Dec. 15, 1959 S. M. LIBIT 2,917,210

DISPENSING CLOSURES

Filed May 9, 1958

Fig 1.

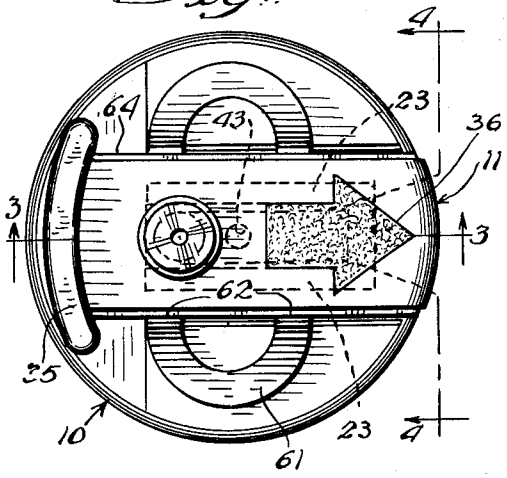


Fig 3

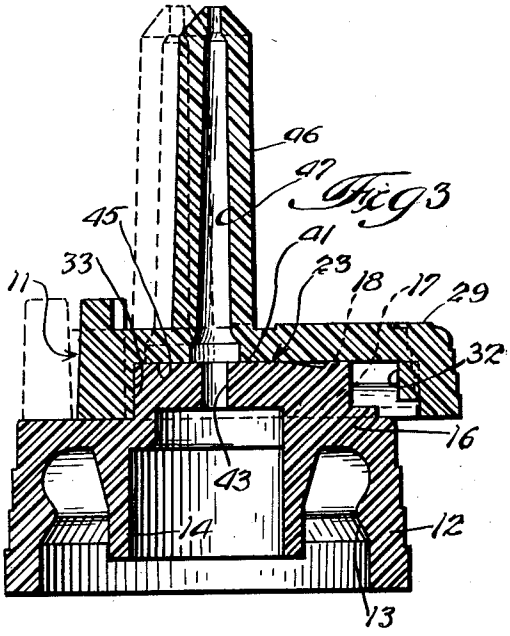


Fig 2.

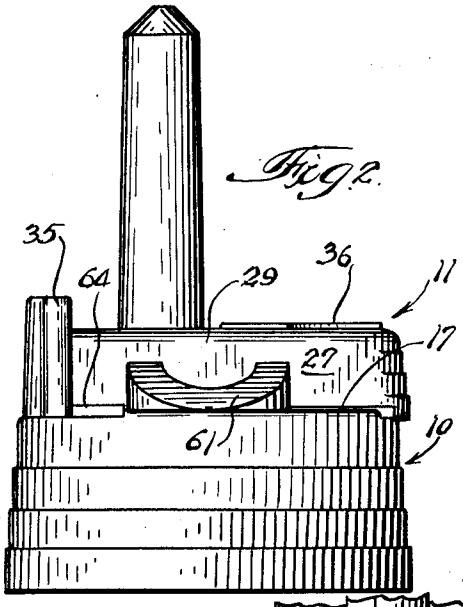


Fig 4.

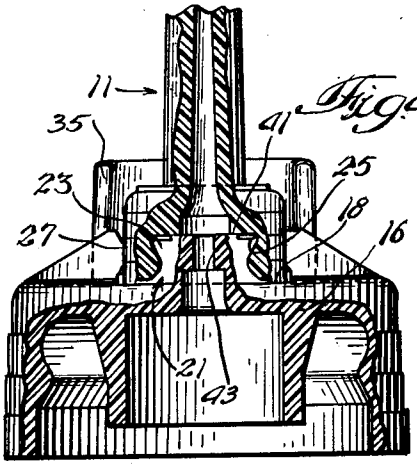
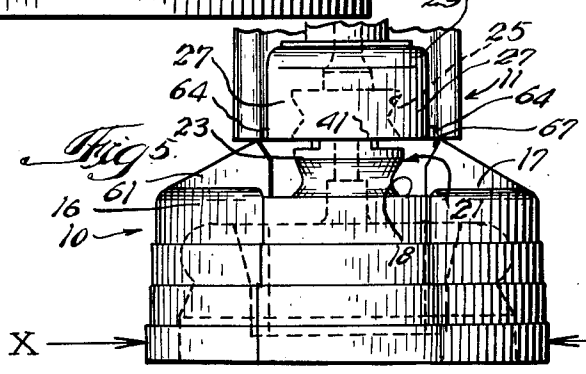


Fig 5.



