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[56]	References Cited	
	UNITED STATES PATENTS	
3,272,389	9/1966	Frangos..... 222/145X
3,410,531	11/1968	Baker..... 137/605X
3,292,827	12/1966	Frangos..... 222/402.24

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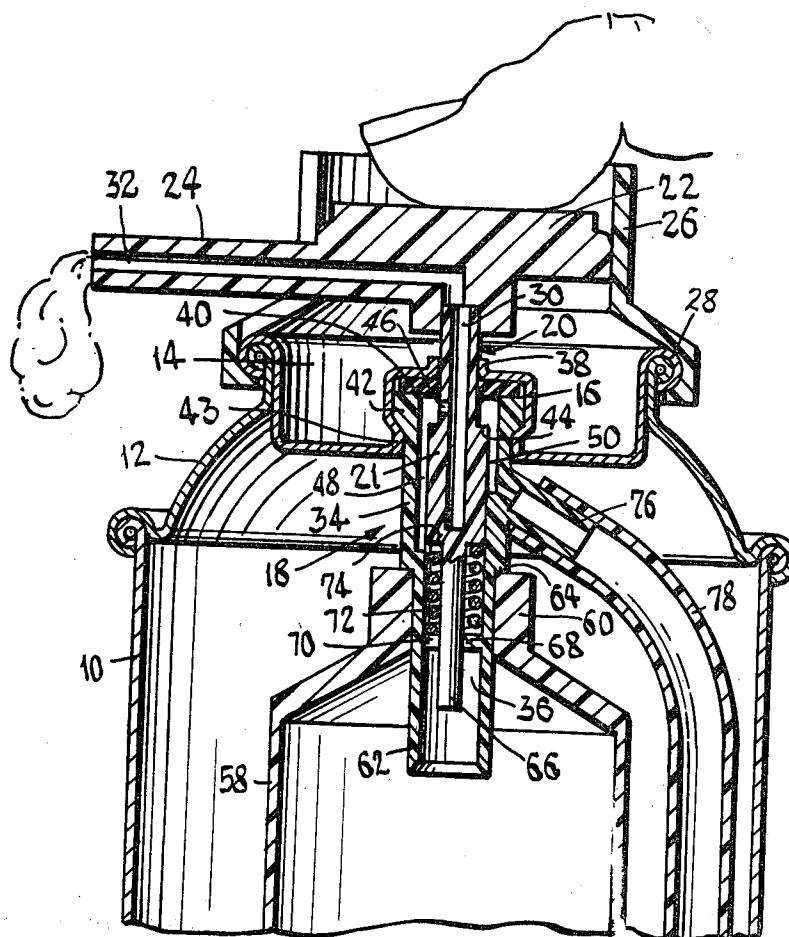
[54] HAND-HELD DISPENSER FOR MIXING FLUIDS
11 Claims, 9 Drawing Figs.

[52] U.S. Cl...... **222/94,**
222/145; 137/605

[51] Int. Cl...... **B65d 35/22**

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145, 136, 193, 402.24; 137/625.4, 602, 605, 606,
607

ABSTRACT: A hand-held dispenser including a container provided with a single discharge valve operated by a stem vertically movable in a tubular valve housing. A second container within the first, communicates with the interior of the valve housing at one location, and at another location the valve housing communicates with the first or outer container. A partition constituted by the valve stem normally keeps the fluids of the first and second containers separated, except when the stem is operated to open the discharge valve.



