FORM 1
REGULATION 95

60 0905

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

PATENT OFFICE
A.C.T. SUB-OFFICE
-- 079703
$220
Collector of Public Moneys

I/We SACMI COOPERATIVA MECCANICI IMOLA
SOCIETA COOPERATIVA A RESPONSABILITA LIMITATA

of Via Provinciale Selice 17/A, IMOLA (Province of Bologna), ITALY

hereby apply for the grant of a Patent for an invention entitled:

APPARATUS FOR THE APPLICATION OF A GASKET INSIDE CLOSURES COMPRISING A CUP, SUCH AS SCREW-ON AND CROWN CAPS

which is described in the accompanying complete specification. This Application is a Convention Application and is based on the Applicant(s) numbered: 3474 A/85 for a Patent or similar protection made in Italy on 24 June 1985

My/Our address for service is:

GRIFFITH HASSEL & FRAZER
71 YORK STREET
SYDNEY N.S.W. 2000
AUSTRALIA

DATED this 19th Day of June, 1986.

SACMI COOPERATIVA MECCANICI IMOLA

By his/their Patent Attorneys

GRIFFITH HASSEL & FRAZER

LODGED AT SUB-OFFICE
19 JUN 1986
Sydney

TO: THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA

4284A:rk

APPLICATION ACCEPTED AND AMENDMENTS
ALLOWED 15-6-90

B — APPLICATION BY ASSIGNEE OF INVENTOR

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

(Name of applicant) In support of an application made by: SACMI COOPERATIVA MECCANICI IMOLA - SOCIETA' COOPERATIVA A RESPONSABILITA' LIMITATA - Via Prov. Selice 17/A - 40026 IMOLA (BOLOGNA) ITALY

(Title) for a patent for an invention entitled: APPARATUS FOR THE APPLICATION OF A GASKET INSIDE CLOSURES COMPRISING A CUP, SUCH AS SCREW-ON AND CROWN CAPS

(Full name and address of signatory) I, Rodiero ALIERI
of Via Liverani 7
IMOLA (Province of Bologna) ITALY
do solemnly and sincerely declare as follows:

1. I am authorised by the above mentioned applicant for the patent to make this declaration on its behalf.

(Full name and address of inventor(s)) 2. The name and address of each actual inventor of the invention is as follows: Rodiero ALIERI
Via Liverani 7
40026 IMOLA (Province of Bologna) ITALY

(State whether by assignment or contract of employment) and the facts upon which the applicant is entitled to make this application are as follows:
The rights passed from the inventor to the applicant for said invention by contract of employment

(Delete paragraphs 3 and 4 for non-Convention application) 3. The basic application(s) as defined by Section 141 of the Act was (were) made as follows:
Country ITALY on June 24, 1985
in the name(s) SACMI COOPERATIVA MECCANICI IMOLA
and ~~in~~ SOCIETA' COOPERATIVA A RESPONSABILITA' LIMITATA
in the name(s)
and in on
in the name(s)

4. The basic application(s) referred to in the preceding paragraph was(were) the first application(s) made in a Convention country in respect of the invention the subject of this application.

(Place and date of signing) Declared at Imola (Bologna) ITALY this 17th day of June 1989.

Signed: Rodiero Alieri

Position: President

(12) PATENT ABRIDGMENT (11) Document No. AU-B-59113/86
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 600905

(54) Title
APPARATUS FOR THE APPLICATION OF A GASKET INSIDE CLOSURES COMPRISING A CUP, SUCH AS SCREW-ON AND CROWN CAPS

(51)[4] International Patent Classification(s)
B29C 043/08

(21) Application No. : 59113/86 (22) Application Date : 19.06.86

(30) Priority Data

(31) Number	(32) Date	(33) Country
3474 /85	24.06.85	IT ITALY

(43) Publication Date : 08.01.87

(44) Publication Date of Accepted Application : 30.08.90

(71) Applicant(s)
SACMI COOPERATIVA MECCANICI IMOLA SOCIETA COOPERATIVA A RESPONSABILITA LIMITATA

(72) Inventor(s)
RODIERO ALIERI

(74) Attorney or Agent
GRIFFITH HACK & CO. SYDNEY

(56) Prior Art Documents
EP 162456
AU 70027/74 70.1; 34.8
AU 286178 42424/64 48.5; 7[illegible].1; 28.11

(57) Claim

1. An apparatus for forming plastic liners and placing them in closure means comprising in combination:

a) extruder means for supplying softened batches of thermoplastic material;

b) a first revolving carousel with a first vertical shaft driven by actuation means, said first carousel including a first plate fixed coaxially with said first shaft, said plate being provided at its periphery with a plurality of semicyclindrical seat means, said seat means housing a plurality of shuttle means, each said shuttle means comprising a molding hollow;

c) batching means to remove said softened batches of thermoplastic material from said extruder means and place them into said molding hollow;

d) first transfer means adapted to transfer said shuttle means from said first carousel to a second

.../2

revolving carousel;

e) said second carousel including a second vertical shaft driven by said actuation means, said second carousel further including a crown plate and fixing means to fix said crown plate coaxially to said second shaft, said crown plate being provided with a plurality of seat means adapted to receive said shuttle means from said transfer means, said second carousel further comprising a plurality of pressing head means fitting a respective molding hollow to press a plastic liner inside said hollow;

f) second transfer means adapted to transfer said shuttle means from said second carousel to a third revolving carousel;

g) said third revolving carousel comprising a third vertical shaft driven by said actuation means, said third carousel further including a lower and an upper plate fixed coaxially with said third shaft, both said lower and upper plates having at their respective peripheries further pluralities seat means vertically aligned, said further seats of said lower plate receiving said shuttle from said second transfer means, said further seats of said upper

plate receiving from conveyer means a plurality of closure means, said third carousel also comprising a plurality of lifting means to lift said liners from a respective shuttle means molding hollow and place them into a respective closure means.

12. A process for forming plastic liners and placing them in closures, substantially as hereinbefore described, with reference to the accompanying drawings.

