United States Patent

[11] 3,559,890

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[21] Appl. No. **756,787**
[22] Filed **Sept. 3, 1968**
[45] Patented **Feb. 2, 1971**

[54] **FOAM DISPENSER**
9 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **239/304,** 239/337, 239/414, 239/527
[51] **Int. Cl.** **B05b 11/00**
[50] **Field of Search** 239/302, 303, 304, 305, 306, 307, 308, 375, 378, 310, 315, 316, 414, 415, 432, 433, 525, 526, 527, 528, 61, 154; 222/145, 134, 135, 402.15, 402.21, 402.22; 137/607

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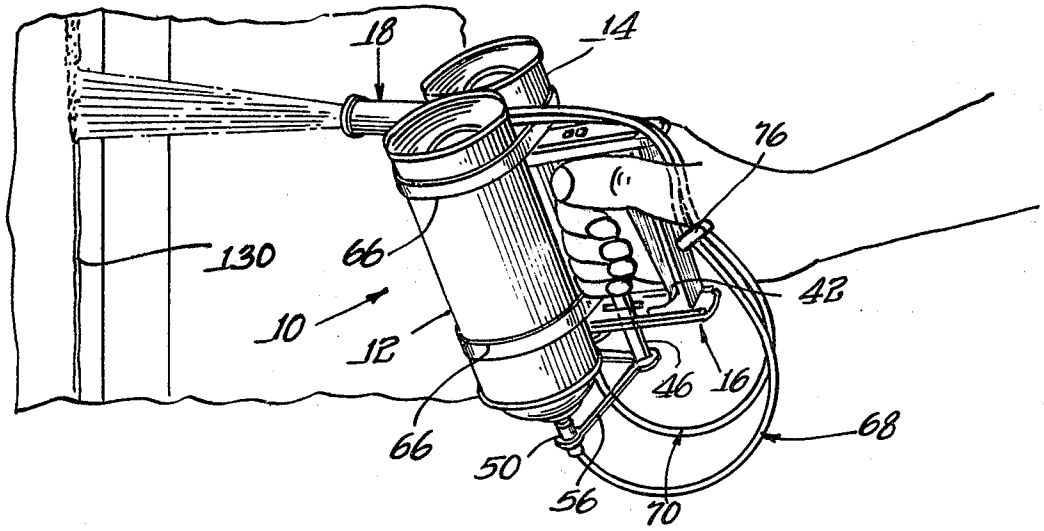
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ABSTRACT: Dispenser apparatus for multicomponent products comprises a pair of containers each having its own dispensing valve. A bracket is arranged to hold the containers in fixed position and includes a manual trigger. Links are provided for connecting the trigger with the valves for actuation of the valves in unison; and the dispenser apparatus additionally includes a remote dispensing nozzle unit and tubing connecting each of the dispensing valves with the latter unit.



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SHEET 1 OF 2

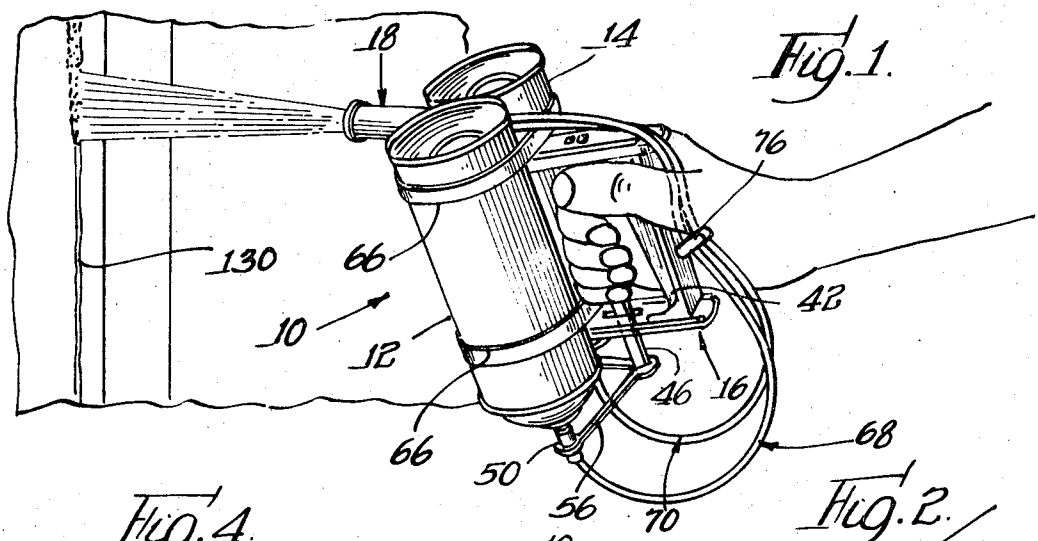


Fig. 1.

