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1

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DISPENSING PUMP UNIT

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2 Claims. (Cl. 222—321)

This invention relates to a dispensing pump unit particularly adapted for use with portable containers such as bottles, cans and the like.

It has been customary in the art to utilize such units wherein the pump barrel is supported in fluid tight manner through an opening, which may be formed either in the container or in the closure therefor, so that fluid may be sucked upwardly into the barrel through a depending suction tube and then discharged through a hollow or tubular plunger reciprocably disposed in the barrel through the open outer end thereof.

Since the plunger in such a pump is usually projected from the barrel on its upward stroke by means of a relatively weak spring, it is impractical to provide a really fluid tight packing between the barrel and the plunger due to the danger of binding the plunger. Because of this, leakage or seepage of fluid between the plunger and its valve will frequently occur when a container equipped with such conventional type of pump is tilted or partially inverted, as will generally occur during shipping of the containers.

In addition, rough handling of the containers during shipping with resulting movement thereof in their respective packages or cartons will frequently result in affording some degree of operative movement to their pump plungers and discharge of their contents unless some means is provided for immobilizing same during shipping.

With these considerations in mind, it is a primary object of the invention to render such a dispensing pump substantially leakproof in shipping and rough handling by providing a novel means operative both to immobilize the plunger and to radially expand a resilient packing ring into fluid tight sealing engagement around the plunger.

To this end the plunger and its barrel are formed with opposed annular shoulders or abutments disposed for relative movement toward each other on the downward or inward stroke of the plunger. A sealing or packing ring of resilient material normally encircles the plunger between these shoulders, and normally disengaged cam elements on the barrel and the plunger respectively are positioned to be brought into operative engagement with each other near the end of the plunger down stroke. Responsive to relative rotation between the plunger and barrel the cam elements are then operative to compress the said packing ring axially between the shoulders whereby it is caused to expand radially into sealing engagement with the plunger and also is thrust into endwise sealing engagement with the said barrel. At the same time, the plunger is immobilized so that it cannot be actuated by rough handling during shipping of its associated container.

It is a further feature of the invention to utilize the said shoulder of the barrel as part of a cylindrical housing for the packing ring and to position certain of the said cam elements in said housing above the packing ring to prevent displacement of the packing ring incident to reciprocation of the plunger.

2

It is a further object to provide stop means associated with the respective cam elements for limiting their relative rotary movement and thereby prevent the imposing of excessive stresses on the various parts of the pump structure.

The foregoing and other incidental features and advantages of the invention will be readily apparent from a consideration of the following detailed description in conjunction with the accompanying drawings.

In the accompanying drawings:

Figure 1 represents a side elevation of the preferred embodiment of the invention as applied to a bottle, the latter being shown in broken lines;

Figure 2, an enlarged vertical section through a portion of the pump unit of Figure 1;

Figure 3, a fragmentary section on the same plane as in Figure 2, but showing the cooperating cam elements interlocked to immobilize the plunger and to compress the resiliently sealing ring into radial sealing engagement with the plunger;

Figure 4, a plan view of the inclined cam elements and their mounting member, showing diagrammatically in dotted lines the position which their cooperating cam elements or lugs assume when in or nearing a position to immobilize the plunger;

Figure 5, a section on the line 5—5 of Figure 2; and Figure 6, a vertical cross section through one of the cam elements showing a modified configuration of its cam surface.

Referring now in detail to the drawings, the pump unit of the invention is illustrated in Figure 1 as applied to a conventional fluid container in the form of a bottle B having a threaded neck N on which is removably threaded a usual cap C. Extending downwardly into the interior of the bottle B through an opening in the cap C is a usual pump barrel 10 having a suction tube 12 extending from its lower end into the liquid contents of the bottle to withdraw same upwardly for discharge. In the embodiment shown the pump barrel 10 is provided with integral radial flange 14 (Figure 2) which extends beneath the lower face of the cap C and rests on the neck of the bottle, and which may serve as a packing or seal for the cap in addition to preventing upward movement of the barrel 10 through the opening in the cap. However, if desired, an additional resilient seal 16 may also be employed.

