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[54] **VALVE FOR PRESSURIZED FLUID SYSTEM**
6 Claims, 4 Drawing Figs.

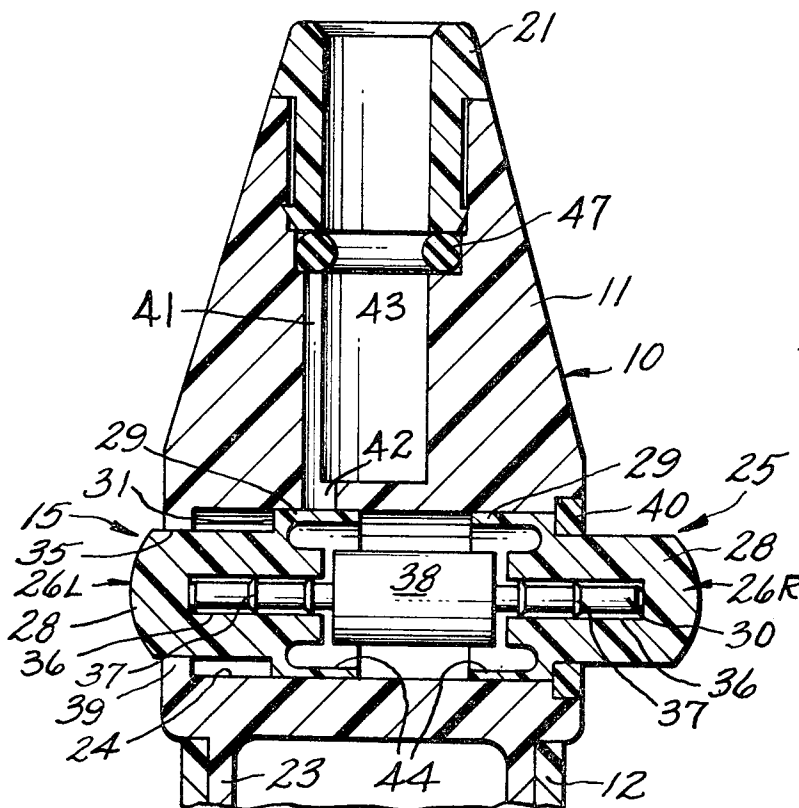
[52] U.S. Cl..... **251/282,**
251/319
[51] Int. Cl..... **F16k 3/24**
[50] Field of Search..... 251/324,
319, 175, 282

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ABSTRACT: An on-off valve for a pressurized fluid system including a pushbutton assembly slideably retained and freely shiftable within a bore interconnecting an inlet and outlet passageway. The assembly comprises two spaced opposing push buttons, each having a button portion and a circumferential flexible flange depending from the button. Each button having equal inner surface areas so that force exerted by the constant fluid pressure is in equilibrium and the assembly remains in its manually set position without spring biasing means.



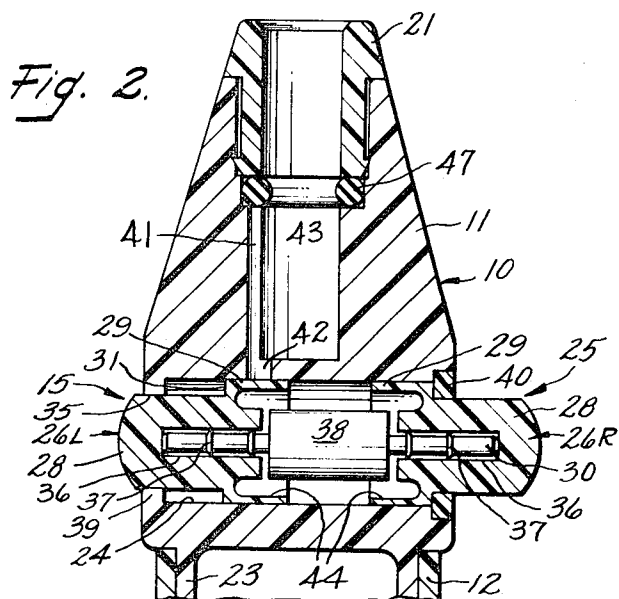
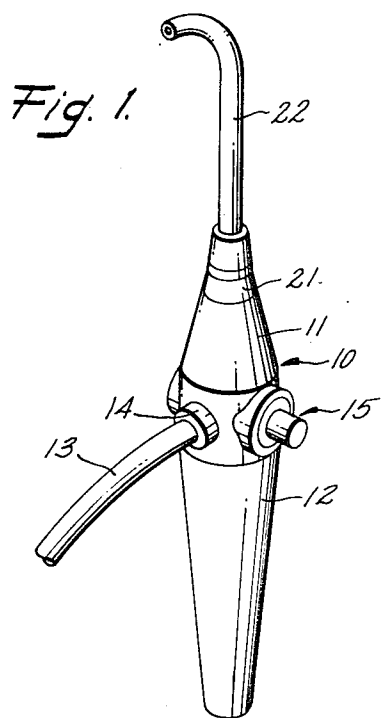


Fig. 3.

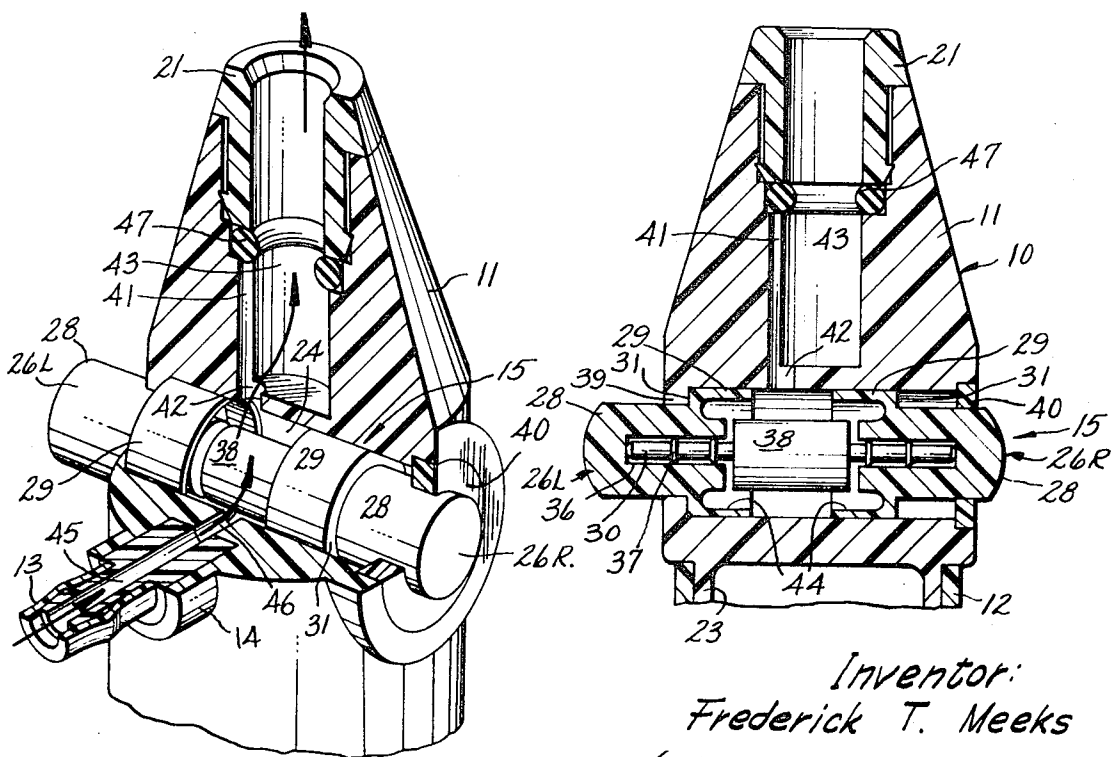


Fig. 4.

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VALVE FOR PRESSURIZED FLUID SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to an on-off valve for a pressurized fluid system and more particularly to a valve in the hand nozzle of an oral hygiene apparatus of the liquid jet type used for cleaning teeth and massaging gums.

Oral hygiene apparatus that produces a small jet of liquid discharged at substantial velocity under pressure may be used for cleaning the teeth and gums. One form of such oral hygiene apparatus includes a reciprocating piston-type pump that supplies pressure to the liquid fluid system. During the forward stroke of the piston, the liquid leaves the pump under pressure by means of a flexible tube that carries the pulsating liquid to a hand nozzle for discharge from the apparatus system.

Oral hygiene apparatus normally have a switch for starting the apparatus by energizing an electric motor which drives the pump piston. Control means for the user to regulate the amount of liquid pressure discharged from the apparatus system is also provided. The hand nozzle is adapted to receive a removable and rotatable nozzle tip and is designed to be manipulated by hand to direct the high-velocity liquid jet discharged from the hand nozzle against the teeth and gums. During operation of the oral hygiene apparatus the user often desires to stop the discharge of water from the hand nozzle without terminating operation of the motor and pump. To this end an on-off valve is provided in the hand nozzle. In order to be effective and acceptable such an on-off valve should offer positive liquid flow control with minimum fingertip effort. Moreover, it is highly desirable to eliminate any metal parts in the valve since they are inherently susceptible to corrosion and would detrimentally affect the functioning of the valve in time.

By my invention, there is provided an improved on-off valve for a pressurized fluid system and particularly a valve useful in connection with hand nozzles of oral hygiene apparatus to control the flow of liquid and which accomplishes all of the above-mentioned desirable characteristics.

SUMMARY OF THE INVENTION

In accordance with this invention, there is provided an on-off valve for a pressurized fluid system that includes a valve body with a fluid inlet passageway, and outlet passageway, and a bore interconnecting both passageways. A pushbutton assembly is slideably retained and manually shiftable to a first and second position within the bore. The pushbutton assembly comprises two opposing push buttons fixed in a spaced relationship to each other, each having a button portion that is accessible from outside the valve body and a circumferential flexible flange depending from the button portion. The outside diameter of the flanges are slightly smaller than the inside diameter of the bore and a major portion of the outer surface of each of the flexible flanges is in contact with the wall of the bore and wipes the wall upon movement of the pushbutton assembly to the first and second positions within the bore.

The valve is arranged so that movement of the pushbutton assembly within the bore to the "off" position locates the flexible flange of one of the push buttons over a port in the sidewall of the bore leading into the outlet passageway. In this manner the passageway is blocked and no fluid is discharged from the hand nozzle. When the pushbutton assembly is manually shifted within the bore to the "on" position the flange is moved away from the outlet port and the fluid may pass into the outlet passageway and subsequently discharged from the hand nozzle.

The freely shiftable pushbutton assembly is constantly subject to pressurized fluid as the inlet passageway delivering the fluid from the pump is never blocked regardless of the position of the pushbutton assembly. To prevent the pressurized fluid from forcing the pushbutton assembly from its manually set position the inner surface area of one button is equal to the other thereby providing an equal exertion of force by the pres-

surized fluid against each button so that a static or dynamic state of balance exists. By this arrangement there is no spring biasing means necessary to maintain the pushbutton assembly in its respective set positions.

It is an object of this invention to provide an improved on-off valve for a pressurized fluid system.

It is also an object of this invention to provide an on-off valve for hand nozzles of oral hygiene apparatus of the high velocity liquid jet type.

It is another object of this invention to provide an on-off valve for hand nozzles of high-velocity liquid jet type oral hygiene apparatus that will remain at its set position without spring biasing means.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a hand nozzle used in connection with oral hygiene apparatus showing the on-off valve.

FIG. 2 is a cross-sectional view of a portion of the hand nozzle showing the valve in the "off" position.

FIG. 3 is the same as FIG. 2 with the valve in the "on" position.

FIG. 4 is a partially sectioned perspective view of the hand nozzle incorporating the on-off valve.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the hand nozzle as illustrated in FIG. 1 comprises a body 10 having a front or upper portion 11 and a rear portion 12. A flexible plastic tube 13 that carries the liquid under pressure from the pumping source of the apparatus (not shown) to the hand nozzle is attached to the hand nozzle by coupler connection 14. The on-off valve 15 is shown in the midportion of the hand nozzle. The hand nozzle is designed to be manipulated by hand so that the user may direct the high velocity liquid jet discharged from the nozzle against the teeth and gums. The hand nozzle has a coupling 21 for receiving an individual removable and rotatable nozzle tip 22.

With reference to FIGS. 2 and 3, the on-off valve 15 is shown in detail. The rear portion 12 of the hand nozzle joins the front portion 11 by telescoping over a collar 23 formed in the front portion. The two portions may then be adhered to each other by ultrasonically welding or by any other suitable means. The front portion 11 of the hand nozzle forms the body of the on-off valve 15 and has a cylindrically shaped bore laterally through the hand nozzle. A manually shiftable pushbutton assembly 25 is slideably retained in the bore. The pushbutton assembly comprises two identical pushbuttons 26L (left) and 26R (right) each having a button portion 28 and a circumferential flexible flange 29 depending from the button portion. At the junction between button portion 28 and flange 29 there is a radially outwardly directed shoulder 31. The outside diameter of flexible flange 29 is slightly smaller than the inside diameter of bore 24 with a major portion of the flange being in contact with the sidewall of the bore as the pushbutton assembly 25 is shifted to its different positions. The two pushbuttons 26L and 26R oppose each other and are maintained in a fixed spaced relationship by a connecting spacing bar 30. Each end of the spacing bar is inserted into a cavity 36 centrally located on the inside of each of the buttons. Each end of spacing bar 30 is provided with projections 37 which extend radially outwardly and retain the pushbuttons 26L and 26R in their respective positions on the spacing bar and prevent the spacing bar from being extracted from cavity 36 of the buttons by gripping the sidewalls of the cavity. Rigidity of spacing bar 30 is achieved by a central disposed thickened cylindrical portion 38.

The pushbutton assembly 25 is subassembled as described and then inserted into bore 24 as a subassembled unit. The bore has at one end thereof a circumferential inwardly directed collar 39 with a central aperture 35 large enough to receive only button portion 28 of pushbutton 26. When the pushbutton assembly 25 is in the position shown in FIG. 3 the

radially outwardly directed shoulder 31 of pushbutton 26L abuts the circumferential collar 39 thereby providing stop means for the pushbutton assembly. The end of bore 24 opposite from the inwardly directed circumferential collar 39 utilizes a ring washer 40 as the stop means and it functions in the same manner to restrict movement of the pushbutton assembly in the opposite direction by shoulder 31 on pushbutton 26R abutting ring washer 40. Ring washer 40 may be adhered to the valve body by any convenient means to retain it in place once the subassembled pushbutton assembly 25 is inserted into bore 24.

Within body 10 in the front portion 11 of the handle there is provided an outlet passageway 41 with an outlet port 42 in the sidewall of bore 24. The passageway 41 leads to an exit cavity 43 which is in communication with coupling 21 that receives a nozzle tip. An O-ring gasket 47 located at the base of the coupling 21 is used to releasably grip the nozzle tip when it is inserted into coupling 21. An inlet passageway also with an inlet port in the sidewall of bore 24 is provided for liquid entering the hand nozzle through plastic tube 13. Liquid entering the hand nozzle is directed through the inlet passageway into the bore 24 between opposing pushbuttons 26L and 26R. As noted previously, the incoming liquid is under pressure and remains under pressure until discharged from the hand nozzle because the reciprocating pump continues to operate unless the motor is turned off. The pressurized liquid exerts force against the flexible button flanges 29 thereby pressing them against the inside wall of bore 24. In this manner the flanges 29 acts as a liquid seal to prevent the liquid from escaping between the pushbutton and the sidewall of the bore. The depending flange 29 of pushbutton 26L is of sufficient length to completely cover outlet port 42 when the pushbutton assembly is in the "off" position, as shown in FIG. 2. By this arrangement the pressurized liquid system assists in sealing the outlet port and thereby preventing discharge of liquid through the nozzle tip 22.

In FIG. 3 the pushbutton assembly 25 is shown shifted to the "on" position as by applying finger pressure to the button portion 28 of pushbutton 26R thereby moving the assembly to the left until shoulder 31 of pushbutton 26L abuts collar 39. When the pushbutton assembly 25 is in the "on" position flexible flange 29 of pushbutton 26L no longer blocks outlet port 42 and the pressurized liquid is permitted to flow into outlet passageway 41.

It is desirable to have a valve used in a liquid fluid system to have no metal parts, otherwise, operation of the valve can be detrimentally affected due to corrosion of the metal. In a pressurized liquid fluid system utilizing a pushbutton valve it is difficult to eliminate metal parts because some sort of spring biasing means is normally required to keep the pushbutton in its set position. I eliminate the need of spring biasing means by having the surface area 44 of each of the opposing pushbuttons 26L and 26R that is exposed to the pressurized liquid equal to each other. With the surface areas of each button equal the pressure exerted on each of the pushbuttons by the liquid fluid system is also equal and will not act to force the pushbutton assembly in one direction or another within the bore 24. Therefore, if the pushbutton assembly 25 has been set to the "off" position it will remain in this position until manually moved or shifted. The same, of course, is true when the pushbutton assembly 25 is in the "on" position as shown in FIG. 3. It should be noted that the inlet port is never blocked regardless of the position of pushbutton assembly 25. In this manner then the liquid within bore 24 between the two opposing pushbuttons 26L and 26R is always under pressure when the apparatus is pumping liquid.

With reference to FIG. 4 the partially sectioned perspective view of the front portion 11 of the hand nozzle shows the flow path of the fluid through the hand nozzle by means of arrows. The plastic tube 13 connecting the pump and hand nozzle is secured to coupling 14 which has the inlet passage 45 with an inlet port 46 in the sidewall of bore 24. With pushbutton assembly 25 in the "on" position as shown in FIG. 4 flexible

flange 29 of pushbutton 26L is located to the left of outlet port 42 in the sidewall of bore 24 and therefore does not block or seal the outlet port. The liquid is free to flow through the space between the two opposing pushbuttons 26L and 26R and around cylindrical portion 38 of the spacing bar 30. The liquid then passes through outlet port 42 into outlet passageway 41 and on into exit cavity 43 which is in fluid flow communication with a nozzle tip that may be inserted in coupling 21 and ultimately discharged. By moving pushbutton assembly 25 to the right flexible flange 29 of pushbutton 26L seals off outlet port 42 and the liquid is no longer discharged from the hand nozzle even though the pump of the oral hygiene apparatus continues to operate.

The valve body 10, pushbuttons 26L and 26R and spacing bar 30 are made of suitable plastic material. It is highly desirable to form the pushbuttons from polyethylene because that plastic material is easily moldable, sufficiently flexible for the flanges 29, and has inherent lubricity characteristics that aid in the functioning of the on-off valve.

The foregoing is a description of the preferred embodiment of the invention, and variations may be made thereto without departing from the spirit of the invention, as defined in the appended claims.

I claim:

1. An on-off valve for a pressurized fluid system comprising:

a. a body with an inlet passageway, an outlet passageway, and a bore interconnecting the passageways with the inlet passageway being located near the center of the bore and the outlet passageway being located toward one end thereof,

b. a pushbutton assembly including,

a.a. two opposing plastic molded pushbuttons with each pushbutton having a button portion for manually shifting the pushbutton assembly, a circumferential flexible flange depending from the button portion, said push buttons having equal inner surface areas, and

b.b. means for maintaining said pushbuttons in opposing spaced relationship, and

c. means for slideably shifting and retaining said pushbutton assembly in said bore without spring biasing means to an off position and an on position, said passageways being spaced such that the inlet passageway is not blocked by either of said pushbutton flanges in either the off or on position and the outlet passageway is blocked by one of said flanges in only the off position.

2. The on-off valve of claim 1 wherein the outside diameter of the flexible flange of both pushbuttons is slightly smaller than the bore diameter and a major portion is in contact with the sidewall of the bore.

3. The on-off valve of claim 1 wherein the two opposing pushbuttons are one-piece molded from polyethylene.

4. The on-off valve of claim 1 wherein the pushbuttons have radially outwardly directed shoulders between the button portion and flange which cooperate with stop means at each end of the bore for slideably retaining the pushbutton assembly in the bore.

5. An on-off valve for use in a hand nozzle of an oral hygiene apparatus utilizing a pressurized liquid fluid system comprising:

a. a body with an inlet passageway, an outlet passageway, and a bore with stop means at each end thereof, said bore interconnecting the passageway with inlet passageway being located near the center of the bore and the outlet passageway being located toward one end thereof,

b. a pushbutton assembly including,

a.a. two opposing plastic molded pushbuttons each pushbutton having a button portion accessible from outside the hand nozzle for manually shifting the pushbutton assembly, a circumferential flexible flange depending from the button portion, each of the pushbuttons having equal inner surface areas and each having the outside diameter of the flange slightly smaller than the bore diameter, and radially outwardly directed shoul-

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- ders between the button portion and flange which cooperate with the stop means at each end of the bore for retaining the pushbutton assembly in the bore,
- b.b. a bar connecting said two opposing pushbuttons in spaced relationship to each other, and
- c. said pushbutton assembly being manually shiftable without spring biasing means in said bore to an off position and an on position, said passageways being spaced

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such that the inlet passageway is not blocked by either of said push button flanges in either the off or on position and the outlet passageway is blocked by one of said flanges in only the off position.

5 6. The on-off valve of claim 5 wherein the two opposing pushbuttons are one- piece molded from polyethylene.

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