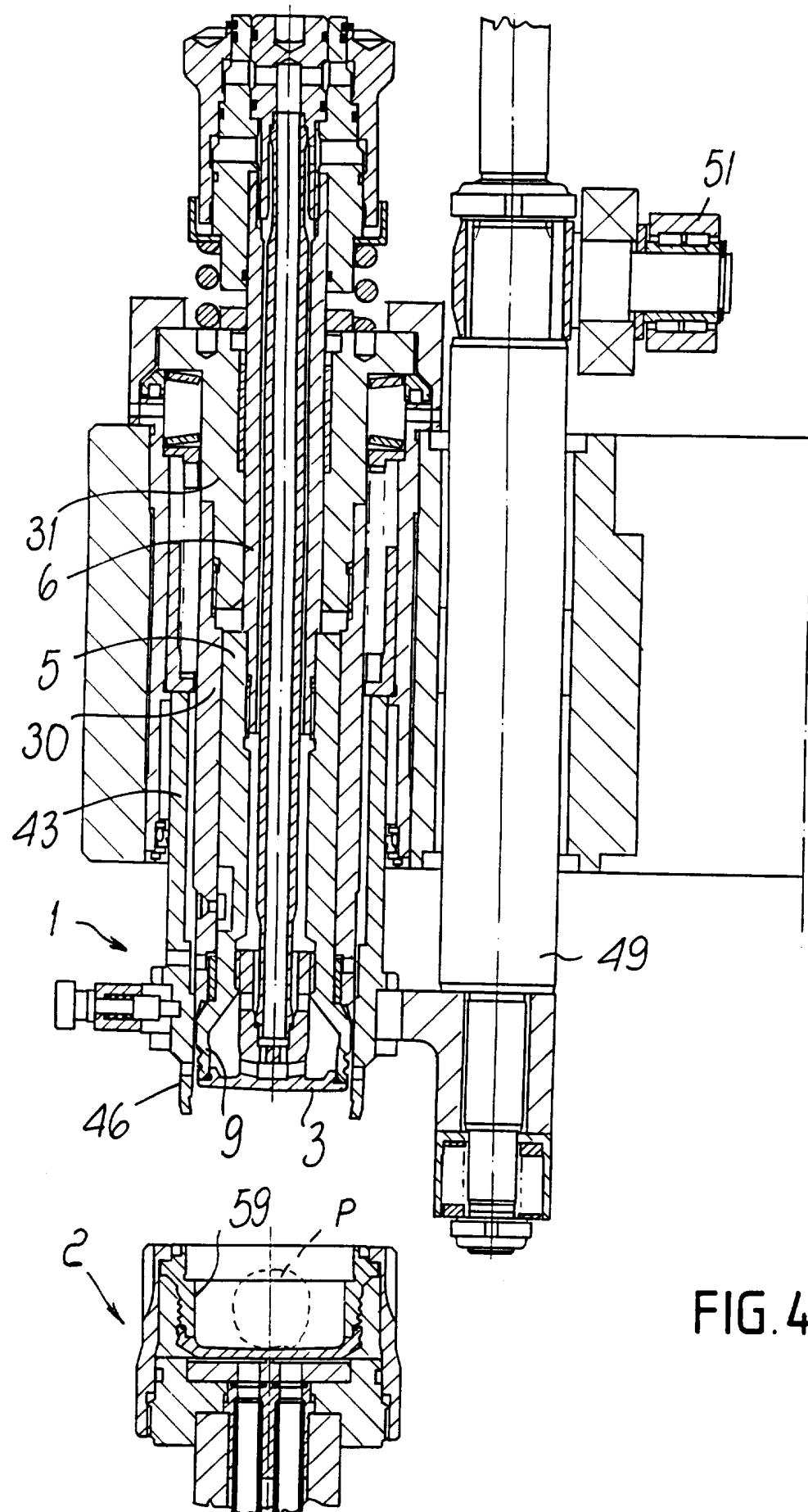


