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(54) **A packaging former set**

(57) A packaging former set having a fill tube comprising an elongate tubular body with an upper end, a lower end and a bore, the body further comprising an inner part and an outer part or layer. The inner part is formed of a relatively hard material of food standard quality, the outer part being formed of a polymeric material having a friction reducing outer surface. The inner and outer parts are intimately connected together preferably around their entire periphery. In this manner, by forming

the inner and outer parts of the fill tube of different materials, each material can be optimized to meet the requirements of the environment to which the part is exposed. In particular, the inner layer may be chosen to have the requisite hardness for withstanding abrasion by the products being packaged and should also meet the relevant food standard quality. The outer part can be optimised for allowing ease of transport of a polymeric packaging web.

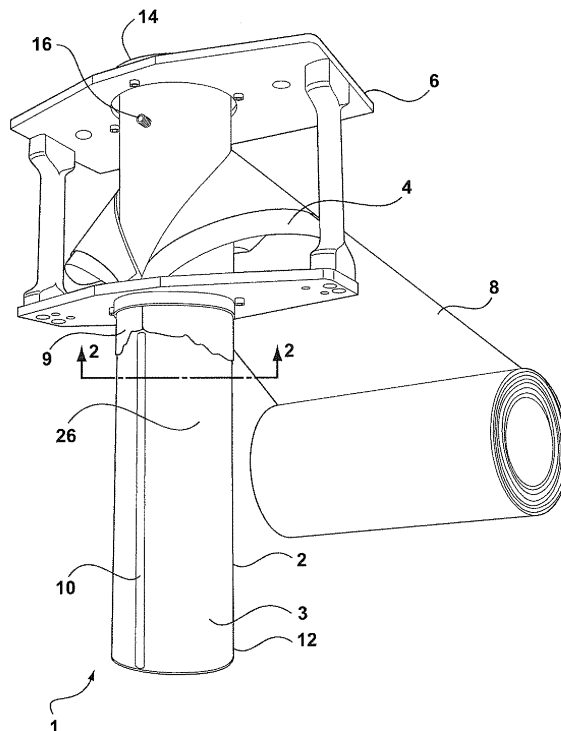


Figure 1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to fill tubes of the type used for packaging purposes, in particular to former sets for use in vertical form, fill and seal machines.

2. Description of the Related Art

[0002] Packaging machines are known in which a product, such as a foodstuff, is sealed within one or more webs of polymeric material to form a package. Such packages may take different forms such as bags, sachets, tubes, envelopes, boxes, capsules and the like. The package may be evacuated or may be provided with a particular gas filling to preserve freshness. One manner of making such packages is to use a former set. The former set comprises a forming collar, which guides the web into a tubular shape around a fill tube. On the fill tube, a longitudinal seal is applied to form a closed tubular web. The tubular web is continuously withdrawn from one end of the fill tube as portions of product are fed into the other end of the fill tube. The filled tubular web leaving the lower end of the fill tube is sealed and severed, usually by an appropriate heat seal bar, to form individual packages. The fill tube and forming collar are supported by a suspension frame.

[0003] Prior art former sets have generally used stainless steel fill tubes. Food standard regulations impose strict limitations on the materials that may come into contact with foodstuffs. Furthermore, depending on the product being packaged, the interior of the fill tube is exposed to considerable wear. Frozen foods are particularly abrasive in this respect. The suspension frame and forming collar have also generally been made of steel in order to comply with food regulations and in order to ensure sufficient strength. Steel is also desirable for the purpose of cleaning. Certain food standards require the use of particularly effective cleaning agents that are highly corrosive. It is however a considerable disadvantage of steel that the whole construction is extremely heavy.

[0004] Attempts have been made to use other materials for the former set. Aluminium fill tubes are lightweight but are subject to corrosion by cleaning detergents. Furthermore, when used for wet products, the interior of the tube can be eroded by cathodic sacrifice due to electrolytic effects. Forming collars have been made of non-metallic materials such as fibre reinforced epoxy but this is not suitable for the fill tube itself. A particular problem with the use of plastics materials in this context is the presence of static electrical charge. Due to the constant movement of the packaging web over the forming collar and fill tube, static charge can build up. This is undesirable as it can cause powdery products and dust to be retained. Another requirement of the exterior surface of

the fill tube and forming collar is that of low friction. Many plastic surfaces offer relatively high frictional resistance to polymeric packaging materials. An additional problem is apparent in the case that the fill tube or packaging web is wet. In this case, surface tension effects can cause the packaging web to adhere to the outside of the fill tube, preventing smooth processing.

[0005] There is thus a need for an alternative former set construction that can overcome some or all of the above problems. Such a device should be relatively cheap and simple to manufacture and should require a minimum of maintenance.

BRIEF SUMMARY OF THE INVENTION

[0006] According to the invention there is provided a packaging former set having a fill tube comprising an elongate tubular body having an upper end, a lower end and a bore, the body comprising an inner part and an outer part or layer, the inner part being formed of a first, relatively hard material, the outer part being formed of a second, polymeric material having a friction reducing outer surface. The inner and outer parts are intimately connected together preferably around their entire periphery. In this manner, by forming the inner and outer parts of the fill tube of different materials, each material can be optimized to meet the requirements of the environment to which the part is exposed. In particular, the inner layer may be chosen to have the requisite hardness for withstanding abrasion by the products being packaged and should also meet the relevant food standard quality. In the present case, the materials of both inner and outer parts are preferably of food standard quality, meaning that they are authorized for entering into contact with food products. The outer part may be chosen for its ability to provide a friction reducing outer surface, either directly or indirectly by its ability to be coated with other materials. By reducing friction, static effects may also be reduced. In general, it will also be of food standard quality. Both materials will preferably be chosen for their resistance to corrosion or damage, in particular by exposure to the product being packaged and to detergents of the type employed for cleaning.

[0007] According to an important feature of the invention, the inner part is provided with a peripheral groove on an outer surface adjacent to at least its lower end and the outer part terminates at and is engaged in the groove. In order to function effectively, the fill tube must be extremely resistant to damage that may typically occur during use and cleaning. In particular, the edges of the outer part must not be exposed to shock which could cause them to be raised and subject to further damage or become susceptible to contamination. By recessing the edge of the outer part in a groove in the inner part, such exposure is largely precluded. While the use of a groove of a limited axial extent is preferred, it is noted that the outer part may be embedded into the inner part over substantially the whole surface should this be desired.

[0008] Various manners of forming a friction reducing outer surface fall within the scope of the present invention. In a preferred embodiment, the outer surface of the outer part comprises a pattern or relief. It has been found that surface roughnesses of between 10 and 200 microns are ideal, depending upon the packaging materials used. Preferably a value of around 100 microns is favoured. One preferred manner of achieving such roughness is by including micro particles or microspheres in the material of the outer part. The micro particles may be any suitable inert material such as silicon, ceramics, glass or metal. Alternatively or additionally the friction reducing outer surface may comprise a friction reducing material such as polytetrafluoroethylene (PTFE) or wolfram disulfide. It has been found that the combination of a friction reducing material over an outer part having a surface relief produces an enhanced effect allowing ease of transport of the packaging web material over the fill tube. Furthermore, the friction reducing material may be applied both to the outer part and also to any other exposed surfaces such as edge regions of the inner part. For circumstances where the fill tube is exposed to moisture, the outer surface should be generally hydrophobic in order to reduce surface tension effects that could cause the packaging material to stick. Wolfram disulfide and friction reducing materials that may be applied at temperatures below the melting temperature of the outer part have been found highly effective in this context.

[0009] Preferably, the outer part has a thickness of between 0.2 mm and 2 mm, most preferably about 0.5 mm. In general, such material thicknesses for the outer part are sufficient to achieve the desired effects while being sufficiently stable to mechanical stresses and easy to apply using coating techniques. It is however also understood that greater thicknesses could be used e.g. using coextrusion techniques to form the inner and outer parts.

[0010] According to a further feature of the invention, a longitudinal groove is formed in or through the outer part over substantially a lower half of its length. In this manner, a removable seal plate may be embedded into the fill tube. The seal plate acts to provide counter pressure for the longitudinal seal assembly of a vertical fill/seal machine. Since this part is exposed to wear, its periodic replacement is desirable.

[0011] According to a still further feature of the invention, a gas flushing channel is provided leading from a gas inlet nozzle situated towards the upper end of the body to a gas outlet adjacent the lower end of the body. The gas flushing channel may be used for packaging products under a particular atmosphere. Air may thereby be evacuated from the package prior to sealing and replaced or supplemented by e.g. nitrogen or another suitably inert or bacteriostatic gas. In order to meet food standard requirements, the bore of the fill tube should be "smooth". For this reason, the gas flushing channel may preferably be recessed e.g. into a wall of the inner part. To achieve this, according to an advantageous embodiment of the invention the bore is located eccentrically

with respect to the inner part such that the wall has a varying thickness, the gas flushing channel may then be formed within a thickened section of the wall. Preferably, the gas flush channel is formed as a groove in the outer surface of the inner part that can be subsequently covered e.g. by the seal plate.

[0012] As indicated above the inner part may comprise any suitable food quality material of adequate hardness and durability. Exemplary materials include stainless steel, aluminium and their alloys. Most preferably the inner part comprises polyvinylidene fluoride (PVDF). A particular advantage of this material is its ease of manufacture as it can be readily machined to form the above-mentioned circumferential groove and gas flush channel. It also has short term resistance to heat up to temperatures of 270 °C and long term resistance up to around 180-190 °C. This is useful in allowing the outer part to be bonded thereto without adversely affecting the structure of the inner part.

[0013] According to a further important aspect of the invention the outer part comprises a mouldable polymeric material, preferably having a melting point of less than 200 °C. Polyamide has been found most suitable for this purpose and has shown itself to be exemplary in forming a good bond with the underlying inner part. In particular, the combination of polyamide and PVDF has been found exceptionally effective. In the past, polymeric coatings have been used for providing non-stick coatings to objects. Such non-stick polymeric materials, of which PTFE is exemplary, characteristically have high melting points and require coating at temperatures above 400 °C using sintering techniques. Such materials are not suitable for application using moulding or spray moulding techniques.

[0014] According to the present invention there is also provided a packaging former set comprising a fill tube as described above together with a forming collar surrounding and spaced from the fill tube for guiding a generally flat web of packaging material into concentric engagement with the fill tube. The packaging former set may further comprise a suspension frame for supporting the fill tube and forming collar within a packaging machine and for maintaining the desired spacing. Preferably, both the suspension frame and the forming collar substantially comprise polymeric materials. In this manner a substantially non-metallic or non-ferrous former set may be provided. The former set has the advantage of considerably lower weight compared to existing metal former sets. In this respect, "substantially comprise polymeric materials" is intended to mean that the main structural components are polymeric. It is understood that minor components and fixation elements such as bolts or the like may nevertheless be formed of metal.

[0015] The packaging former set may further comprise an attachment, preferably a bayonet mount, by which further accessories such as a bag spreader or converter box, mounted on a mounting ring may be attached to the fill tube.

[0016] According to the present invention there is also provided a method of manufacturing a fill tube for a packaging former set, the method comprising providing an elongate cylindrical inner part of a relatively hard material of food standard quality the inner part having an internal bore, applying an outer layer of a polymeric material on an outer surface of the inner part and providing a friction reducing outer surface to the outer layer. Preferably the outer layer is provided by heating the inner part and coating with the polymeric material in a molten state at a temperature of around 200 °C. Polyamide has been found most suitable for application using such spray moulding techniques. The material of the outer layer is thus melted into engagement with the inner part without causing distortion thereof. Preferably, the outer layer contracts on cooling to cause it to be pretensioned into intimate engagement with the inner part.

[0017] Preferably the method further comprises forming a groove in the outer surface of the inner part adjacent to an end thereof, prior to applying the outer layer. The groove may be formed by machining although it is also possible to use appropriate moulding techniques.

[0018] Preferably also, the method comprises applying a mask to the outer surface of the inner part prior to applying the outer layer and subsequently removing the mask to expose areas of the inner part where no outer layer is required. In particular, a longitudinal groove may be formed in this way through the outer layer for receiving a seal plate.

[0019] According to a further feature of the method according to the invention, any exposed edges of the outer layer may be thermo-fixed to bond them to the inner part. This may be performed by application of local heat and optionally pressure to such edges, in particular along the joint with a seal plate. Preferably the local heat is applied at around the melting temperature of the polymeric material, for polyamide, around 190 °C.

[0020] According to a yet further feature of the method the friction reducing outer surface is provided by applying a surface roughness to the outer layer. Preferably, this is achieved by the inclusion of micro-particles or microspheres in the material of the outer layer. The micro-particles may be any suitable inert material such as silicon, ceramics, glass or metal and may be included in the polymeric material prior to hot-coating it onto the inner part. Alternatively or additionally, friction reducing properties may be improved by applying a low friction finish over the outer layer. A most suitable finish is wolfram disulfide in particular Dicronite DL5™. Thermo fixing of the outer layer after coating with wolfram sulfide has been found effective in improving the retention of the wolfram sulfide.

[0021] The invention also relates to a packaging machine comprising a fill tube or a former set as described above. The packaging machine is operable to feed a web of polymeric material over the forming collar and into circumferential relation with the fill tube. The packaging machine is further operable to supply a product to the bore of the fill tube and to seal the web around the product to

form a closed package.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **[0022]** Further features and advantages of the invention will be appreciated upon reference to the following drawings of a number of exemplary embodiments, in which:

10 **[0023]** Figure 1 shows a perspective view of a former set according to the present invention;

[0024] Figure 2 shows a cross-sectional view through the former set taking along line 2-2 of Figure 1;

[0025] Figure 3 shows a perspective view of the fill tube of Figure 1, viewed from the lower end;

15 **[0026]** Figure 4 shows a perspective view of the lower end of the fill tube of Figure 3; and

[0027] Figure 5 shows a longitudinal cross-section through the seal bar of Figure 4 along line 5-5.

20 DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0028] The following is a description of certain embodiments of the invention, given by way of example only and with reference to the drawings.

25 **[0029]** According to Figure 1, there is shown a perspective view of a former set 1 for a vertical fill/seal packaging machine according to one aspect of the present invention. The former set 1 comprises a fill tube 2 comprising an elongate generally cylindrical body 3. A forming collar 4 is provided around the fill tube 2 and both the fill tube 2 and the forming collar 4 are held in spaced concentric relation by a suspension frame 6. The suspension frame 6 also serves to support the former set 1 within a packaging machine (not shown). An elongate seal plate 10 is provided on the exterior of the fill tube 2, extending to a lower end 12 thereof. Towards an upper end 14 of the fill tube 2, there is provided a gas nozzle 16. The fill tube 2 has a friction reducing outer surface 26.

30 **[0030]** Figure 2 shows a cross-section through the fill tube 2 of Figure 1, taken along line 2-2. The fill tube 2 comprises a relatively thick inner part 18, a relatively thin outer part 20 and a friction reducing outer surface 26. As can be seen, the fill tube 2 also comprises a bore 22, which extends from the upper end 14 to the lower end 12. The bore 22 is arranged eccentrically with respect to the inner part 18. As a result of this eccentric positioning, a wall 23 of the inner part 18 varies in thickness around the circumference. A gas flushing channel 24 extends longitudinally through the thickest region of the wall 23. The gas flushing channel 24 extends from the gas nozzle 16, to an outlet 25 (Figure 3) in the bore 22 adjacent to the lower end 12. Also visible in Figure 2 is an annular gap 32 formed between an outer surface of the fill tube 2 and the forming collar 4.

35 **[0031]** The inner part 18 of the fill tube 2 is made out of PVDF. The outer part 20 comprises polyamide. Other materials may also be used, to the extent that they meet food hygiene standards. In particular, stainless steel and

aluminium may be used for the inner part 18 and their combination with an outer part 20 formed of polyamide is considered to be extremely advantageous especially for hard and abrasive products such as frozen foods. The fill tube has an outer diameter of about 16 cm and a length of about 90 cm. The bore diameter is about 14.5 cm and the thickness of the wall 23 varies from about 0.5 cm to 1 cm in the region of the gas flushing channel 24. It will be immediately evident that other dimensions may also be used according to the packaging requirements. Typical dimensions may range from 4 to 25 cm in outer diameter and 60 to 150 cm in length.

[0032] The forming collar 4 is formed of fibre reinforced epoxy material, coated with a non-stick wolfram disulfide coating. It is understood that other materials may be used including stainless steel and aluminum. The suspension frame 6 is also manufactured from polymeric materials. Nevertheless, other conventionally used materials can be used, at least for certain component parts thereof.

[0033] Figure 3 shows a perspective view of the fill tube 2 of Figure 1 with the seal bar removed, viewed from the lower end 12. According to Figure 3, a mounting flange 34 can be seen at the upper end 14 for attachment of the tube 2 to the frame 6. Figure 3 also shows the manner in which the gas flushing channel 24 is formed by machining a longitudinal groove 30 from the outside of the tube 2 and the outlet 25 into the bore 22. At the lower end 12 of the fill tube 2, the bore 22 is widened to form a socket 36. Studs 38 are located within the socket 36 to form a bayonet attachment for the mounting ring of a bag spreader (not shown).

[0034] Figure 4 shows a close up view of the lower end 12 of the fill tube 2. According to an important aspect of the invention, the outer part 20 and inner part 18 are recessed together at this point to avoid undesired separation of or damage to the outer part 20. To this end, a circumferential groove 28 is formed around the outside of the inner part 18, close to the lower end 12. The groove 28 has a relatively abrupt lower edge 40 and tapers away towards the upper end 14 of the fill tube 2. The outer part 20 lies intimately against the inner part 18 and terminates at the lower edge 40 of the groove 28. In this manner, the lower extremity of the outer part 20 is protected from damage. Figure 4 also shows the extremity of the longitudinal groove 30. In this embodiment, the longitudinal groove 30 extends completely to the lower end 12 of the fill tube 2. It may however terminate at a distance from the lower end 12. It should also be noted that different grooves could be formed for respectively providing the gas flushing channel 24 and receiving the seal plate 10.

[0035] Figure 5 shows a partial longitudinal cross-section through the fill tube 2 taken along line 5-5 of Figure 4. In this view, the cross section of the circumferential groove 28 may be seen. Also visible in Figure 5 are the friction reducing outer surface 26, which covers both the outer part 20 and the exposed surfaces of the inner part 18 and the internal shape of the socket 36.

[0036] In use, a web 8 of packaging material is fed over

the forming collar 4 and drawn downwards through the annular gap 32 to wrap it around the fill tube 2. The tubular web 9 is then sealed to itself to form a longitudinal seam by the application of heat and pressure against the seal plate 10 using an appropriate sealing device. As the sealed tubular web 9 is withdrawn from the lower end 12 of the fill tube 2, product to be packaged may be supplied to the bore 22. The tubular web 9 may then be sealed closed by cross seals and severed at preset intervals to form individually sealed packages of product. For certain e.g. perishable products, it is desirable to package them with the inclusion of a certain type of gas such as nitrogen. The gas may be supplied via the gas nozzle 16 and gas flushing channel 24 to the interior of the tubular web as it leaves the lower end 12 of the fill tube 2, prior to forming the cross seal.

[0037] Thus, the invention has been described by reference to the embodiment discussed above. It will be recognized that this embodiment is susceptible to various modifications and alternative forms well known to those of skill in the art. Many modifications in addition to those described above may be made to the structures and techniques described herein without departing from the spirit and scope of the invention. Accordingly, although specific embodiments have been described, these are examples only and are not limiting upon the scope of the invention.

Claims

1. A packaging former set comprising a fill tube, the fill tube comprising an elongate tubular body having an upper end, a lower end and a bore, the body comprising an inner part and an outer part intimately connected together around their periphery, the inner part being formed of a first relatively hard material, the outer part being formed of a second polymeric material having a friction reducing outer surface.
2. The device as claimed in claim 1, wherein the inner part is provided with a peripheral groove on an outer surface adjacent to at least its lower end and the outer part terminates at and is engaged in the groove.
3. The device as claimed in claim 1 or claim 2, wherein the friction reducing outer surface comprises a relief having a surface roughness of between 10 and 200 microns, preferably around 100 microns.
4. The device as claimed in any preceding claim, wherein the friction reducing outer surface comprises a friction reducing material, preferably wolfram disulfide.
5. The device as claimed in any preceding claim, further comprising microparticles dispersed in the polymeric material of the outer part, the microparticles having dimensions of between 10 and 200 microns, prefer-

- ably around 100 microns.
6. The device as claimed in any preceding claim, wherein a longitudinal groove is formed in the outer part over substantially a lower half of its length to receive a seal plate. 5
 7. The device as claimed in any preceding claim, wherein a gas flushing channel is provided leading from a gas inlet nozzle situated towards the upper end of the body to a gas outlet adjacent the lower end of the body. 10
 8. The device as claimed in claim 7, wherein the inner part has a wall and the bore is located eccentrically with respect to the inner part such that the wall has a varying thickness, the gas flushing channel being formed within a thickest section of the wall. 15
 9. The device as claimed in any preceding claim, wherein the inner part comprises PVDF. 20
 10. The device as claimed in any preceding claim, wherein the outer part comprises a mouldable polymeric material preferably having a melting temperature of between 170 and 210 °C, preferably polyamide, in particular amorphous polyamide. 25
 11. The packaging former set according to any preceding claim, further comprising a forming collar surrounding and spaced from the fill tube for guiding a generally flat web of packaging material into concentric engagement with the fill tube. 30
 12. The packaging former set according to claim 11, further comprising a suspension frame for supporting the fill tube and forming collar. 35
 13. The packaging former set according to any preceding claim, wherein the former set substantially comprises polymeric materials. 40
 14. The packaging former set according to any preceding claim, further comprising a bag spreader mounted on a mounting ring attached to the fill tube, preferably by a bayonet mount. 45
 15. A method of manufacturing a fill tube for a packaging former set, the method comprising: 50
 - providing an elongate tubular inner part of a relatively hard material of food standard quality, having an internal bore;
 - heating the inner part to a bonding temperature of between 180 and 210 °C 55
 - applying an outer layer of a polymeric material on an outer surface of the inner part, the polymeric material having a melting temperature of
 - between 170 and 210 °C; and providing a friction reducing outer surface to the outer layer.
 16. The method of claim 15, further comprising forming a groove in the outer surface of the inner part adjacent to an end thereof, prior to applying the outer layer.
 17. The method according to claim 15 or claim 16, further comprising applying a mask to the outer surface of the inner part prior to applying the outer layer and subsequently removing the mask to expose a longitudinal groove through the outer layer for receiving a seal plate.
 18. The method according to any of claims 15 to 17, further comprising thermo-fixing of exposed edges of the outer layer to bond them to the inner part.
 19. The method according to any of claims 15 to 18, wherein the friction reducing outer surface is provided by applying a surface roughness to the outer layer.
 20. The method according to any of claims 15 to 19, further comprising dispersing microparticles in the material of the outer layer, the microparticles having a size of between 10 and 200 microns, preferably around 100 microns.
 21. The method according to any of claims 15 to 20, wherein the friction reducing outer surface is provided by applying a low friction coating over the outer layer at a temperature below 180 °C, the coating preferably being wolfram disulfide.
 22. A packaging machine comprising a former set according to any of claims 1 to 14.

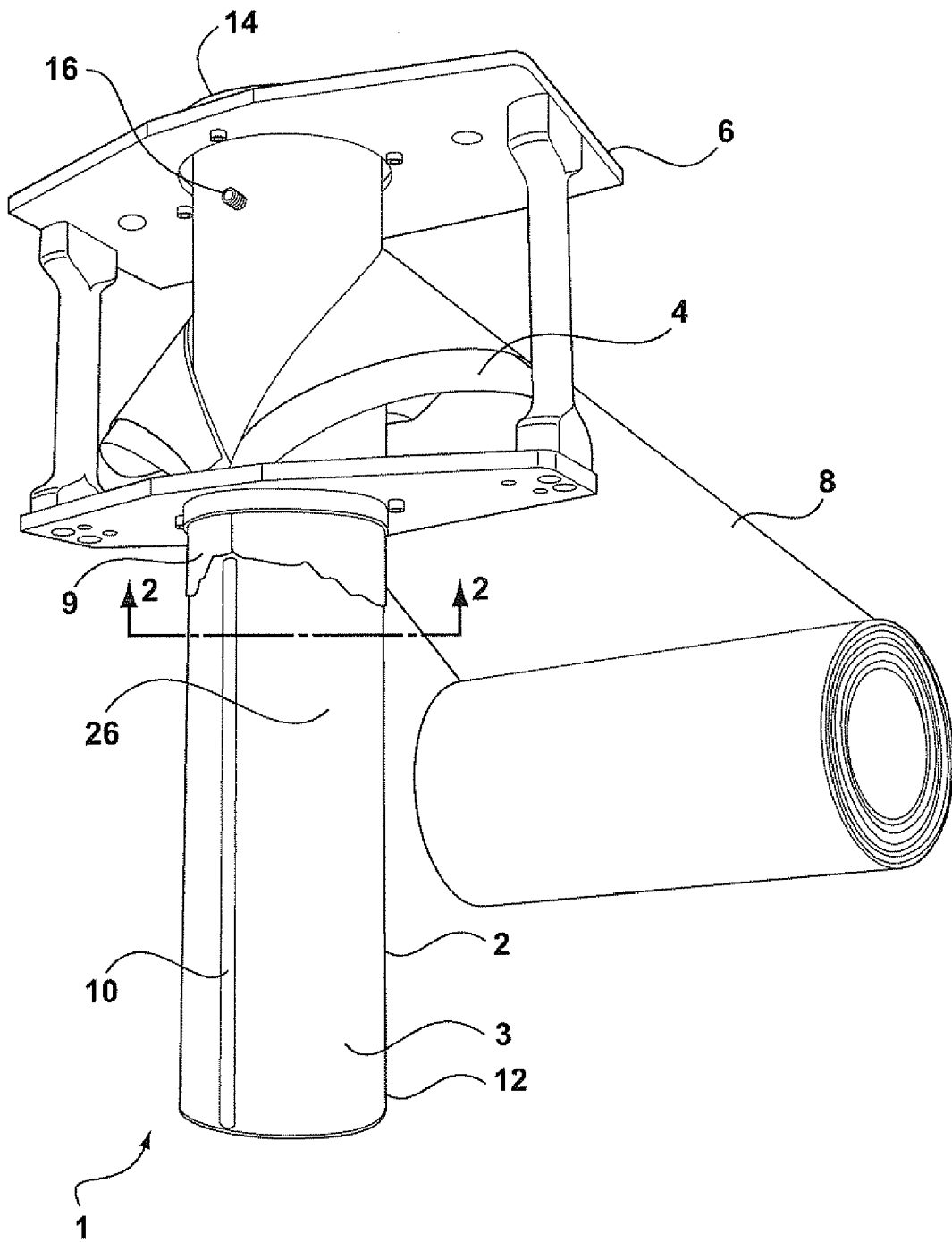
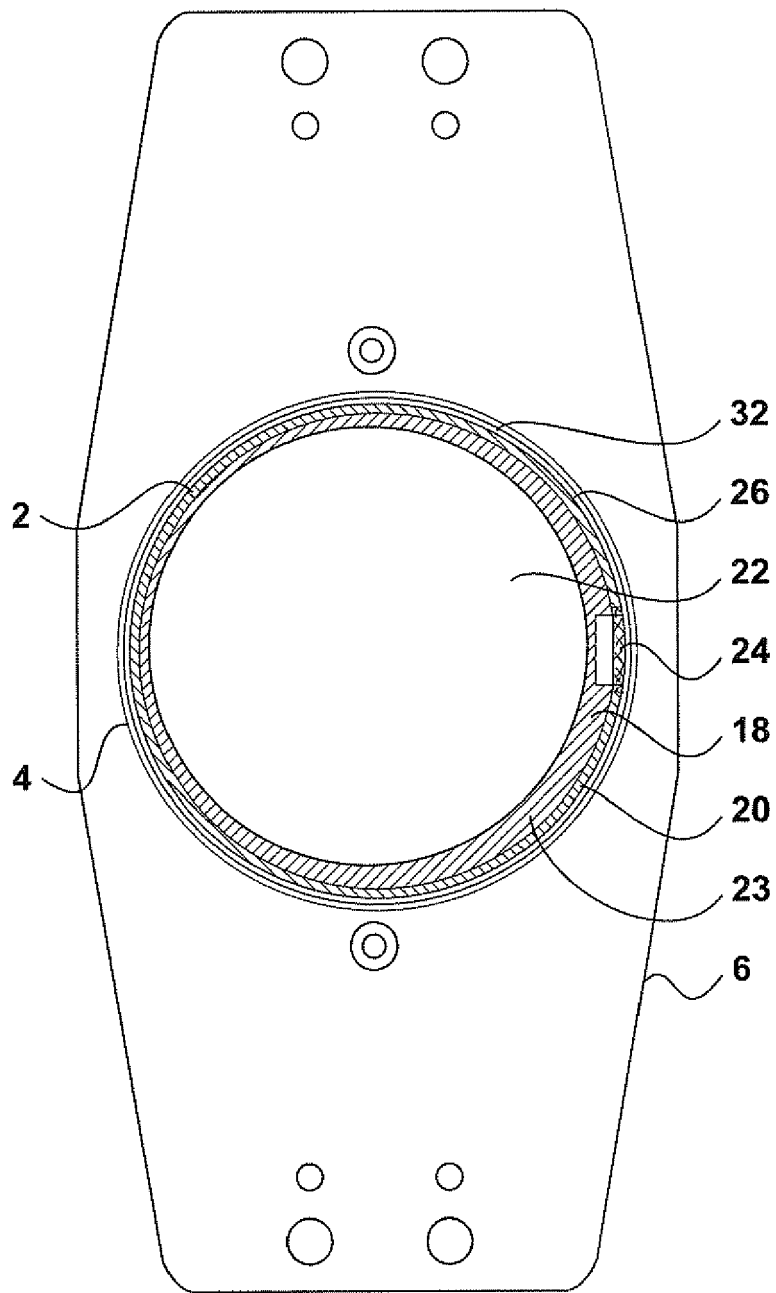


Figure 1



Section 2-2
Figure 2

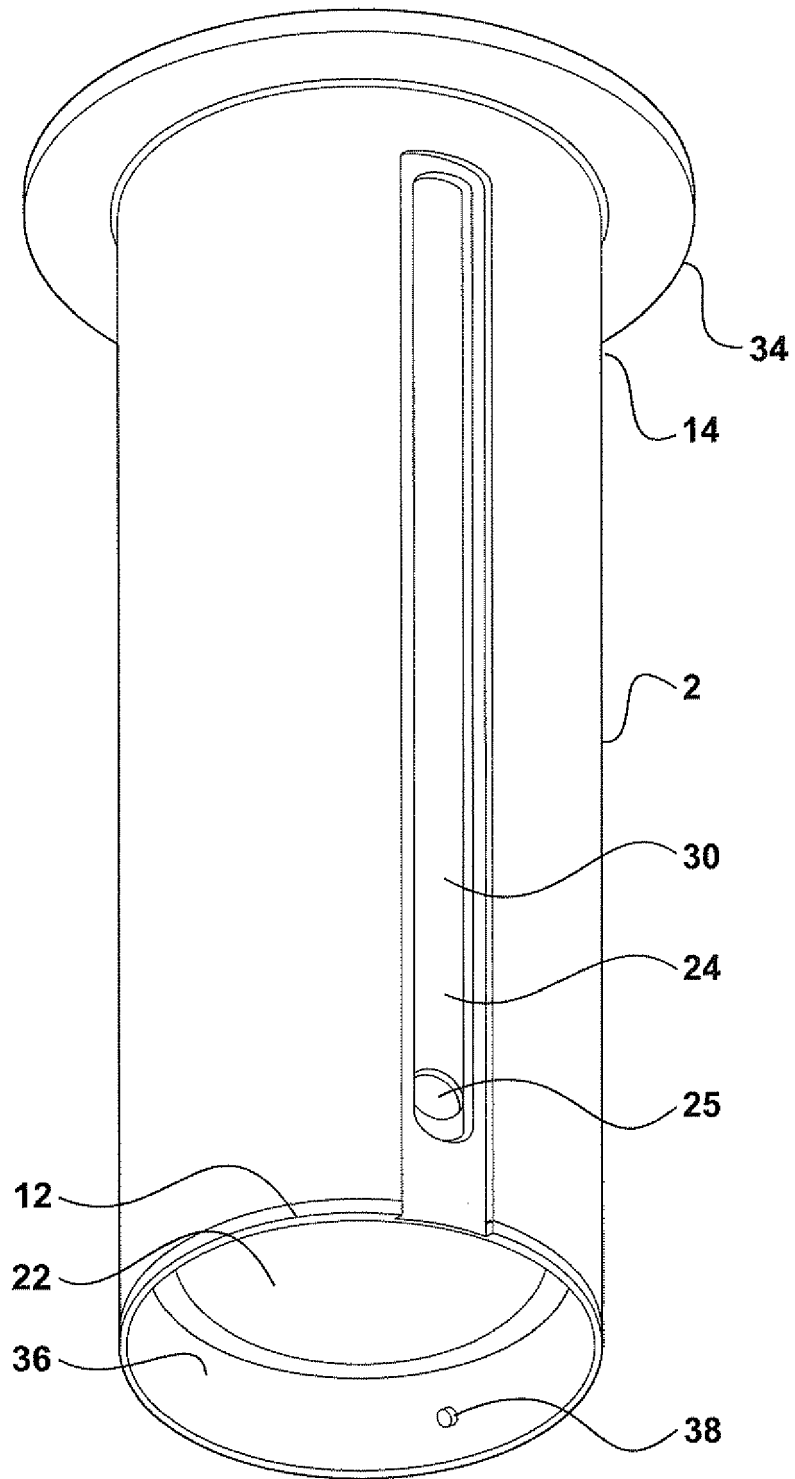


Figure 3

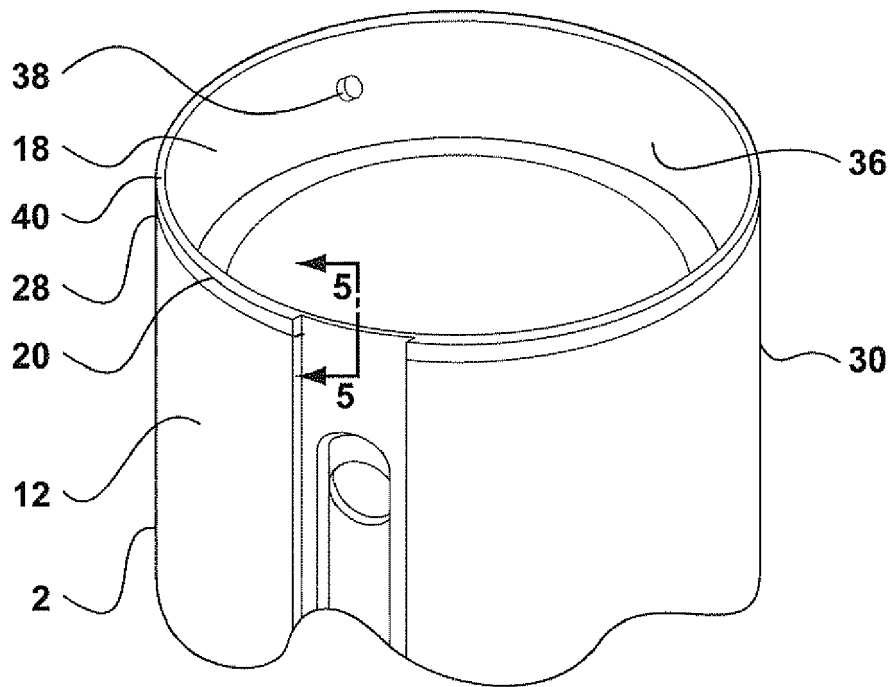
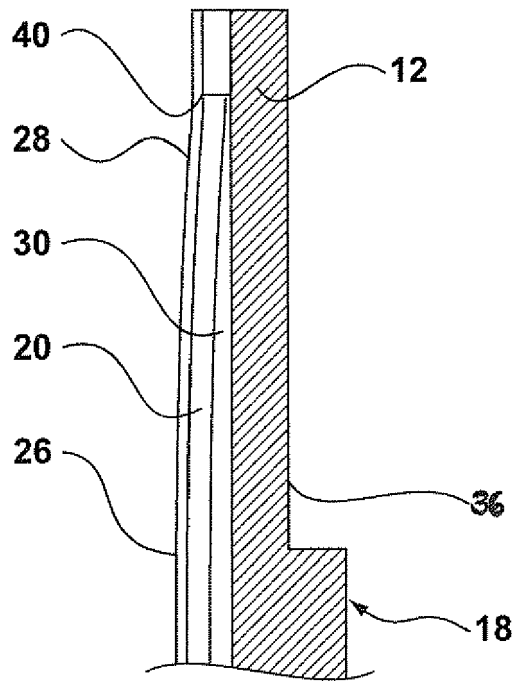


Figure 4



Section 5-5

Figure 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2003/084650 A1 (KUSS GERHARD ET AL) 8 May 2003 (2003-05-08) * abstract * * figures 2,4,5 * * figures 8,9 * * page 2, paragraph 24 - paragraph 26 * -----	1-22	INV. B65B9/22 B65B39/00 B65B39/04
A	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 05, 3 May 2002 (2002-05-03) & JP 2002 002619 A (MITSUBISHI GAS CHEM CO INC), 9 January 2002 (2002-01-09) * figure 1 * * abstract * * paragraph [0011] - paragraph [0016] * -----	1-22	
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A	DE 100 27 581 A1 (HASTAMAT VERPACKUNGSTECHNIK GMBH & CO. KG) 13 December 2001 (2001-12-13) * abstract * * figure 2 * -----	1-22	TECHNICAL FIELDS SEARCHED (IPC) B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2006	Examiner Damiani, A
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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