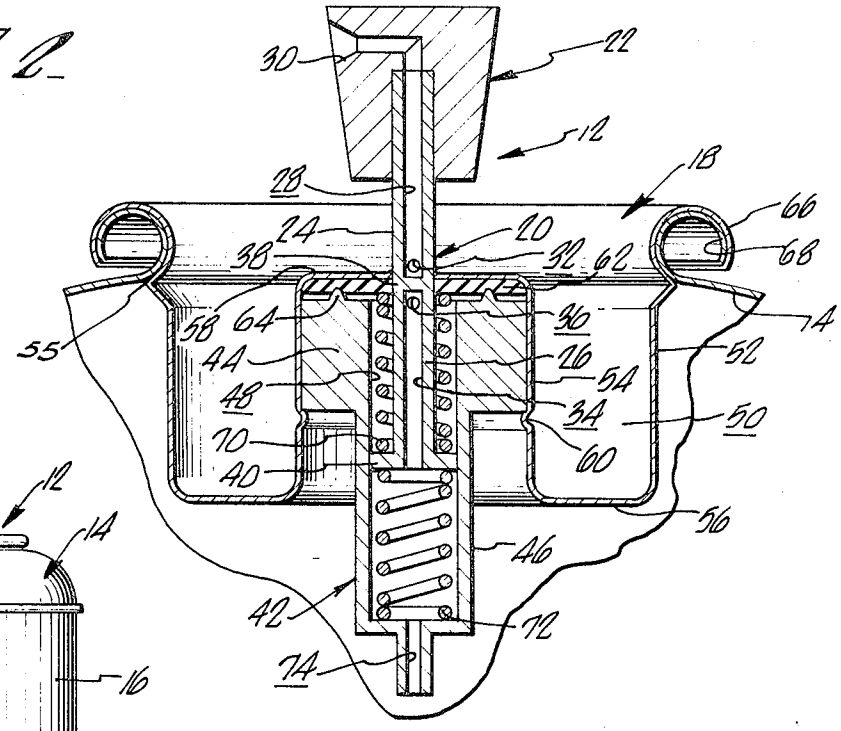
July 7, 1970 J. K. BRUCE 3,519,172

FLUID DISPENSER

Filed March 1, 1968

FIG. 2



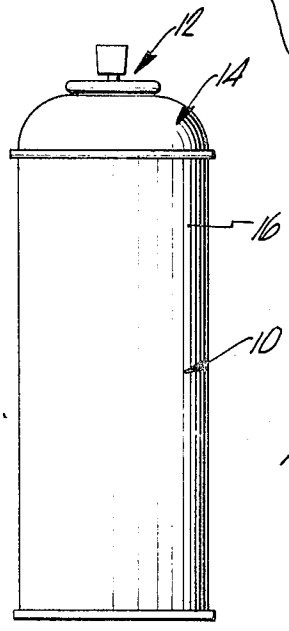


FIG. 1

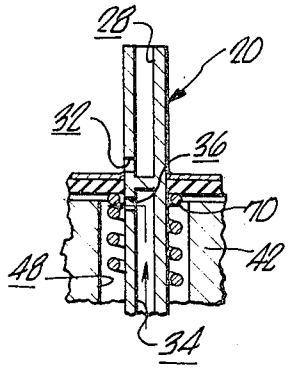


FIG. 3

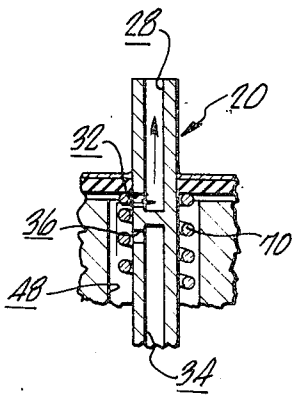


FIG. 4

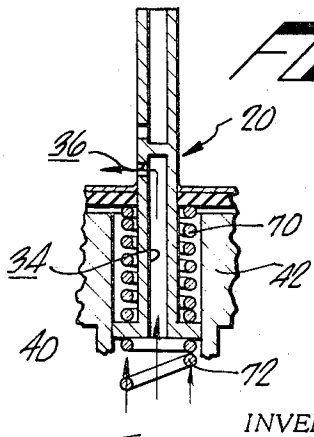


FIG. 5

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United States Patent Office 3,519,172 Patented July 7, 1970

3,519,172

FLUID DISPENSER

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Filed Mar. 1, 1968, Ser. No. 709,563
Int. Cl. B65d 83/14
U.S. Cl. 222—396 15 Claims

ABSTRACT OF THE DISCLOSURE

The dispensing valve of this fluid dispenser has a stem with a pressure vent port and a stem port. These ports are separated by a partition and communicate respective passages with the outside of the stem. The stem is spring-biased to maintain the pressure vent port normally within the dispenser and out of communication with the dispenser's exterior. Upon reaching a predetermined excessive pressure, the stem moves against the spring bias to position the pressure vent port outside the dispenser and, through its passage, relieve the excessive pressure buildup within the container.

BACKGROUND OF THE INVENTION

This invention relates in general to the art of fluid dispensers and, more in particular, to a safety device to prevent excessive pressure buildups in fluid dispensers.

Pressurized fluid dispensers are extremely popular. These dispensers maintain a product to be dispensed under pressure and sealed within them. A dispensing valve is employed to selectively discharge the product.

When heated, the pressure within these dispensers increases. The pressure often increases to such an extent that the container will catastrophically explode. This explosion hazard is present whether the dispenser contains product or whether it is empty. In the latter instance, there is still gas in the container of sufficient quantity to expand under heat and cause an explosion. Accidents are common, for example, where the user of the dispenser inadvertently places it close to a source of heat between usages. In this instance, the consumer is always exposed to the possibility of serious injury. Even when the dispenser is thrown away, it is not uncommon that it finds itself in an open fire or a furnace with the inevitable result of an explosion and possible injury to people close by.

To avoid explosion hazards, several concepts have been proposed. One of these concepts is to have a weakened section in the wall of the dispenser. The weakened section is designed to relieve the pressure within the dispenser, when it becomes sufficiently high, by opening its interior to atmosphere. This concept generally takes two forms. One form is purely pressure sensitive. This dispenser wall is weakened to either allow a plug section to blow out or the dispenser to separate in half. The other form employs a low melting point plug which, upon reaching a sufficiently high temperature, melts to communicate the interior of the dispenser with atmosphere. Both devices operate to vent the interior of the dispenser very rapidly because the pressure at which venting occurs is high. Rapid product venting often leads to disaster. For example, if the contents of the dispenser are flammable their escape in a fire creates a flamethrower effect. In addition, if the plugs or weakened section are not formed correctly the contents of the dispenser may escape prematurely.

Another concept is to break the dispensing valve after the dispenser is emplty in such a manner as to vent the dispenser's interior. This concept does not guard against the explosion hazard while the dispenser still contains

product. In addition, inadvertent destruction of the dispensing valve, while product remains, is itself a hazard because the product will escape very rapidly. Moreover, such inadvertent destruction is wasteful of the product.

Still another concept envisions the freezing of an empty pressurized dispenser and then puncturing the dispenser. To avoid an explosion hazard by having each and every dispenser frozen and punctured by its user is an extremely unreliable and arduous way to safety. Moreover, the concept does not avoid the hazard of explosion while product yet remains in the dispenser.

Therefore, there is an urgent need for pressurized dispensers which vent their interior gradually and reliably without user attention when the dispensers are subjected to heat or other agents of accidental pressure buildup.

SUMMARY OF THE INVENTION

The present invention provides an improvement in pressurized dispensers which avoids the problem of explosion by venting a container's interior when it reaches a predetermined pressure without the attention of the consumer.

The invention employs a dispensing value having a stem with a pressure vent port communicating a passage in the stem with the stem's interior. The stem is biased inwardly of the dispenser to maintain the pressure vent port out of communication with atmosphere. The bias is such, however, that upon reaching a predetermined excessive pressure, the pressure vent port moves in response to such pressure outside the dispenser. Product is then discharged through the relieving pressure vent port because the port is in product communication with the interior of the dispenser through the passage. Means are also provided for selectively dispensing product through the dispensing valve.