FIG.3





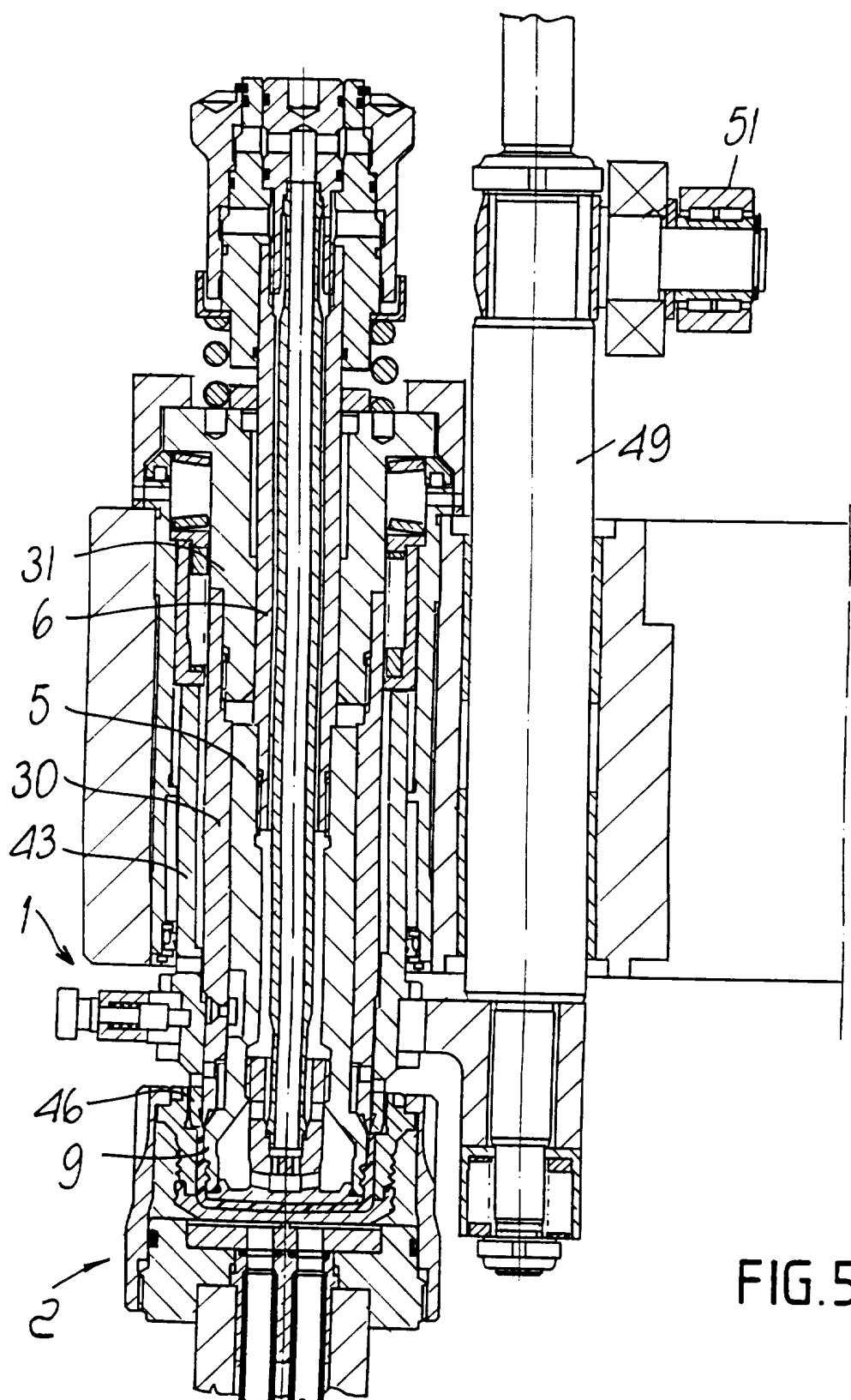
