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(54) **Container closure.**

(57) This invention relates to a securing device for attaching a closure 7 to a container aperture 9, comprising a preformed thread member 1 which is adapted to be fixed to the region defining the aperture 9, wherein the closure 7 may be held in sealing contact with this region so as to close the aperture 9. Also disclosed are a container 4 having a depressible closed aperture portion 22 and methods for attaching a thread member 1 to a container 4 having a neckring 3 and of forming a closed container 4. The invention is particularly suitable for heat-sealable cartons and allows effective closure of containers 4.

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CLOSING CONTAINERS

This invention relates to closing containers such as containers which are preformed and may be made of glass, plastics, metal or similar for example jars, bottles or cans which have apertures secured by closure caps.

The invention also relates to closing non-preformed containers, for example those fabricated from sheet or coil material. Such materials may be laminates such as paper coated with a layer of PVC or a layer of aluminium foil, or they may be homogeneous material such as aluminium or tinplate or some suitable plastics in sheet or coil. Containers fabricated in this way can be very efficiently produced.

When such a container needs to be opened so that its contents can be utilised it is desirable to be able to subsequently replace and remove the closure whenever required. To enable reclosure, preformed containers are usually provided with threads formed integrally with their neckrings for securing the closures, for example lids or covers, to the containers. The provision of such integral threads on the neckring complicates the container manufacturing process and consequently makes such a container costly to produce. Moreover, the application of the closure to the container is a complicated procedure involving complex machinery

Also, known containers made from sheet or coil material are reclosed by pressing together and folding the sides of the aperture and they cannot be opened and reclosed repeatedly or kept once opened for long periods, with success comparable in performance with that enjoyed by preformed containers such as those moulded from glass. As an example, such reclosed containers may not be air-tight.

It is an object of the present invention to overcome this problem.

According to one aspect of this invention, we propose a securing device for attaching a closure to a container aperture, comprising a preformed thread member, which is adapted to be fixed to the region defining the aperture, whereby the closure may be held in sealing contact with this region so as to close the aperture. The thread member can be fixed in position before or after the aperture has been made.

Thus the exterior of the neckring of the container does not require a particular shape or form for receiving closures and it may be plain. A preformed thread member can be secured, for instance, to the walls of an extruded tube or a parallel-sided container.

Containers having the securing device of this invention can be made more cheaply. Furthermore, separately manufacturing the thread means is advantageous in various other

ways. Firstly, it allows greater freedom in the choice of form of thread because the forming operation is no longer restricted to the manufacturing process of the containers themselves. Secondly, the material from which the thread member is formed can be chosen to meet the precise needs of the thread. In a conventional container, the choice of material is limited to that which is suitable for the body of the container.

The invention can have many configurations for example:

(a) the thread can be single or multi start;

(b) the thread can be extended over the whole area of the neckring or can be restricted in length to the minimum required to cam the closure into and out of sealing contact with the neckring;

(c) the thread can be secured directly to the neckring or it can be provided with a flange at its base and this flange can be secured to the neckring;

(d) the flange in (c) can be extended to form an integral sleeve and this sleeve can be secured to the neckring;

(e) a flange as in (c) or a sleeve as in (d) can contain male or female threads;

(f) the thread can be so constructed that its crest or its root is at a constant radial distance from the centre of the neckring, or alternatively so that its radial distance increases in the direction of tightening;

(g) the cross-section of the thread can be symmetrical relative to its base, or alternatively for a male thread can be skewed so that the effective radius of the crest increases during the tightening operation.

A threaded sleeve according to the invention is preferably made of plastics material. A plastics sleeve can be applied to a container by a simple push-on operation, which can ensure that the sleeve grips the container tightly so as to operate as a substantially permanent thread. This sleeve allows a closure cap to be held in sealing contact with the container and to be removed by a screwing action without the sleeve itself becoming detached from the container.

A thread member may be fixed to the region surrounding an aperture in a container which has not yet been made, in for instance sheet or coil material. This member preferably is of thermo-plastics material and can be moulded or assembled on to sheet or coil material in such a way that when that material is fabricated to form a container, the said thread member lies on a surface which can be conveniently pierced to provide an access aperture for filling or emptying the container. The aperture can be pierced prior to or subsequent to the thread or sleeve moulding or assembly. The sleeve can contain an integrally formed thread or annular ring, such as that commonly used on the neckring of glass containers, and it should be noted that the sleeve can accept a twist-on or snap-on closure.

If the sheet or coil material from which the container is to be fabricated is sufficiently ductile, the aperture can be formed by, for instance, a piercing and plunging operation to provide a neckring integral with the fabricated body of the container. Alternatively, the sleeve can be preformed and subsequently secured around the aperture. The sleeve can be secured, for instance, by heat sealing or by the application of an adhesive coating.

According to another aspect of the invention we propose a method of forming a closed container, comprising forming an aperture in a predetermined position on a piece of material, inserting a combined closure cap secured to an internal thread member through the aperture from the side of the material into which the sleeve is to be fixed, and fastening together the respective side and base edges of the container.

Preferably the material is supplied continuously on a roll or sheet and a plurality of containers is thereby formed and the edges of the container are fastened together by means of heat sealing.

In a preferred arrangement, a thread member can be pre-assembled into a closure cap and the assembly can then be applied to a neckring the exterior of which has not been made in a form to receive the closure cap, on a preformed container by a press-on operation. This overcomes one of the major problems in the application of conventional screw-on type closures by eliminating the

need for pre-engagement of threads and for a screw-on facility to be provided within closure application machines. A form of closure cap which is convenient for this method of application is one with an internal bead formed on the lower edge of its side walls, said bead having thread-receiving grooves which will accept threads.

We therefore propose according to another aspect of the invention a method of attaching a thread member to a container having a neckring, comprising securing the thread member and a closure cap together by means of the or each thread on the thread member, forcing the closure cap onto the neckring, and twisting-off the closure cap whereby the thread member is fixed to the neckring of the container.

By using such a method the closure cap can be pushed axially on to the neckring rather than by a twisting movement thereby greatly simplifying its application and the machinery required to carry out such application.