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DISPENSING CLOSURES

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Application May 9, 1958, Serial No. 734,300

9 Claims. (Cl. 222—512)

This invention relates to a dispensing closure for a receptacle for fluent material in which a translationally movable part cooperatees with a fixed part secured to the receptacle to provide a valve action to initiate or to interrupt flow. In particular the present application is a continuation-in-part of my prior application Serial No. 653,309, filed April 17, 1957.

In my said pending application there is disclosed a two part dispensing closure as aforesaid in which the movable part is maintained in slidable operative relation with the fixed part by means of a type of dovetail joint whereby, upon translational movement of the movable part a fluid passage therethrough is placed into and out of register with a fluid passage through the fixed part for permitting and interrupting flow from the receptacle.

In the device there disclosed, in which a resiliently deformable plastic composition is utilized, leakage is sometimes encountered when highly volatile liquids are dispensed. It has been determined that the nature of the sliding fit is such that when sufficient play is permitted for easy shifting of the movable part the fit is then such that volatile fluids, such as naphtha, tend to leak and that, when the joint is made adequately tight for such fluids, difficulty is experienced in manipulation.

In order to augment the field of application of such devices, namely, to permit their use with fluids which are more or less viscous as well as those of volatile character, the present invention has for its principal object the provision of certain improved features of construction lending such versatility.

Another object is to provide a two-part dispensing closure of the type disclosed in my said application which lends itself to more rapid assembly.

A further object is to provide a two-part dispensing closure as aforesaid wherein the likelihood of disengagement of the two parts by careless manipulation is substantially entirely eliminated.

Other objects will become apparent from the ensuing description which, taken with the accompanying drawing discloses a preferred form in which the invention may be embodied in practice.

In this drawing:

Figure 1 is a top plan view of a dispensing closure in accordance with the invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is a cross section taken on the line 3—3 of Fig. 1;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 1; and

Fig. 5 is an end elevation of the device of Fig. 1 as seen from the right to illustrate the mode of assembly of the two parts.

Broadly regarded the invention comprises a two part dispensing closure in which both parts comprise resiliently deformable material, e.g., polyethylene. One of the parts, herein sometimes referred to as the fixed part, is provided with a portion for attachment to a receptacle holding a fluent substance. The mode of attachment

forms no part of the invention per se. The fixed part is provided with a raised portion having the general shape of the male element of a dovetail joint. The movable part is provided with a complementary female element so arranged that after the elements are initially engaged the movable part may be shifted translationally in a predetermined stroke. The length of the stroke corresponds to "on" and "off" positions of the device, since the result thereof is to place passages in the fixed and movable parts in and out of register to permit or to interrupt flow from the receptacle. Means are provided for limiting the translational stroke in each direction. Since the male and female elements of the dovetail are initially engaged by forcing them together against the resiliency of the material and, inasmuch as the ultimate consumer is likely to reverse the process inadvertently the present invention includes means for militating against such occurrence. To this end the movable part is provided with a pair of opposed faces parallel to the direction of movement and which faces are flanked by fixed abutments cooperative with ribs on the said faces of the movable part to restrain these faces against lateral deformation of a degree which would allow unintentional separation of the dovetail joint. Moreover the presence of the abutments and ribs and their relationship with the movable part effects a tighter fluid seal between the two parts.

Thus, adverting to the drawing, I have illustrated a two part dispensing closure comprising a fixed part **10** and a movable part **11** shiftable thereon between "on" and "off" positions. To secure the closure on the receptacle various, well-known expedients are available. For example, a necked bottle or can would receive a skirt **12** thereover while the inner margin of the neck opening receives a plug **14** and a bead at the outer extremity of the neck engages a bead **13** interiorly of the skirt **12**. In the case of a metal receptacle it is sometimes preferred to fit the closure into a circular aperture punched through a wall of the receptacle, for which purpose other expedients are available of. The invention closure may be employed with squeeze type bottles having a neck of the resilient material by forming the skirt **12** as a part of the neck—in which case the plug **14** is omitted.

The skirt **12** depends from a disc **16**, the upper, principal surface whereof may be identified as **17**. This latter is centrally depressed to define a sub-surface **18** within which the movable part **11** is arranged to slide, in which case the sides of the recess thus formed may contribute to retention of the movable part.

