April 5, 1966 H. L. ROGERS 3,244,332

SELF-CLOSING CAP

Filed Nov. 18, 1964

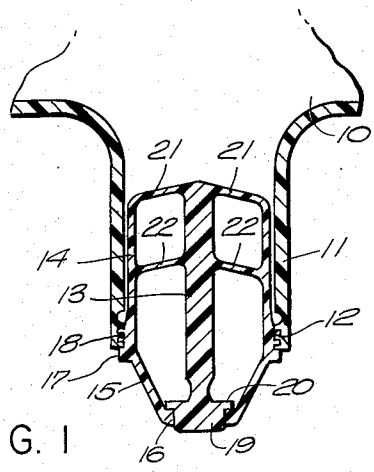


FIG. 1

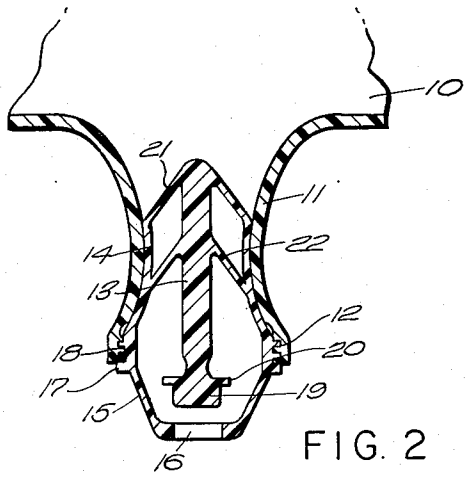


FIG. 2

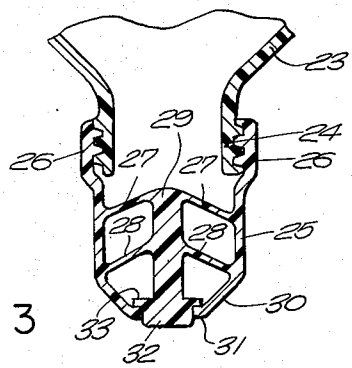


FIG. 3

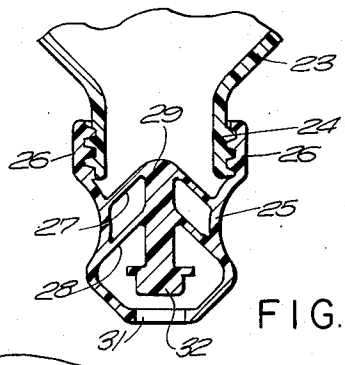


FIG. 4

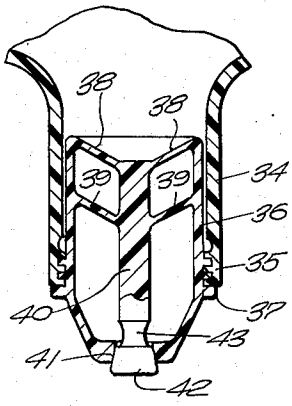


FIG. 5

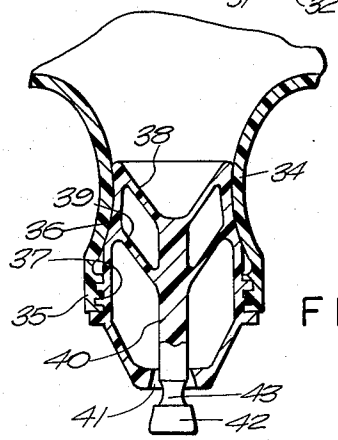


FIG. 6

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SELF-CLOSING CAP

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12 Claims. (Cl. 222—213)

My present invention relates to squeeze tube dispensers and bottles and more particularly to a self-closing cap device for the dispenser.

The principal object of the present invention is to provide a captive cap construction which operates on the squeeze principle and is self-closing after release.

Another object of the present invention is to provide a self-closing cap device which eliminates the use of separate screw caps and provides for automatic closing of the container when the device is released.