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952 600805 Form 10

COMPLETE SPECIFICATION

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number: 59113/86.
Lodged:

Complete Specification-Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing

---

TO BE COMPLETED BY APPLICANT

Name of Applicant: SACMI COOPERATIVA MECCANICI IMOLA SOCIETA COOPERATIVA A RESPONSABILITA LIMITATA

Address of Applicant: Via Provinciale Selice 17/A, IMOLA (Province of Bologna), ITALY

Actual Inventor: Rodiero ALIERI

Address for Service: GRIFFITH HASSEL & FRAZER
71 YORK STREET
SYDNEY NSW 2000
AUSTRALIA

Complete Specification for the invention entitled:

APPARATUS FOR THE APPLICATION OF A GASKET INSIDE CLOSURES COMPRISING A CUP, SUCH AS SCREW-ON AND CROWN CAPS

The following statement is a full description of this invention, including the best method of performing it known to me:-

4284A:rk

"APPARATUS FOR THE APPLICATION OF A GASKET INSIDE CLOSURES COMPRISING A CUP, SUCH AS SCREW-ON AND CROWN CAPS"

This invention relates to an apparatus for the applicaton of a gasket inside closures comprising a cup, such as screw-on and crown caps.

The technologies known up to now concerning the application of gaskets inside closures of the above mentioned type foresee, as a starting element, the extrusion of a belt having a suitable thickness and the blanking of diskets from such belt which are then inserted into cups for the completion of the closures. Said known technologies are not exempt of drawbacks, due to the fact that through the blanking process a not negligible amount of waste material is produced; moreover, the flat configuration of the extruded belt does not allow to model the shape of the gasket for adapting them to the mouth of the containers th y are to be applied at.

Therefore, the technical task of this invention is to provide an apparatus by which the inconveniences of the known technologies are substantially reduced.

The present invention provides an apparatus for forming plastic liners and placing them in closure means comprising in combination:

a) extruder means for supplying softened batches of thermoplastic material;

b) a first revolving carousel with a first vertical shaft driven by actuation means, said first carousel including a first plate fixed coaxially with said first shaft, said plate being provided at its periphery with a plurality of semicyclindrical seat means, said seat means housing a plurality of shuttle means, each said shuttle means comprising a molding hollow;

c) batching means to remove said softened batches of thermoplastic material from said extruder means and place them into said molding hollow;

d) first transfer means adapted to transfer said shuttle means from said first carousel to a second revolving carousel;

e) said second carousel including a second vertical shaft driven by said actuation means, said second carousel further including a crown plate and fixing means to fix said crown plate coaxially to said second shaft, said crown plate being provided with a plurality of seat means adapted to receive said shuttle means from said transfer means, said second carousel further comprising a plurality of pressing head means fitting a respective molding hollow to press a plastic liner inside said hollow;

f) second transfer means adapted to transfer said shuttle means from said second carousel to a third revolving carousel;

g) said third revolving carousel comprising a third vertical shaft driven by said actuation means, said third carousel further including a lower and an upper plate fixed coaxially with said third shaft, both said lower and upper plates having at their respective peripheries further pluralities seat means vertically aligned, said further seats of said lower plate receiving said shuttle from said second transfer means, said further seats of said upper plate receiving from conveyer means a plurality of closure means, said third carousel also comprising a plurality of lifting means to lift said liners from a respective shuttle means molding hollow and place them into a respective closure means.

Further features concerning this invention will be better explained from the following description of a preferred embodiment, illustrated by way of example in the attached drawings, where:

Fig. 1 shows a plan view of the apparatus;

Fig. 2 is a vertical section view according to plan II-II of Fig. 1;

Fig. 3 is a vertical section view according to plan III-III of Fig. 1; and

Fig. 4 is a vertical section view according to plan IV-IV of Fig. 1.

With reference to Fig. 1, 1 is the bed or base of the apparatus on which there are assembled the extruder 2 supplying the plastic material for the gasket or liner molding and three carousels or turrets 3,4,5 placed according to the vertices of an equilateral triangle and the three of them revolving in a clockwise direction A.

Between the carousels 3,4,5 there are interposed three devices or transfer star wheels 6,7,8 all of them revolving in direction B and tangential to the carousels themselves. The apparatus is completed by the star wheel 9, said star wheel revolving also in said direction B to move away the completed closures. The transfer carousels and stars are peripherically provided with semicircular seats equidistant tangentially in which round element shuttles or individual molds 10 are inserted. On the upper face of each mold 10 there is a recess or hollow 11 for the molding of the plastic gaskets or liners 13. As shown in Fig. 1, the shuttles 10 are conveyed on a closed clover shaped

trajectory, starting from said carousel 3 through said star wheel 6 to said carousel 4, from said carousel 4 through said star wheel 7 to said carousel 5 and from said carousel 5 back to said carousel 3 through said star wheel 8.

The apparatus works in the following way. In carousel 3, the softened plastic material supplied by the extruder 2 is deposited in small batches or pellets 12 in the hollows 11 of the shuttles 10. The star 6 provides for the transfer of said shuttles 10 to the forming carousel 4 where the batches, due to the action of suitable punches, are squeezed to take the shape of the hollow 11 thus forming round gaskets 13. The squeezing of the batches is effected on a rotating angle of about 60° including between radius C and D where C is the radius joining the rotation center of carousel 4 with the tangent point of the carousel 4 with star 6.

From carousel 4 shuttles are taken by means of star 7 to carousel 5. Along the circle are extending from the tangent point of star 7 with carousel 5, symbolized by radius E, for about 75° until radius F a plurality of suitable taking elements described more in detail hereinafter, adapted to extract the gaskets 13 from the hollow 11 of the shuttles and insert them into cups or closures 14 which are fed in carousel 5 and supported at a height between gaskets 13 and shuttles 10.

The deposit of the gaskets inside the cups 14 is completed after a rotation of about 165° starting from the angular position E, in line with radius G. When this phase is carried out, the lined closures 15 (that is cups 14 containing gaskets 13) are transferred to the moving away star 9 and then guided to the collecting point.

With particular reference to Fig. 2, carousel 3 includes a horizontal and stationary plate 16 which is supported by means of a spacer ring 17, by a coupling 18 which rises from a bed or base 1 to which it is integrally attached. A vertical shaft 19 is revolvingly supported in coupling 18; to this shaft a cylindrical body 20 is rigidly attached. Shaft 19 receives motion from a motor assembly placed in bed 1 and not described here because it is completely traditional and unrelated to this invention.