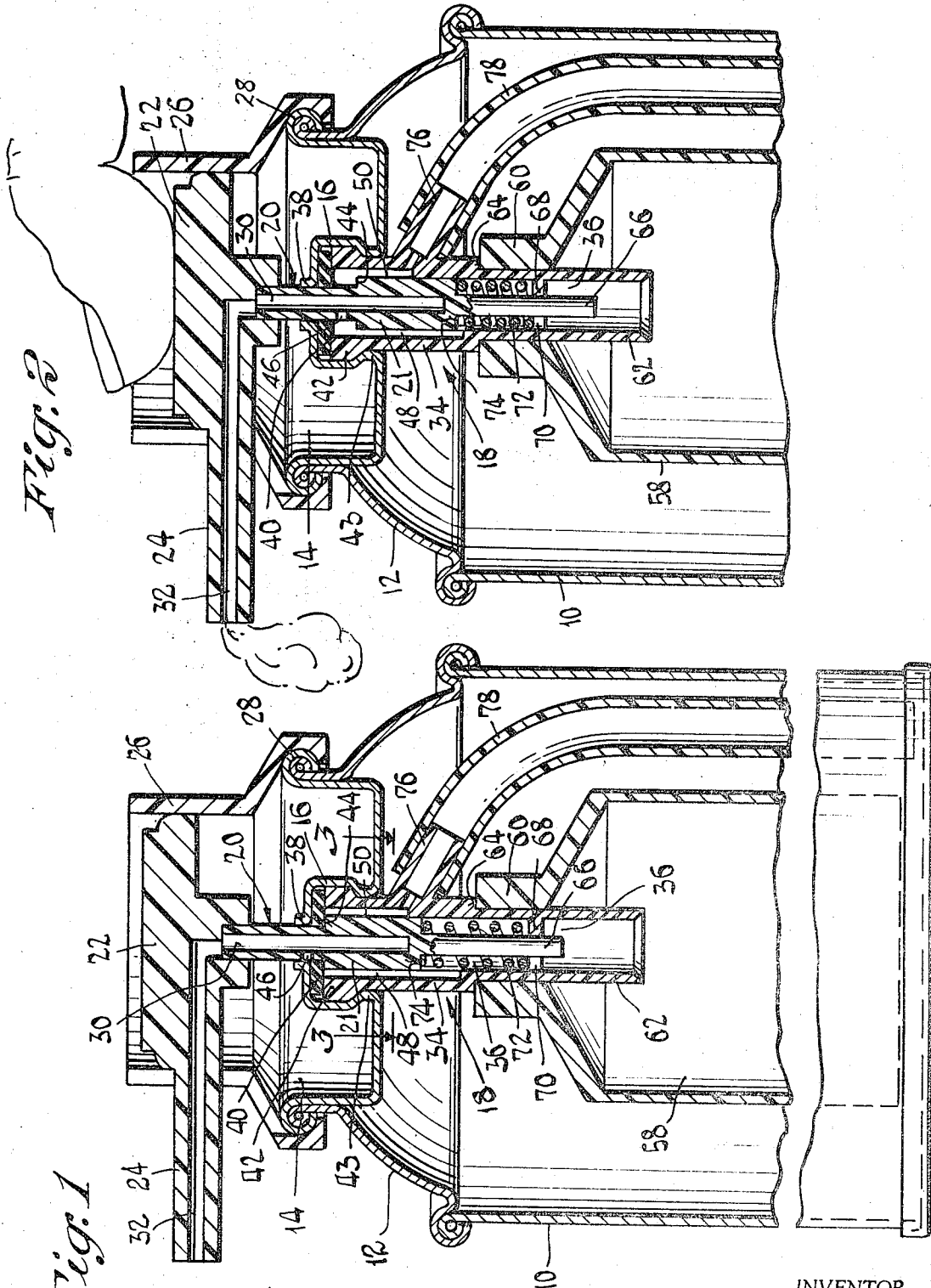
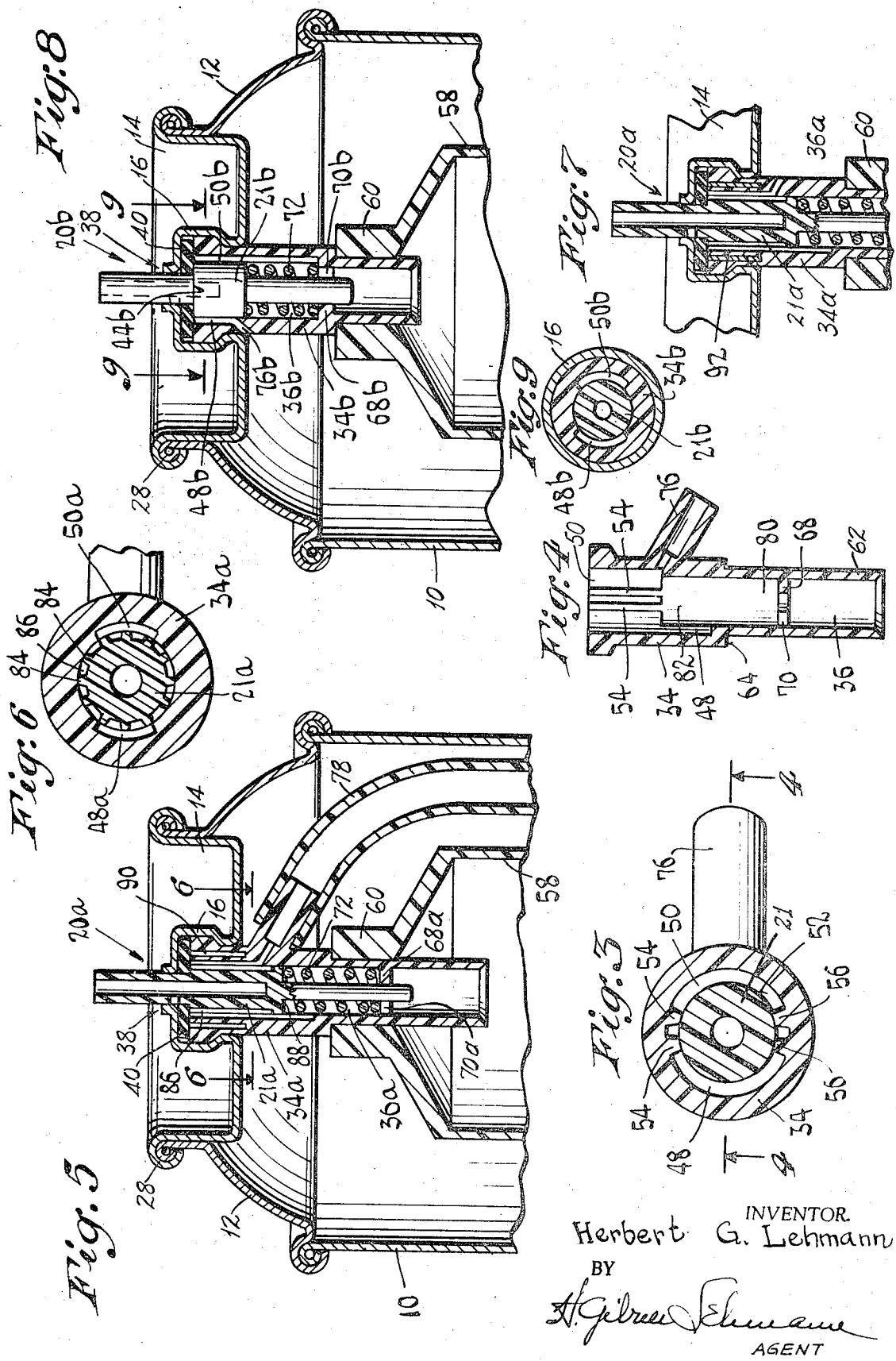