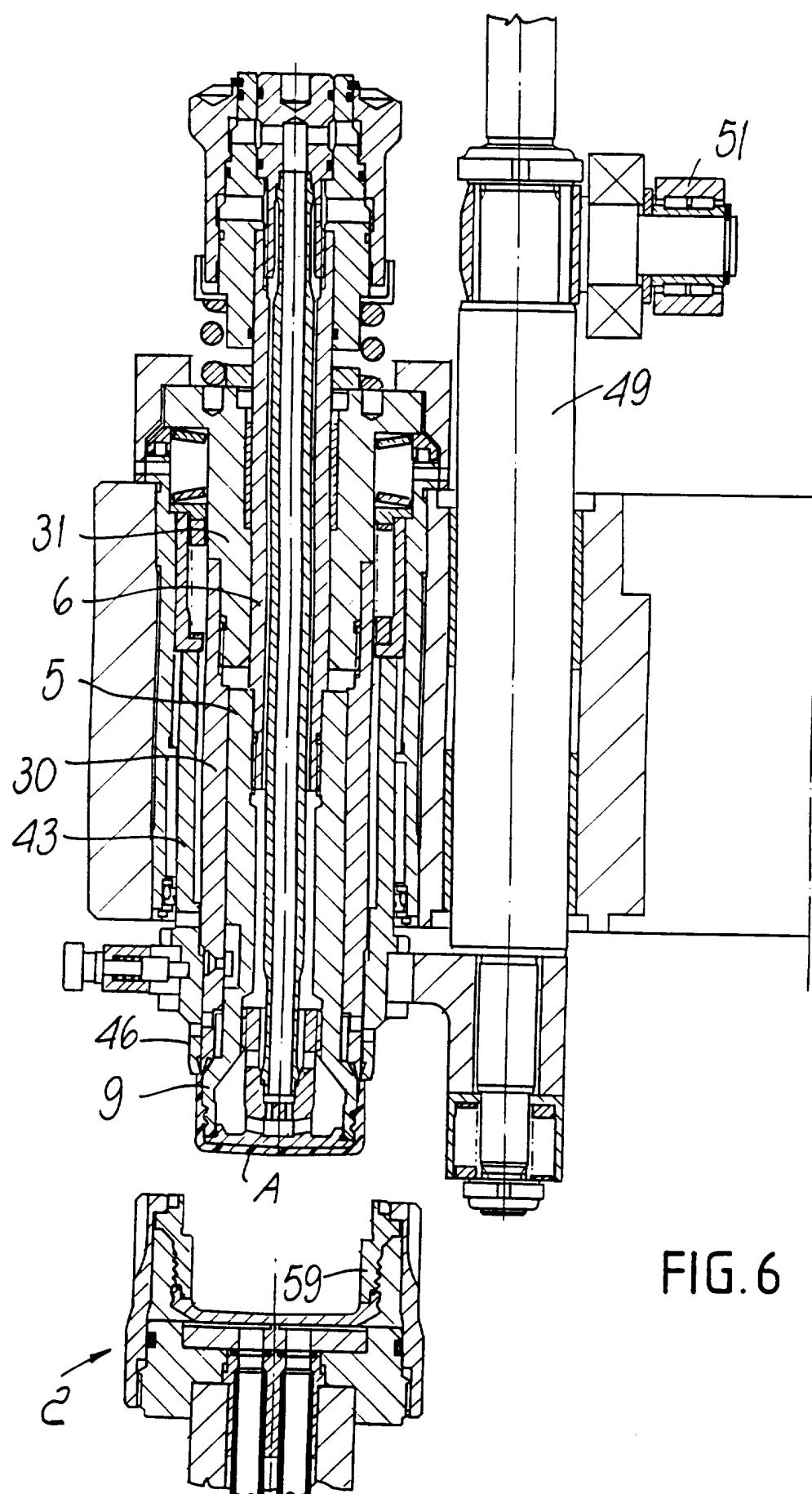