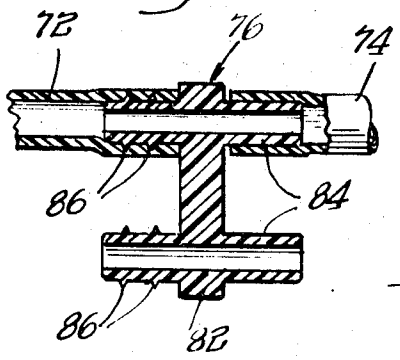


Fig. 4.

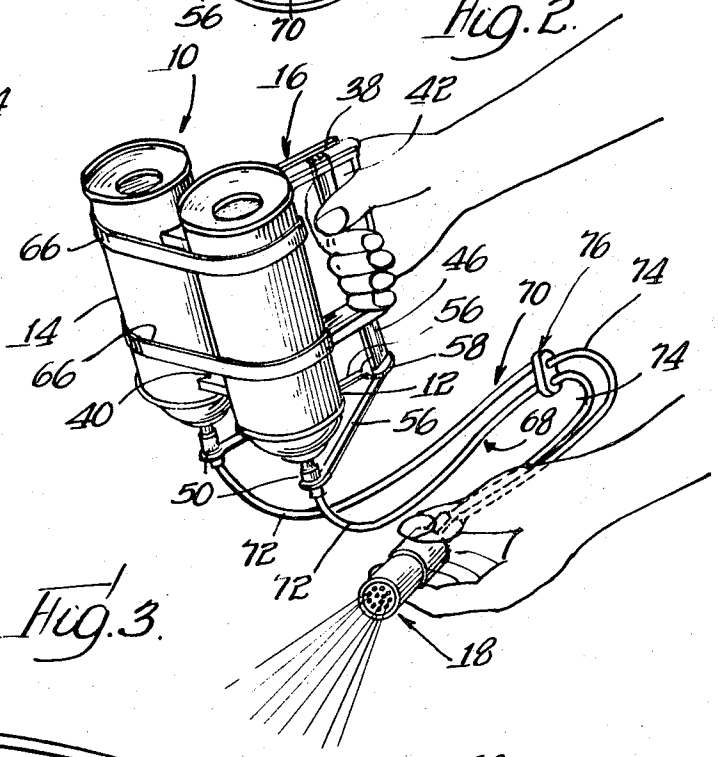


Fig. 2.