A plunger 18 of the hollow tubular type is reciprocable in the barrel 10 through the upwardly presented end thereof, the arrangement being a more or less conventional one in accordance with which the fluid is discharged upwardly through the tubular plunger 18 into a hollow head or fitting 20 from whence it may be expelled either in the form of a jet or a spray by a suitably arranged discharge element 21 in accordance with the known practice.

The interior construction of such a pump unit may be entirely conventional as exemplified, for instance, in the Martin Patent No. 2,362,080. Since it constitutes no part of the instant invention such internal structure and arrangement is not specifically described in the present application.

Normally the plunger 18 is adapted to be depressed by finger pressure on its finger piece 22 and returned by the thrust of suitable spring means (not shown) within the barrel 10, all as disclosed in the above mentioned patent to Martin. The barrel 10 being of hollow cylindrical construction, it will be apparent that the plunger 18 is freely rotatable therein as well as reciprocable.

Fixed on the barrel 10 at its upper end is an upwardly presented shoulder or abutment element 24 which coacts with an upstanding annular wall 26 to define an upwardly opening annular packing chamber 28 around the plunger 18. The shoulder 24 thus defines the bottom of such

chamber. Disposed in the chamber 23 and normally seated on a raised annular ridge 29 on shoulder 24 is a packing ring 30 of any resiliently deformable material. This packing ring 30 encircles the plunger and is normally in light wiping engagement with it to prevent the carrying of excess fluid upwardly with the plunger, while avoiding any undue opposition to upward projection of the plunger.

Preferably the annular shoulder element 24 is provided with an inner depending skirt 32 which is received in the upper end of the barrel 10 and cemented in place to thus accurately position the shoulder 24 and its annular ridge 29 concentrically to the barrel. Formed in the skirt 32 is a downwardly directed stop shoulder 33 adapted for engagement with a coacting shoulder 34 on the plunger to limit the upward movement of the latter. Preferably the upstanding wall 26 is formed separately from the shoulder 24 and provided with a depending skirt 36 which is fitted on and cemented about an outer skirt 38 depending from the annular shoulder or abutment 24. It will be seen that the lower edge extremity of the depending skirt 36 abuts against the top of the cap or closure C to prevent downward displacement of the pump barrel 10. If desired, the skirt 36 may be of slightly resilient material and its skirt 36 formed with an inwardly projecting retainer ring 39 for reception beneath skirt 38.

It will be seen that the plunger 18 is provided with a downwardly directed shoulder 40 which, in the present instance, is defined by the lower end portion of the relatively larger diameter fitting 20. This shoulder 40 is disposed and proportioned for movement downwardly with the plunger 18 into the upwardly opening chamber 23 into thrusting engagement with the packing ring 30.

For the purpose of immobilizing the plunger 18 while at the same time compressing the packing ring 30 between the shoulder 40 and the annular ridge 29 of shoulder 24, the barrel and the plunger respectively carry cooperating cam elements 42 and 44 which may be brought into operative engagement by relative rotation thereof when the plunger is at or near the end of its downward stroke.

The arrangement is such that relative rotary movement of these two elements will cause an ensuing downward axial movement of the plunger 18 within the barrel 10 and the resulting compression of the packing ring or washer 30 will cause it to expand radially inwardly into tight sealing engagement with the plunger 18. Thus the diametrically opposed cam elements 42 in the preferred embodiment are formed as radially inwardly projecting integral portions of the wall 26. These cam elements 42 are relatively circumferentially spaced and the cam elements or lugs 44 of the plunger are positioned and proportioned for movement downwardly through the spaces between elements 42, following which they may be rotated with the plunger for movement beneath the cam elements 42, respectively. It will be seen that the cams 42 in the preferred embodiment are provided with downwardly directed constantly inclined cam surfaces 42', respectively, to exert a substantial downward thrust on the cam elements 44 and their associated shoulder 40 incident to rotation of the elements 44. In the embodiment shown the inclination of the cam surfaces 42' is constant and such as to cause downward movement of the plunger incident to counterclockwise rotation of the plunger. Expressed otherwise the cam elements 42 are in substance the equivalent of threaded segments and these together with their associated elements 44 may be regarded broadly as threaded means.

