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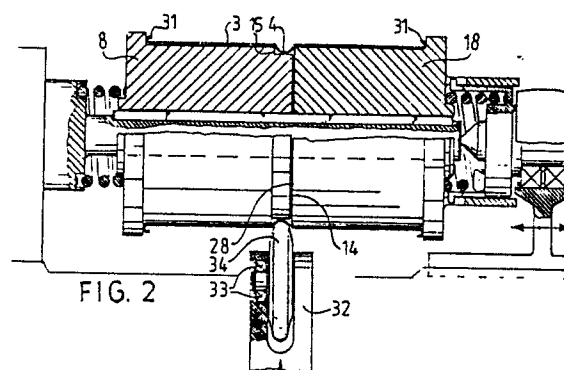

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Method and apparatus for manufacturing a body with a cover locking ring, the manufactured body and a pre-body therefor.


 The invention relates to a method for manufacturing a body with an integral cover locking ring, comprising (1) the provision of a cylindrical pre-body, the length of which is substantially at least twice the length of said body; (2) the fitting of said pre-body to a core which is provided with at least one annular recess; (3) rotation of said pre-body on said core while applying an axial pressure force on said pre-body; (4) the applying of a radial compression force on said pre-body at the point of said recess using a constricting roller, such that a constriction is forced in said pre-body; (5) dividing of said pre-body at the point of said constriction; and (6) the forming of a cover locking ring in the constricted body rim.

Further the invention relates to an apparatus for forcing at least one annular constriction in a pre-body according to this method.

Preferably the core on which the pre-body is accommodated is divided up into a first core and a second core, and in the free peripheral edge of said first core is an annular notch arranged which forms, together with the end wall of said second core directed towards it, the annular recess.



Method and apparatus for manufacturing a body with a cover locking ring, the manufactured body and a pre-body therefor

The current invention relates to a method and apparatus for manufacturing a body with an integral cover locking ring.

The British patent application 2.065.527 describes a method and apparatus for manufacturing a cylindrical body provided with an integrated cover locking ring. The apparatus comprises a punch with two male die members located at a distance from each other. The foremost male die member co-operates with a female die member and forms with the latter an annular inlet split with a cavity connecting to it, the dimensions of which correspond with a bent inward flange from which the cover locking ring is formed. The rear male die member rests against the other free rim of the body and is intended for the forming thereon of an outward bent flange to which an end wall can be seamed. The forming of a constricted body rim by means of upsetting in the manner described leads in many circumstances to deformations, folding in particular, from the moment that the end wall enters the inlet split and has to be bent inward, because the part of the body between the end rims is not supported in any way. The forming of folds already occurs during entry into the annular split when a body is used that is provided with a longitudinal weld seam, because the body thickness is usually greater at the point of the weld seam.

The German patent application 3.619.322 describes a method of providing bodies with die-necked body rims. To this end the bodies are cut, which results in cut, inward or outward bent body rims being formed which are subsequently provided with a constricted part in a separate die-necking device (by means of so-called die-necking). The die-necking is again performed by upsetting, whereby for example as a result of burrs occurring at the cut body rim deformations can arise in the body.

The invention has for its object to manufacture bodies with an integrated cover locking ring, whereby a constricted body rim in which the cover ring is subsequently formed is not created by means of an upsetting process but by means of a radial, inward directed forcing process in a pre-body resulting in the forming of an annular constriction, following which the pre-body is divided at the point of the constriction; in this way the problems resulting from deformations in the body as described above will substantially not occur.

In order to avoid cracks or defects occurring at the point of the deformed constriction during the

radial forcing process, an axial pressure force has to be applied to the pre-body during the forcing.

In order to achieve this aim, the invention provides a method for manufacturing a body with an integral cover locking ring comprising (1) the provision of a cylindrical pre-body, the length of which is substantially at least twice the length of the body; (2) the fitting of the pre-body to a core which is provided with at least one annular recess; (3) rotation of the pre-body on the core while applying an axial pressure force on the pre-body; (4) the applying of a radial compression force on the pre-body at the point of the recess using a constricting roller, such that a constriction is forced in the pre-body; (5) division of the pre-body at the point of the constriction; and (6) the forming of a cover locking ring in the constricted body rim.