Fig. 1

Fig. 2

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HAND-HELD DISPENSER FOR MIXING FLUIDS

CROSS REFERENCES TO RELATED APPLICATIONS

1. Copending application of William R. O'Donnell entitled "Hand-Held Dispenser With Dual Valve," Ser. No. 692,757, filed Dec. 22, 1967, now U.S. Pat. No. 3,525,997 and having common ownership with the present application.

2. Copending application of William R. O'Donnell entitled "Hand-Held Dispenser With Dual Valve," Ser. No. 707,264 filed Feb. 21, 1968, now U.S. Pat. No. 3,503,539 and having common ownership with the present application.

3. Copending application of Herbert G. Lehmann entitled "Hand-Held Dispenser With Mixing Valve," Ser. No. 721,865, filed Apr. 16, 1968, now U.S. Pat. No. 3,499,581 and having common ownership with the present application.

PRIOR ART OF INTEREST

U.S. Pat. Nos. 2,973,883, 3,217,936, 3,241,722, 3,272,389, 3,325,056, and 3,326,426.

BACKGROUND

This invention relates to small, hand-held pressurized dispensers such as are used for shaving cream and the like. The invention particularly involves a dispenser of the kind indicated, wherein several different liquids are stored and kept separate, these becoming mixed by a mixing valve means, only during the dispensing action.

Prior dispensers intended for this purpose all depended on multiple-valve arrangements to normally keep the different liquids or fluids separated.

One prior dispenser of shaving lather, which effects a mixing of two separate liquids at the multiple-valve means to obtain a heating of the lather, is disclosed in U.S. Pat. No. 3,326,426. One liquid suitable for such use is hydrogen peroxide; the other liquid can contain sodium hypophosphite. The reaction of these results in an exothermic nonexplosive decomposition of the hydrogen peroxide, supplying heat to lathering ingredients whereby the discharge comprises a heated, foam-forming mixture or lather. Potassium sulfite may be utilized, to react with the hydrogen peroxide, instead of the sodium hypophosphite.