In one form, the invention contemplates a fluid dispenser of the type wherein the dispenser is sealed and the fluid to be dispensed is dispensed by a dispensing valve. The dispensing valve has a stem which is spring-biased in the direction of the dispenser's interior. The stem has a dispensing and a venting passage separated by a partition. The dispensing passage is normally disposed out of communication with the dispenser's interior while the venting passage is normally disposed within the dispenser. The pressure vent port passes through the wall of the stem into the venting passage. The venting passage is also open to the interior of the dispenser. Means are provided to communicate the interior of the dispenser and discharge product through the dispensing passage at the behest of the user. This may be done by a product port through port through the wall of the stem into the dispensing passage. Upon depression of the stem by the user, the product port communicates the dispensing passage with the interior of the dispenser.

In preferred form, the improved dispensing valve is carried by a valve cup. A housing having an axial bore is mounted interiorly of the dispenser and held by the cup. The stem is spring-biased inwardly of the container by a first spring acting on a flange at the lower end of the stem. A return spring in the bore urges against the bottom of the flange and the housing to effect return of the stem to its unactuated position. A seal is provided about the stem to prevent product leakage where the stem leaves the cup. Product within the dispenser is in communication with the venting passage of the stem through the housing which is open for this purpose.

In use, an excessive pressure buildup within the dispenser forces the stem upward against the action of the biasing spring until the pressure vent port is exposed to atmosphere. At this time, the contents of the dispenser will be vented through the venting passage and out the pressure vent port to atmosphere.

The present invention marks a material advance in the safety of pressurized dispensers. The pressure vent port in the stem will rise in response to pressure buildup within the dispenser. This port will vent the dispenser's interior and relieve the pressure, when sufficient pressure exists to overcome the inward bias. The stem in which the port is disposed is spring-biased inwardly. The spring bias insures against rapid and often catastrophical venting of the dispenser's interior. Moreover, inasmuch as the pressure vent port is carried by the dispensing valve's stem, venting may be against the interior side wall of the valve cup. This effectively distributes the vented product into a small area and dissipates its force. This is an important feature when, for example, the contents of the dispenser are flammable. In addition, the contents are discharged gradually and not catastrophically because as pressure is relieved the biasing spring will return the pressure vent port into the inside of the container to prevent further escape. When pressure again increases, the stem will translate to communicate the pressure vent port with atmosphere.

Thus, the pressure dispensing valve of the present invention avoids all the problems attendant with the concepts previously proposed. The valve is pressure sensitive and therefore consumer attendance to safety is not required. It is not necessary to freeze the dispenser and puncture it after its contents have been emptied or to fracture the dispensing valve to communicate the interior of the dispenser with atmosphere. Relative to these latter concepts, the dispensing valve of the present invention is safe not only when product is within the dispenser but when the dispenser is empty, a feature absent in the prior art. In addition, expensive and unreliable weakened sections are avoided and therefore the problem of catastrophic discharge of the dispenser's contents is also avoided.

These and other features, aspects and advantages of the present invention will become more apparent from the following description, appended claims and drawings.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a view of the improved dispensing valve in its associated pressurized dispenser;

FIG. 2 is a partial view, in half section, of the preferred form of the dispensing valve of the present invention;

FIG. 3 is a fragmentary view showing the path of product prior to its discharge;

FIG. 4 shows how the product is discharged through a a product port; and

FIG. 5 shows how product is vented when an excessive pressure is reached within the dispenser.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 depicts the general combination. A dispenser or container **10** has a dispensing valve **12** mounted in its cover or cap **14**. Except for the dispensing valve, the dispenser may be of standard construction. A closed body portion **16** is connected to cover **14**. The product to be dispensed is contained in dispenser **10** under pressure. The product is dispensed through actuation of dispensing valve **12**. Because the product is maintained at a pressure, it is necessary that dispenser **10** be sealed.

FIG. 2 depicts in detail the improved dispensing valve **12** of the present invention. This assembly includes a valve cup **18**, a valve stem **20** and an actuator **22**.

Stem **20** includes an upper portion **24** and a lower portion **26**. Upper portion **24** has a product dispensing passage **28** in communication with a dispensing orifice **30** of actuator **22**. A product port **32** extends through the wall of upper portion **24** to communicate passage **28** with atmosphere. The position of the product port illustrated is typical, but it may be normally out of communication with atmosphere. It is only necessary that product port **32** be out of communication with the dispenser's interior when valve **12** is in its unactuated position.

Lower portion **26** includes a venting passage **34** which extends downward into the interior of dispenser **10**. A pressure vent port **36** is at the upper end of venting passage **34** and extends through the wall of lower portion **26** to communicate passage **34** with the exterior of stem **20**. The lower end of passage **34** is open. A partition **38** separates dispensing passage **28** from venting passage **34**. An external annular flange **40** forms the base of stem **20**.

A housing **42** couples stem **20** and its carried actuator **22** to the balance of dispenser **10**. The housing includes a generally cylindrical upper portion **44** and a generally cylindrical lower portion **46** of smaller diameter. An interior cylindrical bore **48** extends through upper portion **44** and terminates at the base of lower portion **46**.

Valve cup **18** is formed with a generally toroidal channel **50** which is bounded by exterior vertical wall **52** and interior vertical wall **54**. An annular, outwardly extending, radial crimp **55** is formed in wall **52** and bears on the interior surface of cover **14** to firmly secure valve cup **18** in place. The base of the channel is defined by a generally annular horizontal portion **56** which connects vertical walls **52** and **54**. The space inwardly of vertical wall **54** is bridged by horizontal portion **58**. Valve stem **20** extends through a hole in this horizontal portion.

Vertical wall **54** has an inwardly extending flange **60** which may be formed by crimping. Cylindrical portion **44** of housing **42** is secured in position by this annular flange. A seal **62** is disposed between top portion **58** and the top of cylindrical portion **44**. Stem **20** extends through this seal. The seal prevents product from leaving the interior of the dispenser through the opening in horizontal portion **58** through which stem **20** passes. An annular, upwardly extending flange **64** on the upper surface of cylindrical portion **44** bears against the lower surface of seal **62**. This flange creates a seal between top portion **58** and the upper surface of seal **62** immediately above the flange.

Valve cup **18** has an annular lip **66** which is crimped over a mating lip **68** of cover **14** to secure the cup to the balance of the dispenser.

A pressure or biasing spring **70** is disposed within bore **48** of housing **42** and bears against the upper surface of external flange **40** of stem **20** and the lower surface of seal **62**. A return spring **72** is also disposed in bore **48** but on the other side of external flange **40**. This spring bears against the lower surface of flange **40** and the base of housing **42**. Pressure spring **70** biases stem **20** to normally maintain pressure vent port **36** interiorly of the dispenser and product port **32** outside the dispenser. Spring **72** returns stem **20** to the position shown in FIG. 2 after each use of the dispenser. Spring **70** exerts a downward force on stem **20** through flange **40** even while the pressure in the container is urging stem **20** upward.

Bore **48** of housing **42** is in product communication with the interior of container **10** through a passage **74**. The product exerts pressure on stem **20** and tends to drive the stem upward. The effective area of stem **20** which feels this upward pressure is equal to the sum of the area of partition **38** and the cross sectional area of the walls of lower portion **26** of stem **20**. In normal usage, spring **70** will exert a force on stem **20** which is balanced by the pressure within the dispenser felt by this effective area and spring **72**.

FIGS. 3 through 5 depict the operation of the improved dispensing device of the present invention.

In FIG. 3, stem **20** is in its unactuated position. In this position, dispensing passage **28** is open to atmosphere through product port **32** and dispensing orifice **30**. Within the dispenser, product occupies the interior of housing **42** both above and below flange **40**. Product is also in venting passage **34** of stem **20**. Product will flow through pressure vent port **36** into the space above flange **40**. This is shown by the arrows in FIG. 3.

As is seen in FIG. 4, when valve **12** is actuated, stem **20** is depressed inwardly against the force of spring **72** to lower product port **32** inside the dispenser. When port

32 is within the dispenser, product communication into dispensing passage 28 is effected by product flow through this port from that portion of bore 48 above flange 40. Product flows into this space through pressure vent port 36. Product then flows through port 32, into passage 28 and out through dispensing orifice 30.

