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(54) **Metal precontainer, a blow formed metal container and an apparatus and process for making same**

(57) The invention relates to metal precontainer for blow forming into a blow formed container comprising a cylindrical body, an upper component having an opening, and a lower component, wherein the upper component and/or the lower component are connected to the cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook, to a container blow formed and to an apparatus and process for blow forming the precontainer in to the container.

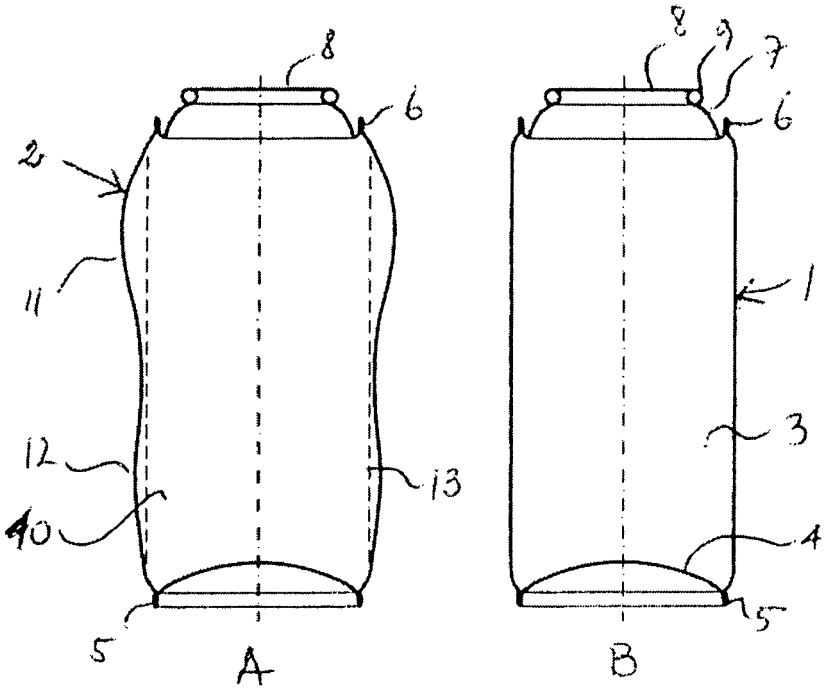

Fig. 1

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Description

[0001] The present invention relates to a metal precontainer, to a blow formed metal container and to an apparatus and process for making such blow formed metal container.

[0002] These blow formed metal containers are generally used as containers for a pressurized content, such as aerosol containers, containers for shaving cream, whipped cream and the like. These containers may be three piece containers comprising a cylindrical body an upper component and a lower component both seamed to the cylindrical body. The container may also have to form of a two pieces container in which case one component, generally the lower component is unitary with the cylindrical body and produced by deep drawing and ironing.

[0003] In the prior art, such as EP 521 637, containers are produced with an apparatus comprising an elaborate and complicated clamping system. The clamping systems is required in order to ensure the double seam joints between the container body and its upper and lower components do not unroll, fail or leak during the blow forming operation. Due to the complicated clamping system this apparatus and process of making blow formed containers suffers from the drawback that the complexity reduces operational flexibility. The reduced flexibility forms a problem in meeting needs to cope with small batch sizes, frequent change overs for making containers with different sizes and forms, particularly for price sensitive customers

[0004] The present invention has for its object to avoid the aforementioned drawbacks and problems and provide a precontainer that can be made by blow forming using a far less complex blow forming apparatus and process.

[0005] The present invention is based on the insight that the apparatus and process for blow forming a container can be relatively simple when the precontainer comprises means that avoid (at least partially) unrolling of the seam thereby maintaining substantially the integrity of the seam. Thereby, the use of complicated systems for clamping and/or maintaining the integrity of the seam can be avoided. This will save apparatus and process costs. Still the blow formed container will meet the customers tolerances and specification to a very high degree of confidence.

[0006] This object of the invention is obtained by providing a metal precontainer for blow forming into a blow formed container, comprising a cylindrical body, an upper component having an opening, and a lower component, wherein the upper component and/or the lower component is connected to the cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook. Although described for tinplate other metals and alloys are equally suitable, such as steel and aluminium.

[0007] As indicated above the incorporation of the locking means will avoid unrolling and a rupture and leaking of the seam which would make it unsuitable for the intended use. Still the costs for including the locking means into the precontainer will not to a major extent increase its costs. Furthermore, shorter cycle times are possible.

[0008] According to a preferred embodiment the seam is there called "double seam" because the metal from the component had been folded twice. Such a seam is reliable and generally used. However, it is noted at this point that other types of seams such as single seams may also be used.

[0009] According to another embodiment the locking means comprise a pinched part of the double seam. By pinching the seam shaper angels and/or kinked structures are formed in the seam. As a result the body hook is locked against unrolling from the component hook, so that during blow forming unrolling of the body hook and the component hook is to a major extent avoided as the unrolling force will be much larger than generated by the blow forming pressure exerted on the body and the component near the seam.

[0010] The pinching should be such that at least in the area of the overlap of the body hook and the component hook (where five metal layers overlap), the measured thickness of the seam relative to thickness of the five metal layers expressed as the seam tightness is more than 85%, preferably 90 - 100%, more preferably 95 - 100%. Without such pinching the seam tightness is generally less than 85%, such as less than 80%. This pinching operation can be carried out when making the double seam and additionally compress or pinch the seam particularly in the overlap area, which is generally the area with were the seam has its largest thickness.

[0011] When the pinching operation is (in addition) carried out in the area outside the overlap area then the seam will be provided in the pinched part with a kinked body hook and/or kinked component hook. Such kinking of the body hook and/or component hook will have a positive effect on the locking of the body hook to the component hook.

[0012] According to another embodiment the locking according to the present invention can be further improved by the selection of body plate material. Such that the body plate is easily formed and as a consequence reduces the tendency of the body hook to be pulled out of the component hook in the seam.

[0013] In order to optimise the material performance it has been found advantages to control the materials elongation properties but to also control the materials r value of the Lankford coefficient which is a measure for the plastic anisotropy of the metal sheet out of which the body is formed. In this way not only is the blow forming force on the double seam reduced, but blow forming expansions of up to 30% are also possible. The r value for the Lankford coefficient is preferably in the range of 1.0 - 2.0, preferably 1.2 - 1.8, more preferably 1.35 - 1.6. In practice, the r value is generally measured at 20% elongation in a tensile test.

[0014] According to another embodiment is in the cylindrical body the C-grain direction in the circumferential direction. This has as an effect that in the circumference the body (particularly in the region of the longitudinal weld) is stronger and more resistant to splitting. This is beneficial at higher expansion and reduces the risk for leaking.

[0015] According to another embodiment of the locking means of the invention, is the locking of the body hook and of the component hook improved when the locking means comprise means adhering the body hook to the component hook, preferably the adhering means comprise adhesive and/or solder. By using adhesive or solder the body hook and component hook are strongly adhered to another. Obviously, this form of locking means can be used in combination with the pinched means. Particularly, for other types of seams.

[0016] According to a second aspect, the invention also relates to a blow formed metal container, obtainable by blow forming a precontainer. In particular, using a precontainer as described hereinbefore. Such container has an optimal resistance against a disrupture of the seam due to the blow forming pressure resulting is a leaking seam, particularly when the seams are not clamped.

[0017] According to a third aspect the invention relates to an apparatus for blow forming a precontainer having an upper component and/or a lower component connected to a cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook, into a blow formed metal container, comprising a blow forming mould having:

i. two mould parts for surrounding a cylindrical body and defining the form of the blow formed container body;
ii. a base block comprising means for supporting the lower component of the precontainer; and
iii. a nozzle block comprising means for applying pressurized blow forming fluidum to an opening in the upper component of the precontainer;

and means for connecting to the pressurized blow forming fluidum, which fluidum is preferably gas, such as air.

[0018] It is preferred that the support means for the lower component comprise a supporting element and/or means for substantially equalizing the fluidum pressure. This reduces the pulling apart force resulting from a change in form of the lower component such as from flat or concave form into a convex form. There is no need to fully support the lower component during blow forming. It is sufficient that the lower component does not undergo a form transformation. This is accomplished when the support element has a form at least partially complementary to the form of a part of the lower component.