A plate 21 is fixed at the lower part of said body 20 coaxially to said shaft 19; this plate provides along the periphery for a plurality of recesses or semicyclindrical seats 22 equidistant and opened towards the outside of the plate 21 giving to said plate a substantially cogwheel like aspect. Around plate 21, whose radial distance from the bottom of seats 22 is equal to the diameter of the seats themselves, stretches an edge or guide member 23 concentric to shaft 19. Said shuttles 10 are placed in said seats 22, resting against edge 23 thus guiding them along a circular way. In body 20, in line with seats 22, there are provided vertical seats 24 in which there are sliding elements for taking the batches 12 of plastic material supplied by extruder 2 and introducing them into the hollows 11 of the shuttles. Such elements include a cyclindrical element 25 axially pierced which, in the lower part, is provided with a sort of spoon 26 turned in the rotating direction A of carousel 3. The spoon 26 is manufactured by cutting, on a longitudinal plan, a reduced tubular part of cylinder 25 so that the spoon takes the shape of a hollow semicylinder.

Axially to the cylinder 25, there is assembled a small pipe 27 whose lower end is opened and stretches into spoon 26 while the upper end is in communication by means of a connnection 28 with a hole 29 made inside a guide 30.

Guide 30 is placed within a seat 31 of the cylindrical element 25 in order to slide parallel to the rotation axis of the carousel. The cylindrical element 25 is prevented from rotating in seat 24 by means of key 32 sliding in a slot 33 of body 20. The cylindrical element 25 is vertically operated by a cam 34 in which there is a pin 35 cantilevered assembled on its top. In the proper sequences the small pipe 27 is operated, with respect to the cyclindrical element 25, by means of a further cam 36 where there is inserted a pin 37 and supported at the top of the guide 30. The cams 34 and 36 are annular shaped and installed on the external surface of a drum 38, said drum 38 being stationary with respect to the carousel and installed coaxially to the shaft 19 over body 20. Hole 29, made in guide 30, is designed to be set selectively in communication with the first radial duct 39 and with a second radial duct 40 in body 20 and opening towards the outside of body 20. The ducts 39 and 40 are joinable respectively by a sucking or vaccum source and a blower or air pressure source. To this purpose the ducts 39 and 40 exit on the upper face of body 20 and are controlled by a ring 41 set in the drum 38 with the interposition of sealing rings. Moreover, in drum 38 there are, angularly offset, relevant pipes 42 for the connection with the vacuum and air pressure sources. Only one is shown in the drawing.

Due to the cams 34 and 36 the spoon 26 and the internal small pipe 27 are lifted and then lowered with respect to the shuttles 10. In the lifted position between spoon 26 and the opposite shuttle 10 there is inserted the nozzle 43 of the extruder head 2. Nozzle 43 shows an orifice 44 turned vertically upwards and arranged to extrude plastic material to be shaved by the spoon 26 when it passes over it for picking up the batch or pellet 12. The transfer star 6 includes a plate 45 coplanar with plate 21 keyed at the top of a vertical shaft 46 revolvingly supported in said

bed 1 and kinematically joined with shaft 19 so that plates 45 and 21 have the same tangential speed. On the periphery of plate 45 there are provided semicircular seats 47 which together with an edge or guide 48 direct the shuttles received by carousel 3 to carousel 4.

Carousel 4 (see figure 3) includes a coupling 49 installed in said bed or base 1 in which it revolvingly supports shaft 50 operated by the same motor assembly which operates shaft 19. On shaft 50, by means of a key 51, is keyed a drum 52 which in the lower part, is placed over coupling 49 and is externally provided with two circular collars 53,54. Collar 53 has the upper face coplanar with the surface of plate 16 and, having fixed thereon a crown or plate 55 provided with semicircular equidistant seats 56 for the housing of the shuttles 10 coming from the transfer star 6. At least for an initial section starting from the angular position marked with radius C, around crown 55, an edge 57 is provided which holds the shuttles in the relevant seats 56.

In collars 53,54 there are provided holes 58-59 which are in line vertically with seats 56. In each hole 59 a tang or lifter assembly 60 is slidably guided vertically and prevented from revolving by a key 61 inserted in a slot axial to hole 59. At the far bottom of tang 60 there is mounted a pin 62 having its rotation axis radial with reference to shaft 50. Pin 62 rolls on an annular cam 63 which is fixed on bed 1 with the interposition of a spacer bearing 64. The upper end of tang 60 is provided with a coaxial shank 65 having a smaller diameter making a bearing shoulder for a spring 66. Spring 66 operates on a bushing 67 placed over shank 65 and held by a pin 68 which extends through the diameter of the shank. On top of bushing 67 there is provided a recess for the housing of a magnet 67a for the holding of shuttles 10. The opposite ends of pin 68

are inserted in slots 69 of bushing 67 said slots extending axially in order to allow the bushing 67 to slide on the shank 65 against the action of the spring force exerted by said spring 66. Cam 63 is made in such a way that the top of the bushing 67 is coplanar with the upper face of plate 16 along the arc between the angular position C and D in order to receive the shuttles from star 6 said cam actuating the bushing 67 in a higher position to close the hollow 11 along the arc between the angular position D and the angular position marked with radius H and then lower again on the coplanar height with plate 16 before reaching the tangent point with transfer star 7.

On drum 52, and rigidly connected therewith, there is placed a flange 70 provided with cylindrical seats or openings 75 in vertical alignment with bushing 67 and which supports hollow punch assemblies 71. Each punch 71 includes a tubular part 72 and a hollow head 73. The tubular part 72 is inserted sealingly in a connector 74 housed in a cylindrical seat 75 coaxial to the relevant hole 58. In the tubular part 72 is placed concentric therewith a small pipe 76 which ends in the hollow head 73. The small pipe 76 is connected with a duct 77 of the flange 70 through which it is lead to the hollow head 73 a heating fluid or a coolant whose return comes through the hollow space between the small pipe itself and the tubular part 72 and a second duct 78 of flange 70.

On the head 73, there is a guided ring 79, said ring being provided on one side, with an internal projection that is seated on top of head 73. Ring 79 has a length such as to project below the lower edge of head 73 and an outside diameter equal to the one of shuttles 10. Between ring 79 and flange 70 a spring 80 is interposed keeping the ring pushed downwards.

As previously stated, in carousel 4 there is the molding of the gaskets 13 by means of the lifting of the shuttles 10 due to bushing 67 against punches 71 and resulting squeezing of the batches 12 of plastic material contained inside hollows 11. The temperature of the molding of gaskets 13 is adjusted by the introduction of liquid into the hollow punches 71 through ducts 77,78. For example, if the plastic material of the batches is made of PVC (polyvinyl chloride) the punches will be duly heated through the introduction of hot water. Instead, in case the plastic material is PE (polyethylene) or EVA (ethylenevinylacetate) the punches will be cooled down by the introduction of cold water. When the molding of the gasket is finished, shuttles pass to the transfer star 7 which is similar to transfer star 6. In fact, also this one includes a plate 81 coplanar with plate 16 and provided with semicircular seats 82 distributed along the periphery. Plate 81 is rigidly connected to a shaft 83, said plate being provided with an edge or guide 84, extending all around said plates from carousel 4 to carousel 5 in direction B, said guide 84 being concentric with said shaft 83. The function of the guide 84 is that of keeping the shuttles in said seats 82 up to their introduction into carousel 5 where gaskets carried by said shuttles and inserted into cups or closures 14.