Other multiple mixing valve arrangements are shown in U.S. Pat. Nos. 2,973,883, 3,217,936, 3,241,722, 3,272,389 and 3,325,056. While the prior devices were operative in most circumstances and enjoyed various degrees of success, the multiple valves and dispensers as shown were either complicated and costly, difficult to manufacture, not fully reliable when in extended use, or else lacked convenience of operation. The multiple valve arrangements had, as a rule, a multiplicity of parts which necessitated considerable tooling, inventories, and assembly labor. Where the movements were complicated, or depended on critical values of resilience there ensued unreliability of operation, malfunctioning, etc. If critical dimensions were involved, there was in addition the matter of added cost.

In addition to the foregoing drawbacks, however, many of the prior devices lacked a precise coordination of the flow through the multiple valves even though the valves were mechanically coupled and therefore theoretically properly timed, or else lacked means to prevent malfunctioning of the valves if they were not mechanically coupled and susceptible to inadvertent operation when the dispenser was shaken. The reason for the lack of precise coordination of the flows was due to the valves being of different types, as for example where one as a poppet type and the other a slide type. The opening and flow characteristics of these different types differed considerably, whereby the coordination suffered even though there was a mechanical coupling of the valve actuators. As a result there could be wasteful use of the several liquids intended to be mixed. With valves which were not mechanically coupled but depended on spring operation, there was a considerable likelihood of inadvertent operation due to the splashing action of the liquids against the valve

parts in the event the dispenser is shaken or subjected to rough handling.

SUMMARY

The above disadvantages and drawbacks of prior, multiple-valve, mixing-type dispensers are obviated by the present invention, one object being to provide a novel and improved multiple-chamber dispenser and semiautomatic mixing arrangement therefor which effects a more precise coordination of the flows through the mixing means while at the same time utilizing but a single valve member serving the dual function of a poppet valve and a gate valve. The single valve member and cooperable structures are extremely simple and uncomplicated with very few components characterized by simple, time-proved movements whereby there is achieved an especially low cost and an improved and reliable performance.

This is accomplished by the provision of a mixer construction employing but a single manually operable poppet valve which controls the discharge flow and which also acts as a gate valve, and by a simple partitioning arrangement constituted of the single-valve stem, acting in conjunction with the tubular housing in which the stem is movable. Thus, since there is no separate second valve the exact mechanical movement of the master valve need not be correlated with other flow-permitting devices of different types and at different locations. In consequence, a precise simultaneous discharge and mixing is had that is independent of mechanical tolerances or couplings, valve seat variations, port shapes and locations, etc.

The present improved dispenser has a molded plastic, tubular valve housing provided with an internal annular valve seat at one end, said end portion of the housing being secured in the mounting cup or closure of a pressurized container and the other end portion carrying, communicating with, and being sealed to the neck of a flexible bag disposed in the container. A longitudinally movable master valve stem in the housing has a tubular projecting end portion through which the discharge passes, and has a master valve shoulder constituting both a poppet and a gate at the base of the tubular portion, said shoulder being engageable with the said annular valve seat. The valve housing also has a port communicating with the space in the container, which surrounds the bag, preferably via a dip tube. When the valve stem is raised, the shoulder thereof engages the valve seat, closing the same and preventing discharge. The shoulder portion of the valve stem within the housing also constitutes a gate which engages the housing bore at opposite locations, thereby forming a partition which divides the housing into two chambers communicating respectively with the bag interior and the space in the container which surrounds the bag. Such partition maintains the two liquids or fluids separated.

Depressing the stem results in the discharge valve seat becoming open, and for such condition flow occurs from the flexible bag axially into the housing, and from the container area which is exterior to the bag, through the sidewall passage of the valve housing into the latter to mix with the first-mentioned flow at points or areas contiguous to the valve seat. The mixture at the valve seat passes out of the housing through said seat and through the tubular end portion of the stem. The stem shoulder is an effective seal when the stem is not depressed. The master valving and partitioning or gating member is a single, simple molded piece. Besides such piece there is only the valve housing, a simple spring, and a washer-like valve seat member making up the mixing valve assembly.

Other objects of the invention are to provide an improved mixing valve partition arrangement and dispenser as above set forth, wherein the desired discharge can be had with the container either inverted or else upright, depending on the particular construction provided inside the container in connection with the sidewall passage of the valve housing; wherein the likelihood of undesired leakage or mixing of the plurality of liquids is greatly minimized if not completely eliminated in spite of shaking, agitation or rough handling of the dispenser;

and wherein only one valve piece is called on to control the flows in the required manner to mix the fluids as discharge simultaneously takes place, said single valve functioning as a positive seal to prevent leakage to the exterior of both the said fluids.

Other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is an axial sectional view of a single-valve, mixing-type, hand-held dispenser as provided by the invention, illustrated in the storage or nondischarging condition.

FIG. 2 is a view like that of FIG. 1 but showing the discharging position of the valve.

FIG. 3 is a transverse section on line 3-3 of FIG. 1.

FIG. 4 is an axial section of the valve housing, taken on line 4-4 of FIG. 3.

FIG. 5 is an axial sectional view of another form of single-valve mixing dispenser.

FIG. 6 is a transverse section taken on line 6-6 of FIG. 5.

FIG. 7 is a fragmentary axial sectional view of still another embodiment of the invention, similar in many respects to that of FIGS. 5 and 6.

FIG. 8 is an axial sectional view of yet another embodiment of the invention.

FIG. 9 is a transverse section taken on line 9-9 of FIG. 8.

Referring first to FIGS. 1-4, there is illustrated a pressurized container 10 of the well-known type including a top shoulder or neck portion 12 having a mounting cup 14 provided with a raised or upwardly cupped central portion 16 in which there is secured a unique discharge valve and mixing assemblage 18.

The novel assemblage 18 includes a vertically movable valve stem 20 passing through a central opening in the cupped portion 16 and carrying a depress button 22 having a discharge nozzle 24. The button 22 is guided in a stationary actuator body 26 which is secured to an annular shoulder or bead 28 constituting the joint between the mounting cup 14 and shoulder portion 16 of the container 10.

The valve stem 20 has a tubular upper portion 30 for conducting discharge of liquids from the container 10, said tubular portion communicating with a horizontal discharge passage 32 in the nozzle 24, this particular detail being well understood in the art.

The valve assemblage 18 further comprises a tubular valve housing 34 having a main or central bore 36 and having an outlet passage constituted of a central opening 38 in an annular washerlike valve seat 40 which is clamped against the upper end or rim portion 42 of the housing 34.

The rim portion 42 of the valve housing 34 is of thicker cross section, providing an external annular shoulder portion which is engaged by spun-in clinched shoulder portions 43 of the cup formation 16.

The valve stem 20 is disposed and movable in the bore 36, and has an enlarged body portion 21 which comprises part of a combination poppet and gate valve means for controlling fluid flow from the housing bore 36 through the outlet passage 38. Such valve means comprises not only the valve seat or diaphragm member 40 but also an annular shoulder or poppet 44 on the valve body or gate 21, engageable with the underside of the seat or diaphragm member 40 to effect a leakproof closing of the passage 38 therethrough.

The upper hollow portion 30 of the valve stem 20 has a side opening 46 which becomes disposed below the seat 40 when the stem 20 is depressed by downward pressure on the depress button 22, thereby to enable a discharge of fluid to occur from the bore 36 of the valve housing 34 through the side opening 46, hollow stem portion 30 and discharge nozzle 32.

In accordance with the present invention, novel cooperable means are provided on the valve stem 20 and in the housing bore 36, providing a pair of diametrically oppositely located chambers in said bore which are isolated from each other when the stem is in the raised position shown in FIG. 1, wherein it closes the valve means and halts the fluid flow. The two chambers are indicated at 48, 50 and comprise shallow recesses formed in the bore of the housing.

As seen in FIG. 3, the valve body 21 is characterized by a cylindrical outer peripheral surface 52, and the valve housing 34 has pairs of bottom-joined vertical ribs 54, 56 slidably and sealingly engaging the cylindrical surface 52 of the stem.

Further, in accordance with the invention, the said cooperable means providing the chambers 48, 50 is so arranged as to enable communication to occur between said chambers and the outlet passage 38 when the stem is depressed as shown in the discharging condition of FIG. 2, that is, positioned to open the valve means 40, 44.

