April 18, 1961 R. S. WADDINGTON ET AL 2,980,300

FLUID HANDLING DEVICES

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Fig. 1.

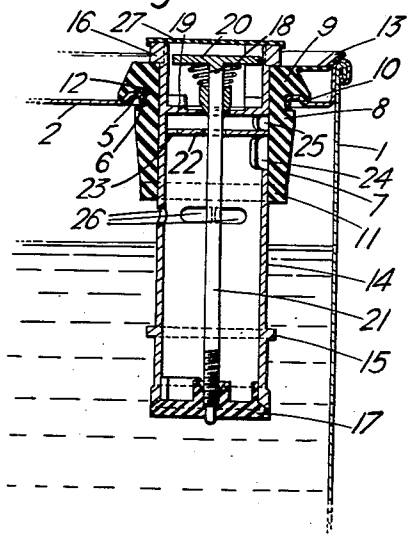

Fig. 2.

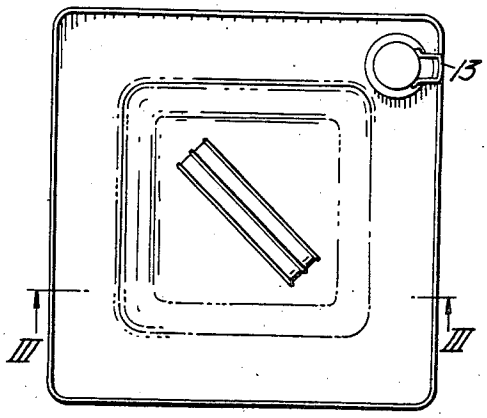

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Fig. 3.

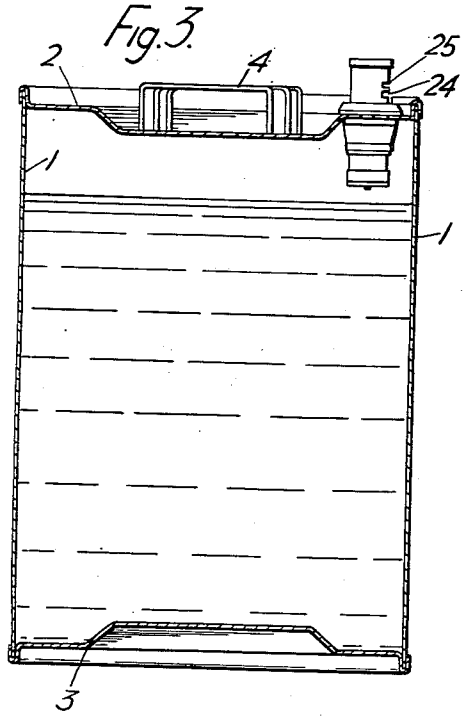


Fig. 4.

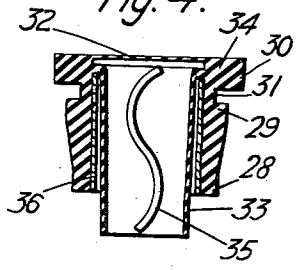
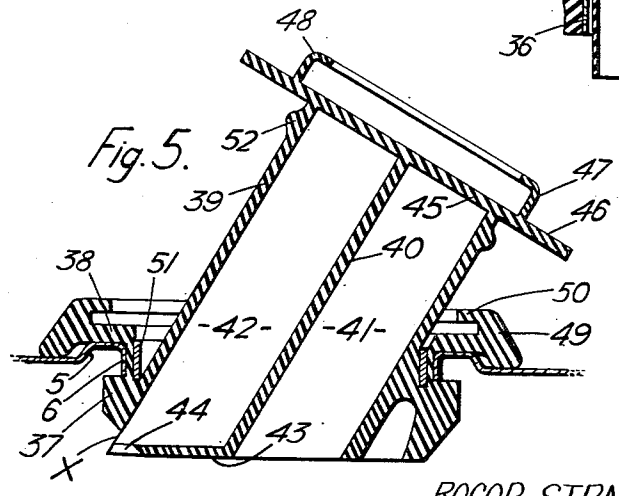


Fig. 5.



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FLUID HANDLING DEVICES

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6 Claims. (Cl. 222—361)

The present invention relates to sealing members for containers and to containers provided with such sealing members.

An object of the present invention is to provide a form of sealing member which permits the efficient sealing of a liquid container having, for filling the container, an aperture of very simple form.

A further object of the present invention is to provide a sealing member for use with such a container which sealing member incorporates a pourer or a fluid delivery valve.

The necessity to provide efficient means for sealing containers for liquids has hitherto rendered it necessary to provide the containers with filling apertures of complex form and has thus rendered the containers expensive to manufacture.

