May 12, 1964 H. A. CARTWRIGHT 3,132,809

SPRAY NOZZLE

Filed Nov. 24, 1961

2 Sheets-Sheet 1

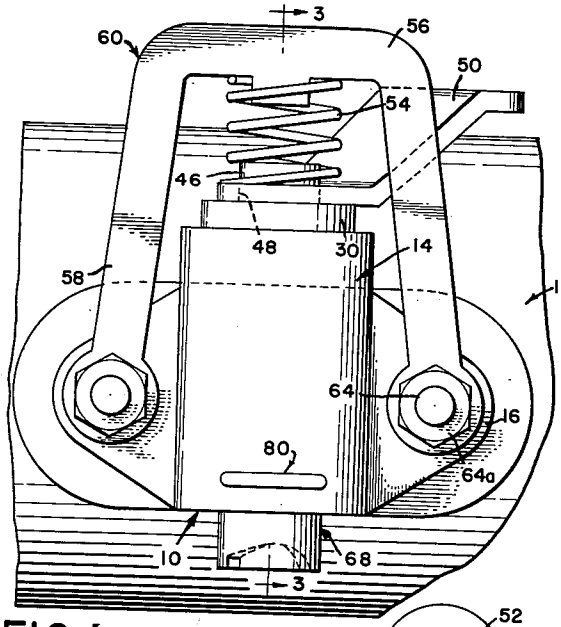


FIG. 1.

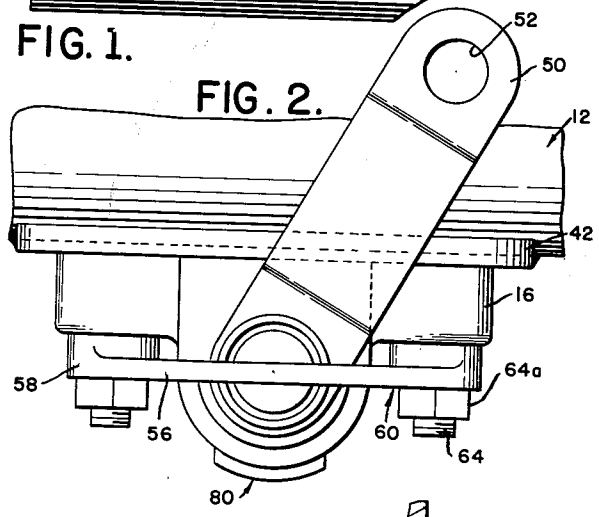
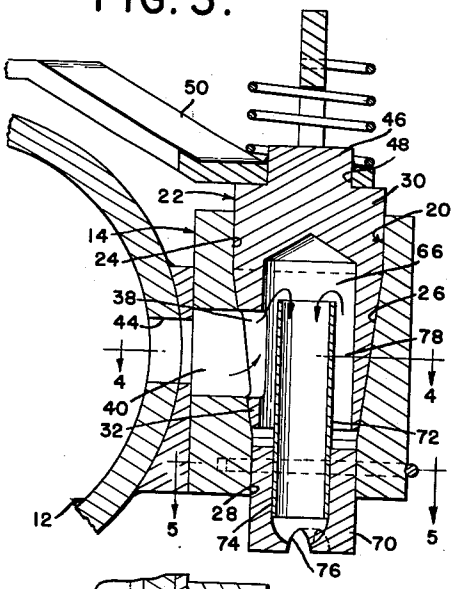


FIG. 2.

FIG. 3.



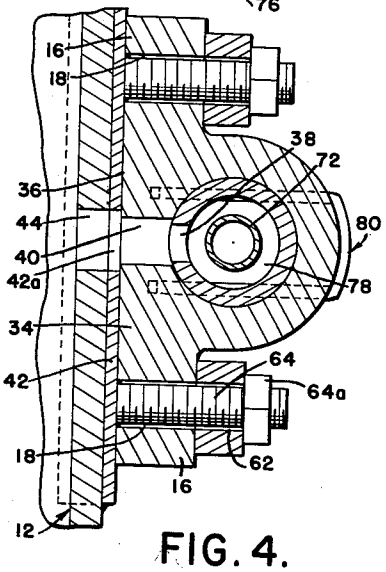


FIG. 4.

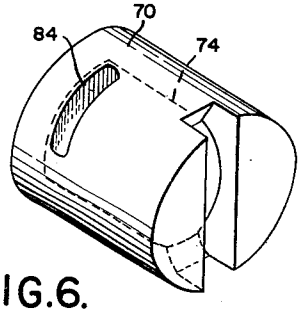


FIG. 6.