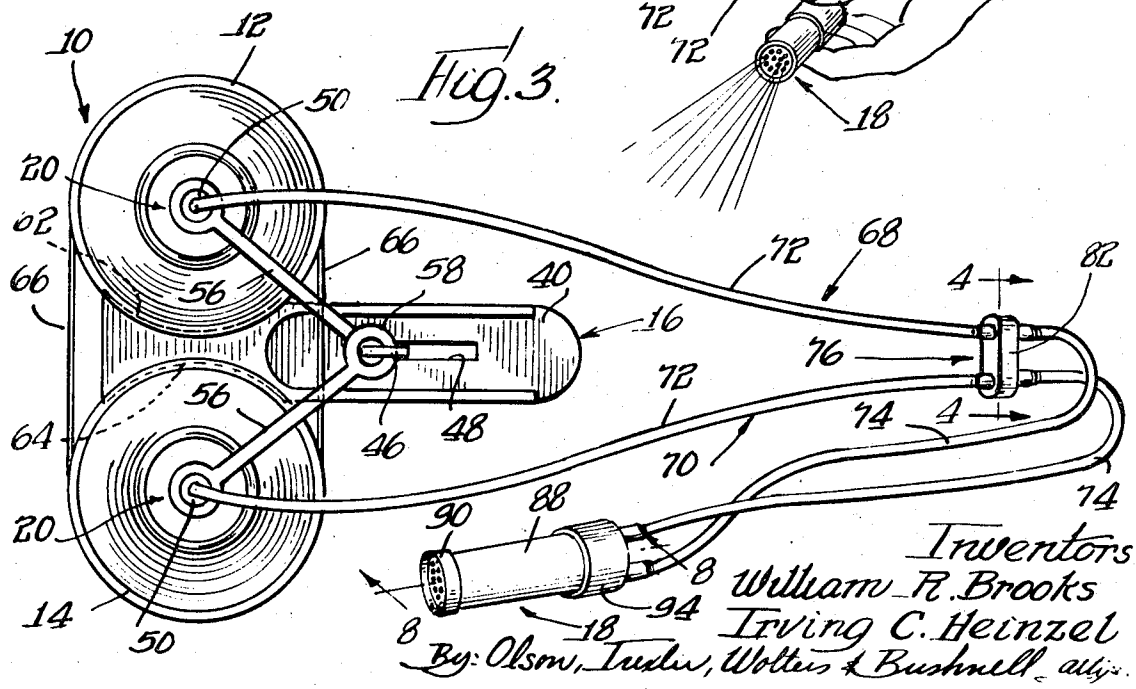


Fig. 3.

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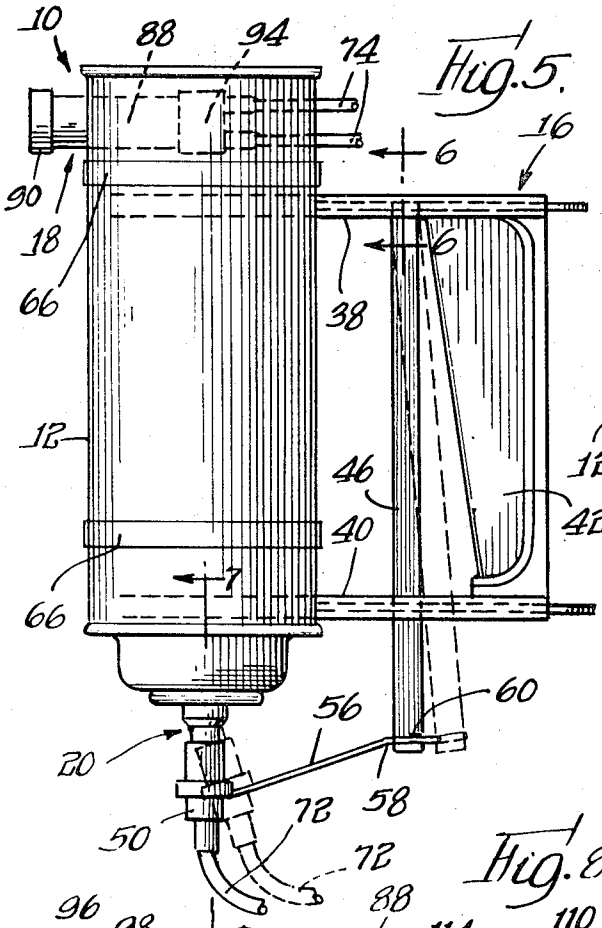


Fig. 5.

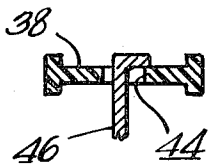


Fig. 6.

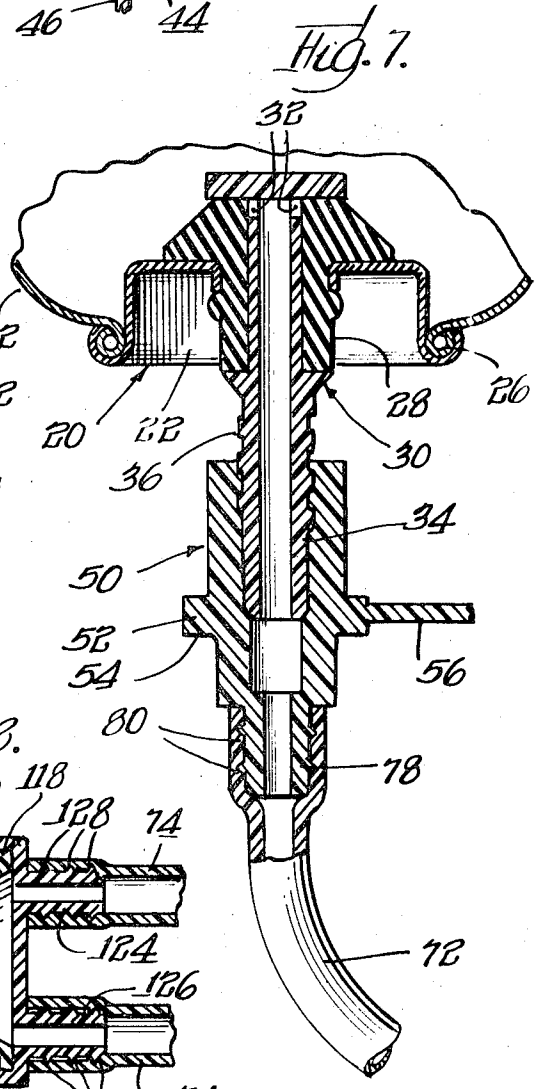


Fig. 7.