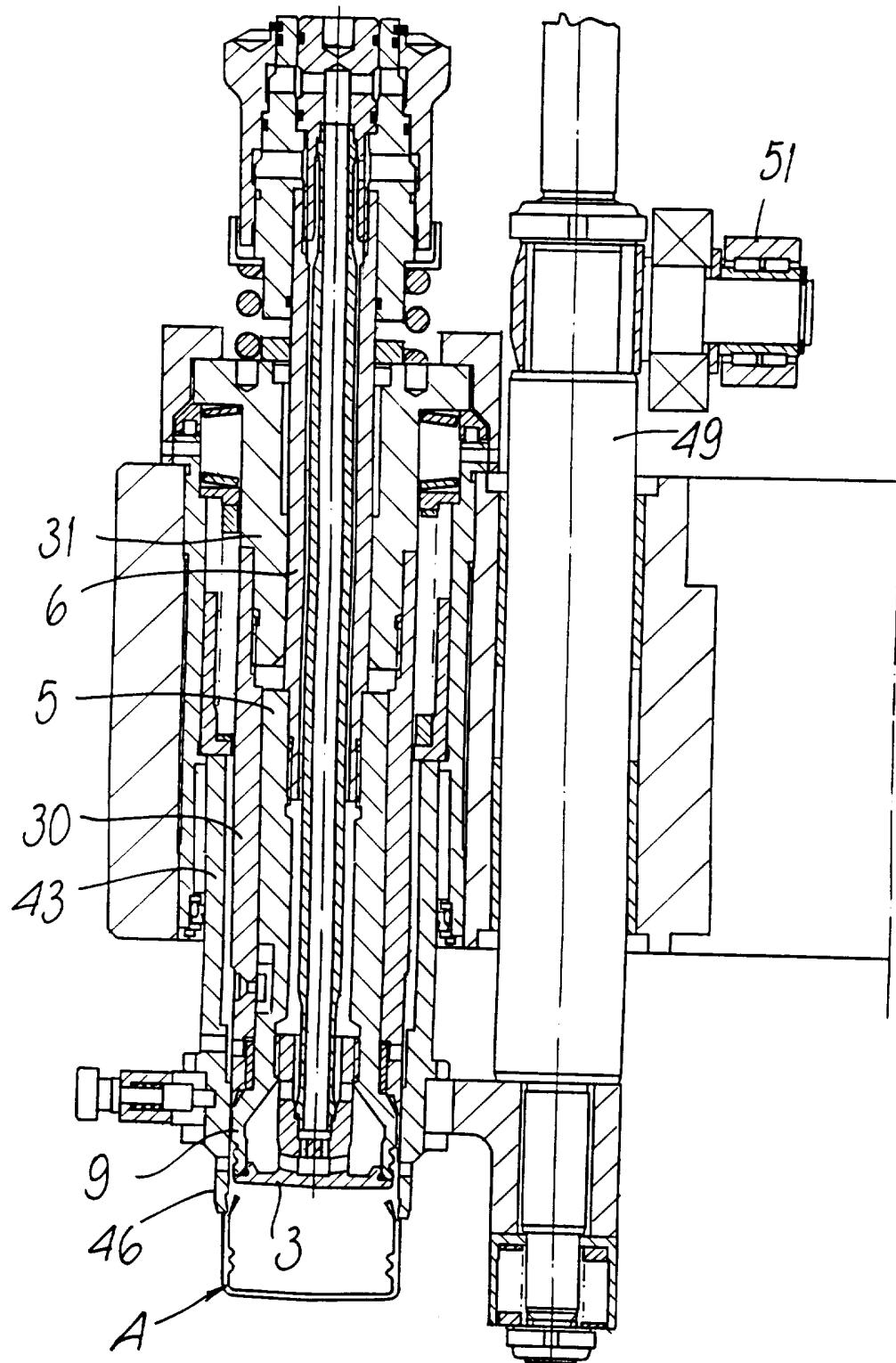