Communicating with the chambers 48, 50 are respectively a collapsible inner container 58 and the interior of the outer container 10. The inner container 58 has a shoulder or neck portion 60 which is press-fitted on the lower end portion 62 of the valve housing 34, against a shoulder 64 thereof. The valve stem 20 has a lower guide portion 66 of reduced diameter which is guided in an internal transverse apertured wall 68 of the housing portion 62, said wall having a notch 70 to provide for upward passage of fluid from the container 58 into the upper portion of the housing bore 36. A valve return spring 72 engages the wall 68 and also an annular shoulder 74 of the valve stem, to normally yieldably maintain the stem 20 in the raised, nondischarging position of FIG. 1.

The chamber 48 in the bore of the housing 34 is shown as extending below the shoulder 74 of the valve stem, whereby it communicates with the space occupied by the return spring 72 and accordingly is also in communication with the notch 70 of the wall 68 and consequently with the interior of the inner collapsible container 58.

The valve housing 34 has a tubular side fitting 76 communicating with the chamber 50 and carrying a dip tube 78 which extends to the bottom of the container 10 and acts as a siphoning means.

By the above organization the chamber 48 is always in communication with the interior of the inner container 58, and the chamber 50 is always in communication with the interior of the container 10 via the dip tube 78. Referring to FIG. 4 it will be seen that the bore 36 of the valve housing 34 has an uninterrupted inner cylindrical surface 80 below the bottom of the recess comprising the chamber 48, and has a cylindrical surface with a single interruption 82 (that effected by the chamber or recess 48) below the joined bottom ends of the ribs 54, 56. The cylindrical surface 82 in cooperation with the outer cylindrical surface 52 of the valve stem and in conjunction with the ribs 54, 56 serves to isolate the chamber 48 from the chamber 50 at such times that the valve stem 20 is in the raised position of FIG. 1. For such raised position, the shoulder 44 of the stem will sealingly engage the valve seat 40, and sealing engagement will also exist between the ribs 54, 56 and cylindrical surface 82 of the valve housing on the one hand, and the cylindrical outer peripheral surface 52 of the valve stem 20 on the other hand.

The valve stem 20 and valve housing 34 are molded of semirigid plastic substance which has a certain amount of yieldability. Accordingly, a fairly tight sliding fit may be established between the cooperable sliding surfaces of the valve stem and housing, comprising the ribs 54, 56, stem surface 52 and housing surface 82. The ribs 54, 56 can yield a slight extent, and the hollow nature of the valve stem also permits a slight yielding of this component. Accordingly, sealing engagement can be affected without excessive binding of the parts which would prevent free vertical movement of the valve stem.

The container 10 in the contained space which is exterior to the inner container 58 may have a pressurized liquid which, due to the collapsible nature of the inner container 58, will impart its pressure to the liquid contents of such inner container. Accordingly, the liquids in both containers will be under like pressures due to the pressurizing medium in the outer container. Such pressurized liquids, however, will be kept separate from each other due to the sealing engagement effected by the cylindrical body portion 21 of the valve stem 20 when the stem is raised. However, at the time that the stem is depressed as illustrated in FIG. 2, the chambers 48, 50 which

are normally isolated will now be allowed to communicate with the discharge opening 38 of the valve housing 34, such discharge opening involving also the side opening 46 and bore of the hollow stem portion 30 and being in communication with the atmosphere via the nozzle 24 and passage 32 thereof. Accordingly, the pressurized liquids will be forced from the containers 10, 58 respectively through the chambers 50, 48 out through the side opening 46 and hollow stem portion 30 (where a mixing of the liquids occurs) to be finally discharged to the atmosphere. Where the mixing liquid has heating effect, the discharge will be heated, as is desired in the case of shaving cream preparations.

At such time that the valve stem 20 is again raised by removal of finger pressure from the button 22, the valve 40, 44 will become closed, again isolating the chambers 48, 50 from each other and preventing further intermingling of the liquids from the two containers.

It will now be seen from the foregoing that I have provided a novel and improved, especially simple mixing and valve arrangement wherein but a single valve comprising the shoulder 44 effects not only a control of the discharge of the dispenser contents but also a separation of the liquids from two different containers, by isolating the chambers 48, 50 from each other and from the discharge passage 38 extending through the valve seat 40. It will be seen that the organization is especially simple, and does not depend on correlation of a multiplicity of valves, in order to effect the mixing of the liquids. Instead, the mixing is quickly, simultaneously effected as soon as flow occurs in consequence of opening of the valve 40, 44.

Another embodiment of the invention is shown in FIGS. 5 and 6. This embodiment also employs the new basic principle of the invention, involving isolation by the main discharge valve of two chambers connected respectively with two containers having different liquid contents. Operation of the embodiment of FIGS. 5 and 6 is accordingly very similar to that already described. The structural differences involve the provision of a plurality of longitudinally extending ribs and grooves 84, 86 on the body portion 21a of the valve stem 2a, said ribs being engageable with cylindrical portions of the bore 36a of the valve housing 34a. Such housing has shallow recesses 48a and 50a which, together with certain of the grooves 86, constitute the two chambers which are in communication with the inner and outer containers 58, 10 respectively.

The ribs 84 on the molded valve stem 20a can yield slightly, this same being true of the narrow bottom edge portion 88 of the stem body 21a. Additionally yieldability of the cylindrical wall surfaces of the bore of the valve housing 34a is effected by the provision of a deep circular or annular groove 90 provided in the upper end portion of the valve housing, as seen in FIG. 5. The groove 90 also minimizes any distorting influence which may occur on the upper portion of the valve housing at the time that it is secured in place by crimping of the mounting cup portion 16, as will be understood.

Aside from the foregoing differences, the mixing and dispensing organization illustrated in FIGS. 5 and 6 is generally similar to that illustrated in FIGS. 1-4.

If additional stiffening of the upper rim portion of the valve housing 34a is desired, a stiff metal ring 92 may be incorporated in the groove 90, as illustrated in FIG. 7. This will tend to strengthen the upper rim portion of the valve housing, and tend to minimize distortion of the cylindrical portions of the bore of such housing.

Yet another embodiment of the invention is illustrated in FIGS. 8 and 9. In these FIGS. the valve stem 20b has a body portion 21b of cylindrical configuration, sealingly engaged with cylindrical surfaces of a bore 36b of the valve housing 34b. The housing 34b has a side port 76b which communicates with the recess or chamber 48b. Another recess 50b in the bore of the valve housing 34b constitutes the second chamber, which communicates by means of a notch 70b with the interior of the second container 58. The body portion 21b of the valve stem has a valve shoulder 44b which is cooperable with

the seat or diaphragm 40b to control the discharge from the dispenser and also the mixing of the two liquids. The valve return spring 72 engages the valve body 21b and also an internal shoulder 68b of the valve housing 34b.

Operation of the dispenser of FIG. 8 is essentially similar to that of the preceding figures, the main characteristic being the single valve comprising the shoulder 44b which not only controls the discharge from the dispenser but also is effective in isolating the two liquids from the containers 10, 58 by virtue of the valve keeping isolated the chambers 48b, 50b.

It will now be understood from the foregoing that I have provided a unique and especially simple combination valve and mixing organization which is characterized by a single valve as distinguished from multiple-valve assemblages of prior devices. With the device of the present invention the single discharge valve comprising the shoulder on the valve stem controls not only the discharge from the dispenser but also effects the isolation of the liquids from the two containers. It will be seen that very few parts are involved, and that the construction and action are simple, straightforward, and foolproof.

It will be understood that during the nondischarging or storage conditions of the dispenser, the liquid pressure in the inner container 58 will be essentially the same as the liquid pressure in the outer container 10, and since such pressures are equalized there are no significant pressure differentials tending to cause mixing of the two liquids. In consequence, the sliding parts as provided herein are effective in maintaining the desired isolation of the two chambers and the two different liquids contained therein.

Variations and modifications are possible, and portions of the improvement may be used without others.

I claim:

1. In a mixing-type dispenser, a fluid control device comprising, in combination:

- a. a valve housing having a bore and an outside wall provided with an outlet opening therein, said outlet opening communicating with said bore;
- b. a valve stem disposed and movable in the housing bore and extending through the said outlet opening;
- c. a combined poppet and gate valve means comprising a single shouldered portion on the stem and a cooperable annular valve seat disposed in the valve housing and comprising the said outlet opening thereof, said shouldered portion controlling fluid flow from the housing bore through said outlet passage in response to movements of the valve stem and further constituting a gate for separating diametrically opposite areas of the housing bore from each other;
- d. cooperable means on the valve stem and in the housing bore and including the shouldered portion of the valve stem, providing a pair of diametrically opposite chambers located in said bore, said chambers being separated from each other by said shouldered portion and constituting portions of said bore when the stem is positioned to close said valve means and halt said fluid flow;
- e. said cooperable means enabling communication to occur between the chambers only simultaneously with opening of said valve means by movement of said stem to permit said fluid flow, said combined poppet and gate valve means shutting off communication between the chambers when the stem is positioned to close said combined valve means; and
- f. a pair of containers for fluid, communicating respectively with said pair of chambers.

2. A dispenser as in claim 1, wherein:

- a. the bore in the valve housing is elongate;
- b. the poppet and gate valve means is disposed at one end of said bore;
- c. one of said chambers being in communication with the other end of said bore;
- d. one of said containers being in communication with said other bore end; and
- e. said one container being attached to a portion of the valve housing which surrounds said other bore end.

3. A dispenser as in claim 2, wherein:

- a. the other of said containers is attached to a portion of the valve housing which surrounds said one bore end; and
- b. said other container enclosing the valve housing and the said one container.

4. A dispenser as in claim 1, wherein the cooperable means of the stem and valve housing comprise inner surfaces of the bore of the housing and a plurality of ribs on the shouldered portion of the valve stem, extending longitudinally thereof and engaged with said inner bore surface of the housing.

5. A dispenser as in claim 1, wherein the cooperable means of the stem and valve housing comprises a cylindrical peripheral surface on the stem and a plurality of ribs in the bore of the valve housing, engaging said peripheral surface.

6. A dispenser as in claim 5, wherein the annular valve seat is disposed at one end of the bore of the valve housing and meets the ends of the ribs therein.

7. A dispenser as in claim 5, wherein the ribs in the bore of the valve housing are arranged in pairs disposed respectively on opposite sides of the valve stem, the ribs of each pair being spaced apart a small fraction of the bore circumference.

8. A dispenser as in claim 5, wherein:

- a. the bore of the valve housing is mainly cylindrical;
- b. one chamber comprises a groove in said bore, extending in the direction of movement of the valve stem; and
- c. the cylindrical peripheral surface of the valve stem slidably and sealingly engages said bore except at the location of said groove.

9. In a mixing type dispenser, a fluid control device comprising, in combination:

- a. a valve housing having a bore and an outlet passage communicating with said bore;
- b. a valve stem disposed and movable in the housing bore;
- c. valve means comprising a single-shouldered portion of the stem and cooperable parts of the valve housing, controlling fluid flow from the housing bore to said outlet passage in response to movements of the valve stem;
- d. cooperable means on the valve stem and in the housing bore and including the said single-shouldered portion of the stem, providing a pair of diametrically opposite chambers in said bore which are separated from each other by said shouldered portion when the stem is positioned to close said valve means and halt said fluid flow;
- e. said cooperable means enabling communication to occur between the said chambers respectively and said outlet passage when the stem is positioned to open said valve means for permitting said fluid flow;

f. a pair of containers for fluid, communicating respectively with said pair of chambers;

g. said valve means comprising an annular valve seat at one end of the bore of the valve housing, through which seat the valve stem extends, and comprising an annular shoulder disposed on the valve stem and engageable with said annular seat;

h. the portion of the valve stem which extends through the valve seat being hollow and having a side opening adjacent the seat; and

i. said side opening and interior area of the hollow stem portion constituting said outlet passage.

10. In a mixing-type dispenser, a fluid control device comprising, in combination:

a. a valve housing having a bore and an outlet passage communicating with said bore;

b. a valve stem disposed and movable in the housing bore;

c. valve means comprising cooperable parts of the valve housing and stem, controlling fluid flow from the housing bore to said outlet passage in response to movements of the valve stem, wherein the improvement comprises:

d. cooperable means on the valve stem and in the housing bore, providing a pair of chambers in said bore which are separated from each other when the stem is positioned to close said valve means and halt said fluid flow;

e. said cooperable means enabling communication to occur between the chambers and outlet passage when the stem is positioned to open said valve means for permitting said fluid flow;

f. a pair of containers for fluid, communicating respectively with said pair of chambers;

g. the valve housing being tubular;

h. said bore of the valve housing constituting the main space therein;

i. one end of the housing having an external annular shoulder;

j. a mounting cup encircling said one housing end, said cup being clinched over the annular shoulder thereof;

k. said cooperable means of the stem and housing comprising relatively slidable surfaces thereof at said one housing end; and

l. said housing end having an annular groove in the end surface, surrounding said valve stem and housing bore to minimize the effect of the cup clinching on the bore size.

11. A dispenser as in claim 10, and further including a stiff metal ring disposed in said annular groove, to stiffen said one housing end.