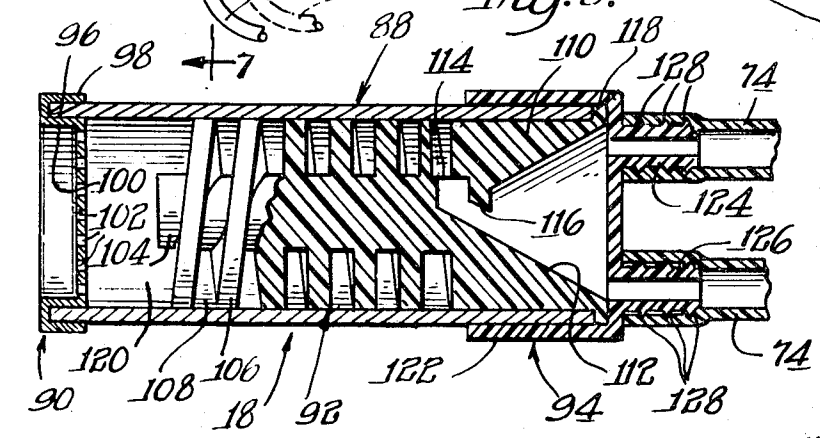


Fig. 8.

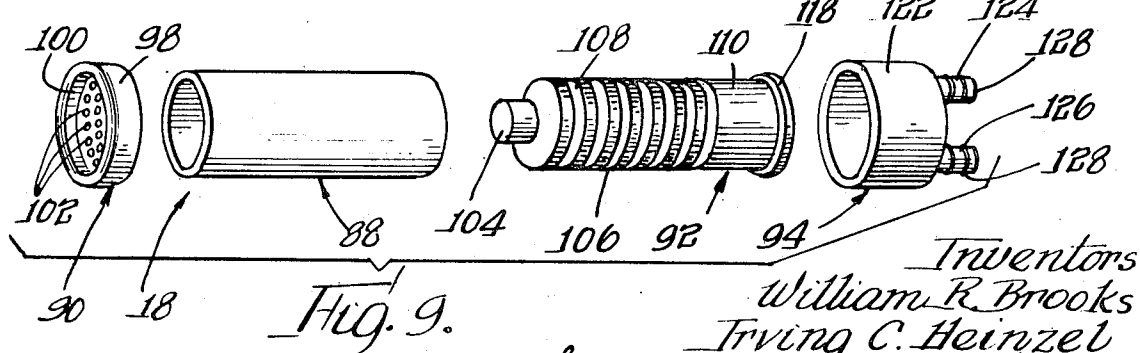


Fig. 9.

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FOAM DISPENSER

This invention relates generally to apparatus for dispensing multicomponent products and more particularly to portable apparatus of that type.

Portable dispensers for multicomponent products, such as urethane foams, have been developed heretofore, and these devices have commonly employed a rupturable membrane for isolating the reactable ingredients of the product. However, when the membrane has been ripped or broken and the ingredients mixed, the entire contents of the device must be used or discarded at once. While this requirement for immediate and complete utilization is acceptable and desirable in instances where the contents closely approximate the volume of the product needed in a particular application, other situations exist in which a considerably smaller quantity of product is desired at periodic intervals.

Therefore, an important object of the present invention is to provide a portable dispenser for multicomponent products which can be operated intermittently with either short or long intervals between activations.

A more general object of the invention is to provide a new and improved portable device for dispensing multicomponent products.

Another object of the invention is to provide a portable dispenser for multicomponent products which incorporates a novel, disposable mixing and dispensing nozzle.

Still another object of the invention is to provide a dispenser of the type described which is capable of one-hand operation.