For example, the apertures of containers of the can type are provided with necks adapted to cooperate with such sealing members as plugs, screw caps or snap closures. The provision of such necks, however short, not only renders the containers the more difficult to manufacture but in practice renders them less durable in use. This is because although it is commercially practicable to provide containers in which the main body is coated with a thin layer of lacquer or other protective finish it is not feasible to provide a similar coating upon the neck. Even if the neck is fabricated from sheet material which has been given a protective coating, the coating cannot be maintained intact during fabrication of the neck and no really cheap method of coating the finished neck has been evolved. Consequently, although the main bodies of containers of the can type usually have a substantial resistance to corrosion, this is not true of their necks which accordingly tend to corrode thus spoiling the contents and rendering the containers prematurely useless. Various attempts have been made to avoid the necessity to provide containers with necks but these attempts have so far proved unsuccessful since it has been impossible heretofore to provide sufficiently cheap and convenient sealing members which can seal simple apertures efficiently.

In accordance with the present invention there is provided a sealing member for a container which comprises a plug of rubber or other elastomeric material formed with a pair of surrounding flanges whose adjacent surfaces are spaced apart in the axial direction of this plug to define a groove whose width in the axial direction of the plug is small in comparison with the peripheral size of the plug at the groove, the first of the flanges

(*a*) being formed over at least a part of its axial length with a surface whose peripheral size increases in the direction of the groove,

(*b*) being of maximum peripheral size adjacent to the groove,

(*c*) having a minimum peripheral size which is, at most, substantially equal to the peripheral size of the plug at the groove, and

(*d*) having a maximum peripheral size which is insufficient to prevent (and preferably just allows) sufficient deformation of the plug and the first flange to allow passage of the first flange through an aperture leading from the outside to the inside of a container, which aperture has a peripheral size which is substantially equal to that of the plug at the groove and an axial length substantially equal to said width of the groove until the first flange is located within the container.

The invention will be understood from the following description in which reference is made to the accompanying drawings.

In the drawings:

Figure 1 is a vertical sectional view and Figure 2 is a top plan, of part of a container sealed by means of a sealing member having a liquid delivery valve positioned therein, according to the present invention,

Figure 3 is a cross section taken on line III—III of Figure 2,

Figure 4 is a cross section of a sealing member incorporating an invaginable pourer.

Figure 5 is a cross section of a sealing member incorporating a pourer of another type from that shown in Figure 4.

The can shown in Figures 1, 2 and 3 is a four gallon can of square cross section formed of lacquered tinplate and having a side wall **1** seamed to an upper wall **2** and a lower wall **3**. The upper and lower walls are recessed as shown most clearly in Figure 3 to such an extent as to accommodate the handles **4** when a plurality of cans of the type shown are stacked compactly together.

Near one corner of its upper wall, the can is formed with a filling aperture, the metal around which is upset as shown to provide a conical seating surface **5** and a planar annular edge **6** which faces into the can. Located within the aperture is a hollow rubber plug **7** formed with a first flange **8** and a second flange **9**. The second flange **9** covers the conical seating surface **5** and is formed at its outer periphery with a downwardly directed rim **10** which contacts the top wall of the can outside the conical seating surface **5**.

The first flange **8** is of uniform diameter over its upper portion and of uniformly decreasing diameter over its lower portion. The flange **8** terminates above the lower end of the plug **7** to leave at the lower end of the plug a short cylindrical section **11**. The upper surface of the first flange **8** and the lower surface of the second flange **9** are constructed and spaced to define a groove **12** whose axial length parallel to the axis of plug **7** and whose bottom diameter are such that the groove snugly engages the filling aperture in the upper wall of the can with the rubber of which the plug is formed being held under slight radial compression. At its upper end the plug is formed with an integrally moulded drip spout **13**. Slidably held within the bore of the plug **7** is a tube **14** formed with radial shoulders **15** and **16** for setting limits to its travel.

A rubber valve plate **17** is held seated in the lower end of the tube by a spring **18** which is compressed between a partition **19**, extending transversely of tube **14** and which closes the tube **14** near its upper end, and a button **20** which is linked with the rubber valve plate **17** by a valve rod **21**.

Just below the partition **19** extending transversely of tube **14** is a further partition **22** which is formed with an airway **23** adjacent to the wall of the tube. A liquid delivery port **24** and an air inlet port **25** are formed through the longitudinal wall of the tube **14** adjacent to the upper and lower sides respectively of the partition **22** diametrically opposite the airway **23**.

