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Sealing plug.

A sealing plug for sealing a container containing a flowable product such as adhesive in a syringe comprises a front plug member (10) and a rear plug member (12). The front plug member (10) has an external periphery (14) for sealingly engaging the internal periphery of the aperture and has a front face (20) for introduction into the aperture which contains a bleed passage (24) extending from said front face to connect with a cavity (22) open to the rear of the front plug member. The rear plug member (12) is sealingly and resiliently received in the cavity (22) to close the same but is displaceable by gas pressure applied via said bleed passage (24). Longitudinally running angularly offset grooves (36) and (38) in the rear plug member (12) then break the seal between the cavity and the rear plug member and allow the venting of said gas pressure past said rear plug member.

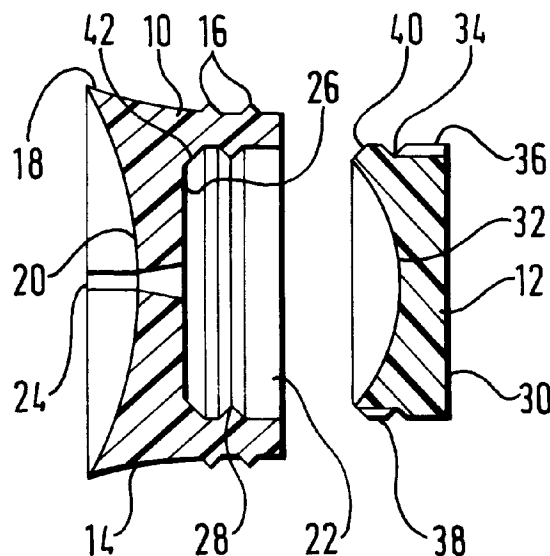


FIG.1.

The present invention relates to sealing plugs which may be used for closing apertures. The invention has particular but not exclusive relevance to sealing plugs for use in closing apertures in containers containing flowable products, e.g. adhesive dispensers.

Various products including adhesives are supplied in syringe-type dispensers having a barrel with an open charging end through which the product is introduced into the dispenser and having at the opposite end a nozzle through which the product is to be dispensed. After the flowable product has been introduced into the barrel, it is necessary to seal the charging end with a suitable plug. In use, the nozzle end is opened and a suitable gun is used to force the sealing plug down the barrel as a syringe plunger to expel the contents.

In the insertion of the sealing plug it is desirable to make provision for the expulsion of air which would otherwise be trapped between the sealing plug and the flowable contents. If this is not done, such trapped air may be compressed and may tend to force the sealing plug back out of the charging end of the container. Also, air trapped in the syringe body will be compressed when the syringe is used and pressure is applied to the syringe plunger to express the contents through the nozzle. The presence of compressed air at that stage will mean that the contents will continue to ooze out after plunger movement stops. Where the flowable contents are sensitive to air, the air must be expelled during the sealing operation to avoid deterioration of the flowable product. Various methods for achieving this have been proposed.

These include sealing the periphery of the sealing plug with an O-ring and using inserted fingers or fixed lugs momentarily to break the seal between the O-ring and the interior wall of the aperture into which the sealing plug is forced. Systems which employ O-rings are however disadvantageous in that the O-ring may become displaced from its proper position and allow leakage or may be damaged by the venting operation, once again resulting in leakage. Furthermore, O-rings are attacked by some products which need to be packaged in such systems.

WO90/05096 discloses a sealing arrangement for an adhesive dispenser intended to tackle this problem by enabling one to avoid the use of O-rings. This provides a sealing plug having a front face including a bleed passage extending to the rear of the sealing plug where there is formed a cavity. A stopper is provided for sealing the cavity which includes a projecting pin which enters into the rear of the bleed passage and closes it when the stopper is pressed home into the back of the sealing plug. Such arrangements suffer from the disadvantage that the sealing plug cannot be fully assembled before being inserted into the syringe barrel. It is necessary to first push the main body

of the sealing plug into position and only then to press the stopper into its home position. If this operation is not perfectly synchronised, flowable product may pass up through the bleed aperture and fill the cavity in the back of the sealing plug sufficiently that pushing the stopper home has the effect of displacing a certain amount of flowable product out of the back of the cavity. Also, it is difficult to get a good enough seal in such an arrangement without an O-ring because the sealing plug does not have enough rigidity to exert sufficient radial force against the barrel. The cavity allows the sealing plug to be too radially compressible. This cannot be counteracted by making the stopper a tight fit in the cavity because when the stopper is to be driven in, the sealing plug will press into the barrel, displacing the contents, if too much force is required.