In the operation of the invention it will be seen that when the containers B are filled and prepared for shipping they may be sealed in leakproof condition by depressing their plungers to present the elements 44 between and beneath the respective cam elements 42, whereupon a slight counterclockwise rotation of each plunger

18 will result in compressing the packing ring 30 to cause it to expand radially into fluid tight engagement with the plunger 18. Where the annular ridge 29 is formed on the shoulder 24, the apex or edge thereof will be caused to bite into the ring 30 in tight sealing engagement therewith. However, it is to be understood that such a ridge 29 is not essential and may be omitted from the shoulder 24 if desired, in which case the ring 30 will still be pressed into sealing relation with the shoulder. This is for the purpose of preventing leakage of fluid from the pump barrel, beneath and around the ring 30. The same operation will result in immobilizing the plunger whereby it cannot be actuated to expel any of the contents of the container incident to rough handling during shipping. When the consumer subsequently wishes to condition the pump for use, it is necessary only that he rotate the plunger 18 in a clockwise direction until the cam elements or lugs 44 register with the spaces between cam elements 42, whereupon the plunger 18 will automatically be projected to its upward position by action of the usual spring within the barrel 10. Obviously, it is immaterial whether the plunger 18 be immobilized by clockwise or counterclockwise rotation, and the cam surfaces 42 may accordingly slope in either direction.

In order to prevent such a degree of rotation of the plunger 18 in immobilizing it as may either exert undue stress on the several parts of the pump or such as might cause the elements 44 to again register with spaces between the elements 42, it may be desirable in some instances to provide integral stops 46 at the lower ends of the inclined cam surfaces 42'.

Also, as shown in Figure 6 it may be desirable in some instances to reduce the tendency of the inclined cam elements 420 to cause a backing off of their associated elements 44, by providing inclined cam surfaces 420' which extend only partially along the modified elements 420 from their leading ends and then merge with truly radial or horizontal surfaces 421 adjacent the stops 460 at their trailing ends.

In this application there is shown and described only the preferred embodiment of the invention together with one minor modification simply by way of illustration of the preferred mode of carrying out the invention. It will be understood, however, that the invention is subject to various modifications within the scope of the expanded claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A dispensing pump unit comprising a cylindrical pump barrel adapted to extend downwardly in sealed relation through a container closure, a pump plunger extending into said barrel from the upper end thereof for reciprocation and rotary movement therein, a housing fixed on said barrel at said upper end defining an upwardly opening annular packing chamber around said plunger, and including an upwardly directed abutment shoulder defining the bottom of said chamber, in combination with a packing ring of resiliently deformable material normally encircling said plunger within the chamber and in wiping engagement with the plunger, a downwardly directed annular abutment shoulder on said plunger disposed for movement downwardly into said upwardly opening chamber into abutting engagement with said packing ring, and cooperating cam elements on said plunger and said housing respectively operative responsive to rotary movement of said plunger for immobilizing the plunger and for axially compressing said packing ring between said shoulders to expand it radially into sealing engagement with said plunger, said cam elements of the housing projecting radially inwardly above the packing ring to prevent upward displacement of the packing ring from the housing, and being spaced radially from the plunger to permit entry of said plunger shoulder within the housing.

2. A dispensing pump unit comprising a normally ver-

5

typically disposed pump barrel, a pump plunger extending into said barrel through the upper end thereof for reciprocation therein, means defining relatively axially opposed annular shoulders on the upper end of said barrel and on the plunger respectively for relative movement toward each other on the down stroke of the plunger, a packing ring of resilient material normally loosely encircling said plunger between said shoulders, and normally disengaged cam elements carried by the barrel and the plunger respectively said cam elements being relatively rotatable into operative engagement with each other near the end of the plunger downstroke, to immobilize said plunger and to compress said packing ring axially between said shoulders whereby it is caused to expand radially into sealing engagement with the said plunger, an upstanding

6

annular wall carried by said shoulder of the pump barrel and encircling said plunger in wiping relation thereto, said shoulder and its associated annular wall defining an upwardly opening chamber housing said packing ring, said cam element of the barrel projecting radially upwardly from said wall and above said packing ring, to retain the packing ring in the chamber.

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