In order to obtain a good constriction, it is favourable that the pre-body is rotated on the core at a speed of 400-1000 revolutions per minute, and in addition that the radius of the constricting roller preferably amounts to 3-8 mm.

It is remarkable that with the method according to the invention pre-bodies with a longitudinal weld seam can also be provided with a forced constriction.

The invention further provides an apparatus which is particularly designed to perform the above described method according to the invention. This apparatus for forcing at least one annular constriction in a pre-body comprises (1) a core supported by a frame for the accommodation thereon of a cylindrical pre-body, which core is provided with at least one annular recess; (2) means for applying an axial pressure force to the pre-body accommodated on the core; (3) means for rotating the core; (4) a constricting roller mounted for pivoting on the frame in a plane through the recess, which roller can exert a radial compression force on the pre-body accommodated on the core; and (5) means for dividing the pre-body at the point of the constriction.

Pre-bodies can be accommodated easily and quickly in the apparatus and the formed bodies provided with a constricted part can easily be removed therefrom, if more preferably the core is divided up into a first core and a second core and if in the free peripheral edge of the first core an annular notch is arranged which forms, together with the end wall of the second core directed towards it, the annular recess.

An optimal axial pressure force can be exerted if more preferably the frame is provided with a shaft end part to be driven with the rotation means

and to which the first core is guided for sliding, and the second core is mounted for rotation to another shaft end part supported by a support which is reproducibly guided relative to the first core in a guiding of the frame, such that a part of the first shaft end part protruding from the first core passes through a complementary coaxial passage in the second core.

If the core is provided with stops co-operating with the end edges of the pre-body, it is possible to manufacture bodies provided with a constricted body rim which are provided at their other body rim with a curl to which an end wall can be directly seamed.

The optimal ratio between the axial pressure force and the radial compression force can easily be determined experimentally. The axial pressure force determines to a significant extent the flow behaviour of the pre-body material during forcing. Too great an axial pressure force leads however to fold deforming in the annular recess and, possibly as a reaction to this, to outward directed deformations. Too small an axial pressure force during the forcing of the body produces excessive stretching forces which can result in cracks occurring at the point of the constriction to be formed.

The radius of the constricting roller is preferably 3-8 mm. Too small a radius induces ridge forming and so-called additional grooving.

The invention further relates to a body provided with a cover locking ring joined integrally thereto, to a body provided with a constricted body rim to be formed to an integral cover locking ring, and to a pre-body intended for manufacture of such a body.

Mentioned and other characteristics will be elucidated on the basis of three embodiments of the method according to the invention for manufacturing a body provided with an integral cover locking ring.

In the drawing:

Fig. 1, 2 and 3 each show a partially broken away view of successive manufacturing steps for the manufacture of a body provided with a constricted body rim;

Fig. 4A and 4B show a partially broken away view of the process whereby the shaped constriction is formed into the integral cover locking ring; and

Fig. 5 shows a perspective view of a body as according to the invention which is provided with an integral cover locking ring.

Fig. 1 and 2 show the first method step according to the invention, whereby in a pre-body 3 a constriction 4 is forced, which eventually forms part of the required constricted body rim 5 of body 6.

The constricting device 7 comprises a first core 8 which is guided for sliding on a shaft end part 10 provided with a guide rib 9. The first core 8

can be pressed counter to the spring force of a spring 11 to a spring support 12 to which shaft end part 10 is attached and which is driven for rotation by the motor 13. First core 8 is provided at its free end 14 with an annular recess 15 and at its other end 16 with a stop 17.

Co-operating with first core 8 is a second core 18, which is guided for sliding with a bushing 19 over a spring box 21 counter to the spring force of a spring 20. Spring box 21 is coupled to a shaft end part 22, which is supported for free rotation on a support 24 by means of bearings 23. This support 24 is guided in a guiding 25 for reciprocal movement relative to the first core 8.

Studs 26 reach into slotted holes 27 arranged in bushing 19 and bound the sliding movement of bushing 19 over spring box 21 in the direction towards the first core 8.

The second core 18 is provided on its end facing away from the free end 28 with a stop 29.