Yet another object of the invention is to provide a portable dispenser of the type described which is able to dispense into relatively inaccessible locations.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

In order that the principles of the invention may be readily understood, a single embodiment thereof, applied to the dispensing of rigid urethane foam products but to which the application is not to be restricted, is shown in the accompanying drawings wherein:

FIG. 1 is a perspective view of dispensing apparatus in accord with the invention used in a one-hand manner for calking a crack in a wall;

FIG. 2 is a perspective view illustrating two-hand use of the apparatus of FIG. 1 with the dispensing nozzle demounted for manual manipulation into a comparatively inaccessible location;

FIG. 3 is an enlarged, bottom plan view of the dispensing apparatus of FIGS. 1 and 2;

FIG. 4 is a further enlarged sectional view of the breakaway fitting, being a view taken substantially along the line 4–4 of FIG. 3;

FIG. 5 is an intermediate scale view in side elevation showing the dispensing apparatus of the invention arranged for one-hand operation, actuation of the manual trigger and corresponding movement of the dispensing valves being suggested in broken outline;

FIG. 6 is a further enlarged, sectional view taken substantially along the line 6–6 of FIG. 5 to show the pivot for the manual trigger;

FIG. 7 is a further enlarged, sectional view taken substantially along the line 7–7 of FIG. 5 to show the construction of a dispensing valve and the fitment used in connecting it to the tubing system;

FIG. 8 is an enlarged, central sectional view taken substantially along the line 8–8 of FIG. 3 to show the construction of the mixing and dispensing nozzle; and

FIG. 9 is an exploded perspective view, on a somewhat reduced scale, of the mixing and dispensing nozzle.

Referring now in detail to the drawings, specifically to FIGS. 1 and 2, portable dispensing apparatus constructed in compliance with the invention and designated generally by the reference numeral 10 comprises a pair of pressure vessels or containers 12 and 14, a support bracket or holder 16, and a dispensing nozzle unit 18. Two of the pressure vessels are employed in the apparatus 10 because the product to be dispensed, for purposes of the illustrative embodiment, is reacting urethane foam and because such foams are comprised of two basic reactants, namely an isocyanate resin and a suitable source of hydroxyl groups, such as a polyester or polyether polyol. The isocyanate component, for example, will be charged into container 12 together with a suitable quantity of a selected, liquified propellant gas, such as dichlorodifluoromethane for example. The companion container is charged with the reactable component, a polyester polyol for example, suitably formulated with catalyst material, such as organotin compounds or tertiary amines, a surfactant and a mixture comprising a suitable, liquified propellant gas and foaming agent, such as a mixture of difluorodichloromethane and trichlorofluoromethane. In compliance with the features of the present invention, a quantity of a common liquified propellant is charged into each of the containers 12 and 14 in order to have substantially the same vapor pressure in each of the containers. As a result, substantially equal volumes will be dispensed from the two vessels, thus insuring proper stoichiometry of the dispensed foam. It is also advantageous to provide a quantity of an inert, compressed but unliquified gas, such as nitrogen, in each of the containers 12 and 14 to preserve the propellant in both a liquid and gas phase so that the liquid phase thereof may serve to froth the reacting resins as they are dispensed.

In order that the dispensing apparatus 10 may be lightweight and portable and capable of one-hand operation, in the manner suggested in FIG. 1, the containers 12 and 14 are fabricated to be of thin-wall construction as well as of pressure-resistant shape whereby to contain the various pressurized contents successfully. Each of the containers 12 and 14, therefore, comprises a cylindrical body, a domed top and a concave bottom. Suitable pressure-resistant construction, as well as manufacturing economy, has been secured by selecting the containers 12 and 14 to be conventional, metal aerosol product cans. Economy of manufacture is also promoted by closing the containers 12 and 14 with a conventional foam aerosol valve 20, as is shown in FIG. 7.

Continuing with reference to FIG. 7, the foam-dispensing valve 20 includes a recessed metal cap 22 having a peripheral rim 24 that is crimped onto a rolled bead 26 surrounding the mouth of the associated pressure vessel or container. The cap 22 is centrally perforated to receive an elastomeric sealing body 28, and the sealing body 28 has a central bore which resiliently receives a rigid valve element 30. The valve element 30 is tubular and is radially apertured with dispensing ports 32 which serve to pass the contents of the pressure vessel whenever the valve element 30 is tilted. An external portion 34 of the valve element 30 is fashioned with a spiral rib or thread 36, the utility of which will be described more fully hereinafter.