A further object of the present invention is to provide a squeeze type closure device suitable for either liquid, viscous material or even powder.

Another object of the present invention is to provide a self-closing captive cap suitable for either a rigid or flexible container.

A further object of the present invention is to provide a self-closing captive cap which is simple in construction and easy and economical to manufacture and assemble.

With the above and other objects and advantageous features in view, my invention consists of a novel arrangement of parts, more fully disclosed in the detailed description following, in conjuction with the accompanying drawings, and more particularly defined in the appended claims.

In the drawings,

FIG. 1 is a partial longitudinal section of a flexible container equipped with the self-closing cap of the present invention.

FIG. 2 is a view similar to FIG. 1 with the cap in open or dispensing position.

FIG. 3 is a view similar to FIG. 1 showing the device mounted on a rigid container.

FIG. 4 is a view of the device as shown in FIG. 3 in open position.

FIG. 5 is a view similar to FIG. 1 showing another form of my invention.

FIG. 6 is a view of the device as shown in FIG. 5 in open position.

In my Patent No. 3,141,580 issued July 21, 1964 and entitled Measuring Pump Dispenser, I have illustrated a device particularly suitable for a squeeze type dispenser for dispensing measured quantities or dosages from a container. The present invention is designed to utilize some of the concepts disclosed in said patent to provide a captive cape for either a flexible or a rigid container and designed to open the container under pressure and to automatically close the container opening upon release. Since no measuring is involved, the opening can be made of any size and the cap of the present invention can therefore be used on almost any type of material, liquid or dry powder.

Referring more particularly to the drawing, FIGS. 1 and 2 illustrate the invention as applied to a container having a flexible neck such as a plastic bottle or other squeeze type container. The container **10** is illustrated in FIG. 1 as having a plastic, flexible, collapsible neck portion **11** terminating adjacent its outer end with internal threads **12**. The closure device shown therein is preferably molded in a single integral construction of a suitable plastic material with a memory. As in my patent above referred to, the preferred material is polypropylene. This material is now made with a high degree of resiliency or memory in a high durometer reading between **90** and **95**. Such material is resistant to most all chemicals and is

stable at a good temperature range above boiling which permits it to be sterilized.

The cap comprises a central elongated cylindrical portion having an outer cylindrical wall **14** which is tapered at the front end **15** to an opening **16**. At the start of the tapered portion, the outer housing portion **14** is provided with shoulder **17** below which are outside threads **18** which mesh with the internal threads **12** of the container. The front end of the central cylindrical portion **13** is provided with a block closure member **19** which fits snugly into the opening **16** as shown in FIG. 1 and is provided at the rear end with a flange **20** which acts as a stop. Integrally connecting the central cylindrical portion **13** with the outer portion **14** are spaced parallelogram strips **21** and **22** adjacent the rear portion. It should be noted that in the form shown in FIG. 1 the parallelogram strips **21** and **22** extend at a slight angle from the central cylindrical portion **13** towards the front end. In this position the memory tendency or preload of the material tends to push the cylindrical portion **13** out of the container downwardly in FIG. 1 towards the opening **16** to close the opening.

In the illustrated form the device is shown as screwed into the container. However it may be joined to the container by heat, glue or other materials. Now referring to FIG. 2, if it is desired to open the container and pour or shake the contents from the container, it is only necessary to bring pressure to bear on each side of the container neck **11** to collapse the neck of the container and also the outer portion **14** of the cap. Inward movement of the cap portion **14** results in a collapse of the parallelogram portions **21** and **22** at an angle towards the central portion **13** as shown in FIG. 2. This moves the central portion **13** rearwardly so that its front end **19** moves away from the opening **16** to open the container. When the pressure is released from the container neck **11**, the polypropylene parts will return to the form shown in FIG. 1 pulling the parallelogram strips **21** and **22** back into the position shown in FIG. 1 and forcing the central portion **13** forwardly so that its end **19** again enters the opening **16** to close the container. This motion is automatic and is inherent with the memory of the material. Thus, release of the container results in the closure of the opening.

In the form illustrated, the portion **14** and the parallelogram portions **21** and **22** may be in the form of wide strips, and if desired a plurality of parallelogram portions **21** and **22** may be placed around the central portion **13**. Further, it is possible to make the portion **14** completely annular or cylindrical and the parallelogram portions **21** and **22** cylindrical too. However, in such form openings must be punched in the portions **21** and **22** to allow the material of the container to flow through the cap. Also, the size of the opening **16** may readily be varied to accommodate different types of materials. For example where powder is being dispensed the opening **16** may be made larger or a plurality of small openings may be used. If it is desired to dispense material in small droplets the opening **16** may be made smaller.

In the form illustrated in FIGS. 1 and 2, the container neck itself must be flexible so that the pressure on the outside of the container neck will be transmitted to the parallelogram strips to operate the closure unit. However, where the container is rigid such as glass or metal, the dispenser may be positioned at the outside as illustrated in FIGS. 3 and 4 and the opening pressure can be applied directly to the dispenser opener. In this form the container **23** is provided with a rigid neck portion **24** having external threads. The closure device comprises a cylindrical housing **25** having a rear internally threaded portion **26** for mounting on the threaded neck **24** of the con-

tainer as shown in FIGS. 3 and 4. The housing **25** is made of the same material as the form shown in FIGS. 1 and 2 and is provided with integral parallel portions **27** and **28** extending slightly rearwardly and integrally joined to a central spindle or core **29**. The front end of the cylindrical housing **25** tapers towards each other at **30** to a front opening **31** which is closed by the enlarged head **32** having a flange **33** at the front end of the member **29**. As in the form shown in FIGS. 1 and 2, pressure on the housing **25** inwardly as shown in FIG. 4 will cause the parallel portions **27** and **28** to move the member **29** axially rearwardly thus pulling the head **32** out of the opening **31** to open the container. When the pressure is released the sides of the housing **25** returns to the position shown in FIG. 3 thus moving the parallel portions **27** and **28** outwardly and moving the member **29** axially forwardly so that the head **32** closes the container opening **31**. Thus, operation of the form shown in FIGS. 3 and 4 is identical to that shown in FIGS. 1 and 2 except that the pressure is directly on the closure device whereas in the form shown in FIGS. 1 and 2 it is on the container which in turn presses the closure device.

In some cases it may be desirable to reverse the movement of the closure device so that in opening the container the central member with the closure head moves forwardly rather than rearwardly. This may be desirable where dry powder is being dispensed. Such a device is illustrated in FIGS. 5 and 6 and mounted in a container such as that shown in FIGS. 1 and 2. However, it should be understood that the type of movement illustrated in FIGS. 5 and 6 can also be applied to the type of construction shown in FIGS. 3 and 4. In this form the container neck **34** is of the same flexible material as the neck **11** in the form shown in FIG. 1. It is provided with internal threads at the end **35** and the outer cylindrical portion of the device **36** is provided with a threaded portion **37** for threadedly engaging the portion **35** in mounting the device in the container. At the rear, the portion **36** is provided with parallelogram strips **38** and **39** integrally joined to a central core **40** at a rearward angle from the center outwardly as opposed to the angle shown in the form shown in FIG. 1. The opening **41** is provided with tapered sides and the end of the central portion **40** is provided with a head **42** having tapered sides and behind the head **42** is a narrow portion **43** to assist in dispensing the contents of the container. Now pressure on the sides **34** of the container as shown in FIG. 6, will produce an inward movement of the walls **36** of the device and the pressure of the walls **36** will cause a flexing of the parallel portions **38** and **39** to move the central portion **40** axially forwardly out of the opening **41**. This allows the contents of the container to move outwardly. Release of the pressure will result in the parts returning to the position shown in FIG. 5 wherein the portion **40** is withdrawn until the head **42** again closes the opening **41**.