When the pressure within dispenser 10 builds up gradually, it will act against stem 20 and against the restoring force of spring 70 to raise the stem upward to a point where pressure vent port 36 is in communication with atmosphere. Venting will be gradual because port 36 will not be completely open to atmosphere. Product will then flow through venting passage 34 until the pressure within the dispenser is reduced sufficiently for spring 70 to lower stem 20 and its pressure vent port 36 into the dispenser. In an aggravated case, when the pressure buildup is rapid and great, port 36 will be forced completely outside the dispenser's interior and remain there until almost all the gaseous contents of the dispenser are discharged through it. In this aggravated case, as seen in FIG. 2, product discharge through pressure vent port 36 will be against vertical wall 52 of valve cup 18. This tends to isolate the discharge into a very limited area and reduce its force. This feature is particularly valuable with inflammables. The restoring force presented by spring 70 on stem 20 insures that product discharge through port 36 is gradual because the port will always tend, except when there is excessive pressure, to return to within the dispenser.

What is claimed is:

1. In combination with a fluid dispenser having a dispensing valve of the type adapted to contain a fluid product under pressure, an improvement in the dispensing valve comprising:
   (a) a movable valve stem having a venting passage open to the interior of the dispenser and a pressure vent port through the wall of the stem in communication with the passage;
   (b) biasing means to urge the stem inwardly of the dispenser to maintain the pressure vent port normally out of communication with atmosphere, the biasing means and valve stem being operable in response to a predetermined, excessive pressure to allow the valve stem to move to a position where the pressure vent port is exposed to atmosphere and relieve the dispenser by venting the dispenser's interior; and
   (c) means for selectively dispensing fluid from the dispenser, the selective dispensing means including a dispensing passage in the stem which is normally out of communication with the dispenser's interior and a product port opening into the dispensing passage through the wall of the stem, the product port communicating the dispenser's interior with the dispensing passage when the selective dispensing means is actuated.

2. The improvement claimed in claim 1 including return biasing means for returning the stem to an unactuated position after actuation of the selective dispensing means.

3. The improvement claimed in claim 2 including a housing mounted in the dispenser having a central bore, the stem being slidably disposed in the central bore.

4. The improvement claimed in claim 3 wherein the stem biasing means includes a spring disposed within the bore of the housing and coupled to the stem to urge it inwardly of the dispenser, and the return biasing means includes a spring disposed within the bore of the housing below the stem and coupled to the stem to urge it upwardly.

5. The improvement claimed in claim 4 including an external flange at the lower end of the stem, the stem biasing and return springs urging against opposite surfaces of the flange.

6. The improvement claimed in claim 5 wherein the housing is carried by a valve cup such that the pressure vent port, when exposed to atmosphere in response to a predetermined excessive pressure within the dispenser, is capable of discharging fluid product against a wall of the valve cup.

7. An improved fluid dispenser comprising:
   (a) a closed container having an interior for storing a fluid product under pressure; and
   (b) a dispensing valve mounted in the container for selectively discharging the fluid product including:
      (i) a movable valve stem having:
         a venting passage in communication with the hollow interior;
         a pressure vent port through the wall of the stem into the venting passage; and
         means for selectively dispensing fluid from the container, the selective dispensing means including: and
            a dispensing passage in the stem axially aligned with the venting passage and separated therefrom by a partition; and
            a product port through the wall of the stem into the dispensing passage, the product port being normally out of communication with the container's interior and positioned such that upon depression of the stem inwardly of the container the product port communicates the dispensing passage with the container's interior; and
      (ii) biasing means for maintaining the pressure vent port within the container when the pressure within the container is below a predetermined excessive pressure, the biasing means and valve stem being operable when such predetermined excessive pressure is reached to allow the valve stem to move outwardly of the container to expose the pressure vent port to atmosphere and relieve the excessive pressure.