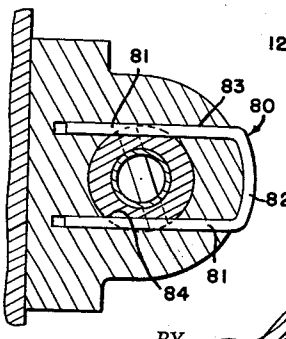


FIG. 5.

INVENTOR
HORACE A. CARTWRIGHT

BY Shoemaker and Mattare

ATTORNEYS

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FIG. 7.

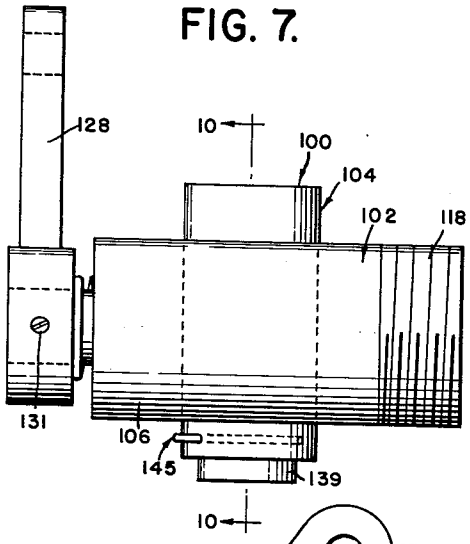
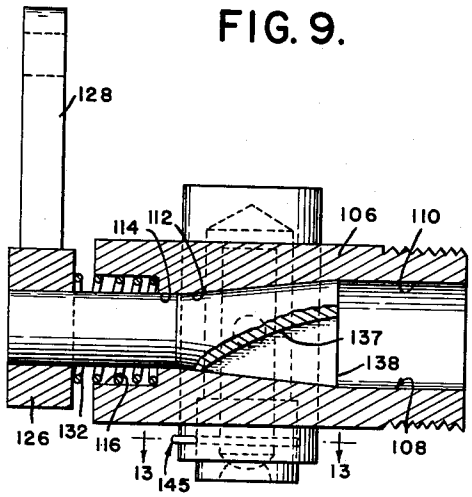


FIG. 9.



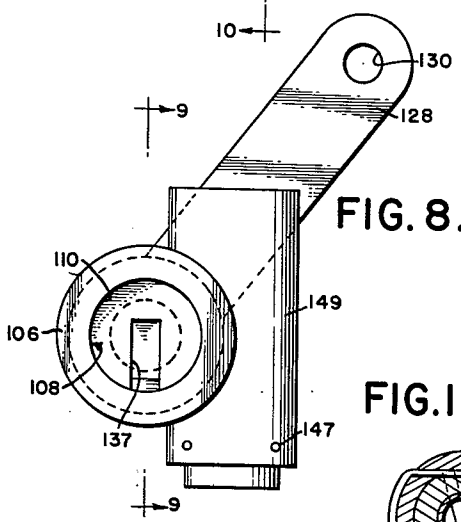
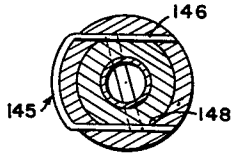


FIG. 8.

FIG. 13.



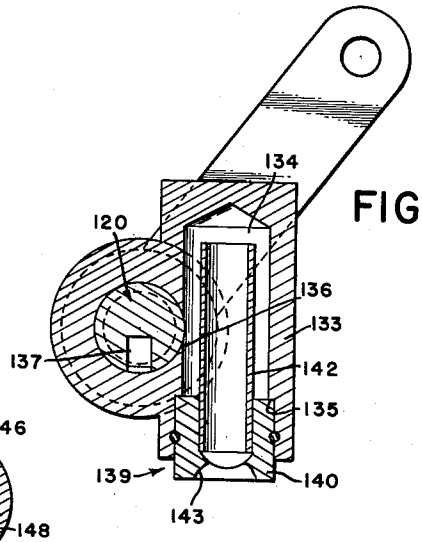


FIG. 10.

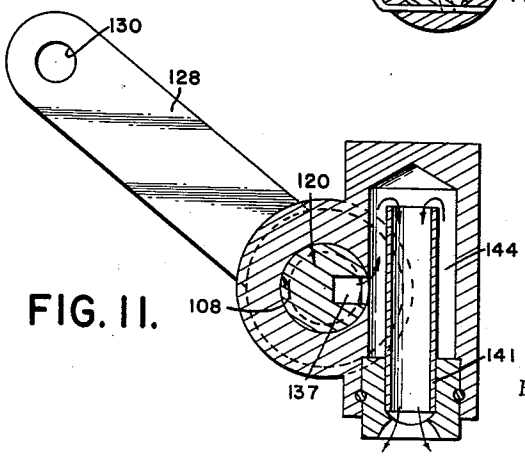
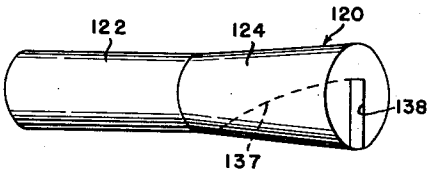


FIG. 11.

FIG. 12.



INVENTOR

HORACE A. CARTWRIGHT

BY Shoemaker and Mattare

ATTORNEYS

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3,132,809

SPRAY NOZZLE

Horace A. Cartwright, Lexington, Ky.
(4106 S. Rockford, Tulsa, Okla.)

Filed Nov. 24, 1961, Ser. No. 154,780
15 Claims. (Cl. 239—569)

This invention relates generally to improvements in liquid discharging or spraying nozzles and is directed particularly to improvements in a nozzle or nozzles designed for use in connection with road coating or spraying machinery.

In the operation of machinery for spraying coating material on road surfaces, it is frequently necessary to change the spray nozzles in accordance with the type of material being sprayed, to facilitate the discharging of greater or lesser amounts of such material and it is accordingly an object of the present invention to provide a new type of spray nozzle which is designed to facilitate the easy and quick changing of the size of the nozzle outlet or slot.

It is another object of the invention to provide a new type of spray nozzle wherein the angle of the discharge slot of the nozzle is fixed with relation to the spray bar on which the nozzle is mounted and which supplies the material to be sprayed to the nozzle.

More particularly, the invention contemplates the provision of a spray nozzle wherein the nozzle tip or nose is associated with a valve element in such a way that it may be easily and quickly introduced into or removed from a receiving opening in the valve body or casing without disturbing the movable portion or element of the valve, by means of which the valve is opened and closed.

In the operation of road coating machinery, it also happens that particles of material get into the coating liquid and pass into and clog the spray nozzles. It is accordingly a further object of the invention to provide a new spray nozzle structure which is designed in such a manner that particles of material, which, if allowed to reach the nozzle outlet, would clog the same, are prevented from moving into the nozzle outlet and thus the nozzle is relatively free from clogging.

The discharge or spray nozzles of road maintenance equipment of the character referred to, also require frequent cleaning and accordingly, it is another object of the present invention to provide a nozzle structure wherein the nozzle tip can be easily and quickly removed for cleaning and wherein such easy removal and replacement is due to a novel locking key carried by the body of the valve of which the nozzle tip forms a part, and which key when inserted into receiving openings in the valve body, straddles and engages recesses in the removable nozzle tip to retain the tip in position.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification and wherein:

FIG. 1 is a view in elevation of a spray nozzle structure constructed in accordance with a preferred embodiment of the present invention.

FIG. 2 is a view in top plan of the same.

FIG. 3 is a sectional view taken in a vertical plane substantially on the line 3—3 of FIG. 1 and showing also in transverse section, a portion of the spray bar upon which the nozzle is mounted for operation.

FIG. 4 is a transverse section taken substantially on the line 4—4 of FIG. 3.

FIG. 5 is a transverse section taken substantially on the line 5—5 of FIG. 3.

FIG. 6 is a view in perspective of the body portion of the nozzle tip showing the discharge slot.

FIG. 7 is a view in elevation of a modified valve construction showing the nozzle tip of the present invention therein.

FIG. 8 is a view looking toward the threaded end of the valve body and showing the nozzle tip housing in side elevation.

FIG. 9 is a section taken substantially in the plane of section line 9—9 on FIG. 8.

FIG. 10 is a sectional view taken substantially along the line 10—10 of FIG. 7 and showing the valve in closed position.

FIG. 11 is a sectional view corresponding to FIG. 10 and showing the valve in open position.

FIG. 12 is a view in perspective of the rotary plug element of the valve and

FIG. 13 is a sectional view taken substantially on the line 13—13 of FIG. 9.

Referring now more particularly to the drawings, the numeral 10 generally designates a spray nozzle structure constructed in accordance with a preferred embodiment of the present invention.