Turning to FIG. 5, the container bracket or holder 16 generally comprises a reclining U-shaped part that is made up of an upper plate 38, a lower plate 40 and an interconnecting bight portion 42 which serves as a handle or grip. As is shown in FIG. 6, the upper plate 38 is fashioned with a rectangular aperture 44 which serves as a pivot point for a trigger blade 46. With reference to FIG. 3, the lower plate 40 is provided with a longitudinally extending slot 48 that acts as a guide for the trigger blade. Returning to FIG. 5, the unpivoted lower end of the trigger blade 46 extends beyond the lower plate 40 into approximately the plane of the dispensing valves 20. Each of the valves 20 is provided with a tubular fitment 50 that is forced onto the rigid valve element 34 until at least several turns of the thread 36 are buried in the fitment as is shown in FIG. 7 whereby to establish a secure connection. In addition, the fitment 50 includes a medial, circumferential flange 52 that defines a shoulder 54 for use in assembling the fitment and the valve element. A flexible tension strap 56 radiates from the fitment 50 at the flange 52 to terminate in a trigger eye 58 as is shown in FIG. 3. With reference to FIG. 5, the unpivoted lower end of trigger blade 46 is fashioned with a rear-

wardly opening, horizontal slot **60** for positioning and retaining the trigger eye **58**. Each of the straps **56** may terminate in an individual trigger eye or the two straps may be provided with a common trigger eye as is desired. In any event, the straps **56** are arranged to be flexible and advantageously of some longitudinal resilience. Flexibility in the straps **56** is desirable to insure actuation of the valves **20** only on a pull stroke of the trigger blade **46**, thus minimizing the possibility of accidental actuation and concomitant undesired dispensing action. Resiliency in the straps **56** is desirable in that it tends to insure equal tilting force on the two valve elements **34** and thereby substantially equal volumetric discharge rates from the two containers **12** and **14**. Suitable radial resiliency in the fitment **50**, suitable axial resiliency in the straps **56** and desired chemical inertness in the fitting **50** is achieved by fabricating these components from an olefinic resin such as polyethylene; and advantageously, the fitment **50**, the strap **56** and the trigger eye **38** are fashioned as a unit by being molded integral.

In order that the valve elements of the valves **20** may be properly tiltably actuated, the pressure containers **12** and **14** must be secured in rigid relationship. For this purpose, both the upper plate **38** and the lower plate **40** of bracket **16** are fashioned with oppositely laterally opening, container-mounting notches or recesses **62** and **64**, shown in FIG. **3**. The recesses **62** and **64** are selected to take a circular shape corresponding with the cylindrical body of the containers **12** and **14** whereby fitably to engage the containers intermediate the ends thereof. In addition, suitable means are provided for drawing the containers **12** and **14** into radially converging relationship tightly fitting into the recesses **62** and **64**. In the illustrated embodiment one or more encircling, tension straps **66** are employed for this purpose.

In compliance with the present invention, each of the valves **20** is connected individually to the dispensing nozzle **18** by a flexible conduit. More specifically and as is well illustrated in FIG. **2**, the pressure vessel **12** is connected to the dispensing nozzle by a tubing unit **68**, and the pressure vessel **14** is connected to the dispensing nozzle by a tubing unit **70**. Each of the tubing units **68** and **70** comprises a primary length of flexible tubing **72** and a secondary length of flexible tubing **74**. The lengths or sections of tubing **72** are connected to the fitments **50**, the lengths or sections of tubing **74** are connected to the dispensing nozzle **18**, and the respective sections **72** and **74** are joined together by a breakaway fitting **76**. Referring for the moment to FIG. **7**, the fitment **50** includes a stem **78** which extends beyond the flange **52**, stem **78** being intended to telescope with the inlet end of tubing section **72** in a relatively secure manner. For this latter purpose, the stem **78** includes external, circumferential shoulders or ribs **80** which lock into the material to tubing section **72**.

Considering FIG. **4**, the breakaway fitting **76** comprises a union plate **82** and a pair of parallel coupling tubes **84** which extend axially from both sides of the plate **82** for joining each tubing section **72** with its companion tubing section **74**. Associated ends of the coupling tubes **84** are fashioned with one or more external, annular ribs **86** for making relatively permanent connections when telescoped into the ends of the tubing sections **72**. On the other hand, the other ends of coupling tubes, which are to be telescoped into the corresponding ends of the tubing section **74**, are smooth-walled in order to facilitate separation of the tubing sections for purposes to be described more fully hereinafter.

The tubing sections **72** and **74** are selected to be flexible to facilitate manipulation of the dispensing nozzle unit **18** into comparatively inaccessible locations in the manner suggested in FIG. **2**. In addition, both the tubing sections **72** and **74** and the breakaway fittings **76** are selected to be of chemically inert material. The various polyolefinic resins have proved eminently useful as materials construction for the tubing and the breakaway fitting.

Turning to FIGS. **8** and **10** for a description of the mixing and dispensing nozzle unit **18**, that unit comprises a tubular cylindrical housing **88**, a dispensing end cap **90**, a static mixing element **92** and an inlet end cap **94**. In order to promote economy and permit periodic disposal of the mixing and dispensing nozzle unit **18**, the housing **88** is fabricated as an inexpensive paper tube or as an extruded plastic sleeve and the discharge end cap **90** is fabricated, for example, as a sheet metal stamping. The cap **90** is fashioned with a peripherally located, axially opening, circular groove **96** that is defined between an outer annular wall portion **98** and an inner annular wall portion **100**. This groove receives the edge of one end of housing **88**, and the wall portions **98** and **100** are crimped together to clamp the end of the housing, forming a secure connection. The cap **90** is also apertured for purposes of dispensing the foaming product; and in order to develop multiple streams of exiting product and thereby promote both expansion and the foamed state, the cap **90** is perforated with a plurality of discharge apertures **102**.

The static mixing element **92** is advantageously fabricated from a rigid, chemically inert resin such as high density polyethylene or polypropylene and structurally comprises a solid, central stem **104** and a single, spiralled fin **106** which cooperates with the stem **104** in defining a radially outwardly opening, spiral mixing groove **108**. The static mixing element **92** also includes a cylindrical base **110** whose outside diameter coincides with the outside diameter of the fin **106** and with the inside diameter of the tubular housing **88**. As is shown in FIG. **8**, the base **110** is provided with a conical premix chamber **112**, and a radial port **114** opens from the premix chamber **112** into the spiral mixing groove **108**. A segment plate **116** advantageously extends across a portion of the opening which connects port **114** and chamber **112** in order to direct the mixing materials into the spiral mixing groove. In accordance with the features of the present invention, the static mixing element **92** is shorter in length than the tubular housing **88**, and the static mixing element includes a radially extending end flange **118** which abuts the edge of one end of the housing **88**, as is shown in FIG. **8**, in order to position the mixing element relative to the housing. This positive location of the static mixing element creates an expansion chamber **120** between the end of the static mixing element and the discharge end cap **90**. It has been found that this expansion chamber promotes efficient foaming of the urethane materials packaged in the pressure vessels **12** and **14**.

The inlet end cap **94** comprises a coupling cup portion **122** which telescopingly receives that end of housing **88** which encompasses the base **110** of the static mixing element **92**. Furthermore, a pair of axially extending tubular inlet members **124** and **126** project from the floor of coupling cup portion **122** to receive the discharge end portions of the tubing sections **74** thereover. Each of the inlet members **124** and **126** is provided with an external, annular rib **128** which promotes and preserves the attachment to the respective tube sections **74**. As will be seen in FIG. **8**, the tubular inlet members **124** and **126** open through the floor of cup coupling portion **122** and into the premix chamber **112** generally adjacent the major diameter thereof.

For purposes of affording a more complete understanding of the invention, it is advantageous now to provide a functional description of the way in which the component parts operate. Assuming that the pressure vessels **12** and **14** have been properly filled with their respective ingredients and that the dispensing valves **20** have been secured in place and assuming that the filled and closured pressure vessels have been assembled with the holder **16**, the tubing units **68** and **70** and the mixing and dispensing nozzle **18**, it is only necessary to pivot the trigger blade **46** from the rest position shown in FIG. **5** in solid outline to the operating position illustrated in that FIG. in broken outline. This movement of the trigger blade tilts the valve elements **34** of the dispensing valves **20**, opening the ports **32** to permit flow of material through the fitments **50**, the tubing section **72** and **74** and into the premix chamber **112** of the dispensing nozzle unit **18**. The holder **16** is arranged for use of the unit in the optimum, inverted condition

of the containers **12** and **14**, vertical grip portion **42** promoting this advantageous feature. When one-hand operation is desired, the mixing nozzle unit **18** will be positioned as shown in FIG. **1**, i.e., resting between the containers **12** and **14** on the forward end of the upper plate **38** This type of operation is particularly convenient for sealing a crack **130** between masonry elements as is suggested in the FIG The dispensed foam, being in an actively expanding condition, will completely fill cracks of any size and adhere to the confronting surfaces. Less accessible locations may be calked using the two-hand method suggested in FIG. **2**.