Carousel 5 (see Figure 4) is composed of a coupling 85 installed on bed 1 and acting as a revolving support for a vertical shaft 86 operated by the same motor elements which power also shafts 19,46,50, and 83. On coupling 85 there is centered a circular flange 87 in whose periphery there is a plurality of studs 88 parallel to shaft 86. On top of studs 88 there is rigidly supported a stationary guide 89 whose shape is concentric to shaft 86. Guide 89 stretches from an angular position I (see Figure 1) of carousel 5, said angular position I corresponding to the feeding point of said cups 14 into said carousel 5, up to

the tangent point with the moving away star 9 which coincides with radius K. In the lower part of guide 89 there is provided a channel 90 open towards the inside and closed downwards by a circular disk 91. Disk 91 is centered and resting on a shoulder 92 of shaft 86 together with a drum 93 standing above. Disk 91 and drum 93 are rotatingly coupled to shaft 86 by means of a ring nut and counter ring nut 94 screwed on a threaded part of shaft 86. Note that the upper face of disk 91 and guide 89 are respectively coplanar with the

upper face of plate 16, and with the surface of the conveyor 95 for feeding cups 14. Moreover, to disk 91 are rotatingly fixed two plates 96,97 placed one on top of the other which are provided with peripherally equidistant and opposite semicircular seats 98,99. Plate 96 has its lower surface coplanar with the upper surface of guide 89. Seats 98,99 are in vertical line and around them there is provided concentrically an edge 100 fixed on guide 89 and a wall 101 of the channel 90 for respectively guiding shuttles 10 and cups 14 during the revolving of the carousel. Further studs 102 are placed along the angular part included between the radius E and I and support an edge of guide 103 whose internal wall lies in the same cylindrical plane as wall 101.

In drum 93, in vertical line with the seats 98,99 therebelow, there are provided holes 104 where the taking elements marked on the whole with 105 are guided and each of them is composed of a tube 106 sliding in a relevant hole 104 and of a shank or rod 107 sliding inside tube 106. At the upper end of tube 106 and of shank 107 there are assembled cantilevered idle pins 108,109 inserted in cams 110,111 which are annular shaped in a cylindrical body 112 that is stationary with reference to the carousel in which shaft 86 is revolvingly supported with the interposition of revolving bearings 113,114.

There is a key 115 on shank 107 which crosses the tube 106 in line with a slot 116 that is vertically elongated. Key 115 projects outside through a slot 117

that is also vertically elongated from drum 93 so that tube 106 and shank 107, while they can slide axially one on the other in hole 104, they are prevented from rotating. The lower end of the shank 107 makes a sort of bell 118 which provides a hollow 119 communicating with a duct 120. Duct 120 stretches for a certain section along the axis of shank 107 and thereafter radially through the key 115 to flow to the external surface of drum 93. An annular connector 121 of flexible material connects duct 120 with a duct 122 provided radially in drum 93 and connected by means of sucking or vacuum elements through a ring 123 sealingly enclosed in body 112 and providing a duct 124.

The lower end of tube 106 is provided with a bushing 125 which wraps around bell 118. Bell 118 and bushing 125 have such a diameter that when the taking element 105 is completely lowered, they rest respectively on the gasket 13 and on the edge of the shuttled 10 surrounding the hollow 11.

At the exit of carousel 5, while closures 15 are fed into the moving away star 9, shuttles 10 are introduced into star 8 which transfers them into the batching carousel 3. The moving away star 9 includes a plate 126 installed on top of a shaft 127 and lying at the same height as plate 96. Along the periphery, plate 126 is provided with semicircular recesses 128 which in cooperation with an edge 129 concentric to shaft 127 guide the closures 15 towards the moving away conveyor 130. A hopper 131 is provided where possible defective closures are unloaded. Similarly to stars 6 and 7,

star 8 includes a plate 132 tangent to both carousel 5 and 3 and provided with peripheral semicircular seats 133. Plate 132 is integrally fixed to shaft 134 which lies at the height of plate 97 for receiving from that plate the shuttles 10 and to transfer them again to carousel 3 in cooperation with edge 135.

The way each of the single carousels 3,4,5 work is as follows. When the carousel 3 revolves, the cylindrical elements 25 are operated in sequence through cam 34, between a lifted position and a lowered one. In the lifted positon (on the right of Figure 2) in correspondence with position marked with L on Figure 1 the cylindrical elements 25 pass over the nozzle 43 and pick up, by means of spoon 26 a batch or pellet 12 of plastic material ejected in the meantime from the orifice 44 of extruder 2. During such a phase, the small pipe 27 relevant to the spoon performing the batch pick-up operation is lifted with reference to the spoon itself and is in communication through the corresponding duct 39 with the pneumatic sucking or vacuum means. Spoon 26 is then lowered thus allowing the downward movement of it along with the taken batch of plastic material. Consequently, the cylinder 25 operated by cam 24 lowers down to move spoon 26 into the hollow 11 of shuttle 10. At the same time the small pipe 27 is operated by cam 36 moves downward. The travel of the small pipe continues with reference to the cylindrical element so as to cause the detachment of the batch or pellet 12 from the spoon and the connection of the small pipe with duct 40 through which it is connected to pneumatic blowing

means. In such a way, the detached batch 12 of plastic material in correspondence of the angular position marked with M of Figure 1 is deposited in hollow 11 of shuttle 10. ~~that is below.~~

The shuttles 10 that are provided with batch 12, are tangentially introduced into seats 56 of carousel 4 by means of star 6. During the passage between the angular positions C and D, operated by cam 63, the shuttles are lifted by bushing 67 and brought peripherally in contact with ring 79 which together with hollow head 73 closes the hollow 11 in the upper part of the shuttles. The further lifting of the shuttles (which stay attached at bushings 67 due to the magnets 67a) causes the squeezing of batch 12 which, in spreading, occupies all of the hollow 11 taking the shape and giving rise to a round gasket or liner 13. During the revolving from the angular position D until position H there comes the stabilization of the plastic material in hollow 11. When position H is overtaken, bushing 67 is again lowered thus allowing the shuttles to enter again the seats 56 and then to pass into star 7 and to be transferred into the final carousel 5 where they are inserted in seats or recesses 99.