From the surface **17** or the sub-surface **18**, as the case may be, there extends a male dovetail element **21** which includes a pair of opposed ways **23** engaged with a complementary pair of grooves **25** of the movable part **11**. These latter are formed in the lateral walls **27** of an inverted box-shaped base **29** of the movable part **11**. From the foregoing it will be clear that the movable part **11** may be shifted relative to the fixed part **10** between positions limited by the end wall surfaces **32** and **33** of the base **29**, as shown by full and broken lines in Fig. 3. A pad **35** may be formed at one end of the base **29** and an embossed arrow **36** on the upper face thereof to convey to the user in unmistakable fashion that pressure on the pad in the indicated direction will open the valve for pouring.

To provide fluid communication between the interior of the receptacle and the upper surface **41** of the dovetail element **21** there is a passage **43**; and between the surface **45** of the base **29** and a pouring spout **46** there is a bore **47**. Accordingly, when the device is as shown by full lines in Fig. 3 the contents of the receptacle may be dispensed and, when the movable part is shifted to the broken line position there shown, pouring is inter-

rupted. These two positions therefore correspond to the "on" and "off" positions of the valve which positions, when selected, are maintained by friction of the parts. To provide a reliable seal between the parts the uppermost surface **41** of the fixed part is made narrower than the distance between the extreme outer surfaces of the dovetail elements **23** whereby a zone of high unit pressure is caused to exist. If desired, such zone may be realized by an annular pad circumscribing the aperture **43**.

Inasmuch as the lateral walls **27** of the base **29** are somewhat elongated and resilient means are provided to preclude dislodgment of the movable part **11** from operative relationship with the fixed part **10** by carelessness on the part of the user, as for example, application of shifting force transversely to the proper direction. To this end there is provided a pair of abutments **61** arranged to present pressure pads **62** of restricted area to the walls **27** through ribs **64** at the lower edge thereof. The transverse spacing (Fig. 5) between the pads **62** is made less than the corresponding dimension between the outer faces of the ribs. Thus the pinching effect of the pads **62** is applied in a concentrated manner, namely, adjacent the lowest part of the base **29**. The net result is to cause the female element of the dovetail to engage the male element with substantially implemented action than would be the case if the flexible walls **27** alone were depended upon. This laterally-applied force is translated via the inclined surfaces of the dovetail sliding one upon the other to provide not only a tighter seal between the sliding faces **41** and **45**, but to resist any inadvertent dislodgement of the movable part **11**. Location of the ribs **64** at the lower edge of the walls **27** enables maximum leverage in applying the force of the abutments **61**. Moreover, and as will be clear from Fig. 1, the abutments are centered about the passage **43** in order that the pressure exerted thereby will be applied principally at the point of register of that passage with the passage **47**.

In order that the parts may be initially assembled with minimum interference between the abutments **61** and ribs **64** the upper corners of the abutments are chamfered or rounded off as at **67**. For assembly the parts are positioned as in Fig. 5 and, while the fixed part rests on a solid support, pressure is applied to the skirt **12** in the direction of the arrows X—X whereby to arch the disc **16**. This action in turn forces the abutments **61** to take up a divergent relationship permitting comparatively unobstructed insertion of the base **29** therebetween, i.e. without danger of tearing the ribs **64**. When the parts are thus completely assembled the pressure at X—X is released.

By applying lateral pressure through pairs of narrow pads **62** at each side as compared with the employment of a single extended pressure-applying surface there is a tendency, while the closure is in "off" position, for the pads to indent, by a "cold forming" process, the respective ribs, which are somewhat narrower transversely than the width of the pads. Consequently when the device is operated to "on" position the pads **62** are cammed, so to speak, out of the indentations and increased pressure thereby applied. This additional advantage has been found particularly useful as closures of the character herein considered have, in the absence of the invention improvements, exhibited a tendency to leak volatile fluids more in the "on" than in the "off" position of the parts. If desired the indentations may be introduced into the ribs by formally including the necessary shape in the mold cavities. It will be noted that the interengagement of the abutments **61** with the indentations also provides a detent action assisting in reliable maintenance of the "off" position.

While I have shown a certain embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

I claim:

1. A two part dispensing closure of resiliently deformable material for a receptacle comprising a fixed part including means for attaching the same to the receptacle, said fixed part having an upper surface, a male dovetail element outstanding from said surface, a movable part adapted for translational movement with respect to said fixed part between "on" and "off" positions, said movable part having wall portions extending parallel to the direction of said movement defining on the interior thereof a female dovetail element complementary to said male element for sliding engagement thereover, said elements presenting respective slidably contacting faces which are contiguous in all positions of the movable part to provide a fluid seal between said elements, said fixed part having a passage for fluid communication between the exterior thereof and the said male element sliding face, said movable part having a passage for fluid communication between the said female element sliding face and the exterior of said movable part, said passages being placed in or out of register in the respective said "on" and "off" positions, a pair of opposed abutments outstanding from said fixed part upper surface flanking said wall portions, said wall portions each having a rib extending in the direction of movement adapted to bear on respective ones of the abutments and the ribs being positioned adjacent said fixed part upper surface whereby said wall portions are subjected to laterally-applied, opposed, compressive forces in a restricted zone which is translated by the abutted sloping faces of the dovetail elements into a component of compressive force normal to the laterally-applied forces to supplement the fluid seal between the two parts.

2. The combination in accordance with claim 1 further characterized in that said wall portions are joined at their ends by transverse wall portions to define a box-like enclosure surrounding the male dovetail element, said transverse wall portions constituting stops cooperative with said male element for fixing the limits of the stroke of the movable part.

3. A two part dispensing closure of resiliently deformable material for a receptacle comprising: a fixed part including means for attaching the same to the receptacle, said fixed part having an upper surface, a male dovetail element outstanding from said surface, said movable part having a base constituted as an inverted box open on a side adjacent said surface, two opposed walls of the base parallel to said male element being provided with female dovetail elements engaged with said male dovetail element for relative sliding displacement of said movable and fixed parts between "on" and "off" positions, each of said dovetail elements presenting respective slidably contacting faces which are contiguous in all positions of the movable part to provide a fluid seal between said elements, said fixed part having a passage providing fluid communication between the exterior thereof and said contacting face of said male dovetail element, said movable part having a passage providing fluid communication between the said contacting face of said female dovetail element and the exterior of said movable part, said passages being placed in and out of register in the respective "on" and "off" positions, a pair of opposed abutments outstanding from said fixed part surface, said walls having ribs positioned on the exterior thereof extending in the direction of movement, said ribs contacting said abutments with a snug frictional fit whereby said dovetail elements are caused to engage tightly to draw said contiguous faces into contact to provide a fluid-tight seal above said passages at their plane of register.

4. The combination in accordance with claim 3 in which each said abutment comprises an abutting face extending perpendicularly to said upper surface, said face

being outwardly curved to reduce sliding friction between the movable part and abutments.

5. A two-part dispensing closure of resiliently deformable material for a fluid-containing receptacle comprising: a fixed part having a pair of opposed, male, guide elements; a movable part having a pair of opposed, relatively deformable longitudinally-disposed side walls, each said wall having an interior female guide element complementary to one of said male guide elements for longitudinal sliding engagement between said parts; each part having respective faces which are contiguous in all operative positions of the parts to provide a fluid seal between said parts; said fixed part having a passage providing fluid communication between the exterior thereof and its said face, said movable part having a passage providing fluid communication between its said face and an exposed surface thereof for pouring; said passages being adapted to be brought into and out of register at said faces upon slidably shifting said movable part between "on" and "off" positions of the closure; abutment means on said fixed part disposed at each side of said movable part adapted to apply opposite, laterally directed, bearing forces on said side walls having a dimension measured longitudinally of said walls substantially less than the length of said walls to provide a concentrated zone of application of bearing force thereto.

6. The combination in accordance with claim 5 in

which the respective bearing regions of said abutment means are spaced laterally from and are located substantially symmetrical with respect to said fixed part passage.

7. The combination in accordance with claim 5 further characterized in that said movable part is provided with a nozzle, the bore of which is a continuation of said movable part passage and said nozzle is a handle for manipulation of said movable part.

8. The combination in accordance with claim 5 in which the complementary portions of said male and female parts include surfaces which are inclined downwardly and inwardly whereby the laterally-applied bearing forces are translated by said inclined surfaces into a component of force normally to the fluid-sealing faces.

9. The combination in accordance with claim 8 wherein one of said sealing faces is of lesser areal extent than the other to provide a concentration of said normal force component over a restricted area surrounding said passages.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,917,210 December 15, 1959

Sidney M. Libit

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 71, for "above" read -- about --.

Signed and sealed this 24th day of May 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents