July 3, 1962 G. B. PACKARD 3,042,313

FLUID METERING DEVICE

Filed Nov. 3, 1960

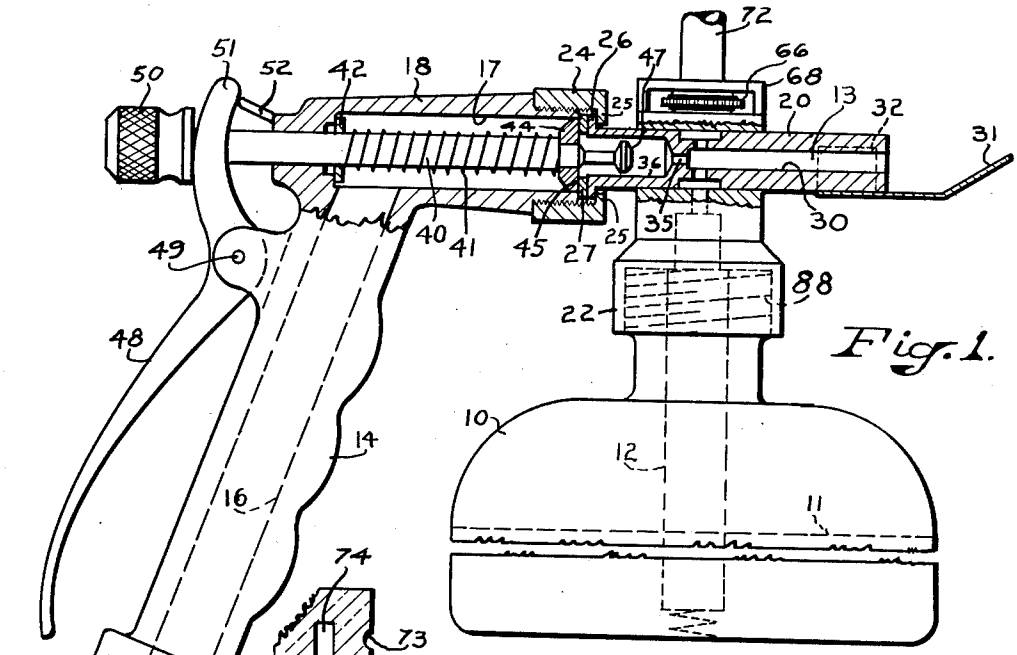

Fig. 1.

Fig. 2.

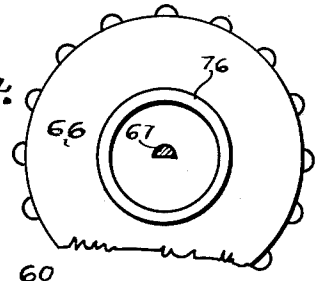

Fig. 4.

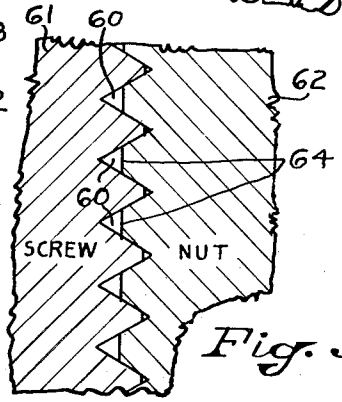

Fig. 3.

INVENTOR.
George B. Packard
BY
Clayton L. Zanka
ATTORNEY

United States Patent Office 3,042,313 Patented July 3, 1962

3,042,313

FLUID METERING DEVICE

George B. Packard, Shrewsbury, Mass., assignor to Barco Manufacturing Co., Inc., Worcester, Mass., a corporation of Massachusetts

Filed Nov. 3, 1960, Ser. No. 67,048
1 Claim. (Cl. 239—318)

This invention relates to a fluid sparying device of the type described in my co-pending application Serial No. 846,362, filed October 14, 1959, now U.S. Patent No. 2,993,651 of July 25, 1961, and more particularly to an improvement in the construction which controls and indicates the proportion of the metering fluid in the water spray.

In that prior device, as will be made apparent hereinafter, a screw is adjustably threaded through a fixed nut and these are so arranged as to provide a channel of a variable extent which controls the volume of fluid passing therethrough. The hollow nut communicates with a tube for withdrawing fluid from a container. The position of adjustment of the screw within the nut is indicated by a stem on the screw which projects into a translucent calibrated cap. The fluid has access to the inside of that cap and in time may leave a sediment or discoloring deposit therein and it may clog or diminish the flow through the metering passage. This has involved a cleansing operation made particularly difficult by the necessity for removing the tube so as to give access to the screw, and the latter had to be screwed downwardly to free it from the nut and a manually operable disk which turns the screw. Reassembly of the parts was even more difficult for the average user of the device.

A primary object of my invention is to overcome this problem involved in cleaning the metering device and to provide a construction which can be quickly disassembled and cleaned and then easily re-assembled. Other objects will be apparent in the following disclosure.

Referring to the drawings illustrating a preferred emmodiment of the invention:

FIG. 1 is an elevation, partly broken away, of a spraying device having an injector action pressure device for removing fluid from a container and from which the flow of fluid is metered by a screw thread passage;

FIG. 2 is an enlarged vertical section of a portion of the container, the screw thread metering device and the finger operated adjustment control member which regulates the quantity of fluid delivered;

FIG. 3 is an enlarged diagrammatic view of a few of the threads showing the relationship of the screw and nut which provide the metering passage; and

FIG. 4 is a fragmentary view of the adjustment disk and associated parts taken on the line 4—4 of FIG. 2.

Referring first to FIG. 1, the container 10 is adapted to contain a suitable aqueous soluble chemical or other active liquid 11 which is to be educted through an outlet tube 12 communicating with the metering device and then is drawn into the spray nozzle 13 where it is mixed with water to form the spray. The water is supplied for that purpose through a suitable handle structure 14 having an internally threaded cap 15 to which a standard hose pipe may be suitably connected to provide water under pressure. The water is led through the internal passage 16 of that handle and into a valve chamber 17 within a normally horizontal cylindrical body 18. From this passage the water is forced by the hydraulic pressure through an injector having a venturi shaped passage which provides a partial vacuum for aspirating the fluid 11 from the container. This may comprise a horizontal cylindrical tube 20 fitted transversely within a cylindrical opening through a housing 22. To hold the parts 18

and 20 assembled, the valve body 18 may have an external thread on a reduced end portion, and a cap 24 having an inwardly depending flange 25 is threaded on that body 18. The flange of the cap engages a radial flange 26 formed on the inner end of the tube 20. A suitable washer 27 may be inserted between the flange 26 and the end of the body 18 to prevent the leakage of water. The nozzle 20 has an internal bore 30 arranged axially thereof. Various provisions may be employed to insure the formation of a spray of the fluid issuing from that bore 30. As shown, this may comprise a suitably shaped water deflecting baffle 31 located in the path of the stream issuing from the bore 30 and suitably held in place by means of a spring clip 32 surrounding the nozzle 20.

The construction of the injector which provides the vacuum for withdrawing the fluid 11 from the container 10 may be as desired. As shown, it comprises a small bore venturi shaped passage 35 which leads into the larger diameter passage 30 of the nozzle. At the left of that small bore passage 35 is a larger entrance passage 36 communicating with the still larger bore 17 of the body 18. It will be understood that the high velocity stream of water issuing through the small bore passage 35 creates a partial vacuum at the near end of the chamber 30, and this partial vacuum is employed to cause fluid to be lifted or aspirated from the container 10 through the vertical tube 12.

A valve may be employed to control the flow of water from the hose pipe through the injector device. As shown, it comprises a valve stem 40 urged inwardly toward a closed position by means of a helical compression spring 41 engaging at one end a suitable washer 42 at the left hand end of the passage 17 which prevents fluid leakage outwardly along the valve stem. At the other end, the spring bears against the valve member 44 suitably mounted on the stem 40. This member 44, which may be substantially rectangular in cross section, has an annular seat 45 adapted to bear against the elastic washer 27 and press it against the outer flat face of the flange 26 to prevent the flow of water when the valve plunger 44 rests thereagainst. When the valve is open, the water passes through the four spaces between the rectangular valve body 44 and the cylindrical wall 17. The stem 40 may terminate in an inner deflector 47 of suitable characteristics which provides a proper distribution of the water around the deflector for its entrance into the constricted passage 35. A handle 48 pivoted to the outer side of the casing 14 at 49 bears against a cap 50 threaded on the outer end of the valve stem 40 so that by manually pressing down on the handle 48 the short end 51 of the handle lever will serve to remove the valve 44 from contact with its washer seat 27 and permit the flow of water. A manually movable pivoted stop 52 of suitable shape may be interposed between the lever end 51 and the body 18 to prevent the valve from closing, or the operator may hold down on the handle during the entire time while the spray is desired. Various other constructions may be employed for controlling the water flow and for providing the injector action to insure withdrawing the fluid from the container 10.

The fluid flow is metered by its being required to pass upwardly between the threads of a loose screw and nut. The fluid is preferably transmitted through a helical passage 60 (as shown diagrammatically in FIG. 3) at the apex of the threads of an elongated screw 61 threaded into an elongated nut 62. This passage may be made arcuate in size by truncating a thread, as by reaming off an outer portion of the threads of the nut, as indicated by the line 64 in FIG. 3. This provides a passage of a def-

inite or substantially uniform cross section. The threads of the nut and the screw may touch otherwise with the usual accuracy. The fluid flow is regulated adequately by varying the length of the helical passage **60** between the nut and the screw. That is, the volume of flow is dependent upon the friction of resistance to the flow as produced by the walls of the helical passage. Hence, the volume regulation is determined in this embodiment by threading the screw **61** into the nut **62** to a greater or lesser degree. When the threads are mated to the full extent, this provides the minimum of fluid flow, and the device may be calibrated so that for a given position of the end of the screw relative to the nut the fluid flow may be controlled. The effective lengths of the nut and screw may be about the same, and in the structure shown, the screw is threaded downwardly through the nut and into the tube **12** to shorten the passage therebetween.

A suitable construction for this regulation of fluid flow is shown in the enlarged view of FIG. 2 wherein the screw **61** is adjustably moved vertically through the nut **62** which is fixedly mounted in the housing **22**, as by a press fit. The screw is turned by means of a finger operated disk or dial **66** having a serrated periphery and which is slidably keyed to a stem **67** connected to the screw **61** in axial alignment and preferably formed integral therewith. The stem **67** may be shaped as a half circle in cross section, and the disk **66** has a similarly shaped keying opening, so that the stem may slide therethrough but is required to turn the screw as one turns the regulating disk **66**.

The primary feature of this invention pertains to a construction which provides for removing and readily cleaning the screw threads and the associated parts. To this end, a cover **68** is removably mounted on the top of the housing **22**. The cover preferably has substantially the same cross-sectional shape as that of the housing, which may be cylindrical. The parts **22** and **68** are so shaped as to provide a lateral opening or slot **69** therebetween within which the manually operable regulating disk **66** is mounted and can be readily turned to rotate the screw. This slot is preferably formed by making the cover **68** in substantially an L-shape which has its under surface **69** parallel with and spaced from the top of the housing **22** sufficiently to hold the regulating disk **66** with its sides parallel to and closely spaced from the housing and cover. The housing and cover may be recessed at **70** to provide easy finger access to the serrated edge of the disk **66**, so that the disk may be made of such small diameter that it does not project materially beyond the side of the housing where it might be turned accidently.

Since the fluid which passes through the metering screw has access to the upper end of the stem **67**, I have provided a hollow cap **72** closed at its upper end which has such height and internal diameter that the stem may move upwardly into the cap to its full adjustment extent. The cap **72** is made of a transparent material, such as vinyl plastic, so that the position of the top of the stem **67** may be readily seen. The cap is provided with markings **73**, such as annular grooves, in proper spacing which may be identified by suitable indicia so that the quantity of fluid flowing through the meter may be determined by observing the position of the top of the stem **67** relative to the markings **73**.

The cap **72** is fixed to and is preferably integral with the disk **66** to form a closed space **74** which receives the stem **67**. The housing **22** has a cylindrical vertical bore **75** of sufficient size so that the screw **61** may pass freely therethrough. The bores **74** and **75** intersect the lateral slot within which the disk **66** is rotatively located.

To prevent the escape of fluid upwardly past the regulating disk **66**, there is an O-ring **76** of suitable compressible rubber or other material located in shallow opposed grooves on the top of the disk **66** and the under surface **69** of the cover **68**. Similarly, an O-ring **77** of rubber or the like is arranged in opposed shallow grooves on the under side of the disk **66** and the top flat face of the housing **22**. Thus the inner space of the cap **72** and associated passage is sealed from access to the outside. The cover **68** has a flat face fitting against the top of the housing **22** and it is secured to the housing by means of a cap screw **79** passing freely through the part **68** and threaded into the housing. An enlarged head on the top end of the screw **79** makes it easy for the user to remove the cover **68** and obtain access to the screw.

It will be observed by reference to FIGS. 1 and 2, which are views taken at 90° to each other, that the passage **30** wherein the vacuum is formed connects through a side passage **85** with the space within the vertical bore **75** in the cap **22** and the helical passage **60** leads thereto, so that the fluid is forced upwardly from the container into the water stream in the nozzle. The bore communicates, as above indicated, with the space at the center of the rotary governing disk **66**, but the O-rings **76** and **77** and the enclosing cap **72** prevent breaking the vacuum at this point. The lateral passage **85** preferably communicates with an annular groove **87**, FIG. 2, which is so arranged that whatever may be the position of assembly of the tube **20**, the container tube **12** will be properly connected to the ejection bore **30** of the spray nozzle. It will be observed (FIG. 2) that the fluid regulating disk **66** is located near the top of the housing **22**. The neck of the container **10** is threaded into a recess **88** on the under side of the housing **22**, and if the leakage of air through that thread is not adequate for the purpose, then a small vent hole may be provided to allow the ingress of air into the container as the fluid is removed by the suction of the spray device.

In accordance with this invention, I have provided a metering device having a helical passage of variable length which frictionally resists fluid flow and in proportion to the length of the passage serves to regulate the flow of fluid from an inlet to an outlet pipe.

In its operation, the user turns the disk **66** which is keyed to the stem **67** to locate the top of the stem opposite the desired calibration mark **73** which indicates the quantity of fluid aspirated from the container **10** by the water from the hose pipe. This regulates the length of the metering passage between the screw **61** and the nut **62**, and the fluid flow upwardly therethrough is substantially proportional to the length of the passage. The screw **61** is moved downwardly into the rubber tube **12** when the metering passage is to be of minimum length and therefore provide a maximum fluid flow.

The inside of the cap **72** and the opposed surfaces of the screw and nut may become coated or discolored by fluid material from the container and so require a cleansing action periodically. To effect this, it is merely necessary to remove the cap screw **79**, and to lift the L-shaped cover **68** upwardly from the housing. It will be appreciated that the cover **68** has a cylindrical bore therethrough of sufficient diameter to permit ready removal of the cover from the substantially cylindrical cap **72**. This frees the stem **67** from the manually operable regulating disk **66**. Then the screw **61** is threaded upwardly through the nut **62** by turning the disk **66** until it is entirely free from the nut. Thereafter, both the screw and the interior of the cap **72** may be readily cleaned by water or other solvent, and this does not require the difficult task of removing the rubber tube **12** from the outside of the stationary nut **62**. To reassemble the parts, the screw **61** is threaded into the nut to a desired extent, and it is comparatively simple to orient the semi-cylindrical keying end of the stem **67** into a similarly shaped semi-cylindrical opening in the disk **66**, which operation can be readily observed. This serves to assemble the disk **66** and the cap **72** in their proper relationship with the screw stem, after which the cap screw is returned to its position to hold the housing cover **68** in a proper assembled position.

It will now be appreciated that the above disclosure of a preferred embodiment of this invention is not to be interpreted as imposing limitations on the appended claim.

I claim:

A fluid metering apparatus comprising a container for fluid, a head removably mounted thereon which has a vertical opening communicating with the interior of the container, a metering device including a threaded nut forming a continuation of the opening and an adjustable screw in the nut, the threads of the screw and nut providing an elongated fluid metering passage of variable length, means for educting fluid from the container through said passage, a cover removably secured on the head which has a vertical opening therethrough, means for removably securing the cover on the head with said vertical openings in axial alignment, said cover and head having a lateral opening therebetween intersecting a vertical passage therethrough which is aligned with the screw, a stem forming an extension of and serving to rotate the screw which extends freely through said vertical passage and across the lateral opening, a manually rotatable regulating disk mounted in said lateral opening which is removably keyed to the stem, a translucent hollow cap enclosing the end of the stem and fixed to said disk to rotate therewith and providing a downwardly opening space closed at its upper end, said vertical opening in the cover being larger in diameter than said cap so that the cap is freely rotatable, said cover being removable to provide for the removal of the cap and disk as a unit for access to the stem for rotatively removing the screw from the nut, and fluid sealing means between said disk and the adjacent surfaces of the cover and head which prevents fluid escaping through said vertical and lateral openings, the lower end of the nut projecting downwardly into the container and comprising an eduction tube secured on said end of the nut and the screw being smaller in diameter than the vertical opening in the head and removable upwardly through the passage in the head without requiring removal of the tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,899,698	Klein	Feb. 28, 1933
2,260,603	Budwig	Oct. 28, 1941
2,310,633	Heimburger	Feb. 9, 1943
2,391,583	Martin	Dec. 25, 1945
2,617,686	Baron	Nov. 11, 1952
2,752,201	Blass	June 26, 1956
2,788,244	Gilmour	Apr. 9, 1957
2,993,651	Packard	July 25, 1961

FOREIGN PATENTS

684,986	Great Britain	Dec. 31, 1952