The numeral 12 generally designates a liquid carrying structure to which the spray nozzle is attached to receive liquid for discharge over a desired surface. The structure 12 is here shown as a pipe or conduit and may represent a portion of a spray bar forming an element of a road surfacing machine such, for example, as the spray bar structure shown in my pending application Serial No. 824,526, filed July 2, 1959, Patent No. 3,043,518, and the spray bar and machine structure shown in my pending application Serial No. 858,913, filed December 11, 1959.

It will, of course, be understood that a number of the spray nozzles such as the one here referred to, would be secured to the hollow spray bar 12 as is conventional.

While the nozzles of the present application are designed primarily for distributing road surfacing or coating material from a suitable receptacle, the nozzles of this application are not restricted to such use but may be used in any location where they are found applicable.

The spray nozzle 10 comprises a valve body 14 which is here shown as being in the form of a short cylinder having mounting ears 16 integral with opposite sides thereof and which ears have stud bolt receiving passages 18 for the purpose hereinafter set forth.

The cylindrical valve body 14 has a bore 20 formed longitudinally therethrough for the reception of a rotary valve plug 22 of tapered form, as shown in FIG. 3.

The bore 20 is of maximum diameter at its upper end, as indicated at 24, and tapers as at 26 to the cylindrical smaller diameter lower end portion as indicated at 28. The valve plug 22 has a cylindrical top portion 30 which fits in the upper end 24 of the bore and a tapered lower portion 32 which fits in the tapered middle chamber portion 26 of the bore. The lower end of the tapered portion 32 of the plug terminates slightly above the lower end of the tapered portion 26 of the chamber in which it is fitted.

The cylindrical portion of the valve body 14 and the mounting ears 16 are joined together to form a plate portion 34 which has a flat mounting surface or face 36, as shown in FIG. 4.

The tapered portion 32 of the valve plug has an elongate fluid inlet slot 38 formed therein and this slot is positioned so that it may be brought into registry with the inlet port 40 which is formed through the plate portion 34 of the valve body.

The valve body, when mounted on a spray bar of circular cross-sectional form, such as that shown in FIG. 3, may be joined by welding, or in any other suitable manner to the spray bar by means of a boss 42, which boss in

turn may be welded to the bar 12 as shown, or in those cases where the spray bar may be of rectangular cross-section as shown in my application Serial No. 824,526, the flat face 36 would be placed against a flat rear side of the spray bar.

The spray bar 12 is provided with a suitable discharge port 44 which is aligned with the inlet port 40 of the valve body plate.

The boss 42 has an opening 42*a*, in alignment with the ports 40 and 44, as shown.

The top end 30 of the valve plug is reduced slightly to form the short extension 46. This extension is received in an opening 48 in one end of a lever 50. The other end of this lever is provided with an opening 52 for facilitating its connection with an operating member, not shown.

Where a number of the spray nozzles are mounted along the length of a spray bar, there is employed a single rod to which the arm 50 of each nozzle is connected so that all of the nozzles can be opened or closed simultaneously.

The lever 50 is preferably welded to the extension 46. However, it may obviously be joined thereto in any other suitable manner which will prevent it from turning with respect to the extension 46.

The valve plug is maintained firmly in position with the tapered portion 32 relatively tightly seated on the tapered surface 26 by means of a spring 54 having one end encircling the plug extension 46 and resting upon the lever 50, with the other end engaged against the under or inner side of a cross bar 56 joining the ends of two leg members 58 of an inverted, substantially U-shaped yoke which is generally designated 60. The ends of the yoke legs 58 straddle the circular portion 14 of the valve body and each is provided with a bolt opening 62 which is aligned with the opening 18 of an ear 16.

Stud bolts 64 are welded to the boss 42 and are thus carried by the spray bar, and extend through the openings 18 and 62, as shown in FIG. 4. Nuts 64*a* are threaded on the studs and secure the spray nozzle unit and yoke in position.

As shown in FIG. 3, the valve plug 22 is provided with an axial bore 66 which extends the length of the tapered portion of the plug and opens through the lower or tapered end thereof and this bore is in communication with the plug port 38 and provides a fluid flow chamber into which the liquid material is received and through which it flows.

The spray nozzle carries a removable and replaceable spray or nozzle tip which is generally designated 68. The tip is comprised of two parts, which are a lower part or barrel 70 and an inner upper part in the form of a tube 72.

The barrel 70 is of a diameter to fit snugly in the lower end portion 28 of the bore 20.