After removal of the finished bodies 6, a pre-body 3 is placed on the first core 8 and the second core 18 is then moved toward the first core 8, whereby shaft end part 10 passes through a complementary passage 30 in second core 18. In this way core 8 and core 18 are synchronously driven by the rotatably driven shaft end part 10.

During the movement of cores 8 and 18 towards each other, curls 31 are formed on the pre-body 3 and the axial pressure which acts on pre-body 3 is generated.

A constricting roller 34 (radius 4mm), arranged for free rotation in a fork 32 using bearings 33, is subsequently pressed against pre-body 3, this at a position located at the point of recess 15.

During the constricting, pre-body 3 is rotated, for example at 800 revolutions per minute, and the diameter at the point of constriction 4 is reduced by forcing from 99 to 83 mm, with a can thickness of 0.23 mm, and a constricting time of approximately 30 seconds.

Fig. 3 shows the next method step, whereby, using a cutting roller 37 arranged for free rotation in a fork 35 using bearings 36, pre-body 3 is divided at the point of constriction 4 into two identical bodies 5 since the cut is made at the point of the half-height of pre-body 3.

Fig. 4A and 4B show the forming device 38 with which the constricted body rim 5 of body 6 is formed to a cover locking ring 2 integrally connected with body 6, for example a so-called ES-closure, PAL-closure or PALOS-closure.

Forming device 38 comprises an annular female die member 40 which is substantially V-shaped in section, is arranged on a stationary punch support 39 and co-operates with a male die member 41.

Using guide rods 42 inserted through spiral

springs 43 male die member 41 is guided for sliding on a punch 44 reciprocally movable towards punch support 39. Male die member 41 is further provided with an annular socket coupling 45 which slides over body 6 and counters bellying out at the point of the cover locking ring 2 during the forming of said ring.

After the forming process in the forming device 38, a bottom end wall 46 can be seamed to a curl 31 in known manner (fig. 5).

It will be apparent that with greater pre-body lengths 3, 4 more bodies provided with constricted body rims formed by forcing can be manufactured at the same time.

Claims

1. Method for manufacturing a body with an integral cover locking ring, comprising

(1) the provision of a cylindrical pre-body, the length of which is substantially at least twice the length of said body;

(2) the fitting of said pre-body to a core which is provided with at least one annular recess;

(3) rotation of said pre-body on said core while applying an axial pressure force on said pre-body;

(4) the applying of a radial compression force on said pre-body at the point of said recess using a constricting roller, such that a constriction is forced in said pre-body;

(5) dividing of said pre-body at the point of said constriction; and

(6) the forming of a cover locking ring in the constricted body rim.

2. Method as claimed in claim 1, **characterized in that** the pre-body is rotated on the core at a speed of 400-1000 revolutions per minute.

3. Method as claimed in claim 1 or 2, **characterized in that** the radius of the constricting roller amounts to 3-8 mm.

4. Method as claimed in claims 1-3, **characterized in that** a pre-body with a longitudinal weld seam is used.

5. Method as claimed in claims 1-4, **characterized in that** the core is divided up into a first core and a second core, and that in the free peripheral edge of said first core an annular notch is arranged which forms, together with the end wall of said second core directed towards it, the annular recess.

6. Pre-body with a constriction forced according to the methods as claimed in claims 1-5.

7. Body with an integral cover locking ring manufactured according to the method as claimed in the claims 1-5.

8. Apparatus for forcing at least one annular constriction in a pre-body according to the method as claimed in claims 1-5, comprising

(1) a core supported by a frame for the accommodation thereon of a cylindrical pre-body, which core is provided with at least one annular recess;

(2) means for applying an axial pressure force to said pre-body accommodated on said core;

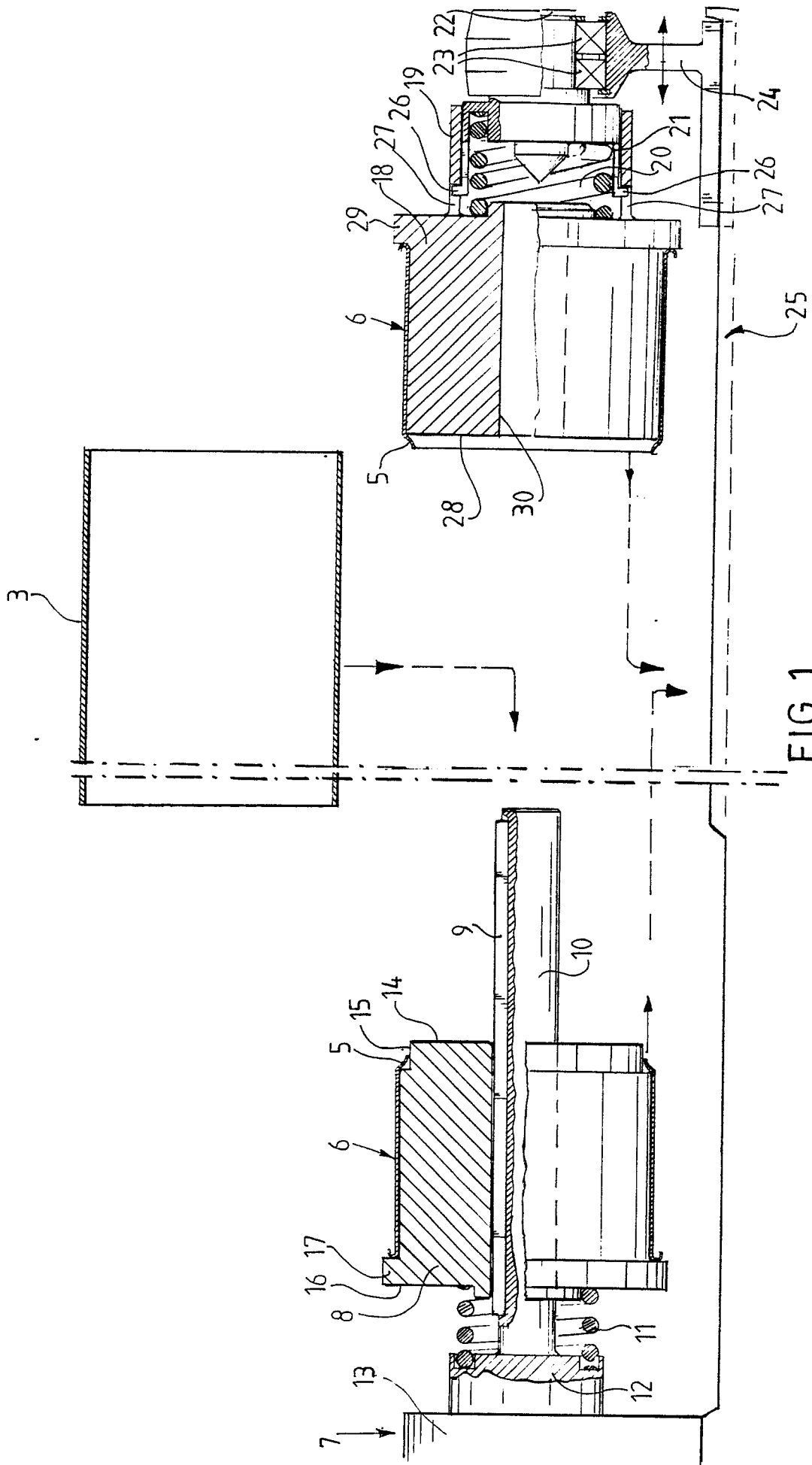
(3) means for rotating said core;

(4) a constricting roller mounted for pivoting on said frame in a plane through said recess, which roller can exert a radial compression force on said pre-body accommodated on said core; and (5) means for dividing said pre-body at the point of the constriction.

9. Apparatus as claimed in claim 8, **characterized in that** the core is divided up into a first core and a second core, and that in the free peripheral edge of said first core an annular notch is arranged which forms, together with the end wall of said second core directed towards it, the annular recess.

10. Apparatus as claimed in claim 9, **characterized in that** the frame is provided with a shaft end part to be driven with the rotation means and to which the first core is guided for sliding, that the second core is mounted for rotation to another shaft end part supported by a support which is reproducibly guided relative to said first core in a guiding of said frame such that a part of said first shaft end part protruding from said first core passes through a complementary coaxial passage in said second core.

11. Apparatus as claimed in claims 8-10, **characterized in that** the core is provided with stops which co-operate with the end edges of the pre-body.



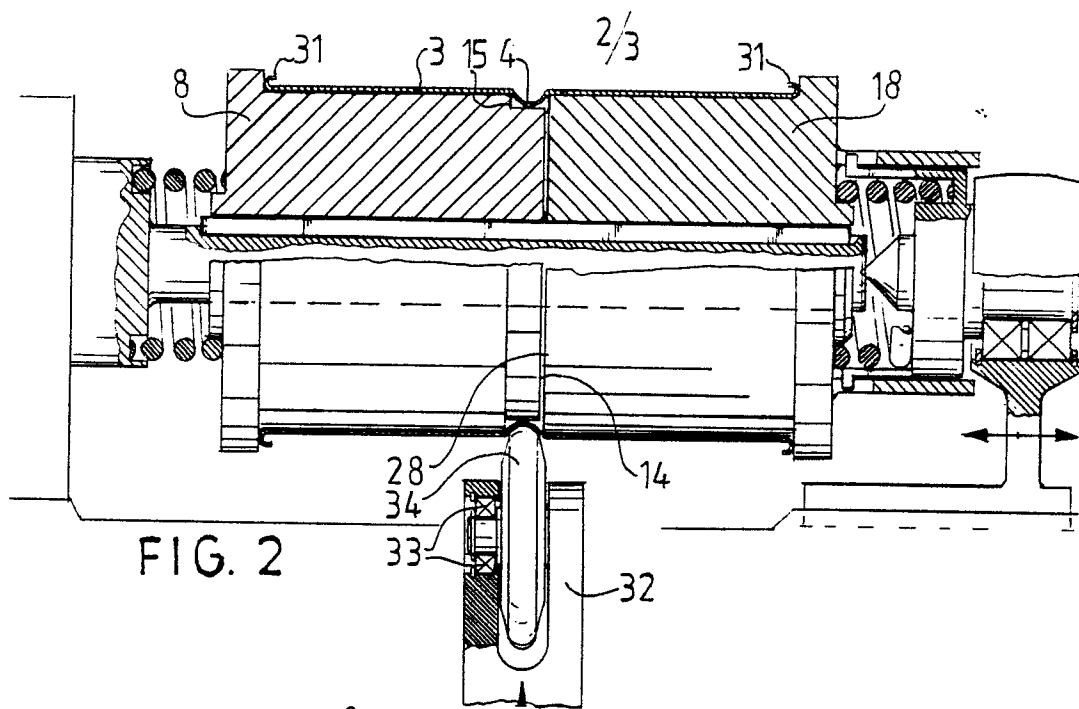


FIG. 2

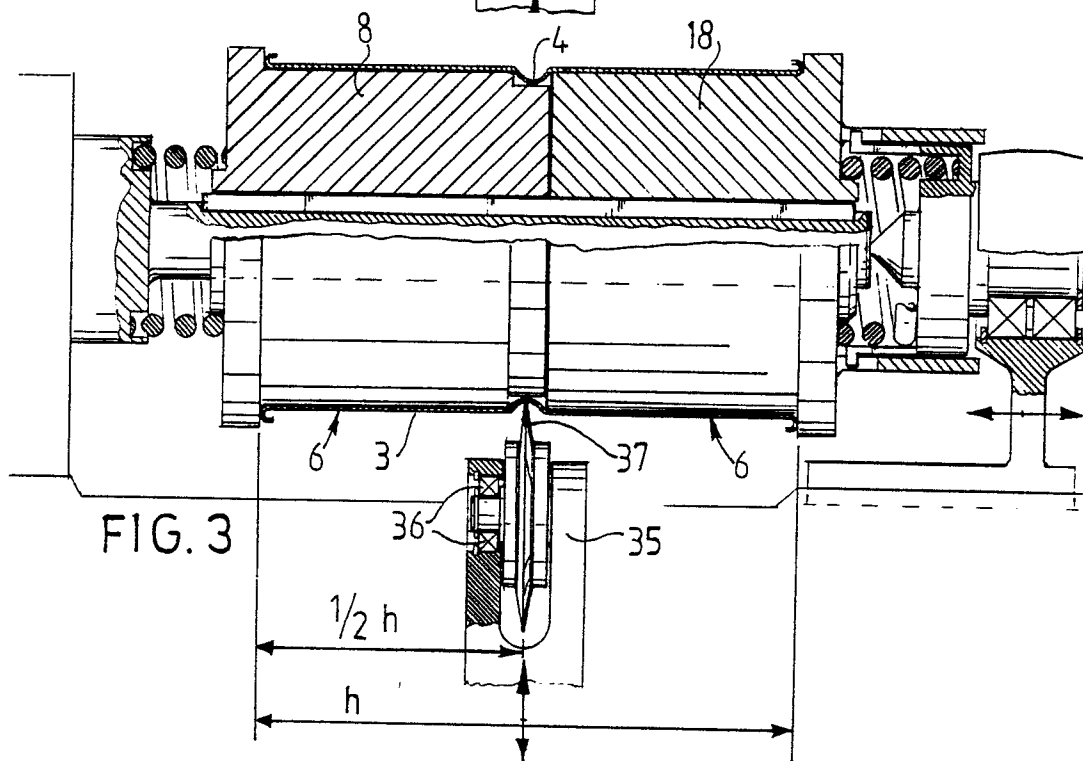


FIG. 3

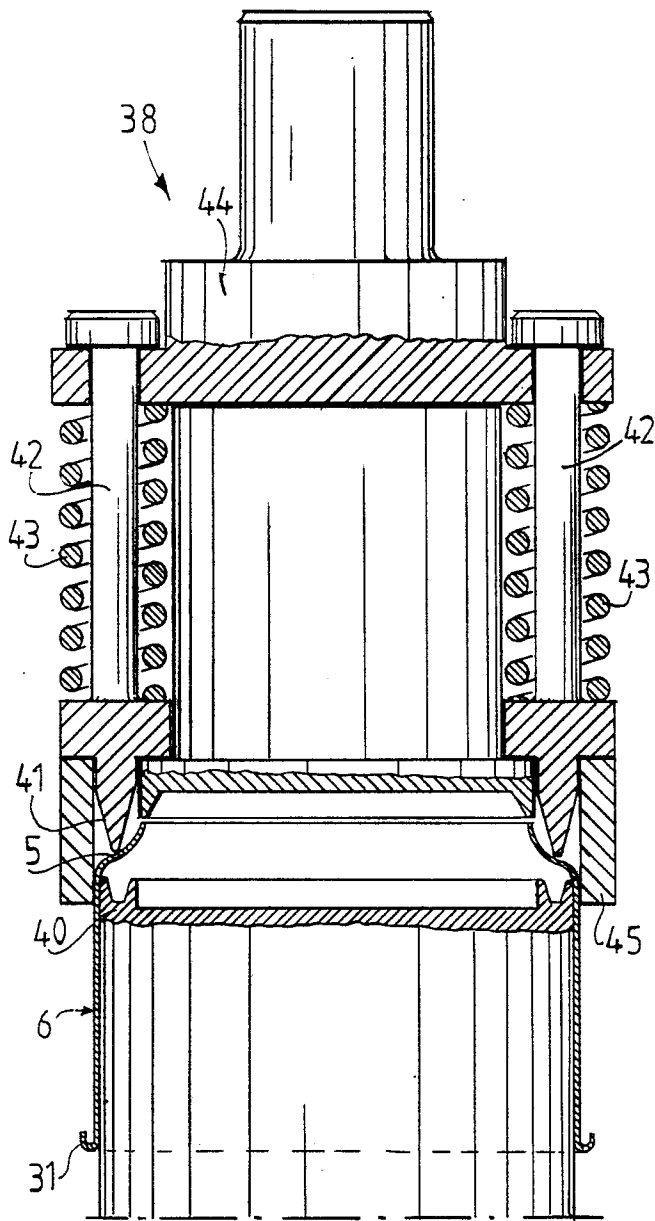


FIG. 4 a

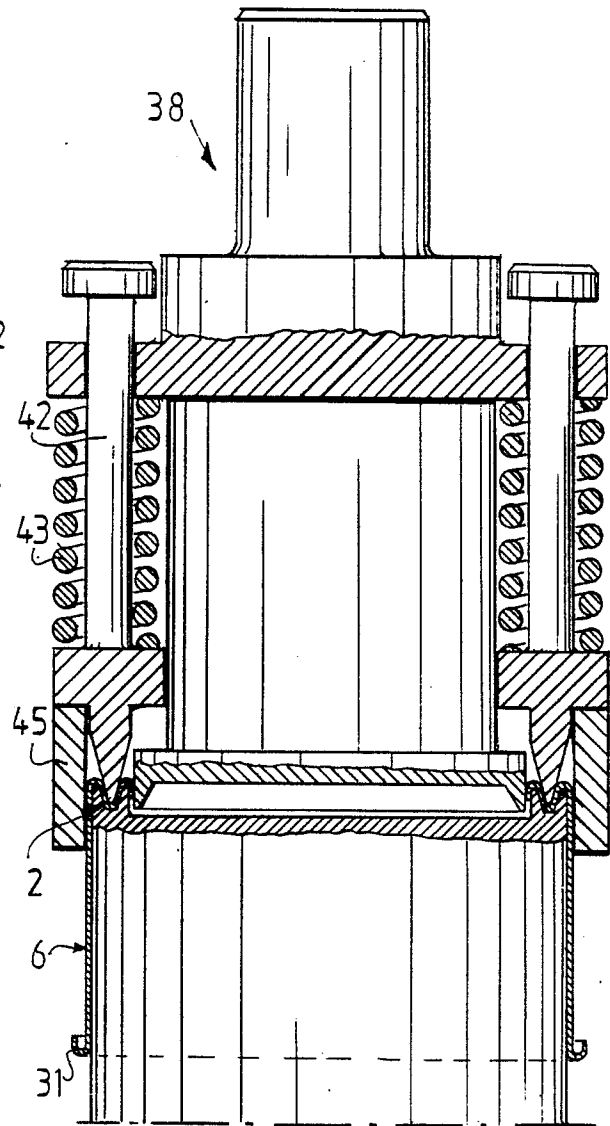


FIG. 4 b

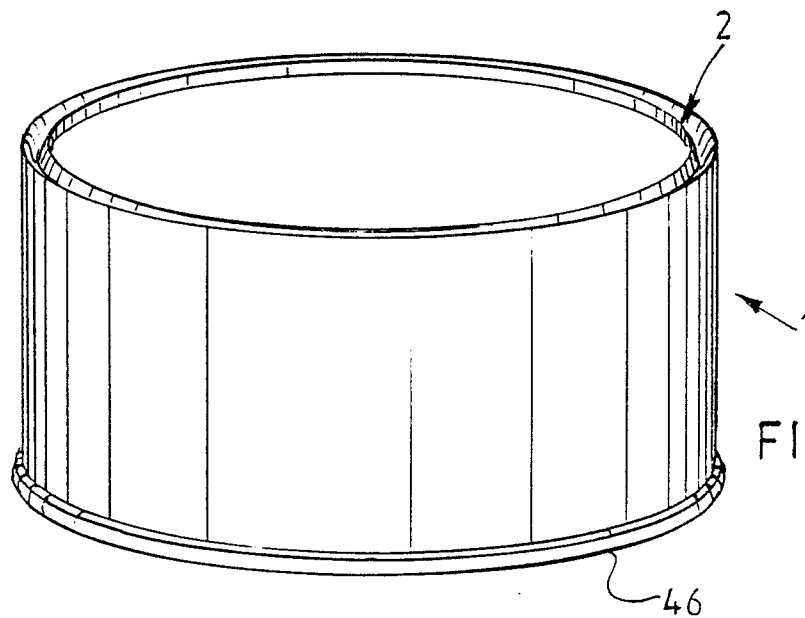


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
D,A	DE-A-3 619 322 (ONO) * Whole document *	1,6,8	B 21 D 51/26 B 21 D 22/10
D,A	GB-A-2 065 527 (METALGRAFICA)	6,7	
A	FR-A-1 552 950 (FMI)		
A	GB-A- 910 (WALLER) (A.D. 1909)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 21 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19-05-1988	Examiner PEETERS L.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			