FIG.5



6/8

FIG. 7



7/8

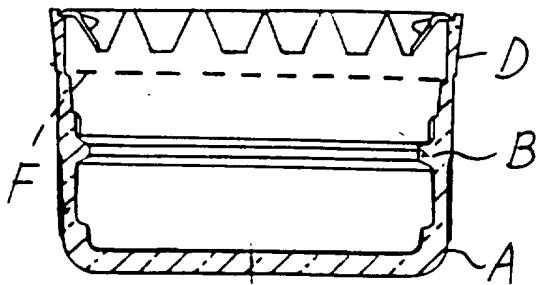


FIG. 8

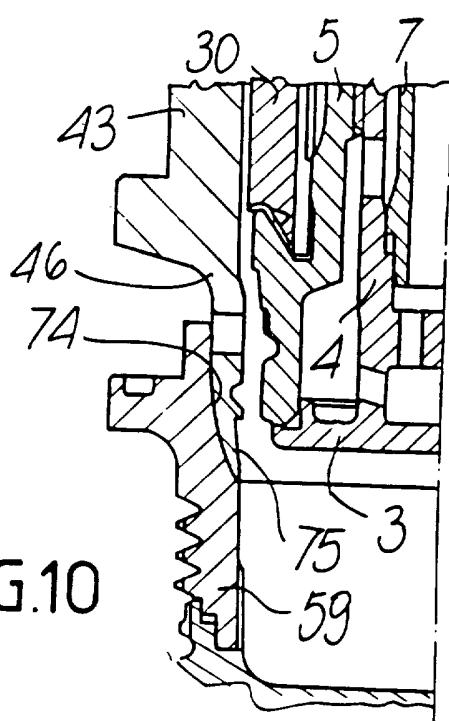
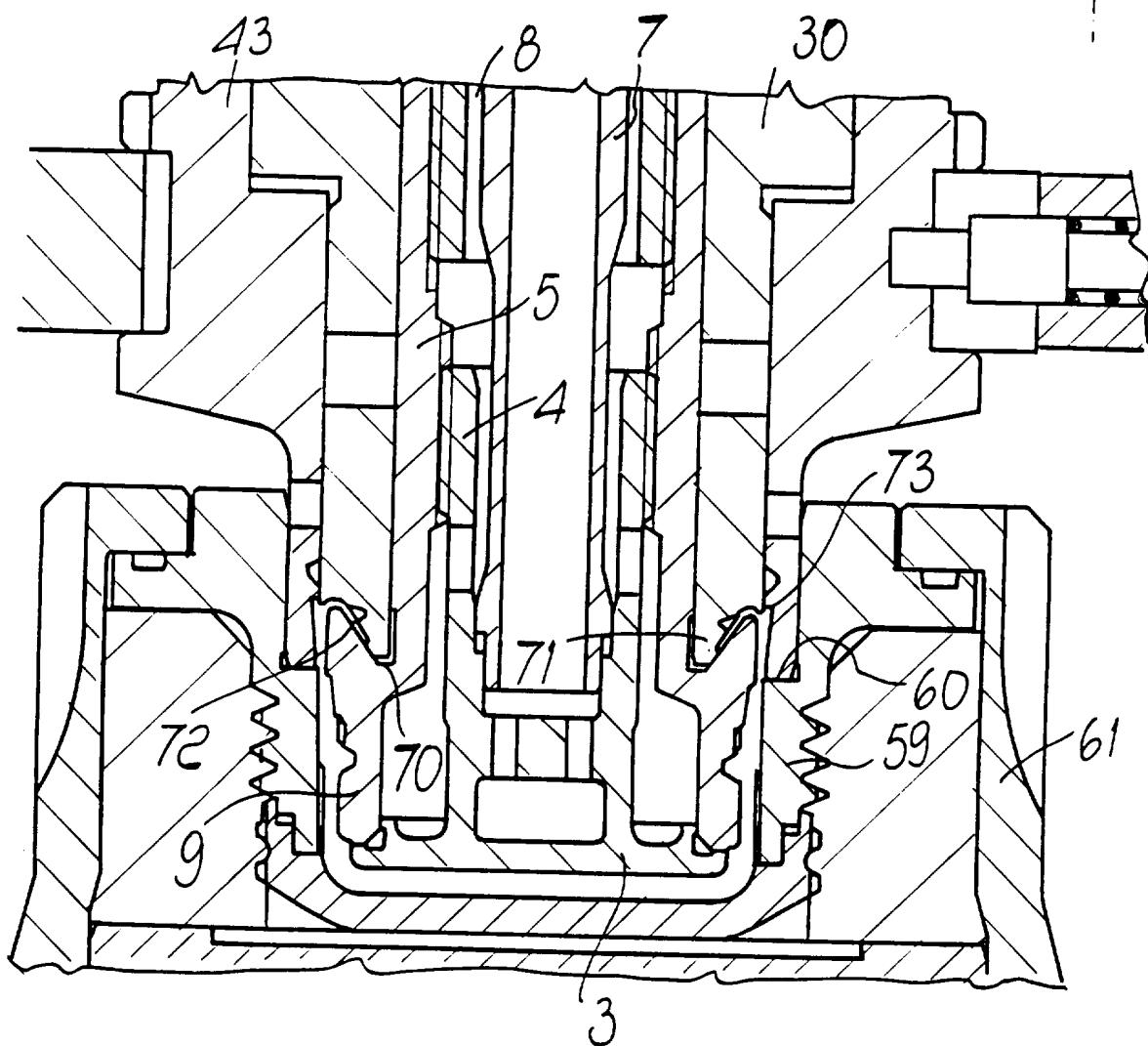


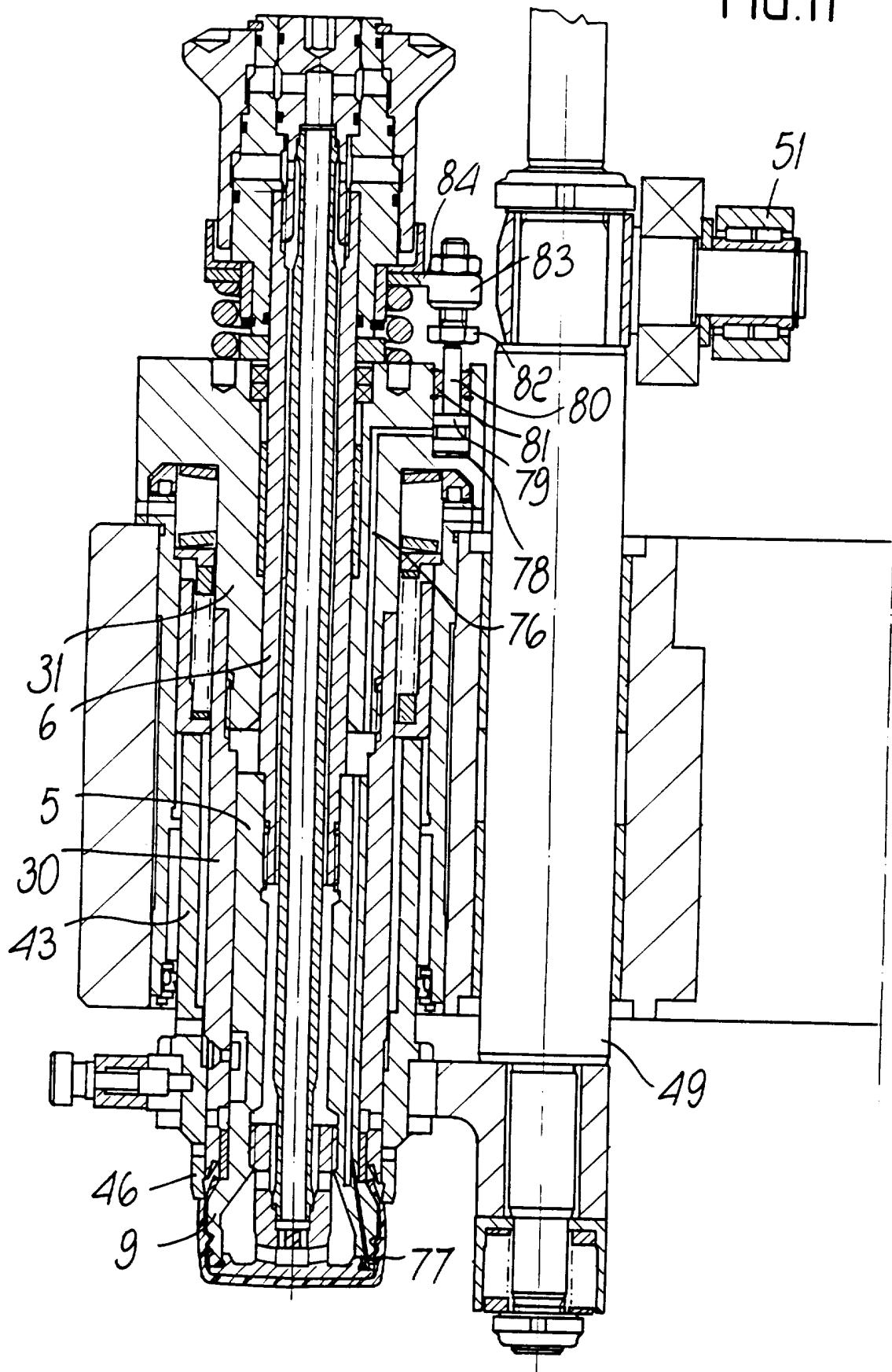
FIG.10

FIG. 9



8/8

FIG.11



INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 95/03644

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B29C43/08 //B29L31:56

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.
E	WO,A,95 32086 (SACMI ;ALIERI RODIERO (IT)) 30 November 1995 see page 3, line 1 - page 4, line 9; figure 1 ---	1
P,X	EP,A,0 654 335 (OWENS ILLINOIS CLOSURE INC) 24 May 1995 see the whole document ---	1-5,10, 11
Y	EP,A,0 162 456 (TOYO SEIKAN KAISHA LTD) 27 November 1985 cited in the application see page 6, line 18 - page 30, line 18; figures 1-8 ---	1-5,8-10
Y	DE,C,842 266 (H. STÜDLI) 26 June 1952 see page 2, line 21 - line 83; figures 1-4,12 ---	1-5,8-10
		-/-

Further documents are listed in the continuation of box C.

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

29 January 1996

Date of mailing of the international search report

- 5. 02. 96

Name and mailing address of the ISA

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

Authorized officer

Labeeuw, R

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/EP 95/03644

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 207 385 (SACMI) 7 January 1987 see page 7, line 8 - page 10, line 8; figures 1,3 ---	1,5,9,10
Y	EP,A,0 091 653 (CROWN CORK JAPAN) 19 October 1983 see the whole document ---	1,5,9,10
Y	DE,A,20 07 777 (DYNAMIT NOBEL AG) 2 September 1971 cited in the application see the whole document ---	1
Y	US,A,2 891 281 (E. E. HEINZELMAN) 23 June 1959 cited in the application see claims; figures 1-3 ---	1
A	EP,A,0 073 334 (HC IND) 9 March 1983 see page 10, line 20 - page 16, line 3; figures 1-3C,4-6 ---	1-5
A	EP,A,0 026 405 (HC IND) 8 April 1981 see page 8, line 13 - page 11, line 5; figures 9,16-21 -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/EP 95/03644

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A-9532086	30-11-95	NONE		
EP-A-0654335	24-05-95	AU-B- BR-A- CA-A- JP-A-	7572594 9404106 2123391 7214580	04-05-95 13-06-95 15-04-95 15-08-95
EP-A-0162456	27-11-85	JP-B- JP-C- JP-A- US-A- US-A-	1055973 1567713 60245517 4640673 4755125	28-11-89 10-07-90 05-12-85 03-02-87 05-07-88
DE-C-842266		CH-A-	260147	
EP-A-0207385	07-01-87	AU-B- AU-B- DE-A- JP-B- JP-A- US-A- US-A-	600905 5911386 3686745 6018711 61297113 4979282 5007150	30-08-90 08-01-87 22-10-92 16-03-94 27-12-86 25-12-90 16-04-91
EP-A-0091653	19-10-83	JP-B- JP-C- JP-A- US-A-	1055084 1567672 58173612 4776782	22-11-89 10-07-90 12-10-83 11-10-88
DE-A-2007777	02-09-71	NONE		
US-A-2891281	23-06-59	NONE		
EP-A-0073334	09-03-83	US-A- US-A- US-A- AR-A- AU-B- AU-B- AU-B- AU-B-	4418828 4407422 4497765 230239 556794 8555182 560751 8555282	06-12-83 04-10-83 05-02-85 01-03-84 20-11-86 27-01-83 16-04-87 27-01-83

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 95/03644

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0073334		CA-A- 1190519 CA-A- 1215206 CA-A- 1289104 DE-A- 3277686 EP-A, B 0072924 EP-A- 0224649 GB-A, B 2108892 GB-A, B 2102776 JP-C- 1752393 JP-B- 4022794 JP-A- 63096052 JP-C- 1692038 JP-B- 3053181 JP-A- 58030949 JP-C- 1500044 JP-A- 58051116 JP-B- 63048705 US-A- 4545496 DE-A- 3237764 FR-A- 2514326	16-07-85 16-12-86 17-09-91 23-12-87 02-03-83 10-06-87 25-05-83 09-02-83 08-04-93 20-04-92 26-04-88 27-08-92 14-08-91 23-02-83 28-06-89 25-03-83 30-09-88 08-10-85 19-05-83 15-04-83
EP-A-0026405	08-04-81	US-A- 4343754 AU-B- 540432 AU-B- 6339280 CA-A- 1168812 WO-A- 8100822 US-A- 4497765	10-08-82 15-11-84 14-04-81 12-06-84 02-04-81 05-02-85