As will be seen from Figure 1 the air inlet **25** and the liquid delivery port **24** are covered by the plug **7** when the tube is pushed inwardly to its fullest extent. With

the tube in this position, filling ports 26 formed through the wall of the tube 14 and which are located just below the lower end of the plug 7 therefore provide communication between the inside of the tube 14 and the inside of the container 1, 2, 3. As will be seen from Figure 3, pulling the tube 14 upwardly outwardly to its fullest extent, exposes the fluid delivery port 24 and the air inlet port 25 outside the container and simultaneously covers the filling ports 26.

If the can is placed on its side and the tube is pulled upwardly outwardly to its fullest extent, a fixed quantity of the liquid is delivered through port 24. If the button 20 inside of tube 14 is then pressed the lower end of the tube is opened by depressing plate 17, and liquid flows through the tube and out of port 24 while air passes through port 25 and thence via airway 23 into the tube and finally into the can.

In order to provide for safety during transit the plug is formed as shown in Figure 1 with an integral transit seal in the form of a thin rubber cap 27 which covers the outer end of the tube 14 and which may be torn away when required.

The plug 7, the tube 14 and the transit seal form a convenient assembly which may readily be brought into sealing relationship with the can by positioning the short cylindrical terminal portion 11 within the aperture in the upper wall of the can and pressing the plug assembly home until the groove 12 engages the aperture as shown in Figure 1.

Even using the transit seal, the exposed part of the assembly projects only slightly above the adjacent seam of the container; therefore, a plurality of containers similarly equipped, can be stacked without interference.

The thickness of the rubber layer between the bottom 12 of the groove and the tube 14, and the diameter of the flange 8 adjacent the groove, are related in such a manner that the maximum diameter of the flange is not quite sufficent to prevent the amount of deformation required to enable the first flange 8 to be passed through the aperture in the upper wall 2 of the can while the shape of the inner surface of the tubular plug 7 is maintained constant by the tube 14. In consequence, the plug assembly cannot be withdrawn from the filling aperture. Any attempt to make such withdrawal causes tighter engagement of the edge 6 of the metal against the first flange 8. No radial compression can take place, and the arrangement necessarily remains firm, the fact that the upper portion of this first flange is maintained having a constant uniform diameter, materially contributing to the firmness of this engagement.

In the modified form of device shown in Figure 4 a hollow plug 28 is formed with a first flange 29 and a second flange 30 defining therebetween a groove 31 for co-operation with the filling aperture of a container, and is closed at one end with a thin diaphragm 32 which serves as a transit seal. Within the bore of the plug is positioned a flexible pourer-tube 33 which is sealed by its upper end 34 to the inner surface of the plug. A tape 35 secured within the lower end of the readily flexible tube 33 enables the tube to be invaginated after the transit seal has been broken that is, it can be readily turned inside out. A thin metal tube 36 which lines the inside of the plug 28 and extends from the lower end thereof to a position above the groove 31 serves for maintaining the rubber of the tube compressed in engagement with the sealing aperture of a container.

In the further modified form of device shown in Figure 5 a hollow rubber plug assembly P is formed with a first flange 37 and a wide second flange 38 defining therebetween a groove for co-operation with the filling aperture of a container, e.g. the container as shown in Figure 1. A tube 39, also of rubber, having its axis inclined to the axis of the plug P is united in fluid-tight relationship with the inner surface of the plug as shown. Internally, the tube is divided by a longitudinal septum 40 to form a liquid passageway 41 and an air passageway 42, the air passageway being provided at its lower end with a partition 43 which, apart from leaving a small air-port 44, totally encloses the end thereof. If desired the partition may be formed to totally enclose the end of the air passageway and a small air-port may be formed at position X, the wall of the tube 39 being extended downwardly beyond the plug to have the air-port formed therein.

At its upper end the tube is totally closed by a cover 45 which projects radially to form a flange 46 on which is carried a projecting cylindrical flange 47 which terminates in an inwardly directed rim 48. A small circumferential ridge or shoulder 52 whose outer diameter is greater than the inner diameter of the rim 48, surrounds the tube 39 below the flange 46. On its upper surface, the second flange 38 carries an additional cylindrical flange 49 whose inner diameter is approximately equal to the outer diameter of flange 46 and which terminates in an inwardly directed retaining rim 50.

A short sleeve 51 formed of metal or other rigid material lines the bore of the plug P at the position of the groove defined between the flanges 37 and 38. This sleeve 51 is the only part of the device which is not formed of rubber.

The device shown in Figure 5 may be deformed so that the rubber tube 39 is crumpled into the bore of the plug and flange 46 is retained under rim 50. In this condition the device forms a compact seal for the aperture of a container and it will be noted that the sleeve 51 cannot be contacted by liquid in the container and need not therefore be formed of corrosion resistant material.

To open the container the tube 39 is pulled out as shown in Figure 5, and the cover 45 removed by cutting between the flange 46 and the ridge 52. Liquid can now be poured through the liquid passageway 41 while air flows inwardly through air-passageway 42 and air port 44 thus ensuring steady delivery of the liquid.

To close the container the cut-off cover 45 is inverted and placed over the end of the tube 39 with the rim 48 engaged by the ridge 52.

Apart from the air passageway partition 43, the whole of the rubber parts of the device may be provided in the form of a single integral moulding. Even the partition 43 can be formed as part of the integral moulding by making the air-port large enough to permit that part of the mould which provides a core for the air passageway 42 to be withdrawn therethrough when the rubber is stretched. Making the air-port large however, reduces the steadiness of delivery of the liquid.

With a metal sleeve 51 having an axial length as shown in Figure 5, the rubber assembly of the device has sufficient stability within the filling aperture of a container to prevent accidental withdrawal. It can however be withdrawn without much difficulty. Greater stability can be achieved by providing a metal sleeve which extends to a greater distance under the first flange 37 and is cut away at that side which appears to the left in Figure 5 in order to accommodate the tube 39.

As will be appreciated various departures may be made from the specific constructions herein described without departing from the scope of the present invention.

We claim:

1. Sealed dispensing apparatus for a container which comprises a tubular plug of elastomeric material, a fluid dispensing device fitting the bore of said plug in fluid-tight relationship therewith and, surrounding said plug, a pair of flanges whose adjacent surfaces are spaced apart in the axial direction of the plug by a distance which is small in comparison with the diameter of the plug inside the flanges and forming a groove between said flanges, the first of the flanges being bounded over at least a part of its axial length with a surface whose diameter

increases in the direction toward the groove, being of maximum peripheral size adjacent to the groove, having a minimum peripheral size which is, at most substantially equal to the peripheral size of the plug on a section taken through the groove, and having a maximum peripheral size which is insufficient to prevent sufficient deformation of the elastomeric material while the shape of the bore of the plug is maintained constant by said fluid dispensing device, to allow passage of the first flange through an aperture leading from the outside to the inside of a container.

2. Sealed dispensing apparatus according to claim 1 in which the fluid dispensing device is a hollow cylinder having an apertured longitudinal wall, which cylinder is reciprocable through the plug, is formed with a pair of radial abutments defining a pair of limits for the reciprocation of the cylinder and is closed at at least one of its ends, the bore of the plug being sealed when the hollow cylinder is at one of said limits and the interior of the tube communicating via the apertured wall with the atmosphere when the hollow cylinder is at the other of said limits.

3. Sealed dispensing apparatus according to claim 1 in which the dispensing device is a hollow cylinder which is closed at both ends and the wall of the cylinder is formed with apertures which lie between the abutments and which are positioned such that at least one of the apertures is located beyond one end of the tubular plug when the hollow cylinder is at one end of said limits and at least one other of the apertures is located beyond the other end of the tubular plug when the tubular plug is at the other of said limits.

4. Sealed dispensing apparatus according to claim 3 in which one end of the cylinder is closed by a valve which is adapted to be opened from the other end of the cylinder.

5. Sealed dispensing apparatus according to claim 4 in which the cylinder is formed near said other end with a pair of apertures both of which are positioned such

as to be exposed to the atmosphere when the abutment which is the nearer to said one end contacts the plug, a transverse partition divides the interior of the cylinder at a position between the apertures of said pair and an air passageway is formed through the partition adjacent the wall of the cylinder and diametrically opposite said pair.

6. A liquid carrier which comprises a container formed with an aperture which leads from the outside to the inside thereof and has an axial length which is small in comparison with its peripheral size, and in sealing relationship with said aperture, a sealing assembly constituted by a tubular plug of elastomeric material, a fluid dispensing device fitting the bore of said plug in fluid-tight relationship therewith and, surrounding said plug, a pair of flanges whose adjacent surfaces are spaced apart in the axial direction of the plug by a distance which is small in comparison with the diameter of the plug inside the flanges and forming a groove between said flanges the first of the flanges being formed over at least a part of its axial length with a surface whose diameter increases in the direction of the groove, being of maximum peripheral size adjacent to the groove, having a minimum peripheral size which is, at most, substantially equal to the peripheral size of the plug, on a section taken through the groove, and having a maximum peripheral size which is insufficient to prevent sufficient deformation of the elastomeric material while the shape of the bore of the plug is maintained constant by said fluid dispensing device, to allow passage of the first flange through the aperture leading from the outside to the inside of a container until the first flange is located within the container.

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