For the portion before the angular position E, the taking elements or lifter assemblies 105 are lowered on the shuttles by cams 110, 111. More precisely, the lowering of elements 105 ~~is~~ are controlled in such a way that, in correspondence with the angular position E, ~~that~~ the bush 125 is resting on the periphery of the

~~relevant~~ corresponding shuttle and the bell 118 on gasket 13. Thereafter, the vacuum is created in hollow 119, causing the adhesion of gasket 13 to bell 118. In order to avoid the gasket entering the hollow 120 due to the sucking effect the lower closing of the bell can be provided with a pierced disk which allows application of the vacuum to the gaskets. The evacuation of bell 118 is operated in connecting the hollow 119 with the vacuum elements 120-122. As soon as the gasket is firmly attached at the bell, due to the effect of cam 11, the shank 107 is lifted so as to cause the detachment of the gasket 13 from the shuttle 10 which remains held in seat 99 by bushing 125 which is still in the lowered position. Thereafter, following the movement of cam 110, the tube 106, and also bushing 125, are lifted together with shank 107 until gasket 13 reaches a height standing over plate 96. These phases come along the rotation angle of the carousel included between radius E and I. During the further rotation of carousel 5 between I and G, the shank 107 moved by cam 111 goes down again bringing the bell 118 with gasket 13 inside the cups or closures 14 that in the meanwhile have been introduced by the conveyor 95 into seats 98 and slide between the guide 100 and are held by the plate 96. When the bottom of the cups is reached, the vacuum stops and the gasket remains seated in the bottom of the cups. While closures 15, complete with gaskets, go on to the moving away star 9, the shuttles 10 are moved again into star 8 which transfer them to carousel 3 where the cycle begins again and

follows the way above described. The fact that the time of molding for gaskets is sufficiently long in order to grant a perfect molding of the gaskets, gives relevant advantages to the apparatus. The apparatus can be provided with sensors suitable to check possible gaskets imperfections and to operate the rejection of defective closures into the unloading hopper 131. Advantageously, the hollows 11 of shuttles 10 have peripheral walls converging upwards, for a more effective retention of the gasket that could become curly, due to internal tensions.

The above described apparatus is subject to numerous changes and modifications all of which are within the scope of the inventive concept. For example, it is possible to provide along the way of the shuttles suitable heating elements which are able to influence the temperature of the plastic material in the shuttles.

Advantageously, one may manufacture, in accordance with the invention, an apparatus wherein a third star wheel is provided to recycle empty individual mold means from the third rotary turret to the first rotary turret.

The invention permits one to obtain an appartus including means for delivering closures to the third rotary turret.

The invention also permits one to obtain an apparatus including means for ejecting closures with imperfect liners.

According to one aspect of the invention an apparatus is provided including means for removing closures with liners therein from the fourth star wheel.

According to another aspect of the invention there is provided an apparatus wherein individual mold means are individual shuttles having a cylindrical recess in their upper surface for forming the liner therein.

Expediently, an apparatus may be provided in accordance with the invention wherein the cylindrical recess has an upwardly conveying side wall.

The invention also advantageously provides a process for forming plastic liners and placing them in closures comprising:

a) placing a batch of softened thermoplastic material into an individual mold;

b) pressing the batch to form a plastic cylindrical closure liner;

c) removing the closure liner from the mold; and

d) placing the liner in a closure;

the process expediently including recycling the individual molds from step c) back to step a).

The invention also envisages a process including feeding both the closures and the individual molds into a rotary turret assembly where steps c) and d) are carried out.

In accordance with the invention the above-cited process may be provided including cooling the closure liner after step b) is completed and before step c) starts.

Finally, also in accordance with the invention a process is disclosed including moving the molds between the first, second, and third rotary turret assemblies by means of rotary star wheel assemblies.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for forming plastic liners and placing them in closure means comprising in combination:

a) extruder means for supplying softened batches of thermoplastic material;

b) a first revolving carousel with a first vertical shaft driven by actuation means, said first carousel including a first plate fixed coaxially with said first shaft, said plate being provided at its periphery with a plurality of semicyclindrical seat means, said seat means housing a plurality of shuttle means, each said shuttle means comprising a molding hollow;

c) batching means to remove said softened batches of thermoplastic material from said extruder means and place them into said molding hollow;

d) first transfer means adapted to transfer said shuttle means from said first carousel to a second revolving carousel;

e) said second carousel including a second vertical shaft driven by said actuation means, said second carousel further including a crown plate and fixing means to fix said crown plate coaxially to said second shaft, said crown plate being provided with a plurality of seat means adapted to receive said shuttle means from said transfer means, said second carousel further comprising a plurality of pressing head means fitting a respective molding hollow to press a plastic liner inside said hollow;

f) second transfer means adapted to transfer said shuttle means from said second carousel to a third revolving carousel;

g) said third revolving carousel comprising a third vertical shaft driven by said actuation means, said third carousel further including a lower and an upper plate fixed coaxially with said third shaft, both said lower and upper plates having at their respective peripheries further pluralities seat means vertically aligned, said further seats of said lower plate receiving said shuttle from said second transfer means, said further seats of said upper

plate receiving from conveyer means a plurality of closure means, said third carousel also comprising a plurality of lifting means to lift said liners from a respective shuttle means molding hollow and place them into a respective closure means.

2. The apparatus of claim 1, wherein said first and second transfer means for transferring said shuttle means between the first, second, and third revolving carousel comprises a first and a second rotary transfer star wheel.

3. The apparatus of claim 2, including a fourth star wheel for removing said closure means, with said plastic liners therein, from the third revolving carousel.

4. The apparatus of claim 1, wherein the said first revolving carousel includes a base with a hollow coupling with said first shaft extending therethrough; a stationary circular table, below said first plate and coaxial with said first plate, attached to said coupling for supporting said shuttle means.

5. The apparatus of claim 1, wherein said batching means include a cylindrical body coupled to said first shaft, said cylindrical body having a plurality of vertical openings above each said shuttle means, each said vertical opening comprising a sliding element for taking said softened batches of thermoplastic material from the extruder and depositing it into said molding hollow of a respective shuttle means.

6. The apparatus of claim 5, wherein the sliding element includes: an enlarged cylindrical section axially slidable in said vertical opening; a reduced semicylindrical portion at the lower end of the enlarged cylindrical section for stacking thermoplastic material into a batch; a pipe axially slidable in and extending through the enlarged and reduced cylindrical sections; cam means for raising and lowering the pipe; vacuum means connected to the pipe when it is in the raised position;

and air pressure means connected to the pipe when it is in the lowered position.

7. The apparatus of claim 1, wherein said second revolving carousel includes; a base with a hollow coupling with said second cylindrical shaft extending therethrough, a drum fixed to said shaft and having a lower and an upper circular collar provided with a plurality of cylindrical openings therein; the upper collar having said crown plate fixed thereon, with the seat means of said crown plate normally centered over said openings; the lower collar providing a plurality of cylindrical openings vertically aligned with the opening in the first collar; a plurality of cylindrical lifter assemblies slidably mounted in the oipenings in the upper and lower collars for moving said shuttle means upwardly and downwardly; a circular flange member fixed to the upper end of the shaft and having a plurality of hollow punch members, each said punch member being mounted above an opening in the upper collar member and adapted to compress said batches of plastic material inside each said mold hollow of said shuttle means to form said plastic liners when each said lifter assembly is moved upwardly; and an actuator assembly on the lower end of each lifter assembly.

8. The apparatus of claim 1, wherein said third revolving carousel includes: a base with a hollow coupling with said third cylindrical shaft extending therethrough; a drum member mounted on said third shaft for rotation therewith; a disk attached to the lower end of the drum, with said upper and lower plates mounted on the upper surface of the disk; guide members fixed to the hollow coupling and positioned opposite to said further seat means of said upper and lower plates to retain said shuttle means and said closures within said further seats; a plurality of vertical openings in the outer portion of the drum vertically aligned with said further seat means in said upper and lower plates.

9. The apparatus of claim 8, wherein said lifting means comprise a plurality of lifter assembly, each said lifter assembly slidably mounted in each opening in the drum for lifting the liners from the molding hollow of said shuttle means and placing the liners into said closures; and actuating means for raising and lowering each lifter assembly.

10. The apparatus of claim 9, wherein the lifter assembly includes: an outer tube having a lower end adapted to seat on the molding hollow of said shuttle; the upper end of the tube being coupled to means for raising and lowering the tube; a cylindrical shank slidably mounted in the tube and having a lower end adapted to abut the plastic liner in the mold; the upper end of the shank coupled to means for raising and lowering the shank; means for applying a vacuum to the lower end of shank when said plastic liner is removed from said molding hollow; and means to apply air pressure to the lower end of the shank when the plastic liner is placed inside said closure.

11. An apparatus for the application of a gasket inside closures comprising a cup, such as screw-on and crown caps, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

12. A process for forming plastic liners and placing them in closures, substantially as hereinbefore described, with reference to the accompanying drawings.

13. An apparatus substantially as described herein and with reference to the accompanying drawings.

14. An apparatus for the application of a gasket inside closures substantially as described herein and with reference to the accompanying drawings.

DATED this 21st day of November 1989

SACMI COOPERATIVA MECCANICI IMOLA SOCIETA COOPERATIVE
A RESPONSABILITA LIMITATA
By their Patent Attorneys
GRIFFITH HACK & CO

7492S/sy

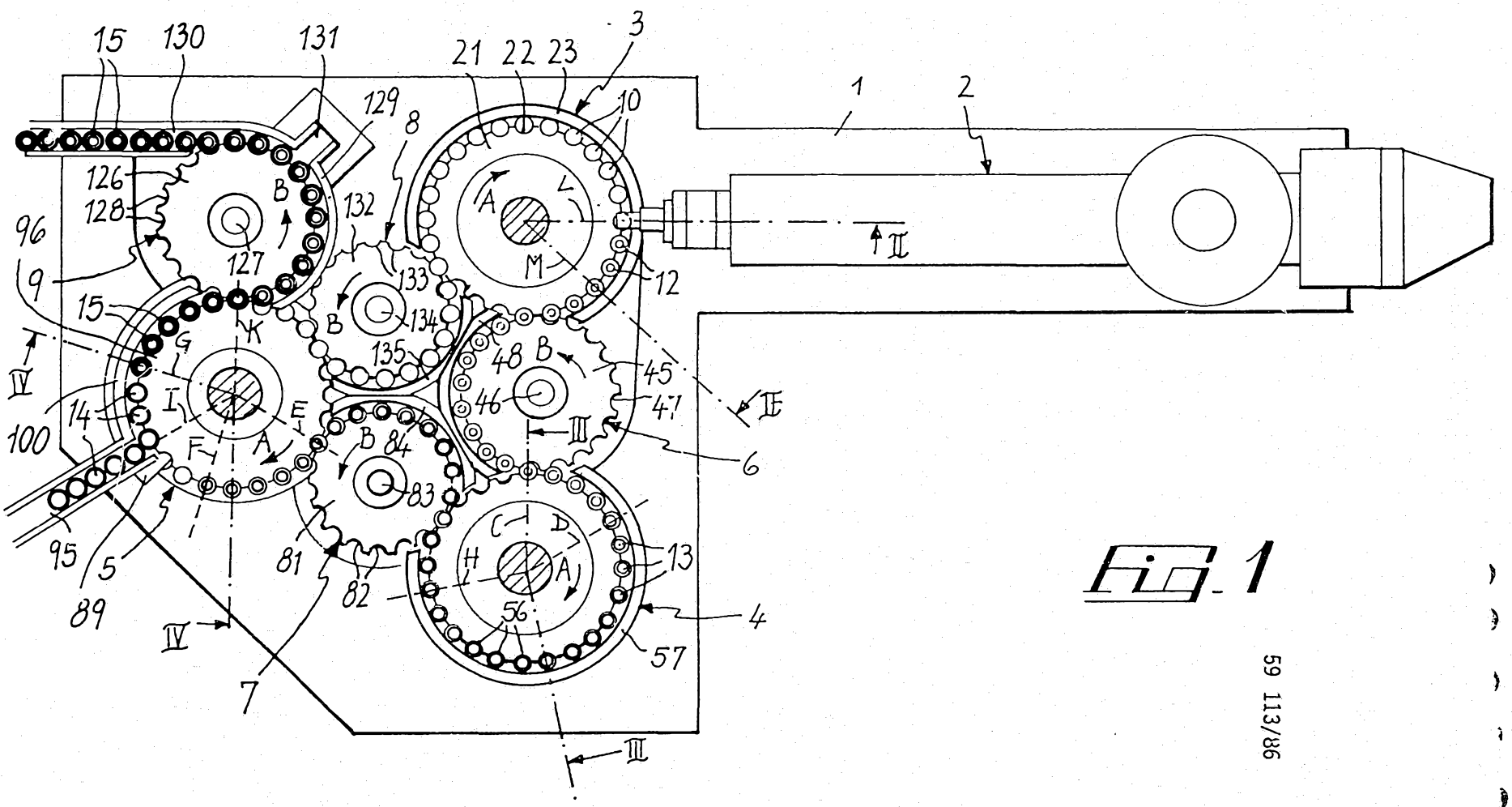


Fig. 1

59 113/86

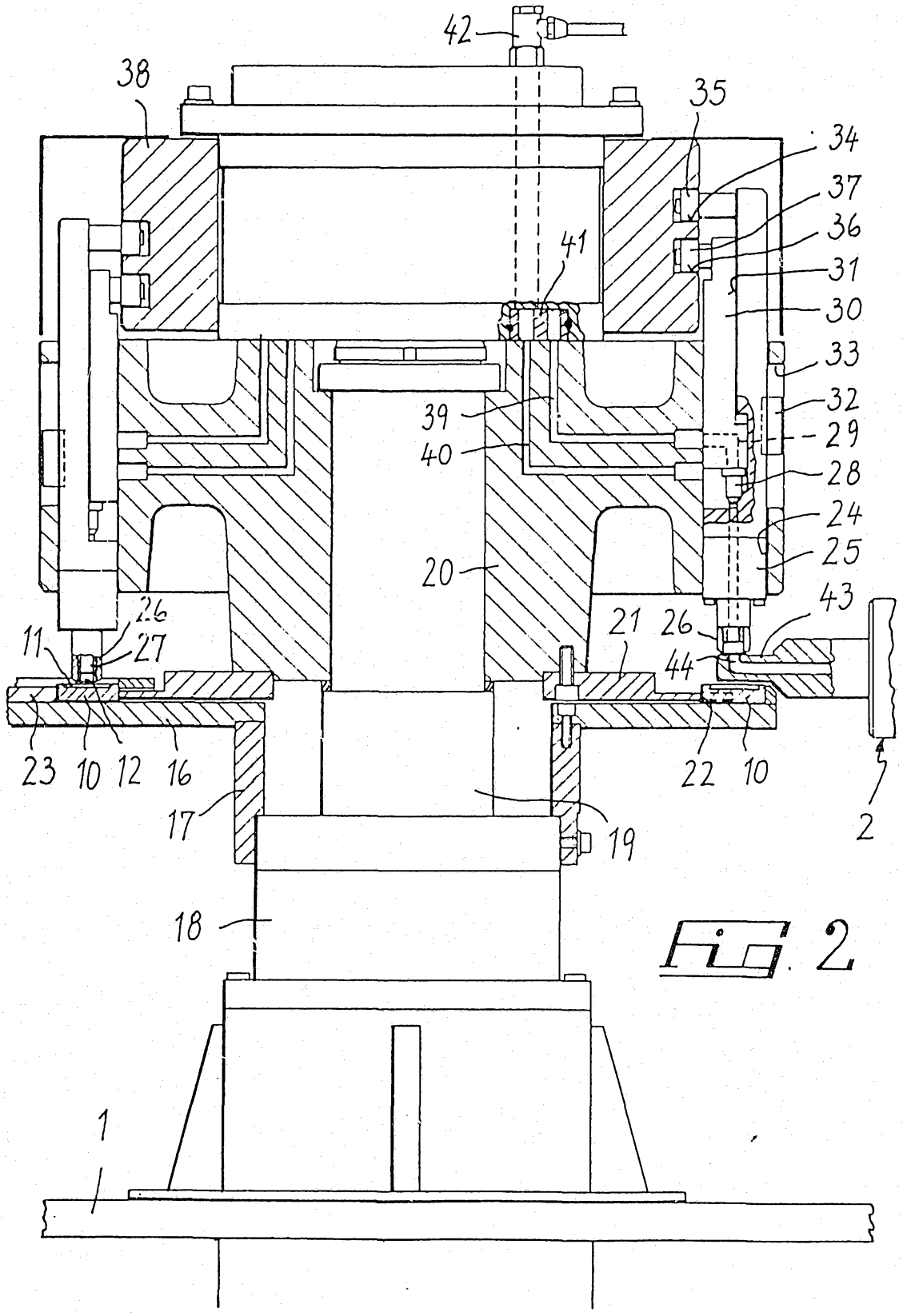
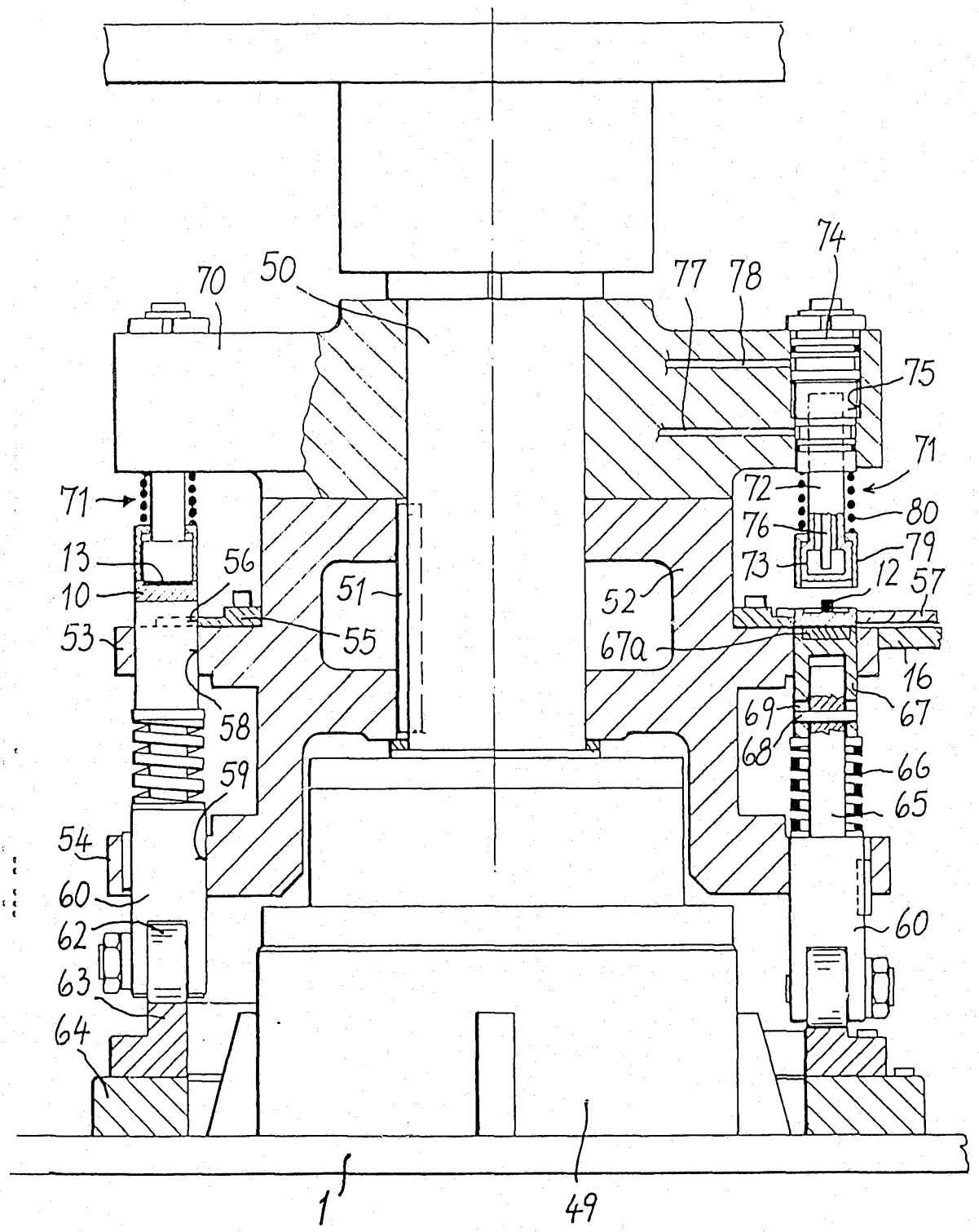

42
38
35
34
37
36
41
31
30
33
32
39
29
40
28
24
25
20
43
26
21
26
11
27
44
23
10
12
16
22
10
2
17
19
18
1

Fig. 2

Fig. 3


70
50
77
78
74
75
71
72
80
76
79
73
12
57
71
13
56
10
51
52
53
55
67a
16
58
69
67
68
59
66
65
54
60
60
62
63
64
1
49

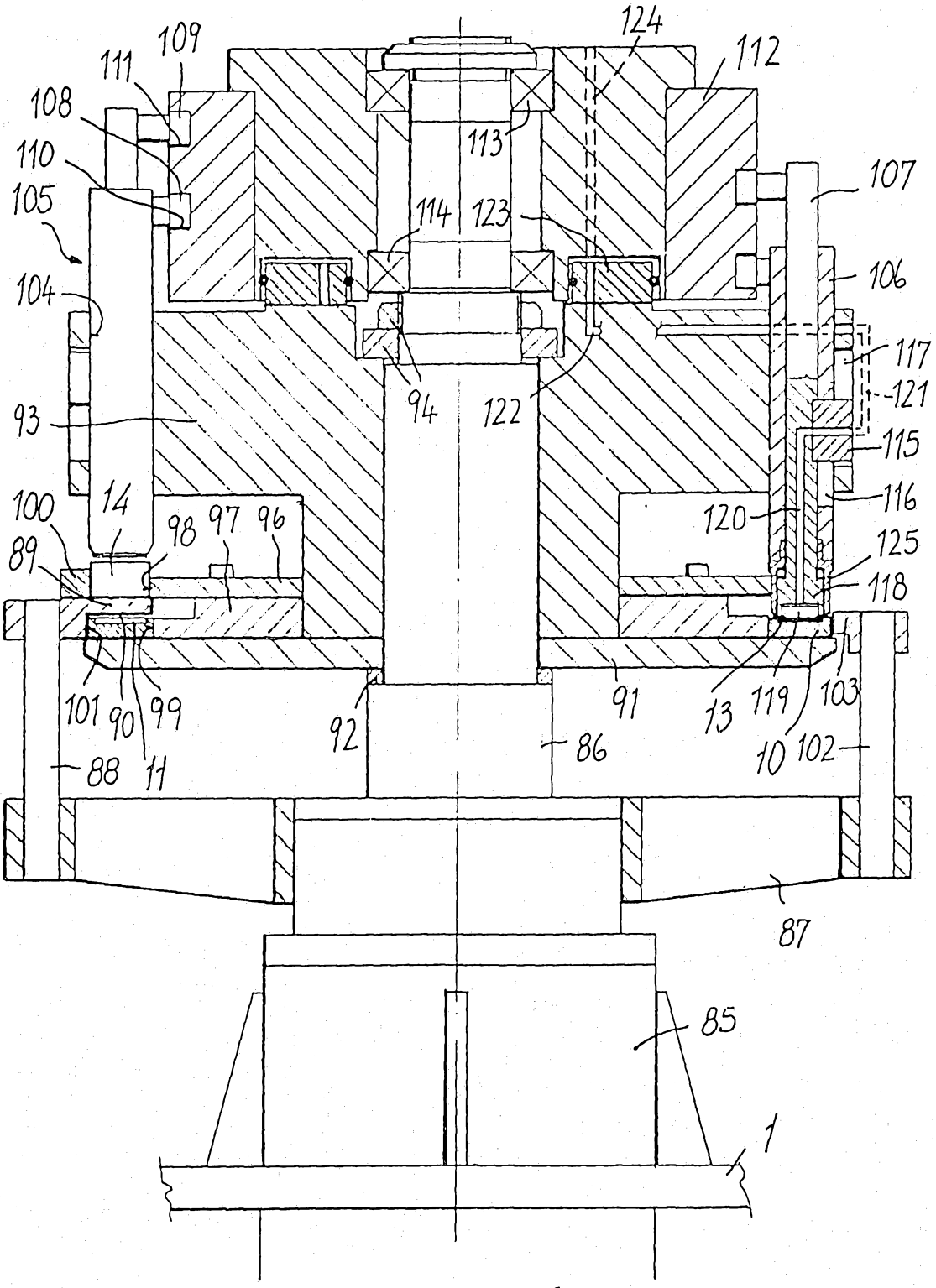

124
112
109
111
108
110
105
104
113
107
114
123
106
117
121
93
94
122
115
116
100
14
98
97
96
120
125
89
118
101
90
99
92
91
13
119
103
88
11
86
10
102
87
85
1

Fig. 4