I have thus provided a closure device which can be readily molded in a single piece of plastic material and inserted in the neck of a container to provide in effect a captive cap. There are no parts to be unscrewed or unplugged. The container is opened to release its contents merely by pressure on the sides of the neck or on the sides of the device whichever the form that is used. Release of the pressure closes the container. The construction is simple and its assembly is rapid and easy. Other advantages of the present invention will be readily apparent to a person skilled in the art.

I claim:

1. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action.

2. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting forwardly from said closure member to move said closure member rearwardly to open said outlet and forwardly to close said outlet.

3. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting rearwardly from said closure member to move said closure member forwardly to open said outlet and rearwardly to close said outlet.

4. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting forwardly from said said closure member to move said closure member rearwardly to open said outlet and forwardly to close said outlet, said closure head comprising a cylindrical plug adapted to nest in said outlet, and a flange at the rear of said plug for stopping forward movement of said head.

5. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said mem-

ber and head to closed position in said outlet on release of said squeezing action, said strips slanting rearwardly from said closure member to move said closure member forwardly to open said outlet and rearwardly to close said outlet, the wall of said outlet tapering outwardly, said head having an outwardly tapering wall nesting in said outlet in closed position, said closure member having a reduced diameter behind said head.

6. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said container neck being of resilient material and having internal threads, said closure housing having external threads adjacent its front end for threadedly mounting said closure housing in said neck, whereby squeezing of said neck will squeeze said housing.

7. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips, moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said container neck having external threads adjacent its outer end, said housing being internally threaded at its rear end for threadedly mounting said housing on said neck.

8. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting forwardly from said closure member to move said closure member rearwardly to open said outlet and forwardly to close said outlet, said container neck being of resilient material and having internal threads, said closure housing having external threads adjacent its front end for threadedly mounting said closure housing in said neck, whereby squeezing of said neck will squeeze said housing.

9. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said members and head to closed position in said outlet on release of said squeezing action, said strips slanting forwardly from said closure member to move said closure member rearwardly to open said outlet and forwardly to close said outlet, said closure head comprising a cylindrical plug adapted to nest in said outlet, and a flange at the rear of said plug for stopping forward movement of said head, said container neck being of resilient material and having internal threads, said closure housing having external threads adjacent its front end for threadedly mounting said closure housing in said neck, whereby squeezing of said neck will squeeze said housing.

10. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting forwardly from said closure member to move said closure member rearwardly to open said outlet and forwardly to close said outlet, said container neck having external threads adjacent its outer end, said housing being internally threaded at its rear end for threadedly mounting said housing on said neck.

11. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting rearwardly from said closure member to move said closure member forwardly to open said outlet and rearwardly to close said outlet, said container neck having external threads adjacent its outer end, said housing being internally threaded at its rear end for threadedly mounting said housing on said neck.

12. A container having a dispensing neck open at the top, and closure means for said neck comprising a tubular housing of highly resilient material, the rear end end of said housing opening into said neck, an outlet at the front end of said housing, an elongated closure member mounted for axial movement in said housing, the front end of said member having a closure head for said outlet, a plurality of resilient parallelogram strips integrally connecting said member with said housing, said strips normally urging said member and head into closed position in said outlet, said strips moving said closure member and head away from said outlet into open position when said housing is squeezed, and said strips moving said member and head to closed position in said outlet on release of said squeezing action, said strips slanting rearwardly from said closure member to move said closure

member forwardly to open said outlet and rearwardly to close said outlet, the wall of said outlet tapering outwardly, said head having an outwardly tapering wall nesting in said outlet in closed position, said closure member having a reduced diameter behind said head, said container neck having external threads adjacent its outer end, said housing being internally threaded at its rear end for threadedly mounting said housing on said neck.

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