When one particular task has been completed, operation of the dispensing apparatus **10** may be ceased merely by releasing the trigger blade **46**. The resiliency of the sealing bodies **28** will urge the valve elements **34** into their normal non-dispensing condition, terminating flow. The unit may be stored in this condition, the solidifying material in the mixing and dispensing nozzle **18** acting as an efficient seal for any ingredients remaining in the tube sections **72** and **74**. When it is desired to restart and reuse the apparatus, the tube sections **74** and the nozzle unit **18** connected thereto will then be discarded and fresh components assembled at the breakaway fitting. The dispensing apparatus **10** is thus readied for a second utilization. This use procedure may be repeated until the contents of the pressure vessels **12** and **14** is exhausted, at which time the entire apparatus may be discarded.

From the foregoing descriptions, it will be appreciated that the instant invention provides conveniently used apparatus for dispensing a multicomponent product such as a curing urethane foam. It will also be appreciated that the apparatus of the present invention is readily stopped and restarted repeatedly; and while use of the dispensed foam as a calking material has been described, numerous other utilities are contemplated, for example, but not limited to, repair of refrigeration and air conditioning insulation, potting and environmental protection in the electronic industry, packaging of fragile and delicate instruments or tools or art objects, vibration or sound dampening, pipe insulation and various decorative applications.

The drawings and the foregoing descriptions are not intended to represent the only form of the invention in regard to the details of its construction and manner of operation. Changes in form and in the proportion of parts, as well as the substitution of equivalents, are contemplated as circumstances may suggest or render expedient; and although specific terms have been employed, they are intended in a generic and descriptive sense only and not for the purposes of limitation, the scope of the invention being delineated in the following claims.

We claim:

1. Dispenser apparatus comprising first and second container means, each including a foam dispensing valve mounted in the bottom end thereof, said valve including a downwardly extending, tiltably actuatable valve-and-delivery element; bracket means for holding said containers in fixed positions and including a manual grip portion and a manual trigger spaced from said valves and disposed between said valves and said grip portion, said bracket means further including spaced upper and lower container-retaining means engaging said container means for rigidly positioning said container means against actuating tension from said trigger whereby to insure uniform actuation of said valves; links connecting said trigger to said valve-and-delivery elements for actuation of said valves in unison; disposable mixing and dispensing nozzle means; and flexible tubing means, including disposable portions releasably connecting each of said valve-and-delivery elements with said mixing and dispensing nozzle means.

2. Dispenser apparatus according to claim **1** wherein each of said container means encloses a quantity of a propellant liquid, the propellant liquid in said first container means having substantially the same vapor pressure as the propellant liquid in said second container means whereby to dispense substantially equal volumes of the contents of said container means.

3. Dispenser apparatus according to claim **1** wherein each of said tubing means includes first and second lengths of tubing connected respectively to a said dispensing valve and said dispensing nozzle means and a breakaway fitting releasably interconnecting said first and second lengths of tubing.

4. Dispenser apparatus according to claim **3** wherein said breakaway fitting comprises tubular connectors telescoping into said lengths of tubing, said connectors having external rib means at said first lengths and smooth external surface portions at said second lengths.

5. Dispenser apparatus according to claim **1** wherein said dispensing nozzle means includes a tubular housing, an apertured discharge cap on one end of said housing, and a static mixing element in said housing spaced from said cap to define an expansion chamber therebetween.

6. Dispenser apparatus according to claim **5** wherein said cap has a plurality of discharge apertures therein.

7. Dispenser apparatus according to claim **5** wherein said static mixing element includes a radially extending end flange for positioning said element relative to said housing.

8. Dispenser apparatus according to claim **5** wherein said static mixing element includes a radially outwardly opening, spiral mixing groove, a conical premix chamber, and a radial port connecting said groove and said premix chamber.

9. Dispenser apparatus according to claim **8** wherein said dispensing nozzle means further includes an inlet cap on the other end of said housing, said inlet cap having axially aligned inlet members adapted to be connected to said tubing means and opening into said premix chamber.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,559,890 Dated February 2, 1971

Inventor(s) William R. Brooks and Irving C. Heinzel

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

Column 2, line 3, after "is" insert --a--;

Column 5, line 20, after "sections 74" insert the followi --will be pulled from the breakaway fi 76, and the used tube sections 74--

Signed and sealed this 28th day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Pat