The present invention provides a sealing plug for closing an aperture comprising a front plug member and rear plug member, the front plug member having an external periphery for sealingly engaging the internal periphery of a said aperture and having a front face for introduction into the aperture which front face contains a bleed passage extending from said front face to connect with a cavity open to the rear of said front plug member, the rear plug member being sealingly and resiliently received in said cavity to close the same, wherein said rear plug member is displaceable by gas pressure applied via said bleed passage so as momentarily to break the seal between the cavity and rear plug member and allow the venting of said gas pressure past said rear plug member.

In an alternative aspect, the invention provides a sealing plug for sealing a container containing a flowable product, which sealing plug comprises a bleed passage extending from a front part thereof for introduction into said container to an interior portion of said sealing plug, and means actuable by pressure of gas trapped between said sealing plug and said product for venting said interior portion of said sealing plug so as to release said trapped gas without permitting said product to pass said sealing plug.

Preferably a sealing plug according to this aspect of the invention comprises a front plug member and a rear plug member, the front plug member having an external periphery for sealingly engaging the internal periphery of a said aperture and having a front face for introduction into the aperture which front face contains said bleed passage extending from said front face to connect with a cavity open to the rear of said front plug member, said rear plug member being sealingly and resiliently received in said cavity to close the same, wherein said rear plug member is displaceable by said gas pressure applied via said bleed passage so as momentarily to break the seal between the cavity and the rear plug member and allow venting of said gas pressure past said rear plug member, as in the first aspect of the invention.

Preferably, the cavity and the rear plug member

are circular in cross-section and the resilient sealing connection therebetween is by virtue of an annular rib and an annular groove provided each on a respective one of said cavity interior and said rear plug member.

Preferably, the annular groove is on the rear plug member and the annular rib is on the wall of the cavity.

There is preferably a gas bleed passage extending from said annular groove out of said sealing plug and a gas bleed passage leading to said annular groove from said cavity in the front plug member.

Preferably, each said gas bleed passage leading to or from said annular groove is formed by a groove in the periphery of the rear plug member. The gas bleed passage leading out of the annular groove may be formed in the wall of the front plug member defining the outer part of the cavity.

Preferably, the gas bleed passages leading to and from said annular groove are off-set angularly from one another. Thus, preferably, there are two grooves in the side wall of the rear plug member which are spaced around the periphery of the rear plug member.

Preferably, the front face of the rear plug member and the base of the cavity in the front plug member are so shaped that when the rear plug member is fully home in the cavity, a portion of the volume of the cavity remains unfilled by the rear plug member to accommodate flowable product and any residual trapped gas.

The invention will be further described and illustrated with reference to the accompanying drawings in which:-

Figure 1 shows a sealing plug according to the invention disassembled into its component parts; and

Figure 2 shows a sealing plug according to the invention with its parts assembled.

In the illustrated embodiment, a sealing plug according to the invention comprises a front plug member 10 and a rear plug member 12 both of circular transverse cross-section. Front plug member 10 has an external periphery 14 shaped to form a good seal in a tubular syringe bore by the provision of two annular sealing ribs 16 toward the rear end of the front plug member and an outwardly flared front portion 18. To provide flexibility to the flared portion 18, the front face 20 of the front plug member is inwardly dished. A generally cylindrical cavity 22 is formed in the rear face of the front plug member and a gas bleed passage 24 extends from the front face to the base 26 of the cavity 22. An annular rib 28 is provided on the interior wall of the cavity 22 approximately mid-way into the depth thereof.

The rear plug member has a plane rear face 30 and dished front face 32 separated by a generally cylindrical side wall having annular groove 34 formed therein for co-operation with the annular rib 28 to form

a liquid tight seal when the groove and rib are fully engaged. A first longitudinally running groove 36 is provided extending from the annular groove 34 to the rear face 30 of the rear plug member. A second longitudinally running groove 38 is provided extending from the annular groove 34 to the front face 32 of the rear plug member.

The forward part of the cylindrical wall of the rear plug member is chamfered to provide an annular angularly forward facing surface 40 which co-operates with a similarly angled annular surface 42 formed between the base and the side wall of the cavity 22 and assists in forming a liquid tight seal when the rear plug member is fully home in the cavity.

Prior to introduction into the barrel of a syringe containing a flowable material, the rear plug member 12 is pressed into the cavity 22 of the front plug member 10 as shown in Figure 2. A seal is established between the cylindrical periphery of the rear plug member 12 and the interior wall of the cavity 22. By virtue of the dished front face 32 of the rear plug member 12, there is a volume within the cavity which is unfilled by the rear plug member 12.

In use, the front of the sealing plug is introduced into the charging aperture of a syringe containing a flowable material such as adhesive or an adhesive component, the sealing plug is pressed into the syringe by means such as a hollow piston acting on the rear of the front plug member but not pressing on the rear plug member as indicated by the arrows in Figure 2. Air trapped within the syringe body between the flowable product contained therein and the front face 20 of the sealing plug is displaced through the gas bleed passage 24 into the unfilled volume of the cavity 22 where it is pressurised until it forces back the rear plug member 12 against the resilience provided by the engagement of the annular groove 34 and the annular rib 28. At this point, the gas can vent into the annular groove 34 through the longitudinally extending gas bleed groove 38, can track around the annular groove and exit from the sealing plug by the longitudinally extending gas bleed groove 36. Before any flowable product can follow the gas via this route, the rear plug member 12 will be pushed forward by the pressure of the rib 28 cutting off this escape route.

Usually a residual volume of gas will be left in the space provided by the dished front surface 32 of the rear plug member which will allow thermal expansion of the product in the syringe without tending to displace the rear plug member.

When it is desired to express product from the syringe, a piston acting both on the rear plug member and on the rear face of the front plug member can be used to drive the sealing plug down the bore of the syringe.

Many modifications and variations of the invention as described with reference to the specific embodiment are possible. This by way of example, it is

possible to provide the groove 34 on the interior face of the cavity 22 instead of on the rear plug member 12. It is possible to provide the rib 28 on the rear plug member 12 and the groove 34 in the side wall of the cavity 22. The groove 36 should then be provided on the wall of the cavity rather than on the wall of the rear plug member and the groove 38 may optionally be provided on the wall of the cavity instead of on the wall of the rear plug member.

More than one groove 36 and/or more than one groove 38 may be provided if desired but this is likely to be disadvantageous.

The invention is not restricted to sealing plugs for syringes but can be used in many other contexts where it may be desired to vent gas from the front face of a sealing plug whilst retaining flowable contents or simply to relieve pressure.

Claims

1. A sealing plug for closing an aperture comprising a front plug member (10) and rear plug member (12), the front plug member (10) having an external periphery (14) for sealingly engaging the internal periphery of a said aperture and having a front face (20) for introduction into the aperture which front face (20) contains a bleed passage (24) extending from said front face to connect with a cavity (22) open to the rear of said front plug member, the rear plug member (12) being sealingly and resiliently received in said cavity (22) to close the same, characterised in that said rear plug member (12) is displaceable by gas pressure applied via said bleed passage (24) so as momentarily to break the seal between the cavity and rear plug member and allow the venting of said gas pressure past said rear plug member.
2. A sealing plug for sealing a container containing a flowable product, which sealing plug comprises a bleed passage extending from a front part (20) thereof for introduction into said container to an interior portion (22) of said sealing plug, characterised in that said sealing plug further includes means actuatable by pressure of gas trapped between said sealing plug and said product for venting said interior portion of said sealing plug so as to release said trapped gas without permitting said product to pass said sealing plug.
3. A sealing plug as claimed in Claim 2, comprising a front plug member (10) and a rear plug member (12), the front plug member (10) having an external periphery (14) for sealingly the engaging the internal periphery of an aperture in a said container and having a front face (20) for introduction

into the aperture which front face contains said bleed passage (24) extending from said front face to connect with a cavity (22) open to the rear of said front plug member, said rear plug member (12) being sealingly and resiliently received in said cavity to close the same, wherein said rear plug member is displaceable by said gas pressure applied via said bleed passage so as momentarily to break the seal between the cavity and the rear plug member and allow venting of said gas pressure past said rear plug member.

4. A sealing plug as claimed in Claim 1 or Claim 3, wherein the cavity (20) and the rear plug member (12) are circular in cross-section and the resilient sealing connection therebetween is by virtue of an annular rib (28) and an annular groove (32) provided each on a respective one of said cavity interior and said rear plug member.
5. A sealing plug as claimed in Claim 4, wherein the annular groove (34) is on the rear plug member (12) and the annular rib (28) is on the wall of the cavity (22).
6. A sealing plug as claimed in Claim 5, wherein there is a gas bleed passage (36) extending from said annular groove out of said sealing plug and a gas bleed passage (38) leading to said annular groove from said cavity in the front plug member.
7. A sealing plug as claimed in Claim 6, wherein each said gas bleed passage leading to or from said annular groove (34) is formed by a groove in the periphery of the rear plug member.
8. A sealing plug as claimed in Claim 6 or Claim 7, wherein the gas bleed passages (36, 38) leading to and from said annular groove are off-set angularly from one another.
9. A sealing plug as claimed in any one of Claims 3 to 8, wherein the front face of the rear plug member and the base of the cavity in the front plug member are so shaped that when the rear plug member is fully home in the cavity, a portion of the volume of the cavity remains unfilled by the rear plug member to accommodate flowable product and any residual trapped gas.

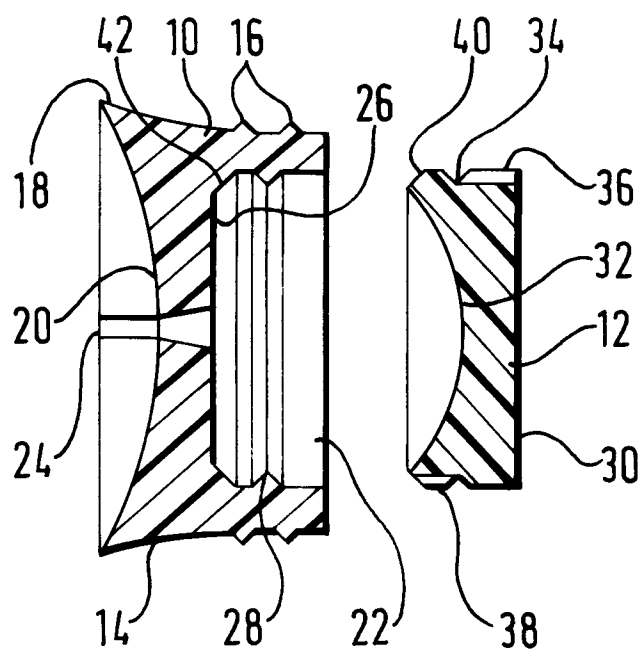


FIG. 1.

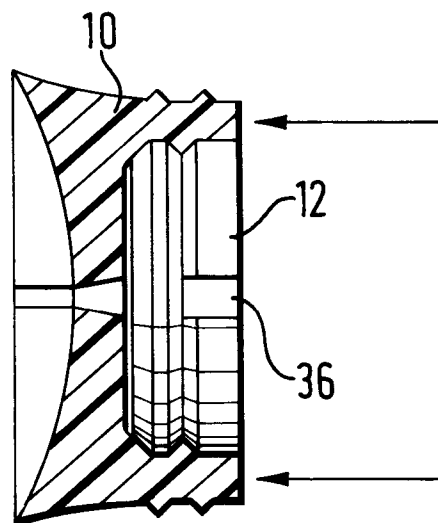


FIG. 2.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 4071

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 351 517 (GUALA S.P.A.) 24 January 1990	1,2	B05B11/00 B65D83/00
A	* column 3, line 49 - column 4, line 24; figures 1-3 *	9	

A	EP-A-0 463 991 (KELLER) 2 January 1992 * page 2, line 17 - page 3, line 3; figures 1-3 *	1,9	

			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B05B B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 4 October 1994	Examiner Vollering, J
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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