[0019] It is preferred for reasons of lower production costs when the two mould parts are mould halves of equal form and dimensions.

[0020] In order to substantially maintain the original form and dimentions of the seam and/or opening, so that customers may use these structural elements for attaching caps, metering and release valves and the like, it is preferred that the base block and/or the nozzle block comprise confinement means for confining the seam and/or the opening of the upper component. Accordingly, form and dimension changes during blow forming is substantially avoided.

[0021] Optimal results are obtained with the apparatus of the invention when preferably the precontainer is a precontainer as defined hereinbefore.

[0022] A fourth aspect of the invention relates to process for blow forming a precontainer into a blow formed metal container, comprising the steps of:

i. providing the precontainer of which the upper component and/or the lower component are connected to the cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook;
ii. supporting the precontainer on a base block; confining the cylindrical body with two mould parts defining the form of the blow formed container body;
iii. supporting the lower component of the precontainer; and
iv. applying pressurized blow forming fluidum to an opening in an upper component of the precontainer.

[0023] It is preferred for avoiding pulling out of the body hook that in step iii) the lower component is supported by a supporting element and/or by fluidum pressure. For similar reasons it is preferred when in step iv) before applying the fluidum pressure the upper component is supported, and/or the seam and/or opening is confined.

[0024] Mentioned and other features of the precontainer, the blow formed container, the apparatus and process for making such container according to the invention will be further illustrated by several examples and embodiments which are given for information purposes only and are not intended to limit the invention to any extent. In relation to these embodiments reference will be made to the annexed figures of which:

Figure 1A and 1B side views of the blow formed container and its precontainer, respectively;
Figure 2A - 2D schematically the formation of a double seam according to the invention;
Figure 3 schematically another double seam of the invention;
Figure 4A and 4B in cross section a double seam according to the invention before and after blow forming, respectively;
Figures 5 and 6 in cross section double seams of the invention with a tightness of 100% and 95%, respectively;
Figure 7A and 7B alternative seams according to the invention;
Figure 8 and 9C-D show schematically the blow

forming of a container of the invention;
Figures 10 and 11 show in cross section alternatives for the nozzle block of the invention;
Figure 12A-D show in cross section alternatives for the base block; and
Figure 13 shows in a broken away perspective an alternative for the nozzle block of the invention.

[0025] Figure 1 shows a precontainer 1 and a blow formed container 2 according to the invention. Both containers 1 and 2 are a tinplate (gauge 0.19mm, TS260) three piece container 1,2. The precontainer comprises a cylindrical body 3 made from a sheet of tinplate and formed into a cylinder and longitudinally welded. A lower concave or dome shaped component 4 is connected to the body 3 via a double seam 5. Via a double seam 6 is an upper component 7 connected to the body 3. The upper component 7 has an opening 8 provided with a curl 9. When needed height compensation is possible.

[0026] The blow formed container has a blow formed body 10 comprising two expanded body portions 11 and 12 of larger but mutually different diameters. The contour of the precontainer 1 is illustrated by the broken line 13. Expansion up to 30 - 40% is possible.

[0027] Figure 2 shows the various steps of making a double seam of the invention comprising the inventive locking means 14. Figures 2A shows a chuck 15 contacting an upper component 16 resting on an edge 17 of a body 18. A seaming roller 19 contact a curl 20 of the upper component 16. As shown in figure 2B, the roller 19 moves while rolling towards the chuck 15 thereby forming the body hook 21 and the component hook 22. In a second step a seaming roller 23 is contacting the seam and ultimately forms the double seam 24. The double seam comprises pinched part 25 having a tightness of 98% and a kinked component part 26. Accordingly, the locking means 14 according to the invention as reliable and easily formed with adapted seam forming means (roller 23) resulting in a tightly pressing and kinking of the double seam 24.

[0028] Figure 3 shows another double seam 36 of the invention connecting a lower component 37 and a body 38. The tightness at the overlap of the body hook 39 and the component hook 40 is about 100%. Such tightness was obtained by pinching at least the overlap area 41.

[0029] Figure 4A shows a double seam 29 of the invention connecting a body 28 and an upper component 27. The double seam comprises a body hook 30 and a component hook 31 which partially overlap. At this location 32 is the tightness about 90%. In the pinched distal part 33 of the seam 29 is the tightness about 99%. The location 32 and the pinched part 33 form the locking means 14 of the invention. Figure 4B shoes the double seam 29 after blow forming. It is evident that the blow forming had no substantial effect of the structure and form of the double seam 29. The tightness at the location is slightly smaller and in the pinched part 33 substantially not changed.

[0030] Figure 5 shows a double seam 35 having a tightness of about 100%.

[0031] Figure 6 shows a double seam having a tightness of about 95%. Both measures of the tightness were done in the area of maximum thickness of the seam which is at the location of the overlapping body hook and component hook.

[0032] Figure 7A shows an alternative for the locking means 14 of the invention for the seam 42. The locking means 14 comprise adhesive 43 adhering the body hook 46 and the component hook 47 together. In a similar manner the locking means 14 of the seam 44 comprise solder 45 attaching the body hook 46 and the component 47 together.

[0033] Figures 8 and 9 show the making of a container 1 according to the invention. From a rol 48 of tinplate having an r value of 1.45 for the Lankford coefficient and the C grain direction in the direction of the arrow 50 is cut along cutting line 51 into sheets 52. The sheet 52 is formed into a cylinder 53 and longitudinally provided with a weld 54.

[0034] The cylinder 53 is provided at both ends with an upper component 7 and a lower component 4 as described in relation to figure 2. The precontainer 1 is placed on a base block 55 and aligned by accommodating the seam 5 in a groove 58 (figure 9A). The groove is wider than the thickness of the seam 5 and functions also as a go/no-go gauge when the seam 5 is not sufficiently pinched and out of specification. Obviously the blow forming can proceed without the use of such groove 58. When during blow forming height is reduced, height compensation is possible with the base block and with the nozzle block, independently as well as concomitantly.

[0035] Subsequently, the cylindrical body 1 is confined between two identical mould halves 59 and 60 moved in along the arrows 61 and 62. The mould halves 59 and 60 carry the contour 63 for the expanded outer form of the container 2 (figure 9B). A nozzle block 64 is place along arrow 65 on the upper component 7 sealing on the seam 6 by a seal 66 (figure 6C). A piston 67 is placed in the nozzle block 64 and seal a seal 69 contacts the curl 9 of the upper component 7. Pressurized air (30 -40 bar) is used to blow form the container 2 (figure 6D). Thereafter, pressure is shut off, the nozzle block 64 and the mould halves 59 and 60 removed. Vacuum 56 is interrupted and the blow formed container 2 released. As shown with relatively simple mould parts (55, 59, 60, 64 and 67) and without clamping the double seams 5 and 6 of the invention a reliable aerosol container can be made using a blow forming pressure of 30-40 bar although the container will operate generally at about 12-15bar.

[0036] With regard to the tendency of upper component 7 to reverse as a consequence of the internal forming pressure this may be reversed and controlled. Figure 10 shows a nozzle block 70 that introduces the high pressure air into the precontainer 1 via the opening 8. The nozzle block 70 has a seal in an annular groove 71 that seals on the double seam 6. The nozzle block 70 also

has a counter bore 73 that allows the high pressure air to circulate on both sides of the upper component 7 thus internal and external forces are matched and there is no tendency for the component to move.

[0037] Figure 11 shows an alternative embodiment of the nozzle block 74 in which the inner face 75 of the nozzles block 74is profiled to create metal to metal contact between the upper component dome 7 and the nozzle block 74. This has two functions, to create a partial seal and to resist any tendency of the component to reverse. Thereto an annular groove 76 containing a seal 77.

[0038] In an alternative the top nozzle block has the same counter bore profile as Figure 11 but in this case to create a complete metal to metal seal and thus the annular groove with the seal is unnecessary. In this case the metal to metal contact serves both as a seal and a means of preventing the component from reversing while under high pressure.

[0039] Figure 12 A-D shows various alternatives for the base block. In Figure 12A the base block 78 has a support that partially (not in its centter) support the dome shaped lower component 4 of the container 1. In Figure 12B the base block has a support provided with vacuum channels 82 and also partially supporting the lower component 4. In figure 12C the base block 83 has a central depression 84 and an annular support 85. Figure 12D shows a base block 88 having a centre pin 87 that supports the dome shaped lower component 4 during the blow forming. In all embodiments the transformation of the lower component 4 from concave (or flat, not shown) is avoided.

[0040] Figure 13 shows a nozzle block 89 of the invention. The nozzle block comprises a skirt 90 provided with a groove 91 accommodating a seal 92 contacting the double seam 6. The skirt 90 with the wall 93 contacts the curl 9. Both curl 9 and seam 6 are confined when blow forming the container 2 thereby avoiding deformation and maintenance of the original form and dimesions.

Claims

1. Metal precontainer for blow forming into a blow formed container comprising a cylindrical body, an upper component having an opening, and a lower component, wherein the upper component and/or the lower component is connected to the cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook.

2. Precontainer according to claim 1, wherein the seam is a double seam.

3. Precontainer according to claim 2, wherein the locking means comprise a pinched part of the double seam.

4. Precontainer according to claim 3, wherein the pinched part has a seam tightness being the measured thickness of the seam relative to the thickness of the five metal layers, is more than 85%, preferably 90 - 100%, more preferably 95 - 100%.

5. Precontainer according to claim 3 or 4, wherein the pinched part comprises a kinked body hook and/or kinked component hook.

6. Precontainer according to claim 1 - 5, wherein the metal of the cylindrical body has a Lankford coefficient of 1.0 - 2.0, preferably 1.2 - 1.8, more preferably 1.35 - 1.6.

7. Precontainer according to claim 1 - 6, wherein in the cylindrical body the C-grain direction is in the circumferential direction.

8. Precontainer according to claim 1 - 7, wherein the locking means comprise means adhering the body hook to the component hook, preferably the adhering means comprise adhesive and/or solder.

9. Blow formed metal container, obtainable by blow forming a precontainer according to claim 1 - 8.

10. Apparatus for blow forming a precontainer having an upper component and/or a lower component connected to a cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook, into a blow formed metal container, comprising a blow forming mould having:

    i. two mould parts for surrounding a cylindrical body and defining the form of the blow formed container body;
    ii. a base block comprising means for supporting the lower component of the precontainer; and
    iii. a nozzle block comprising means for applying pressurized blow forming fluidum to an opening in the upper component of the precontainer;

    and means for connecting to the pressurized blow forming fluidum, which fluidum is preferably gas, such as air.

11. Apparatus according to claim 10, wherein the support means for the lower component comprise a supporting element and/or means for substantially equalizing the fluidum pressure.

12. Apparatus according to claim 11, wherein the support element has a form at least partially complementary to the form of a part of the lower component.

13. Apparatus according to claim 10 - 12, wherein the

base block and/or the nozzle block comprise confinement means for confining the seam and/or the opening of the upper component.

14. Apparatus according to claim 10 - 13, wherein the precontainer is a precontainer as defined in claims 1 - 8.

15. Process for blow forming a precontainer into a blow formed metal container, comprising the steps of:

i. providing the precontainer of which the upper component and/or the lower component are connected to the cylindrical body by a seam comprising a component hook, a body hook and means for locking the body hook to the component hook;
ii. supporting the precontainer on a base block;
iii. confining the cylindrical body with two mould parts defining the form of the blow formed container body;
iv. supporting the lower component of the precontainer; and
v. applying pressurized blow forming fluidum to an opening in an upper component of the precontainer.

16. Process according to claim 15, wherein in step iii) the lower component is supported by a supporting element and/or by fluidum pressure.

17. Process according to claim 15 or 16, wherein in step iv) before applying the fluidum pressure the upper component is supported, and/or the seam and/or opening is confined.

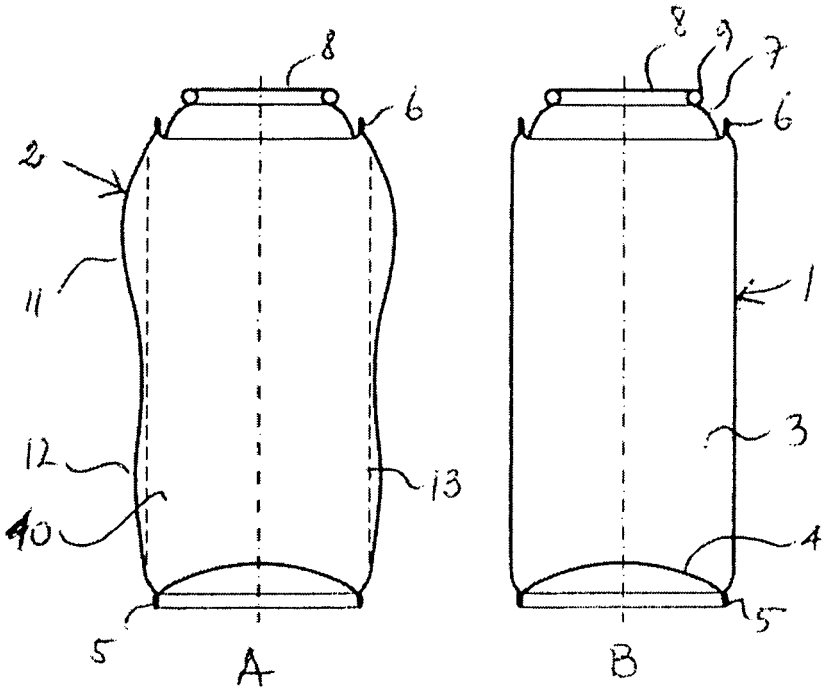

Fig. 1

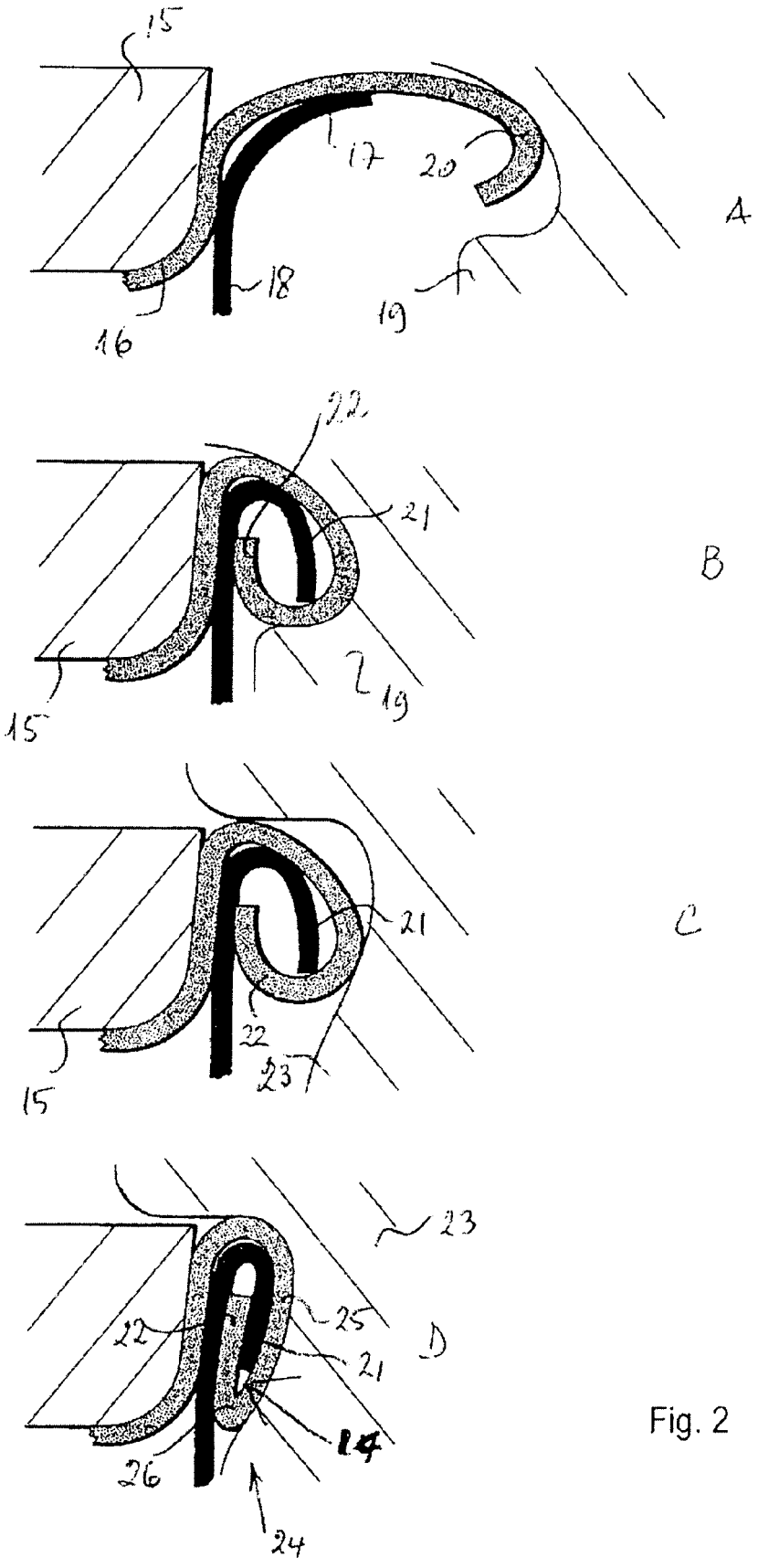

Fig. 2

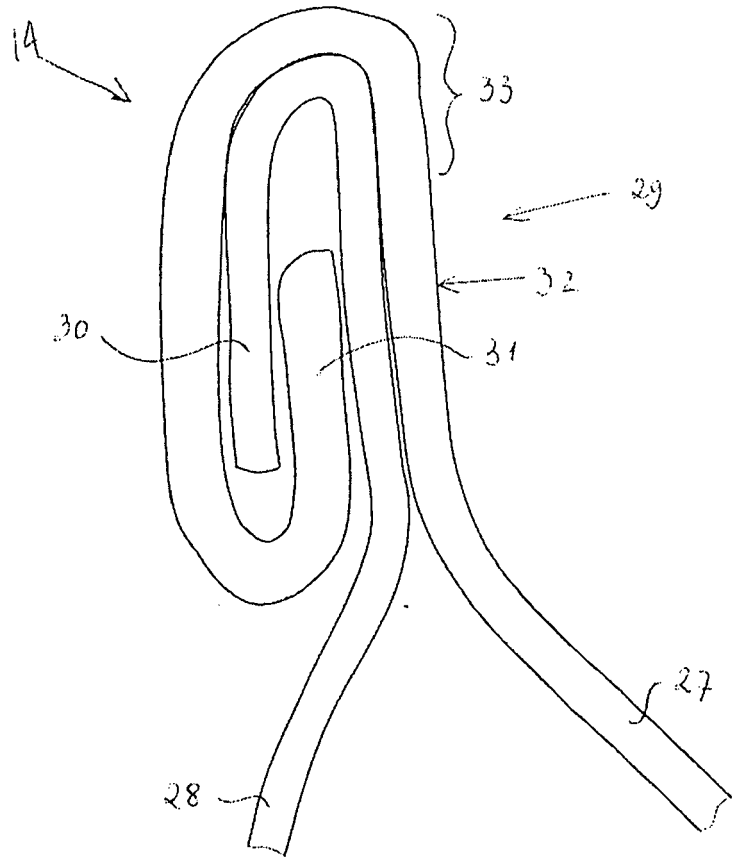

Fig 4 A

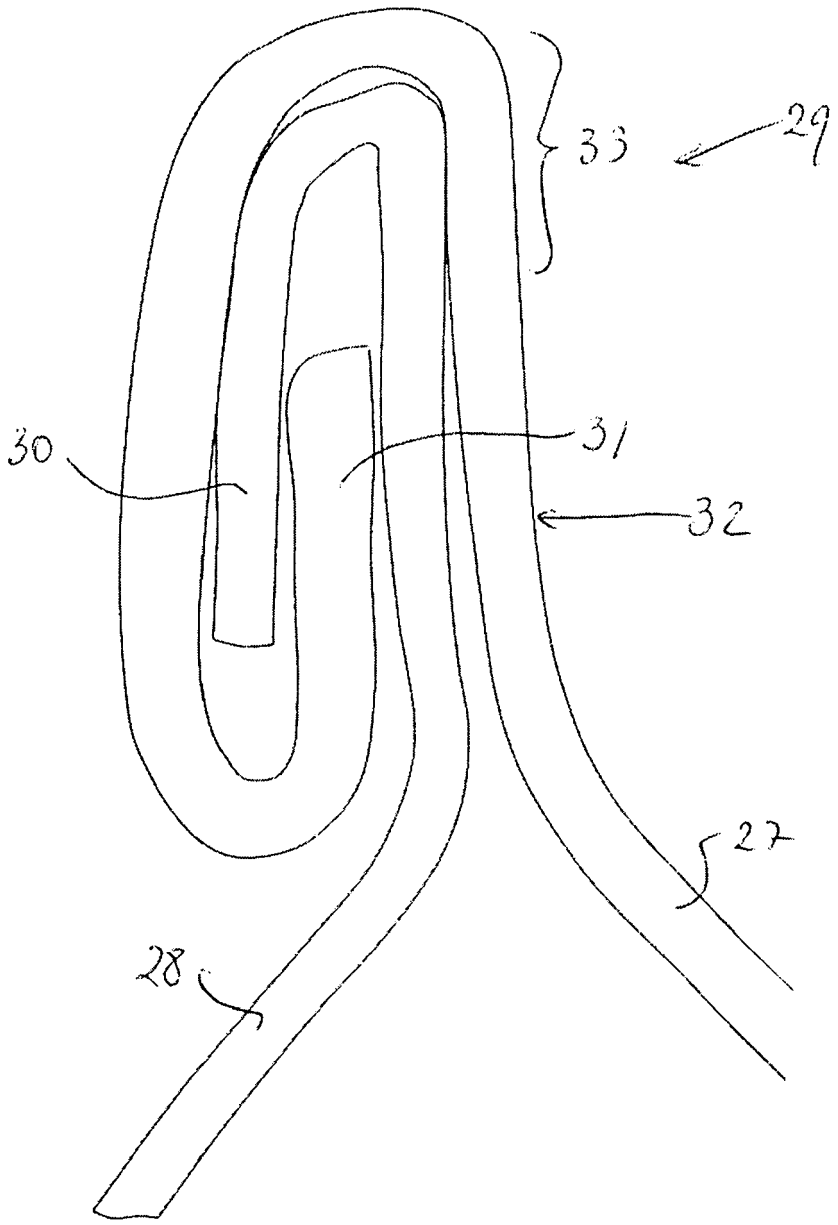

Fig 4 B

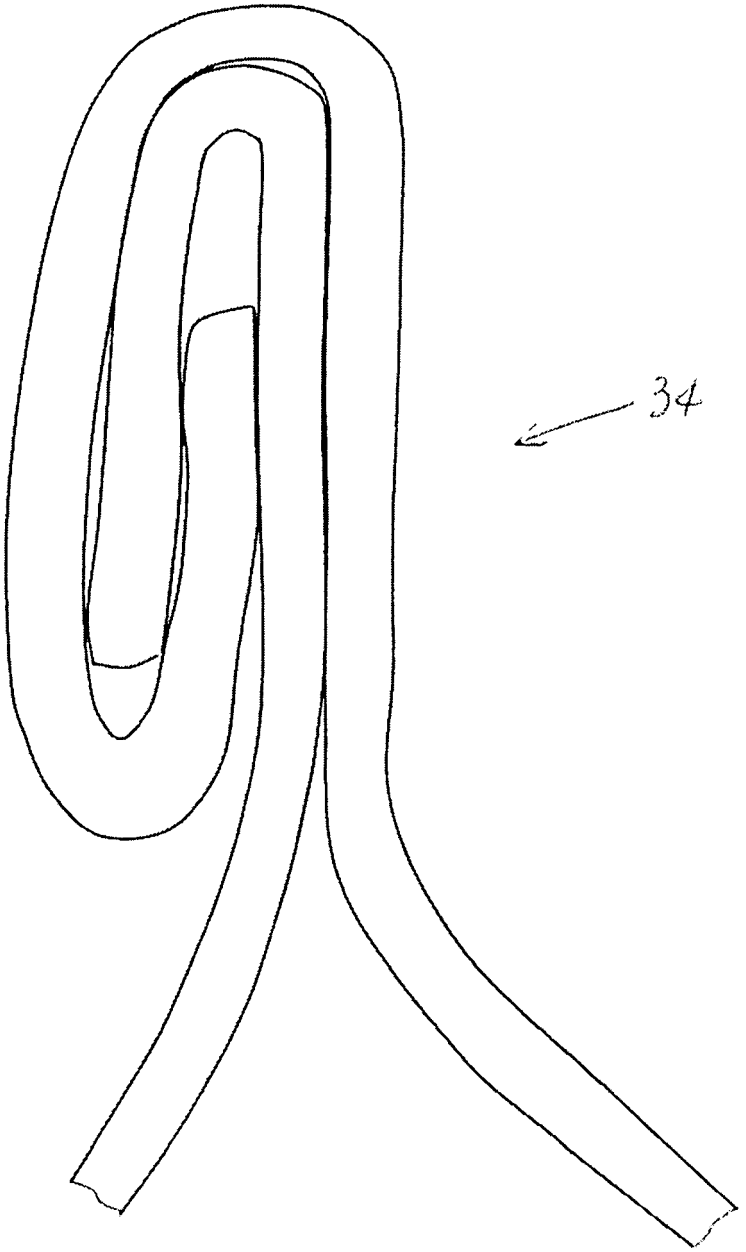

Fig 5

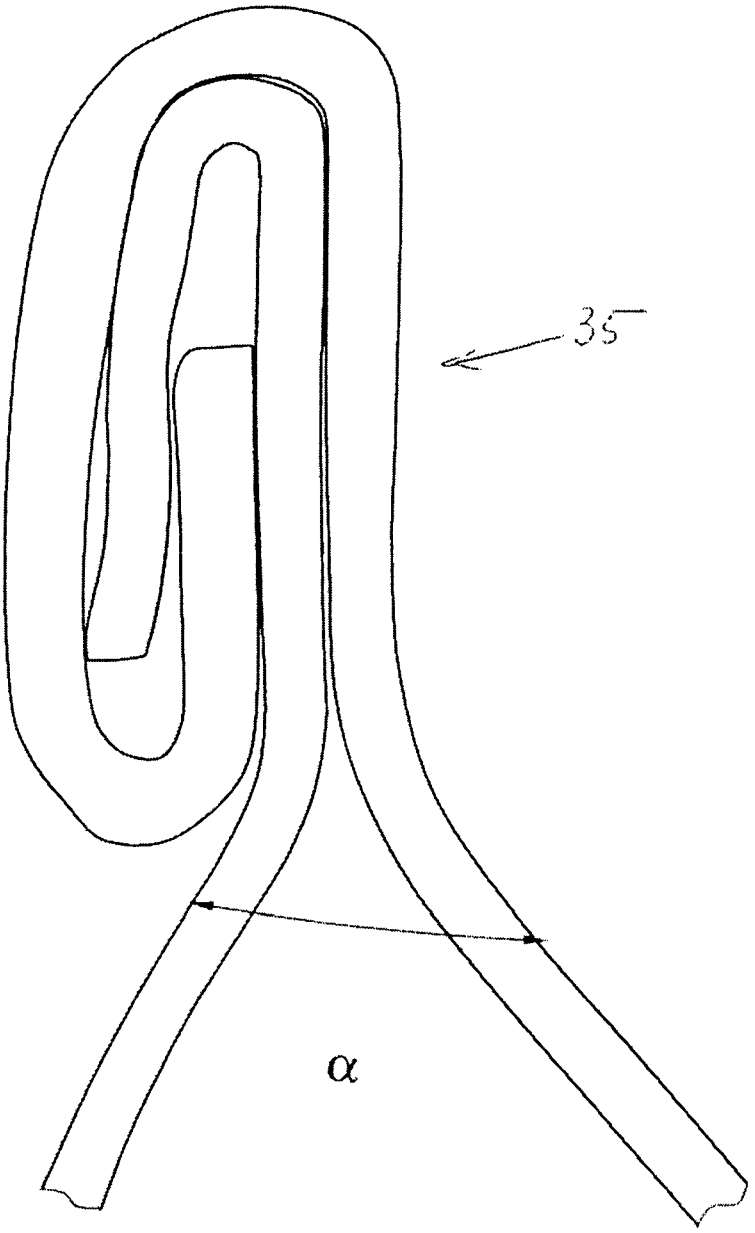

Fig6

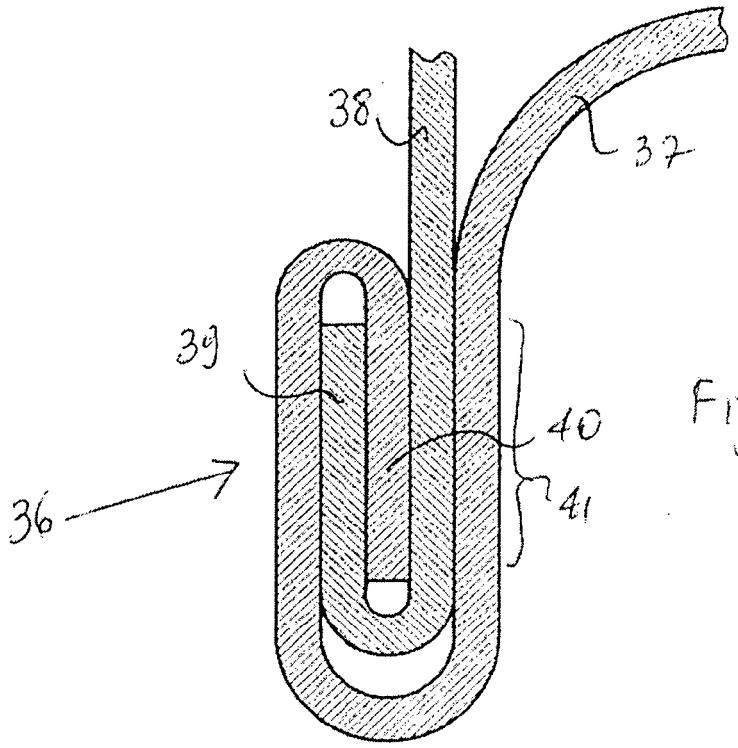

Fig 3

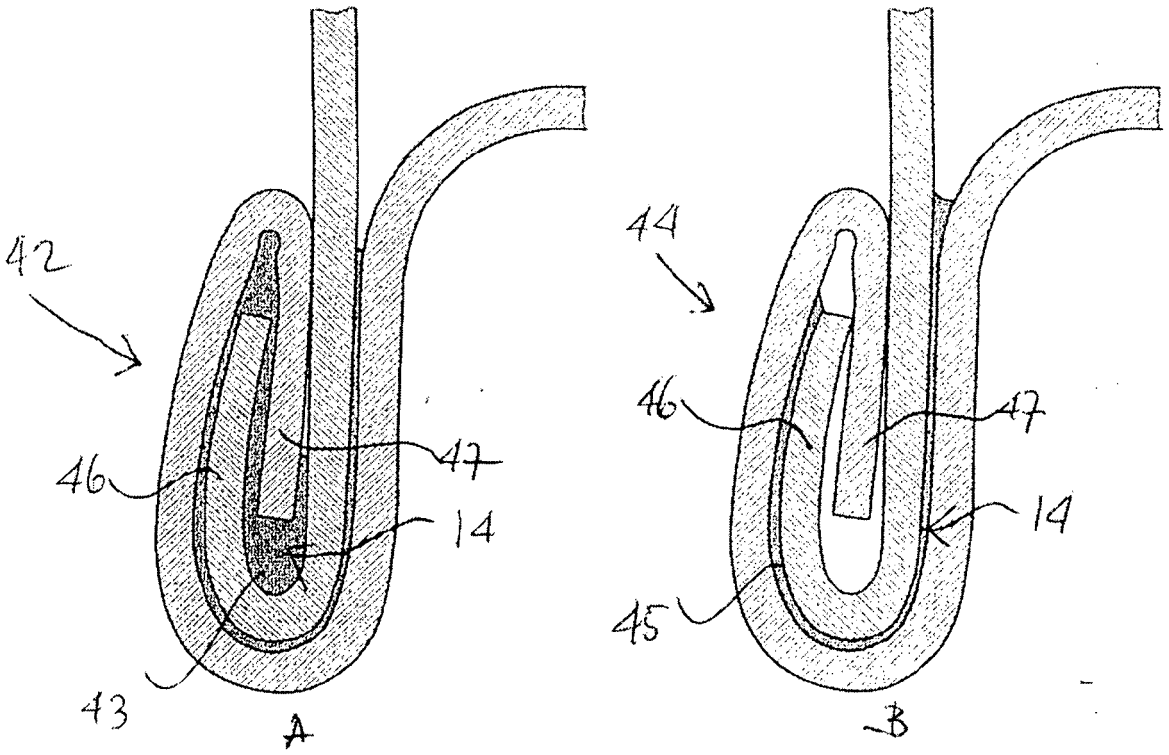

Fig 7

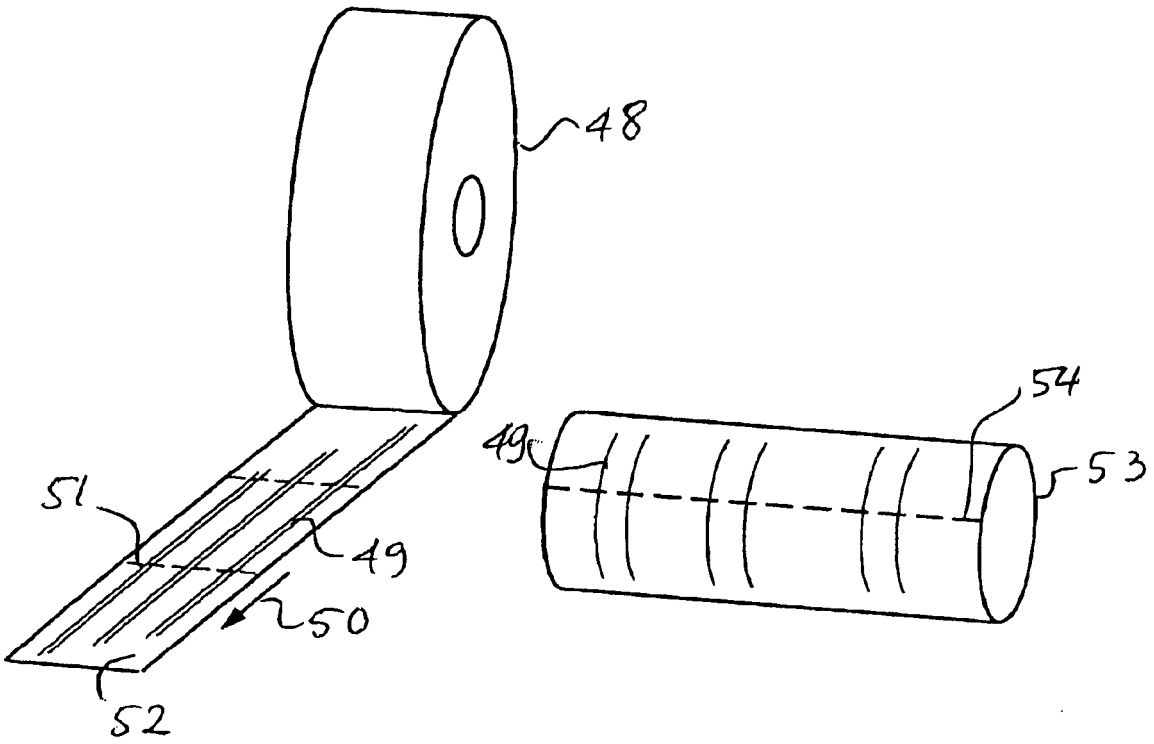

Fig 8

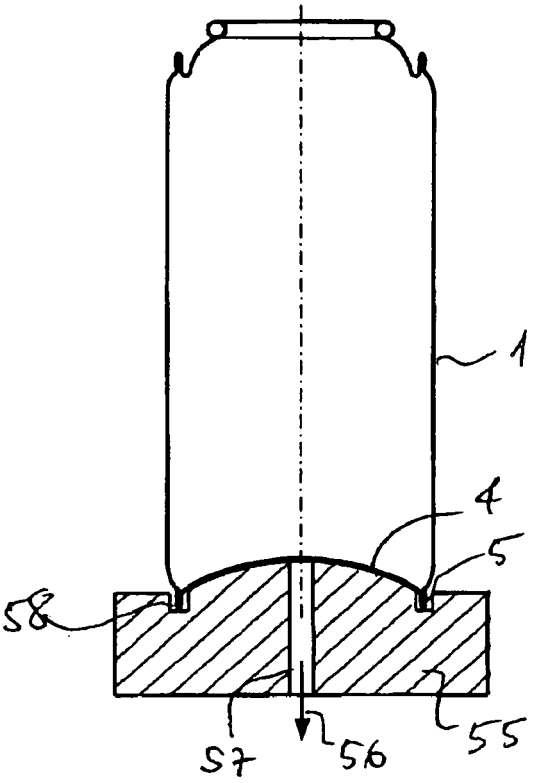

Fig 9A

Fig. 4

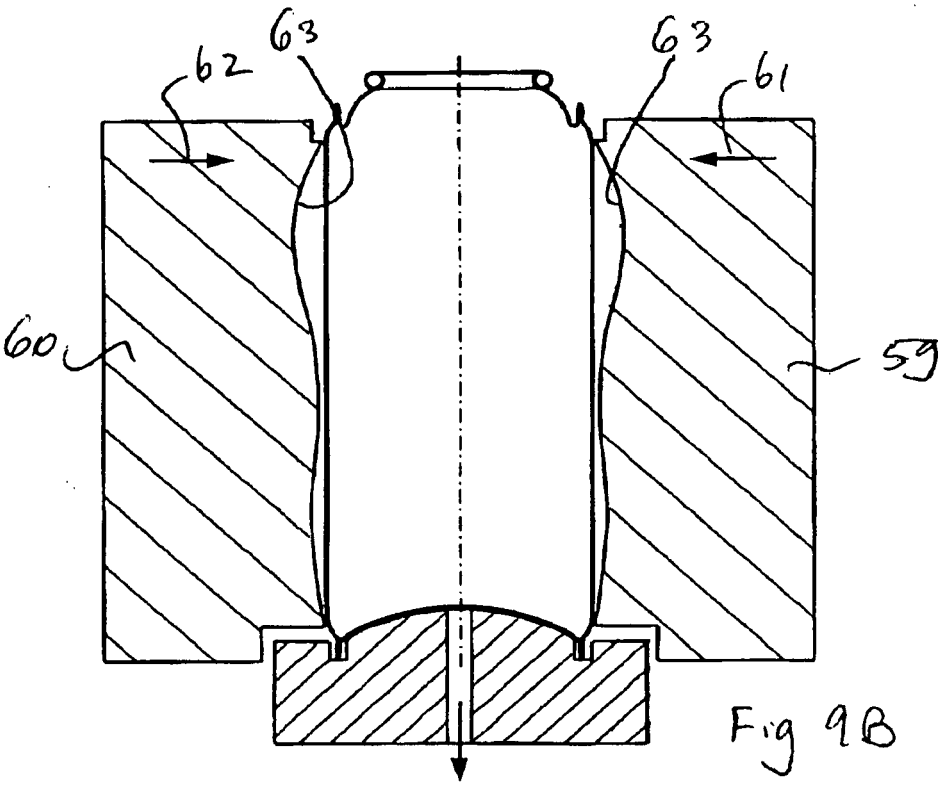

Fig 9B

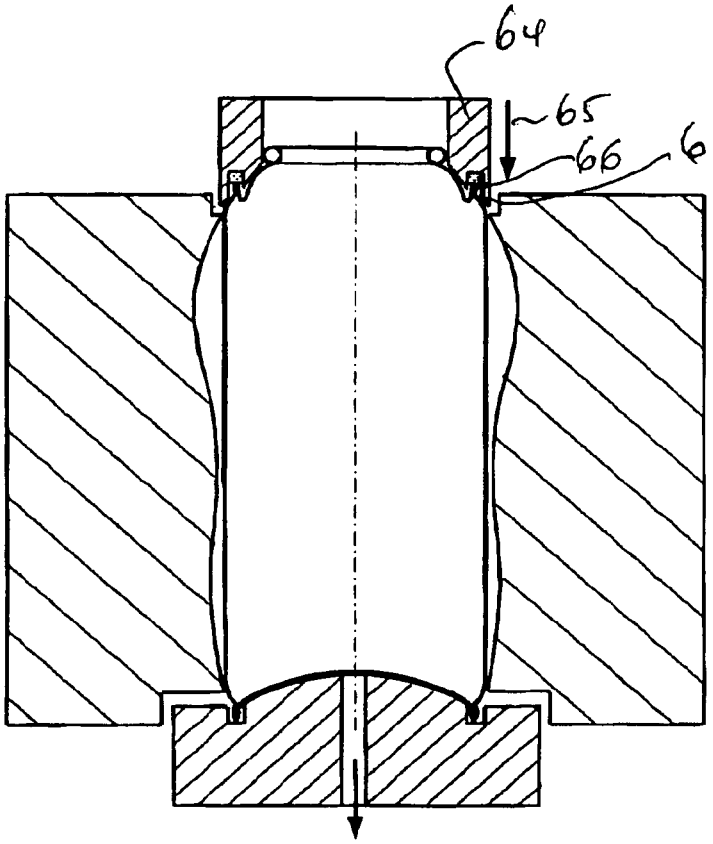

Fig 9C

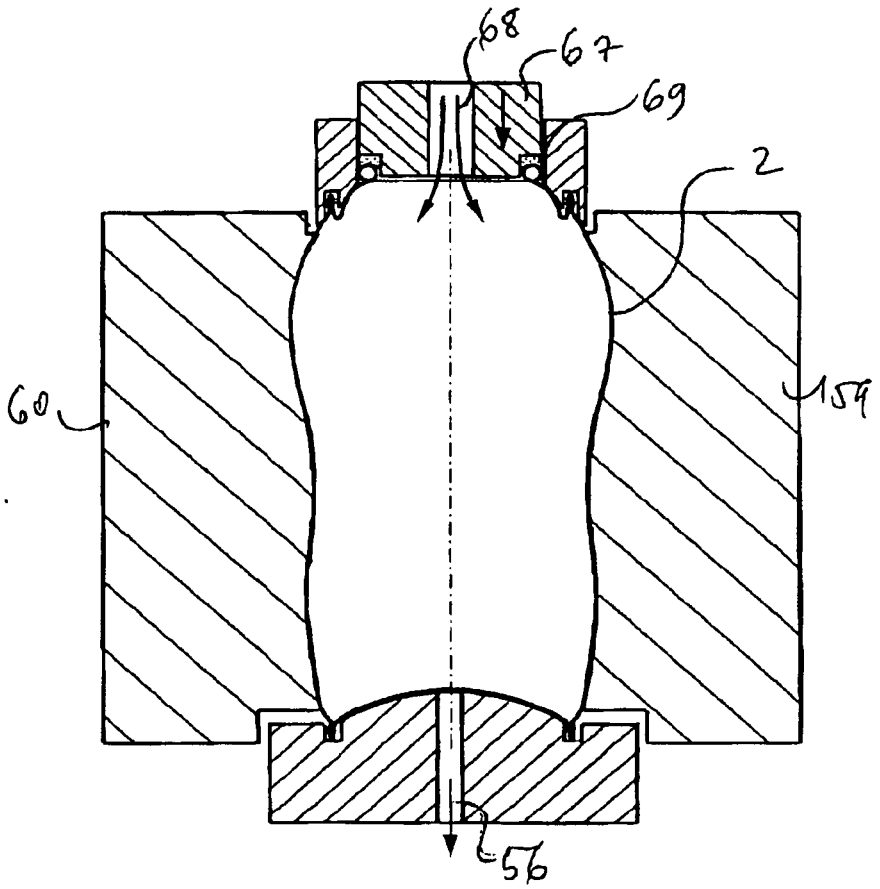

Fig 9D

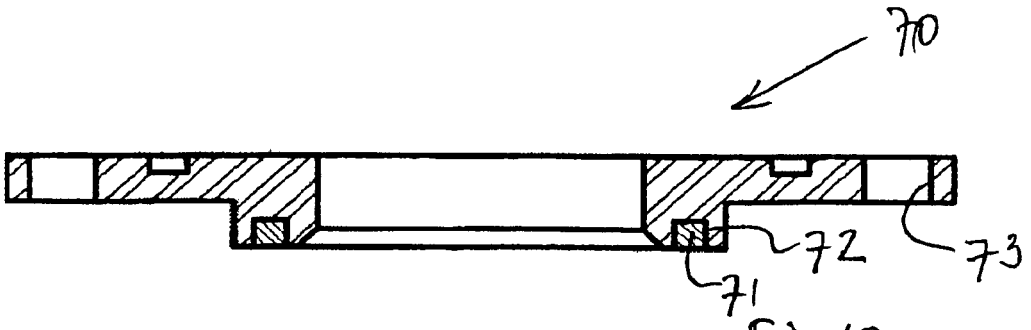

Fig10

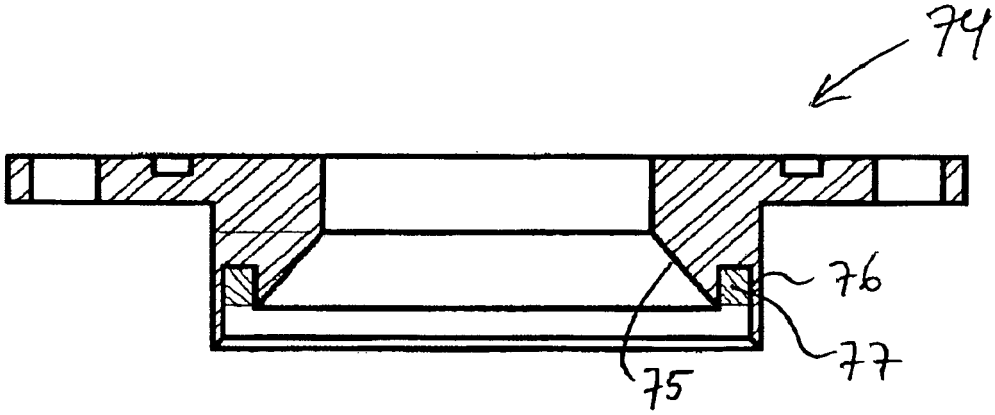

Fig11

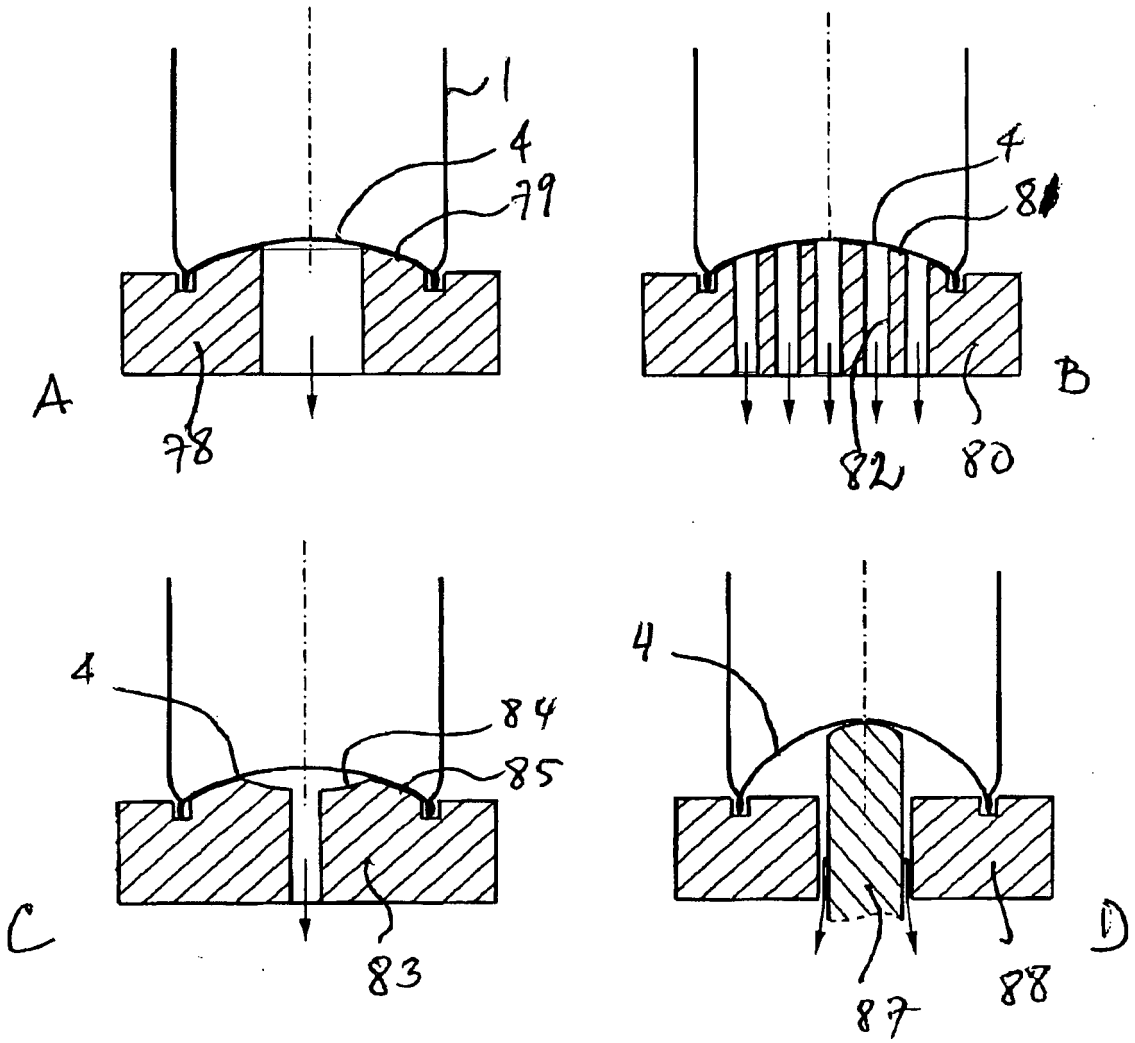

Fig 12

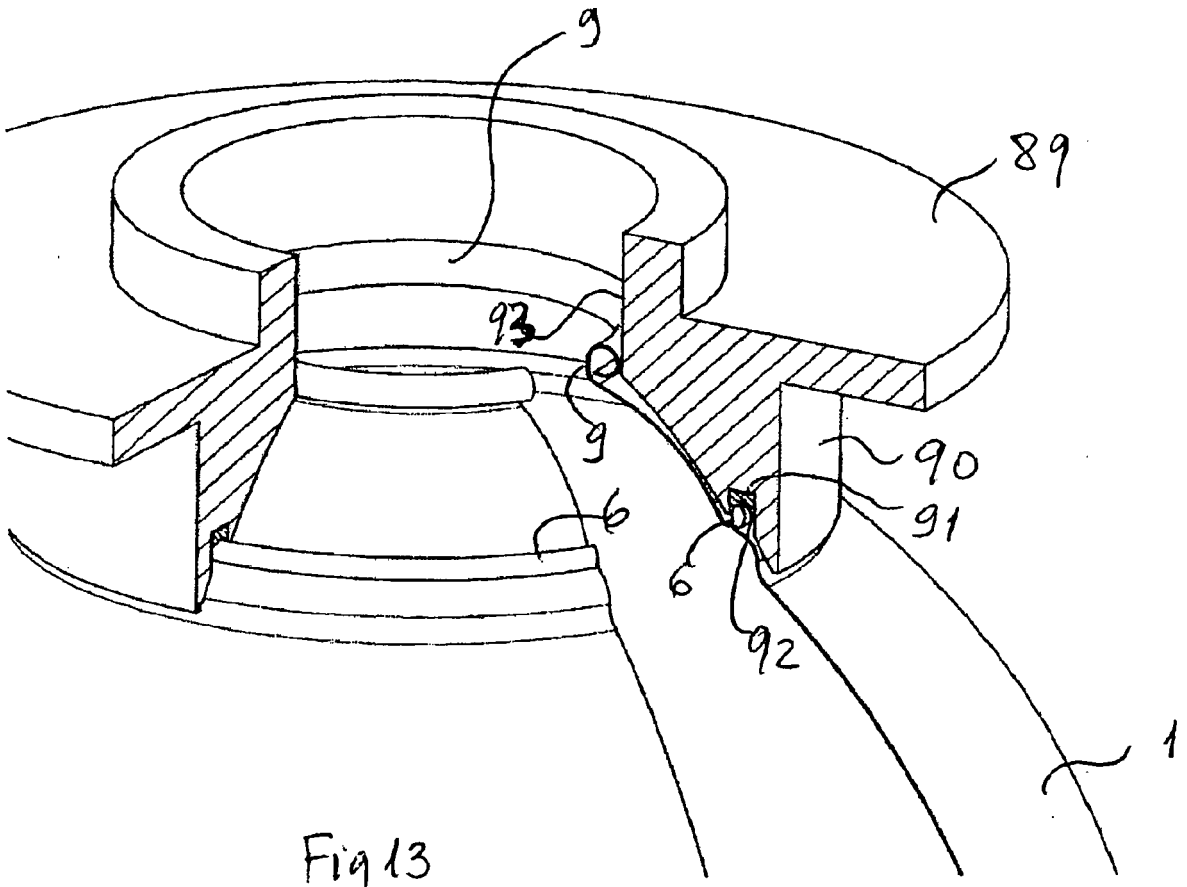

Fig 13

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 00 1827

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 034 860 A2 (DISPENSING CONTAINERS CORP [US]) 13 September 2000 (2000-09-13) * page 6; figures 3,4,4a,11 *	1-8	INV. B21D51/26 B21D51/30
X	EP 0 543 695 A1 (METAL BOX PLC [FR]; METAL BOX PLC [FR] METAL BOX PLC [FR]) 26 May 1993 (1993-05-26) * columns 3,4; figures 5-7 *	1-17	
X,D	EP 0 521 637 A1 (CMB FOODCAN PLC [GB] METAL BOX PLC [GB]) 7 January 1993 (1993-01-07) * columns 3,4; figures 5-7 *	1-17	
X	GB 1 220 129 A (CARNAUD & FORGES [FR]) 20 January 1971 (1971-01-20) * the whole document *	1-8	

TECHNICAL FIELDS SEARCHED (IPC)
B21D
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 September 2010	Knecht, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1034860 A2	13-09-2000	NONE	
EP 0543695 A1	26-05-1993	DE 69219439 D1	05-06-1997
		DE 69219439 T2	13-11-1997
		ES 2101064 T3	01-07-1997
		FR 2683750 A1	21-05-1993
		GR 3024221 T3	31-10-1997
		US 5275033 A	04-01-1994
EP 0521637 A1	07-01-1993	AT 109695 T	15-08-1994
		DE 69200315 D1	15-09-1994
		DE 69200315 T2	01-12-1994
		DK 0521637 T3	26-09-1994
		ES 2057961 T3	16-10-1994
		GB 2257073 A	06-01-1993
		GR 3025278 T3	27-02-1998
		HK 136394 A	09-12-1994
		SG 137394 G	13-01-1995
GB 1220129 A	20-01-1971	BE 714654 A	30-09-1968
		DE 1752316 A1	17-02-1972
		DE 6609884 U	16-11-1972
		ES 138622 Y	01-07-1969
		ES 353778 A1	16-10-1969
		FR 1533260 A	19-07-1968
		NL 6806635 A	11-11-1968
		OA 2810 A	15-12-1970

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 521637 A **[0003]**