The barrel 70 has an axial bore 74 therein which opens through the upper end and terminates short of the lower end of barrel, but is in communication with a discharge slot 76 which is cut across the bottom end of the barrel, as illustrated in FIG. 6.

The tube member 72 of the nozzle tip has one end fixed in the bore 74 of the barrel and this tube extends upwardly into the valve plug chamber 66 when the barrel 70 is secured in the lower end of the bore 20.

The upper end of the tube 72 terminates short of the top end of the chamber 66 but extends beyond the highest part of the inlet port 38, as shown in FIG. 3.

The outside diameter of the tube 72 is also materially less than the inside diameter of the chamber 66, so that when the nozzle tip is in operative position, an annular space 78 will be formed around the tube, into which the fluid will enter and then flow upwardly, as indicated by the arrows in FIG. 3, to the top end of the tube, from which it will flow downwardly through the tube to be discharged through the nozzle outlet 76.

The nozzle tip 68 is maintained in operative position, but for easy and quick removal and replacement by a key member which is generally designated 80. This key member is formed of suitable wire material and is substantially U-shaped, as shown in FIG. 5, having the two spaced parallel legs 81 connected together by the cross bar 82.

The key legs 81 are received in the spaced parallel bores 83 which are formed in the lower end of the valve body 14 and open through the front of the valve or the side of the body remote from the spray bar 12 to which the valve is secured.

The bores 83 intersect the lower end portion 28 of the bore 20 which is formed in the valve body.

The barrel 70 of the nozzle tip has formed transversely across opposite sides thereof, the shallow slots 84. Each of these slots registers with a bore 83 when the barrel 70 is placed in position in the lower end of the valve body. It will be obvious, of course, that in order to bring the slots 84 into registry with the bores 83, the barrel 70 may be turned or rotated and vertically moved until the desired registry is obtained, whereupon the legs 81 of the key 80 can be inserted and will engage in the slots 84 to lock the nozzle tip in position.

As shown in FIG. 5, the discharge slot 76 in the barrel 70 is disposed to extend slightly obliquely with respect to the slots 84 of the barrel, so that when the nozzle tip is inserted and secured in position, the fan of spray material will be in a plane oblique to the length of the spray bar.

Referring now to FIGS. 7 to 13, inclusive, the nozzle tip is shown embodied in a spray nozzle structure of a slightly different design. However, it will be noted that the nozzle tip is of the same form or design in both nozzle structures.

In the second illustrated application of the invention, the numeral 100 generally designates the entire nozzle structure.

In the structure 100, there are embodied the two elongate parts 102 and 104, which are preferably cast or otherwise formed in a single unit.

The part 102 forms a rotary plug valve body or housing, wherein the body of the housing is designated 106.

As shown in FIG. 9, the housing body 106 has an axial bore formed therethrough which is generally designated 108. This bore opens through both ends of the housing body and as shown, it comprises at one end a section of maximum diameter 110, an intermediate section or portion 112 which tapers to a section 114 of a minimum diameter which leads into a counterbore terminal portion 116 which opens through the other end of the body.

The end of the body 106, which for convenience of description may be termed the inlet end of the valve, is suitably screw threaded, as indicated at 118, or otherwise formed to facilitate the attachment of the valve body to a manifold such as the spray bar 12, hereinbefore referred to and which would be provided with suitable threaded parts (not shown) for the purpose.

Rotatably positioned within the bore 108 is the rotary valve plug which is generally designated 120. This plug comprises a long neck portion 122, of cylindrical cross-section, which joins at one end with the smaller end of a frusto-conical portion 124 which is suitably tapered or dimensioned to fit snugly in the tapered portion 112 of the bore 108, while the neck portion 122 fits snugly in the small diameter portion 114 of the bore.

As shown in FIG. 9, the larger end of the conical or tapered portion of the plug terminates in the area where the portions 110 and 112 of the bore join.

When the conical portion of the rotary plug is seated snugly in the tapered portion of the bore, the neck 122 extends a substantial distance beyond the counterbore end of the bore and has fitted thereon the collar 126 formed at one end of a lever 128. The other end of the lever is apertured as indicated at 130 for the connection therewith of a suitable means for turning the valve plug.

The collar 126 may be secured to the neck end of the plug in any suitable manner, as by the use of a set-screw 131 or the like.

Seated in the counterbore is a spring 132 which encircles the neck portion of the plug and bears at its outer end against the collar 126 and being under compression and constantly tending to expand, it will draw the tapered end of the plug firmly against the conical seat in an obvious manner.

The portion 104 of the valve structure is also shown, like the portion 102, as comprising a cylindrical body 133, although, obviously, neither portion 102 or 104 has to be externally cylindrical as shown.

The body 133 is disposed at right angles to the body 106 and the body 133 has an axial bore 134 formed therein which opens through one end of the body 133 and through a portion of its length at the said one end, the bore 134 is slightly enlarged in diameter, whereby to form the annular shoulder 135.

As will be seen upon reference to FIGS. 10 and 11, the bores 108 and 134 intersect to form in the cross-over area, a communication or transfer port 136.

The tapered portion 124 of the valve plug has an arcuate slot 137 cut longitudinally in the side thereof. This slot tapers off at a point adjacent to the smaller end of the plug and opens to its maximum width through the wider end of the plug, as indicated at 138. Thus, the wider end of the slot forms the inlet for fluid entering the valve casing and when the plug is rotated to the "valve on" position as shown in FIG. 11, the side of the slot will register with the port 136 and thus fluid will be conveyed through the plug into the chamber 134.

Numeral 139 generally designates the removable nozzle tip, the construction of which is the same as that hereinbefore described in connection with the description of FIGS. 1–5, inclusive.

This nozzle tip 139 comprises the barrel 140 which fits into the enlarged end portion of the bore 134 and seats at its inner end against the shoulder 135.

The barrel 140 has an axial bore 141 therein which receives one end of the tube 142 at the inner or upper end of the barrel, while at the lower or outer end, the barrel has a slot 143 cut therein which intersects the end of the bore to form the nozzle tip discharge opening.

As in the previously described structure, the tube 142 is considerably smaller in outside diameter than the diameter of the bore 134, thus providing an area 144 around the tube when the tip is fixed in position, and also the tube terminates short of the upper end of the bore 134 but extends across or beyond the port 136 so that fluid entering by way of the plug slot 137 first passes into the area 144 and flows upwardly to the top end of the tube and then down to the outlet of the nozzle tip.

The nozzle tip is secured in position by means of the U-shaped wire key 145, the two legs 146 of which are inserted into parallel bores 147 formed transversely of the lower end of the body 133, and which bores intersect the lower end portion of the bore 134. The key legs also engage in recesses 148 formed in and transversely of opposite sides of the barrel 140, and thus securely lock the barrel and accordingly the nozzle tip, in position.

From the foregoing, it will be seen that the present invention provides a new spray nozzle structure wherein the sizes of the slots of the nozzle tips may be changed merely by removing the locking key, taking out the nozzle tip and replacing it with another nozzle tip having a discharge slot or opening of a larger or smaller size, as desired.

Another feature of the invention is in the provision of the narrow passage space between the tube of the nozzle tip and the wall of the bore in which the tube is positioned, which will prevent any large size hard particles of matter from clogging the discharge orifice of the nozzle tip. If and when the nozzle tip needs cleaning, it can be very quickly removed, cleaned and replaced.

Another feature of the invention resides in the fact that nozzles may not only be supplied in which the discharge orifices are of different sizes but also the different nozzle tips may be supplied with the discharge slots at varying angles to the grooves or slots 84 and 148 in the barrel of the tip, so that the angle at which the spray may be discharged from the nozzle can be changed or set as desired.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined in the appended claims, and all changes that fall within the metes and bounds of the claims, or that form their functional as well as conjointly cooperative equivalents, are therefore intended to be embraced by those claims.

I claim:

1. In a liquid spray nozzle, a body, means within the body providing an elongate fluid flow chamber having an outer end and a closed inner end, a nozzle tip comprising an elongate unit embodying two longitudinal portions, one of said portions having an over-all outside width at least equal to the diameter of said chamber and being secured to the body in a position in which it closes the said outer end of said chamber with the other portion extending longitudinally in the chamber and terminating short of the closed inner end thereof, said elongate unit having a longitudinal passage therethrough opening at one end into the said chamber adjacent to the closed end thereof and communicating at its other end with a discharge orifice, the said other portion having an overall width less than the diameter of the chamber and forming a narrow annular area communicating with said one end of the said passage, and means for introducing fluid into said annular area at a location lying entirely between said one end of said passage and the said one of said portions of the unit.

2. The invention according to claim 1 with a valve means carried by the body for controlling the introduction of fluid into said annular area.

3. The invention according to claim 1 wherein the means for introducing fluid into said annular area comprises a port having a width greater than the width of the area between the wall of the chamber and the outer side of said other portion of the unit, whereby the passage of particles of matter large enough to block the orifice will be trapped in the bore.

4. In a liquid spray nozzle, a valve body, a longitudinal chamber within the body and having an outer end and a closed inner end, a nozzle tip embodying an elongate unit having an outer end longitudinal portion and an inner end longitudinal portion, said outer end portion being secured to the body and closing the said outer end of said chamber, said outer end portion of said tip having a spray orifice in the outer end thereof, the nozzle tip having a longitudinal passage therein leading to said spray orifice, the said inner end portion of the tip extending longitudinally through the major part of said chamber, the end of said passage remote from the orifice being in communication with the chamber, said inner end portion of the unit being spaced throughout its length from the wall of the chamber, a fluid inlet port opening through the wall of the chamber into the space between the chamber wall and said inner end portion of the unit and between the outer end portion of the unit and the said end of the passage which is in communication with the chamber, and rotary means carried by the valve body for controlling fluid flow through said inlet port.

5. In a liquid spray nozzle, a valve body, a longitudinal chamber within the body and having an outlet end and a closed inner end, a nozzle tip embodying an elongate unit having an outer end longitudinal portion and an inner end longitudinal portion, said outer end portion being secured to the body and closing the said outer end of said chamber, said outer end portion of said tip having a spray orifice in the outer end thereof, the nozzle tip having a longitudinal passage therein leading to said spray orifice, the said inner end portion of the tip extending

longitudinally through the major part of said chamber, the end of said passage remote from the orifice being in communication with the chamber, said inner end portion of the unit being spaced throughout its length from the wall of the chamber, a fluid inlet port opening through the wall of the chamber into the space between the chamber wall and said inner end portion of the unit and between the outer end portion of the unit and the said end of the passage which is in communication with the chamber, means for removably securing said nozzle tip unit in the chamber comprising an elongate key member, a bore formed in the housing perpendicular to the chamber and intersecting a side of the latter and adapted to receive the key member, and said outer end portion of the tip unit being formed with a means to cooperate with said bore to receive a portion of the key member when said outer end portion of the tip is in a prescribed position in the chamber.

6. The invention according to claim 5, wherein said spray orifice is in the form of a narrow slot extending diametrically across said outer end portion of the tip unit and said orifice slot extending obliquely to the key receiving bore when the tip unit is in operative position.

7. In a liquid spray nozzle, a valve body, a longitudinal chamber within the body and having an outlet end and a closed inner end, a nozzle tip embodying an elongate unit having an outer end longitudinal portion and an inner end longitudinal portion, said outer end portion being secured to the body and closing the said outer end of said chamber, said outer end portion of said tip having a spray orifice in the outer end thereof, the nozzle tip having a longitudinal passage therein leading to said spray orifice, the said inner end portion of the tip extending longitudinally through the major part of said chamber, the end of said passage remote from the orifice being in communication with the chamber, said inner end portion of the unit being spaced throughout its length from the wall of the chamber, a fluid inlet port opening through the wall of the chamber into the space between the chamber wall and said inner end portion of the unit and between the outer end portion of the unit and the said end of the passage which is in communication with the chamber, said valve body including an outer member and an elongate inner member rotatable about its longitudinal axis, said inner member of the valve body constituting a rotary valve plug and having a portion of said longitudinal chamber formed therein, the said fluid inlet port being in part in the valve plug member and in part in the outer member, and means connected with the valve plug member for facilitating rotation of the latter.

8. In a liquid spray nozzle, a valve unit embodying a housing having a bore extending therethrough and having one end portion of the bore of large diameter and an opposite end portion of the bore of smaller diameter and an intermediate tapered portion of the bore forming a valve plug seat, a valve plug in said bore and having a head end positioned in said one end portion of the bore and having a tapered end engaging said seat for axial turning thereon, the plug having a blind bore extending longitudinally therein and opening through the tapered end of the plug into said smaller diameter portion of the housing bore, an inlet port in the housing, an inlet port in the tapered portion of the plug in communication with said bore and positioned to be brought into registry with said housing inlet port by turning the plug for conveying fluid into the plug bore, and a removable spray tip comprising an elongate unit having a lower end barrel portion and an upper end tube portion, the barrel portion having an axial bore leading into the tube portion and also having a discharge orifice communicating with the latter bore, said barrel portion fitting in and closing the said smaller diameter portion of the housing bore, said tube portion being of smaller outside diameter than the plug blind bore and extending into the latter beyond the inlet port in the plug and having its open upper end spaced from the blind end of the plug bore, means securing the said barrel portion of the tip in said portion of the housing bore forming a quick, releasable connection between the barrel portion of the tip and the housing, and means connected with the plug for rotating the latter.

9. The invention according to claim 8, wherein said quick releasable connection comprises an elongate key element, a bore formed in the housing to receive the key element and intersecting one side of the housing bore in the small diameter portion thereof, and the barrel having means for registry with the key bore for receiving a portion of the key element.

10. The invention according to claim 9, wherein the said discharge orifice is in the form of a slot extending diametrically across the lower end of the barrel portion and oblique to the key element receiving means of the barrel portion.

11. In a liquid spray nozzle, the combination of a valve body having a bore therethrough and opening through opposite ends of the body, said bore having a tapered portion intermediate its ends and opening through opposite ends of the body, said bore tapered portion forming a plug seat, an elongate body integral with the valve body and lying transversely thereof in the area of the valve body in which the tapered portion of the bore is located, said elongate body having a longitudinal blind bore opening through one end thereof and intersecting the bore of the valve body to form a communication port between the bores, a tapered rotary plug body in the valve body in engagement with said seat, the plug body having a stem extending from the smaller end thereof and projecting through and beyond the adjacent end of the valve body bore, means in the plug body forming a fluid passage leading from the larger end of the plug body and opening through the side of the plug body for communication with said port in one position of rotation of the plug body, means for turning the plug body, and a spray tip comprising an elongate unit embodying two aligned longitudinal portions, one of said portions being positioned in and closing the open end of said blind bore, and the other one of said portions extending longitudinally in the blind bore and terminating short of the blind end thereof, said elongate unit having a longitudinal passage therethrough which opens at one end into the blind bore and communicates at its other end with a discharge orifice at the end of the said one of said portions, the said other one of said portions having an outside diameter less than the diameter of the blind bore, whereby is provided an annular area communicating with said one end of the passage, and said port opening into said annular area at a location between said one end of said passage and the said one of the portions of the unit, and means releasably securing the elongate unit in the blind bore.

12. The invention according to claim 11, wherein the blind bore has a counterbore at the open end thereof, forming a portion of increased diameter and an inner annular shoulder, the said one of said portions of the unit being positioned in said counterbore and seated against said shoulder, and said securing means being carried by the elongate body and engaging the said one of the said portions of the unit.

13. The invention according to claim 12, wherein said means comprises an elongate key element positioned in a bore formed transversely of the elongate body adjacent to the open end of the blind bore and joining an opening in a side portion of the said one portion of the elongate unit.

14. In a spray nozzle, a body, an elongate fluid conducting chamber within the body, said chamber having an outer end and a closed inner end, an elongate nozzle unit comprising inner and outer, connected and aligned cylinder portions having longitudinal communicating fluid passages therethrough and opening through the remote ends of the portions, the passage in the outer cylinder portion being reduced at its outer end forming a spray

outlet, said nozzle unit having the inner cylinder portion thereof extending longitudinally in said fluid conducting chamber and terminating at its inner end short of the closed inner end of the chamber, removable means securing the outer cylinder portion to the body at the outer end of the chamber, the outer cylinder portion forming a closure for the outer end of said chamber, said inner cylinder portion having an outside diameter smaller than the diameter of the chamber and forming with the chamber wall a narrow encircling fluid flow area which is in communication with the inner end of the passage in said inner cylinder portion, a fluid admission port in the body opening into said fluid flow area at a location between the outer cylinder portion and the inner end of the inner cylinder portion, and means carried by the body for controlling passage of fluid to said admission port.

15. The invention according to claim 14, wherein the said body is formed at the outer end of the chamber to receive said outer cylinder portion and the said removable

means for securing the outer cylinder portion to the body comprises a wire key inserted in a key-way formed in the body and extending transversely of the outer cylinder portion and aligned with an opening in the outer cylinder portion to receive the said key.

References Cited in the file of this patent

UNITED STATES PATENTS

1,035,441	Honabach	Aug. 13, 1912
1,066,671	Steinbecker	July 8, 1913
1,176,089	Nichols	Mar. 21, 1916
1,547,494	Fish	July 28, 1925
2,571,583	Kolbach	Oct. 16, 1951
2,618,511	Wahlin	Nov. 18, 1952

FOREIGN PATENTS

453,113	Canada	Dec. 7, 1948
338,791	Switzerland	July 15, 1959