A thread member or sleeve according to the invention confers many advantages, for example by filling the gap between the beaded portion of the closure and the wall of the neckring the ingress of dust or foreign bodies is substantially prevented. The sleeve may be formed with a portion to cover the top of a neckring whereby it may act as a

sealing gasket and can protect the exposed top edge of the neckring against damage, hence facilitating the re-use of the container. The sleeve may contain a flange protruding outwardly from its lower edge; this flange can be developed as a sealing surface and also, with a closure, provides protection against tampering and pilfering. The flange can be attached to the lower edge of the closure wall so that after the combined sleeve and closure have been assembled to a container, the closure cannot be removed without shearing the flange, thereby providing visible evidence of removal. The sleeve may be made long enough to enter into sealing contact with a co-operating closure and of such flexibility that if the internal pressure in the headspace is higher than or alternatively lower than, the ambient air pressure, the resultant flexing of the closure and/or the sleeve acts to increase the sealing contact. A sleeve pre-assembled with the closure will add rigidity to the closure and allow the use of thinner and hence more economical sections in the construction of the closure. Furthermore, pre-assembly with a closure and application to a container by a press-on operation, allows the use of a short neckring and minimises the amount of material forming the skirt of the closure cap.

Various methods may be employed so that a thread member according to the invention, optionally embodied in a flange or sleeve, is tightly seated on the neckring.

It can be applied for instance by heat-sealing or by the application of an adhesive coating between the surfaces to be joined together. A sleeve including a thread can be secured to a container by subjecting the sleeve to pre-heat causing it to expand prior to being allowed to contract around the neckring. The sleeve and the neckring can be formed with co-operating tapers which can be locked together by downward pressure during engagement. In this alternative, the downward force exerted on the sleeve by unscrewing the closure from the assembled sleeve and neckring tends to lock the sleeve on to the neckring. The external surface of the neckring can be grooved, ribbed or splined, or the surface finish can be roughened, which further improves the tight fit on the container.

In another preferred arrangement, the sleeve can be pre-assembled into a closure cap and the assembly can then be applied to a plain or plunged aperture by a press-on operation. Using a press-on operation not only simplifies the assembly operation, but also allows a closure to be applied safely to a container of low structural rigidity. In the case of an aperture comprising a pierced hole without any formed wall to serve as a neckring, it is often advantageous for the sleeve to have an integral flange at its base to provide an adequate area for adhesion. In the case where the aperture is formed with an integral neckring the sleeve can be conveniently affixed around it or around and over it.

In yet a further preferred arrangement where the container is fabricated with the contents already in place, the sleeve can be assembled to the wall over the area where the aperture is to be formed and the wall can be left intact until the contents are required for use. By this means the security of the pack can be enhanced and the pack can remain substantially tamper and pilfer-proof. Furthermore, the intact wall will add to the stability of the container throughout its life until access to the contents is required. If necessary, for ease of access when the contents are required, the area of the wall which is to form the aperture can be provided with an easy removal feature. For instance it can be part-pierced or perforated or reduced in thickness around the removal line. Alternatively, the sleeve can be pre-assembled with an easily removable diaphragm covering the opening at the end to be affixed to the container so that when the sleeve is affixed over an aperture in the container access to the container cannot be gained without piercing the said diaphragm.

The invention readily lends itself to use with pressure holding containers such as those formed by drawing and ironing operations. In this application the mating profiles of the neckring and sleeve need to be so formed that they readily interlock when the internal pressure of the container is higher than the external pressure, whilst allowing the closure to be removed from the sleeve by a conventional twist-off action.

According to a fourth aspect of the invention, we propose a container including a closed aperture portion, comprising material which is flexible at least in the neck region between the aperture and the adjacent container wall, so that the closed aperture portion can be retained in a depressed mode and subsequently raised into an upstanding mode upon pressure being exerted on the walls of the container. Preferably, the container is a carton, which may be heat-sealable. This arrangement is advantageous in that storage and transit space are minimised. The container may include a removable diaphragm covering the aperture portion for protection.

Embodiments of the invention are now described by way of example only with reference to the drawings, wherein:-

Fig. 1a shows a single start male thread and Fig. 1b shows a plain neckring to which it could be affixed;

Fig. 1c shows an alternative thread member comprising single start male thread with a flange on each side of the thread and Fig. 1d shows this in cross section;

Fig. 2a illustrates a sectioned closure cap which could be used in conjunction with a pre-formed multi-start male threaded sleeve, one of which is shown in Fig. 2b;

Fig. 2c shows a plain neckring to which the assembled closure cap and sleeve of Figs. 2a and 2b could be applied;

Fig. 3a shows a typical sleeve containing a female thread which could be applied to a plain neckring as shown in Fig. 3b;

Fig. 4a shows a sleeve incorporating a lower external flange;

Fig. 4b illustrates a sleeve with an internal flange to engage the top of a neckring;

Fig. 4a' shows a sleeve as shown in Fig. 4a assembled in a closure cap;

Fig. 4c shows a typical sleeve of minimal height to accommodate the shortest practical length of thread;

Fig. 4c' shows a sleeve as shown in Fig. 4c assembled in a closure cap;

Fig. 5a shows a sleeve assembled into a closure cap;

Fig. 5b shows a plain neckring to which the assembled sleeve and closure cap shown in Fig. 5a could be affixed;

Fig. 5c shows the application of the sleeve/closure combination of Fig. 5a to the plain neckring of Fig. 5b;

Fig. 6a shows schematically the movement required for removal of a closure cap as shown in Fig. 6b;

Figs. 7 a, b and c each show a different flanged sleeve bonded around a pierced hole in a container;

Figs. 8a and b each show a sleeve to be fitted on a flanged hole;

Fig. 9 shows a sleeve bonded onto the inner surface of a carton to resist internal pressure;

Fig. 10a shows a sleeve with an integrally moulded diaphragm to cover the aperture in a container;

Fig. 10b shows in perspective the moulded-on projection of Fig. 10a to be used as a finger grip for tearing the diaphragm along the dotted line. (The dotted line indicates a line of weakness in the diaphragm);

Fig. 10c shows a container which has a partly-pierced disc in its surface underneath the closure; on opening an aperture can be formed by removing the disc;

Fig. 11 shows the shape of a typical fabricated container with the closure conveniently placed for ease of pouring;

Fig. 12 shows diagrammatically the formation of a carton from a roll of sheet material;

Fig. 13a shows a carton with a depressed displaceable container aperture portion, with the aperture located below the side of the container and Fig. 13b shows the carton with the aperture portion displaced and upstanding;

Fig. 14 shows a modification of the displaceable aperture;

Fig. 15 shows an alternative modification of the displaceable aperture; and

Fig. 16 shows diagrammatically and in plan view another alternative modification.

A plastics thread member 1, shown in Figure 1a, comprising a single start, male thread is tightly fixed for example by heat sealing or adhesive to the exterior 2 of the plain neckring 3 of a container 4 such as a glass jar. The thread member could be made of spring steel or other resilient material. The thread member may have

a flange 5 on one or both sides of the thread 1 for strengthening the attachment to the neckring.

An alternative form of thread member comprises a threaded sleeve 6, as shown in Figure 2b. The sleeve 6 is adapted to be located around the plain neckring 3 of the container 4 and a closure cap 7, including an internal thread, which may be either multi-start or single start, is screwed onto the sleeve 6 on the neckring 3 so as to close the aperture 9. Alternatively, the closure cap may have internal lugs instead of threads 8 for engagement with the thread member.

The sleeve 6 may include a female thread 10 instead of or as well as a male thread for receiving projections from inside the closure cap 7 and a conventional lug cap may be employed for this. The sleeve 6 may have a lower, external, peripheral flange 11, as shown in Figures 3a and 4a, which provides a) a stop for the cap 7, b) a seal to prevent ingress of dirt and dust as shown in Fig. 4a', in which the lower external flange is sealingly engaged with the bead of the closure cap. The sleeve 6 may have an upper peripheral rim 12, for covering the top of the neckring 3 to form a seal.

If a threaded cap is intended to be employed the sleeve 6 may be made shorter as in Figure 4C, as may the cap.

A sleeve 6 may be applied to a plain neckring 3 by firstly, screwing the cap 7 onto the sleeve 6, as shown in Figure 5a, and then pushing this combination downward onto the neckring 3 of the container 4 so as to tightly surround the neckring 3. The cap 7 is then removed by turning in an anti-clockwise direction, as shown in Figure 6a and removing the cap 7 upwardly, and the sleeve 6 is left anchored on the neckring 3, as shown in Figure 6c.

A sleeve 6 may be applied to a container 4 having an aperture 9 without a neckring for example a carton as shown in Figure 7a, by attaching the external flange 11 to the region around the aperture 9 on top of the edge of the container clearance 'S' must be provided between the flange and the bottom of the cap.

The cap may be a screw-on or snap-on type either for an externally threaded sleeve, as shown in Figures 7a and 7b respectively, or for an internally threaded sleeve, as shown in Figure 7c.

Alternatively, the sleeve does not have the external flange 11 to save costs and connection between sleeve 6 and container is effected by means of an upturned rim 14, as shown in Figure 8a, in the container 4 around the aperture 9, which may be punched out. In a modification, the sleeve has a groove 15 to accommodate the rim 14, which is shown in Fig. 8b.

The flange 11 could be attached to the region around the aperture 9 underneath the edge of the container. This is shown for an externally threaded sleeve in Figure 9. The combination of the cap 7 and the sleeve 6 can be applied by passing from the inside to the outside of the container 4 through the aperture 9 i.e. in the direction of the arrow A. The pressure inside the cap 7 tends to urge the flange 11 against the container 4 rather than away from it.

Any of the embodiments herein described may be fitted with means for protection against tampering and pilfering and any of these may be provided with means for removal of the protection means such as a line of weakness, reduction in the material thickness or part shearing. Examples of this are given in Figures 10a, 10b and 10c. The first means of protection, shown in Figure 10a, comprises a tear-out diaphragm 16 integral with the sleeve 6 and having a line of weakness 17 (shown in dotted line). The diaphragm 16 may be removed by pulling the projection 18 outwardly. The projection also helps to prevent excessive outward deformation of the diaphragm 16 as it engages the underside 19 of the cap 7. In a modified diaphragm 20, a line of weakness 21 is provided in a diaphragm made out of the same material as the container 4, that is to say made integral with the container 4.

As has already been mentioned, this invention is extremely effective when employed with containers made out of sheet or coil material. By the same token,

the invention relates to containers which are made in situ, that is during the same process as manufacture of the containers. A typical such container 4 is a carton. As shown in Figure 11, the closure is formed in a non-seamed portion 21 of the carton. The material of the container 4 comes off a roll at stage A, as shown in Figure 12, and apertures 9 are punched at predetermined positions along the sheet according to the lengths required of the finished containers. A combined cap and sleeve is inserted through the aperture from the side of the sheet onto which the sleeve is to be fixed and then the sleeve is fixed by such as heat sealing to the container in stage C. Finally, the side and base edges are heat sealed together and the container is filled and cut away from the unrolled sheet in shape D. Instead of inserting the combined cap, and sleeve through the aperture, the sleeve can be applied directly to the exterior of the carton around the aperture or the area in which the aperture is subsequently to be formed.

In yet another modification according to this invention, for example as shown in Figures 13a and 13b, the container and/or sleeve materials are flexible at least in the neck region between the aperture and the adjacent container wall so that the closed aperture portion 22 may be manufactured and sold in a depressed mode and subsequently displaced outwardly of the container upon pressure being exerted on the sides 23 of the container into an upstanding mode whereby the cap 7 may be removed from the upstanding aperture

portion 22. The mode of initial depression affords greater storage and transit space. Alternatively, the aperture portion 22 can be formed by a flexible member 24 which includes an outer flange 25 for attachment to the container wall via the edge of a tamper-proofing diaphragm 26 which extends over the aperture and the depressed portion 22.

The tamper-proofing diaphragm 26 may include a line of weakness 27 for allowing removal of the diaphragm from the aperture. The depressed portion 22 and tamper-proofing diaphragm 26 may be co-attached by preferably heat sealing or adhesive and then attached by preferably heat sealing to the wall of the main container 4. In an alternative, shown in Figure 15, the tamper-proofing diaphragm 26 only extends over the aperture and the flexible diaphragm 24 is attached directly to the wall of the main container 4. This diaphragm also has a means of weakness, provided for example by a line of weakness 27 and/or a partly sheared portion 28.

In operation the diaphragm or carton covering the closure would be removed before the closure pop-up action is initiated. In the case of Figure 16a finger nail or other sharp object would be inserted through 28 and the segment bounded by 28 and the straight portion of 27 would be used as a finger grip to complete the removal operation.

Advantages of the above arrangements are:-

1. The closure could not accidently pop up in transit due to pressure on the walls of the container.
2. The diaphragm or carton section protects the cap from damage which can consequently be produced more economically from thinner material.

3. The package is made tamper evident since the contents can only be removed after the diaphragm or carton section is torn away.

CLAIMS

1. A securing device for attaching a closure to a container aperture, comprising a preformed thread member, which is adapted to be fixed to the region defining the aperture, whereby the closure may be held in sealing contact with this region so as to close the aperture.

2. A securing device according to claim 1, wherein the thread member comprises an externally threaded sleeve.

3. A securing device according to claim 2, further comprising an external flange at the end of the sleeve remote from the aperture for abutment with the closure.

4. A securing device according to claim 1, 2 or 3, wherein the thread is continuous.

5. A securing device according to any preceding claim for location on a neckring of a container or around the periphery of the aperture of a container.

6. A container including a securing device according to any preceding claim.

7. A container according to claim 6, further including anti-tamper means comprising a removable diaphragm located across the aperture.

8. A container according to claim 7, wherein the diaphragm includes lines or regions of weakness, whereby the diaphragm can be torn away.

9. A method of attaching a thread member to a container having a neckring comprising securing the thread member and a closure cap together by means of the or each thread on the thread member, forcing the closure cap over onto the neckring, and twisting-off the closure cap whereby the thread member is fixed to the neckring of the container.

10. A method of forming a closed container, comprising applying a closure cap secured to a thread member to a surface of the material of the container so as to secure the thread member to said surface and fastening together the respective side and base edges of the material to form the container.

11. A method according to claim 11 comprising forming an aperture at a predetermined position in the material and inserting the closure cap through the aperture so as to apply the thread member to the material.

12. A method according to claim 10 or 11, wherein a plurality of containers are produced by supplying the material continuously, forming a plurality of apertures in the material and successively taking predetermined lengths from the material.

13. A method according to claim 10, 11 or 12, wherein the edges of the container are fastened together by heat sealing.

14. A container including a closed aperture portion, comprising material which is flexible at least in the neck region between the aperture and the adjacent container wall, so that the closed aperture portion can be retained in a depressed mod and subsequently raised into an upstanding mode upon pressure being exerted on the walls of the container.

15. A container according to claim 14, wherein the flexible material in the neck region includes a thread member according to claim 1.

16. A container according to claim 15, including anti-tamper means comprising a removable diaphragm located across the aperture.

17. A container according to claim 14, 15 or 16, in the form of a heat-sealable carton.

18. A securing device for attaching a closure to a container aperture constructed and arranged substantially as herein described with reference to any of Figures 1 to 10 and 13 to 16.

19. A container constructed and arranged substantially as herein described with reference to Figure 11.

20. A method of attaching a thread member to a container substantially as herein described with reference to Figures 5 and 6 of the drawings.

21. A method of forming a closed container substantially as herein described with reference to Figure 12 of the drawings.

22. A container including a depressible closed aperture portion constructed and arranged substantially as herein described with reference to any of Figures 13 a and b and 14 to 16.

FIG.1a.

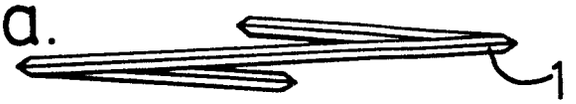
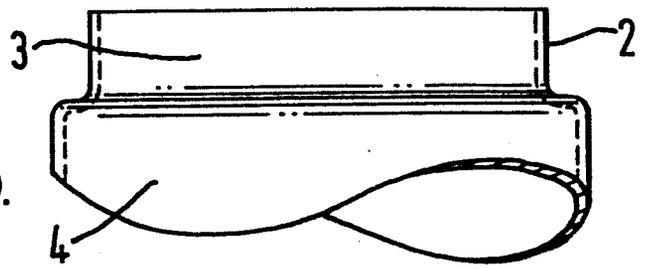


FIG.1b.



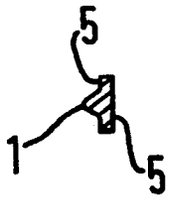


FIG.1d.

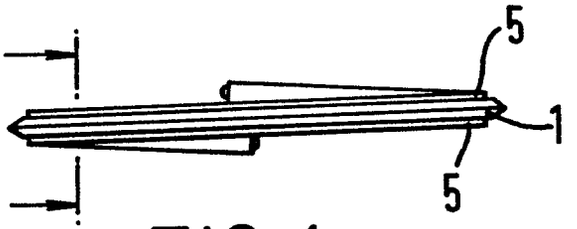


FIG.1c.

FIG.2a.

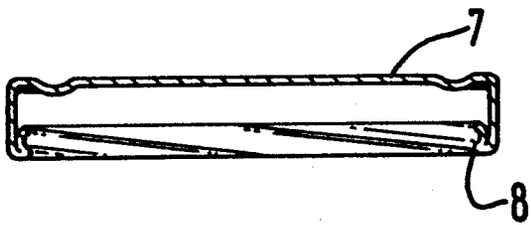


FIG.2b.

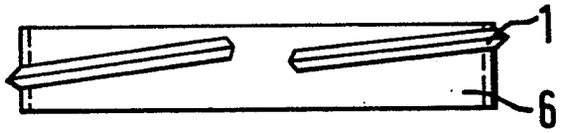


FIG.2c.

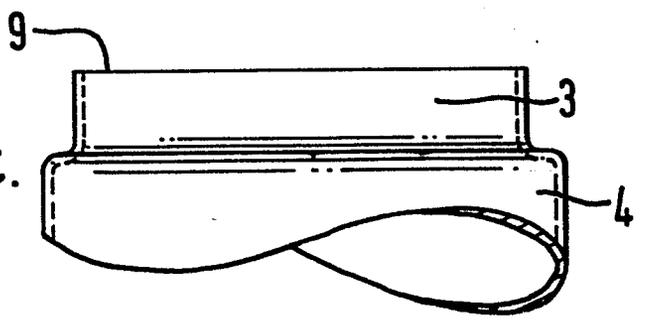


FIG. 3a.

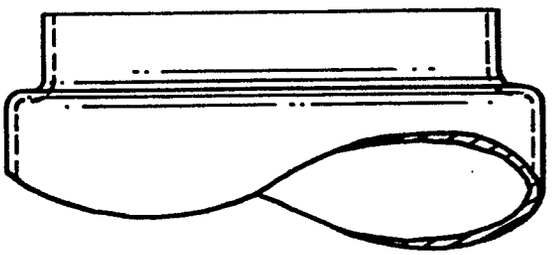
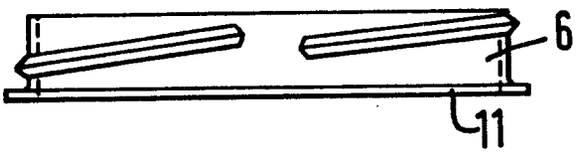


FIG. 3b.

FIG. 4a.



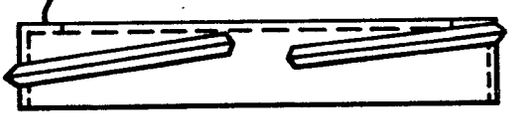


FIG. 4b.

FIG. 4a'

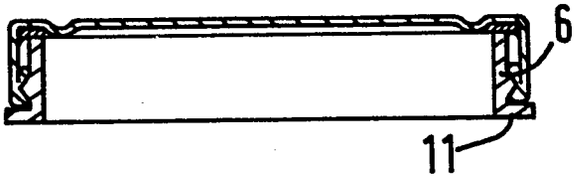
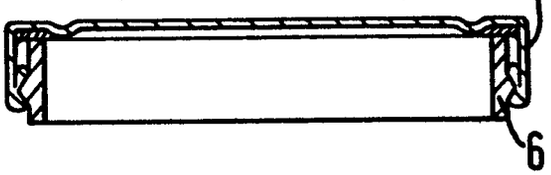


FIG. 5a.



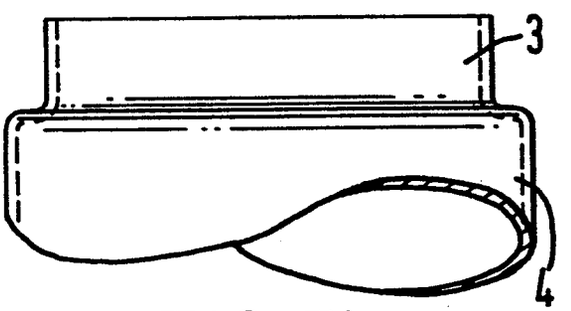


FIG. 5b.

FIG. 4c.

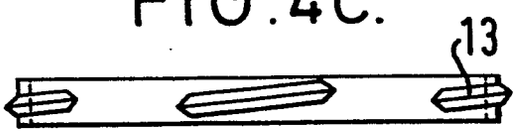


FIG. 4c'.

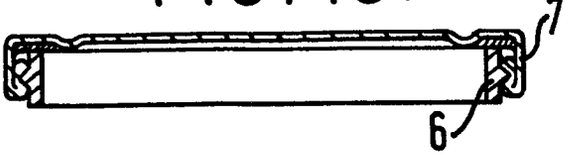


FIG. 5c.

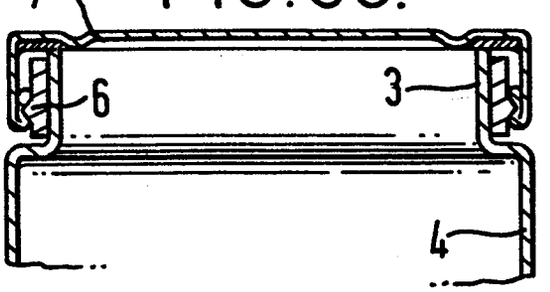


FIG. 6a.

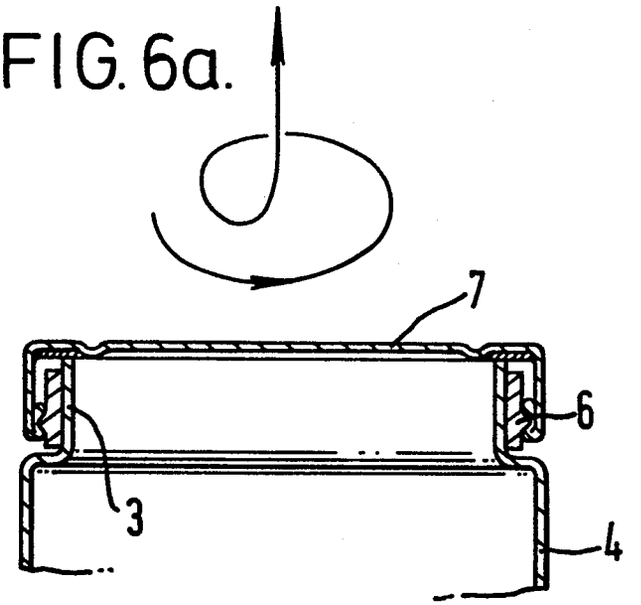


FIG. 6b.

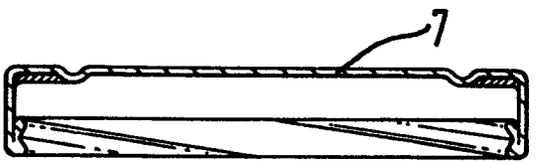


FIG. 6c.

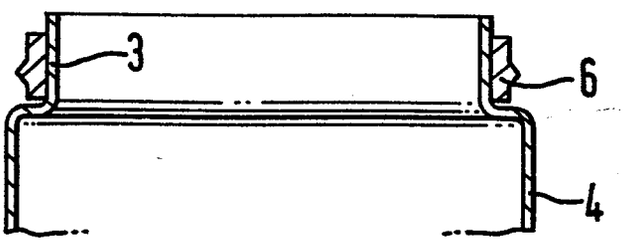


FIG. 7a.

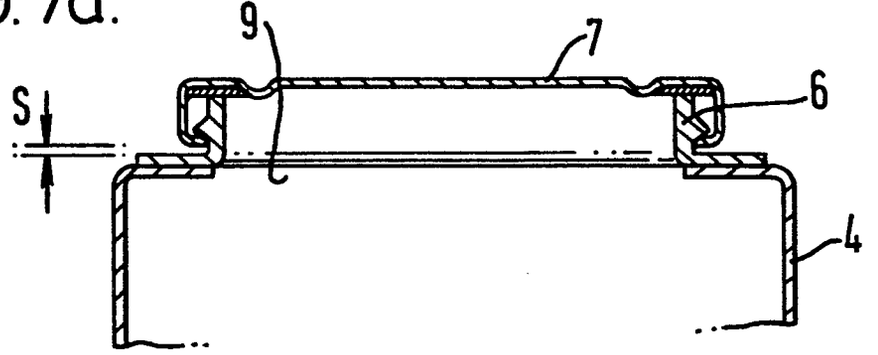


FIG. 7b.

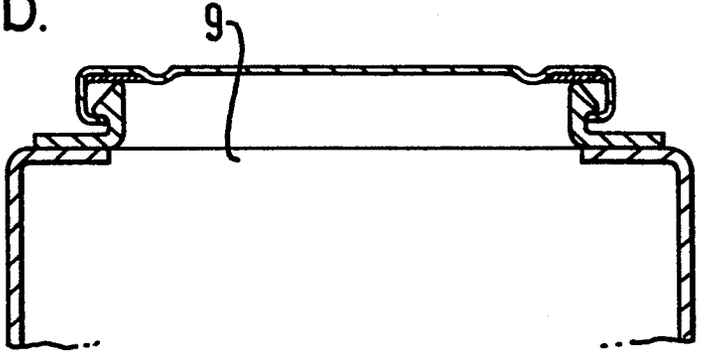
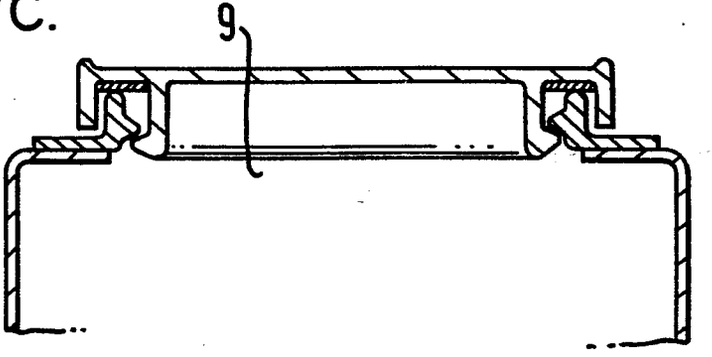


FIG. 7c.



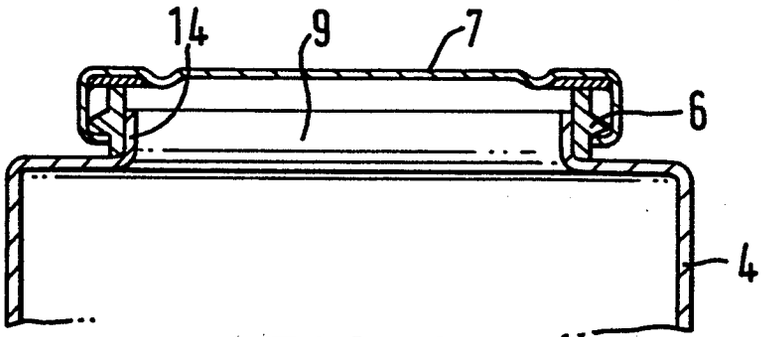


FIG. 8a.

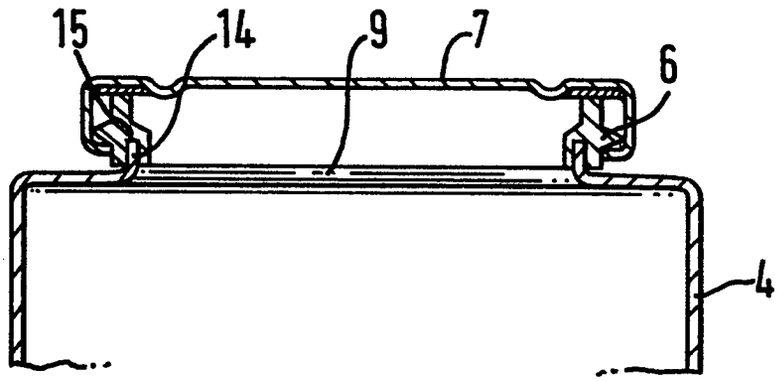


FIG. 8b.

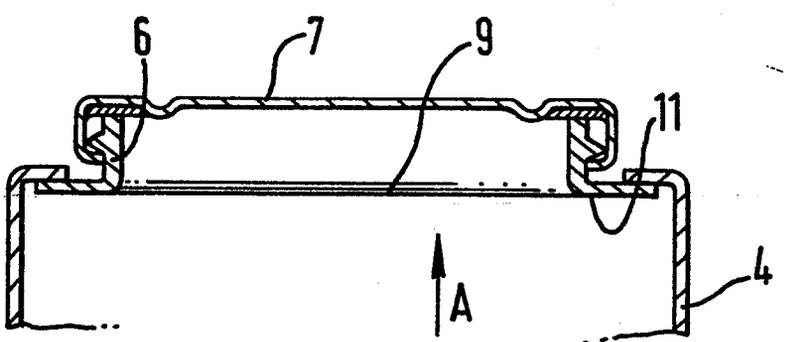


FIG. 9.

FIG.10a.

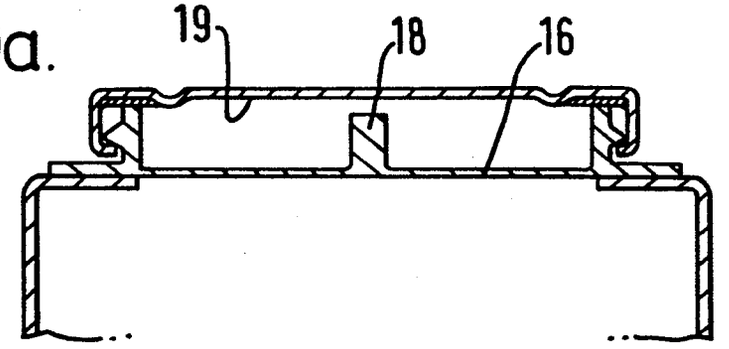


FIG.10b.

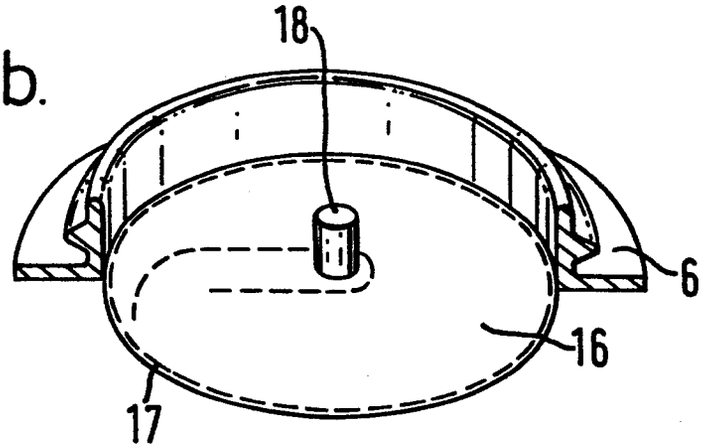


FIG.10c.

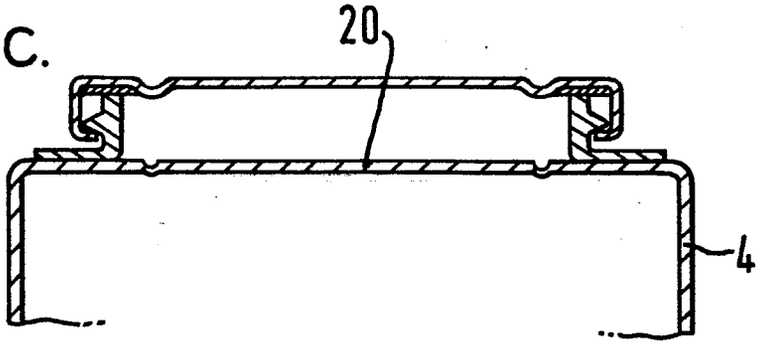


FIG.11

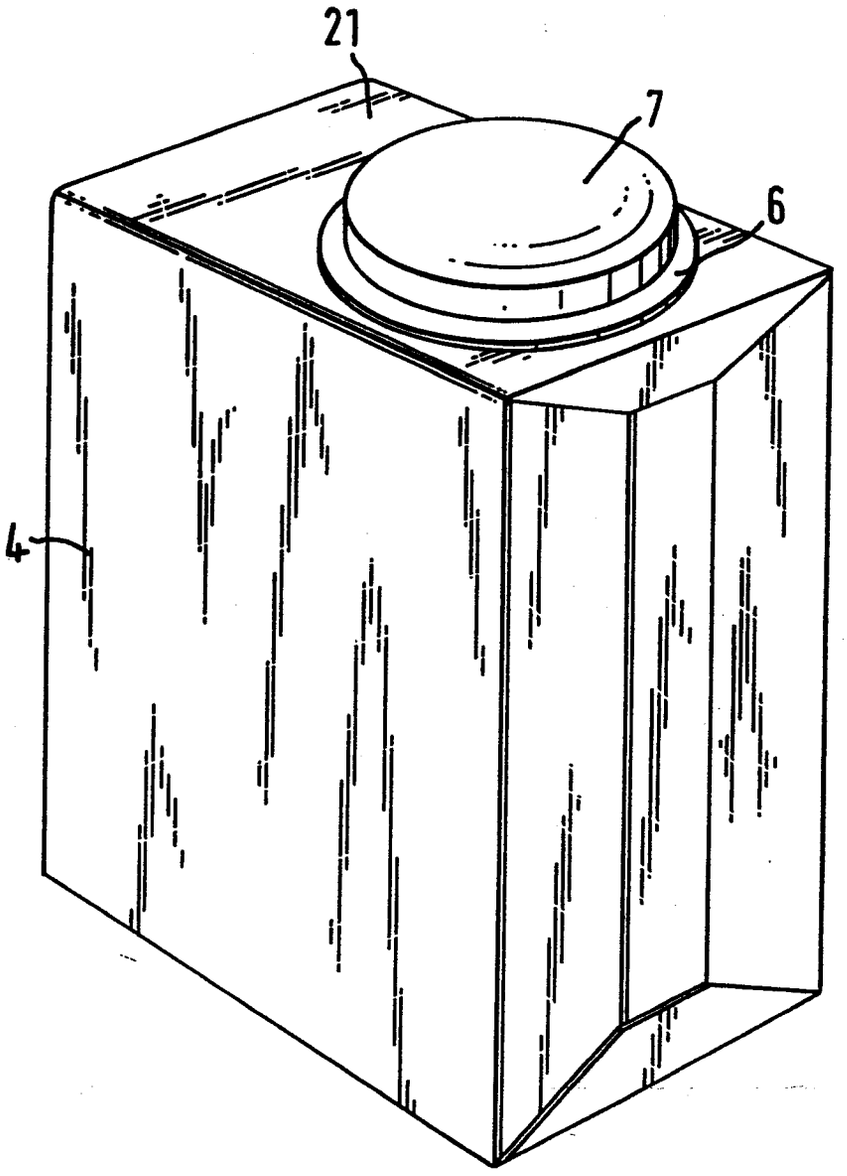


FIG.12.

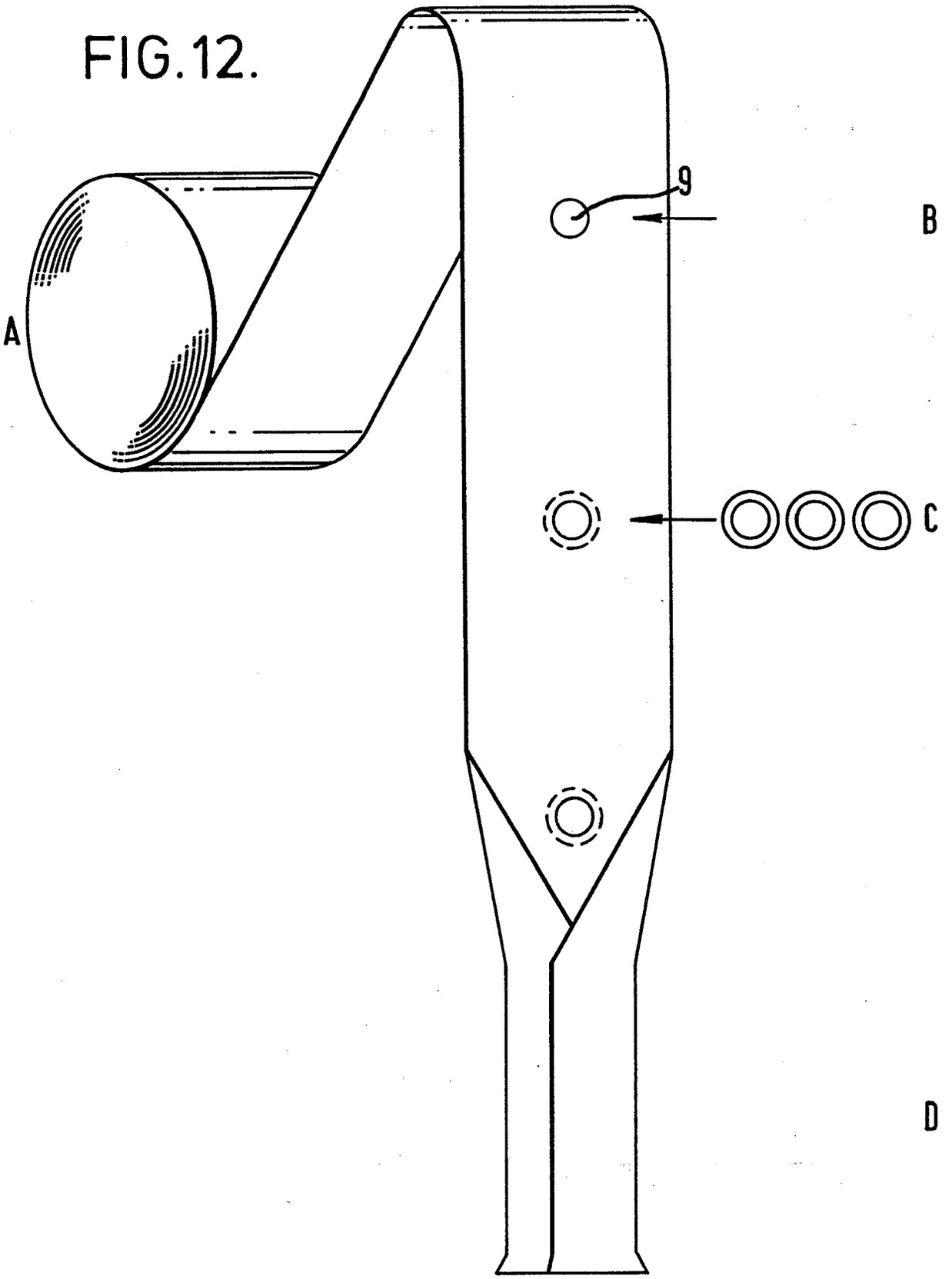


FIG.13a.

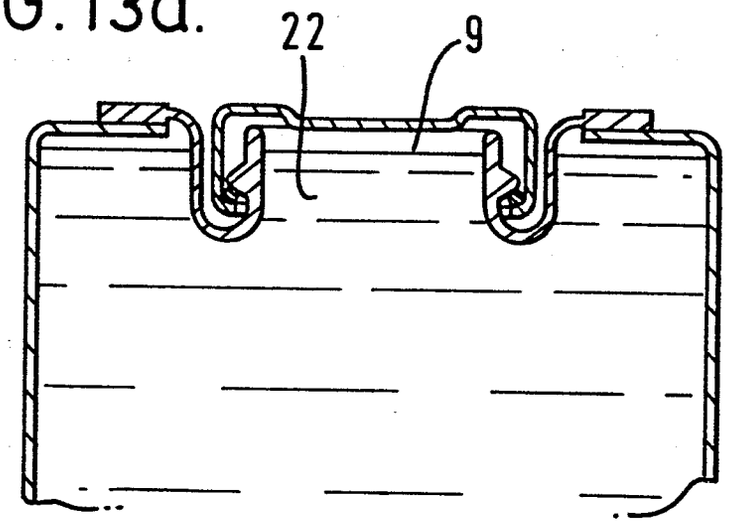


FIG.13b.

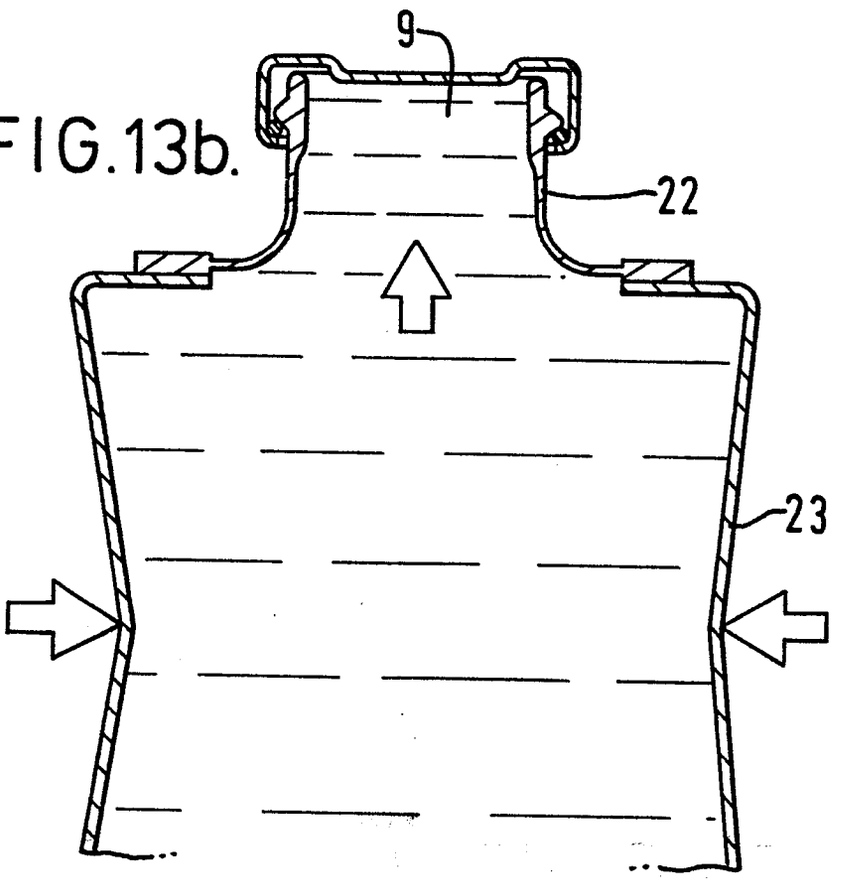


FIG. 14.

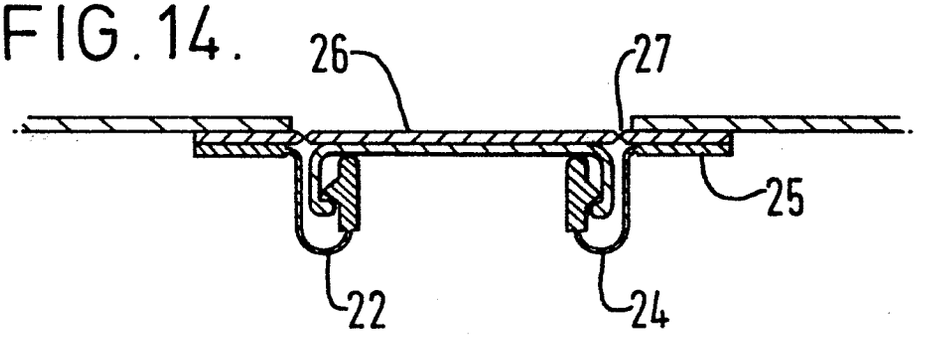


FIG. 15.

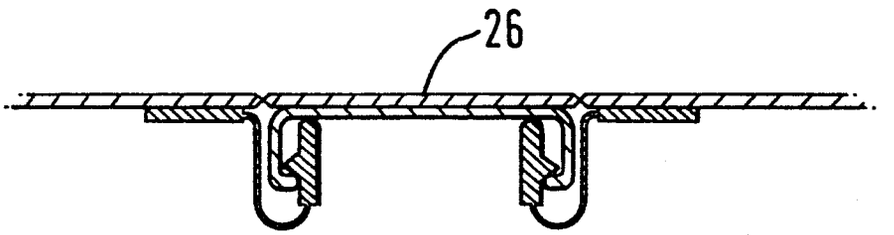


FIG. 16.