8. The improved fluid dispenser claimed in claim 7 wherein:
   (a) the biasing means includes a biasing spring operatively engaged to the valve stem to urge the valve stem inwardly of the container; and
   (b) the selective dispensing means includes a return spring operatively engaged to the valve stem to urge the valve stem upwardly of the container, the valve stem being carried by the biasing spring and return spring.

9. The improved fluid dispenser claimed in claim 8 wherein:
   the dispensing valve is carried by a valve cup such that the pressure vent port, upon exposure to atmosphere, is capable of discharging fluid product against a wall of the valve cup.

10. The improvement claimed in claim 3 wherein:
   the stem biasing means and stem are operable to maintain the pressure vent port in communication with the central bore to provide fluid product thereto through the venting passage at pressures within the dispenser below the predetermined excessive pressure, the product port communicating with the dispenser's interior through the central bore when the selective dispensing means is actuated.

11. The improved fluid dispenser claimed in claim 7 wherein:
   (a) the dispensing valve has an axial bore in communication with the hollow interior, the stem being received in the axial bore;
   (b) the stem biasing means and stem are operable to maintain the pressure vent port in communication with the central bore to provide fluid product thereto through the venting passage at presssures within the container below the predetermined excessive pressure; and

(c) the product port communicates with the hollow interior through the axial bore when the selective dispensing means is actuated.

12. An improved dispensing valve for use with a pressurized fluid dispenser comprising:

(a) means for mounting the dispensing valve to the dispenser;

(b) a housing carried by the mounting means having an axial bore with an opening for fluid product communication with the interior of the dispenser;

(c) a stem received in the axial bore of the housing for axial movement therein between an unactuated position, an actuated position and a pressure relief position, the stem extending outwardly of the housing and having:

(i) a venting passage open to the axial bore of the housing,

(ii) a presssure vent port through the wall of the stem into the venting passage, the pressure vent port being within the housing in the unactuated and actuated positions and outside the housing in communication with atmosphere in the pressure relief position,

(iii) a dispensing passage,

(iv) a product port through the wall of the stem into the dispensing passage, the product port being out of communication with the axial bore in the unactuated position and in communication with the axial bore in the actuated position, and

(v) a partition dividing the dispensing passage and the venting passage to prevent direct fluid communication between the two;

(d) means for biasing the stem against pressure within the dispenser such that the presssure vent port is within the housing at pressures within the dispenser below a predetermined excessive pressure, the biasing means and the stem being operable to allow the stem to move outwardly of the housing at pressures within the dispenser above the predetermined excessive pressure to the pressure relief position for communicating the pressure vent port with atmosphere; whereby

when the dispensing valve is mounted on the dispenser and the predetermined excessive pressure is exceeded, the stem moves outwardly of the housing to the pressure relief position where the pressure vent port is in communication with atmosphere to relieve the excessive pressure by product discharge through the venting passage and pressure vent port to atmosphere, and at pressures below the predetermined excessive pressure, the displacement of the stem to the actuated position communicates the product port with the axial bore of the housing for the selective discharge of product.

13. The improved dispensing valve claimed in claim 12 wherein:

the pressure vent port is in communication with the axial bore of the housing at pressures below the predetermined excessive pressure to provide product communication between the axial bore and the interior of the dispenser through the venting passage.

14. The improved dispensing valve claimed in claim 13 including:

return biasing means for returning the stem to the unactuated position from the actuated position.

15. The improved dispensing valve claimed in claim 14 wherein:

(a) an external flange on the stem is provided;

(b) the stem biasing means includes a spring disposed within the axial bore of the housing and urging against the external flange to bias the stem toward the unactuated position and away from the pressure relief position; and

(c) the return biasing means includes a spring disposed within the axial bore of the housing and urging against the external flange to bias the stem toward the unactuated position and toward the pressure relief position.

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U.S. Cl. X.R.

222—402.24

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,519,172 Dated August 11, 1970

Inventor(s) J. K. Bruce

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the specification: Column 1, line 70, "emplty" should be --empty--. Column 2, line 23, "value" should be --valve--; line 51, delete "through port".

In the claims: Claim 7, column 6, line 17, delete "and".

SIGNED AND
SEALED
OCT 20 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents