Feb. 24, 1953

R. H. MUNSON

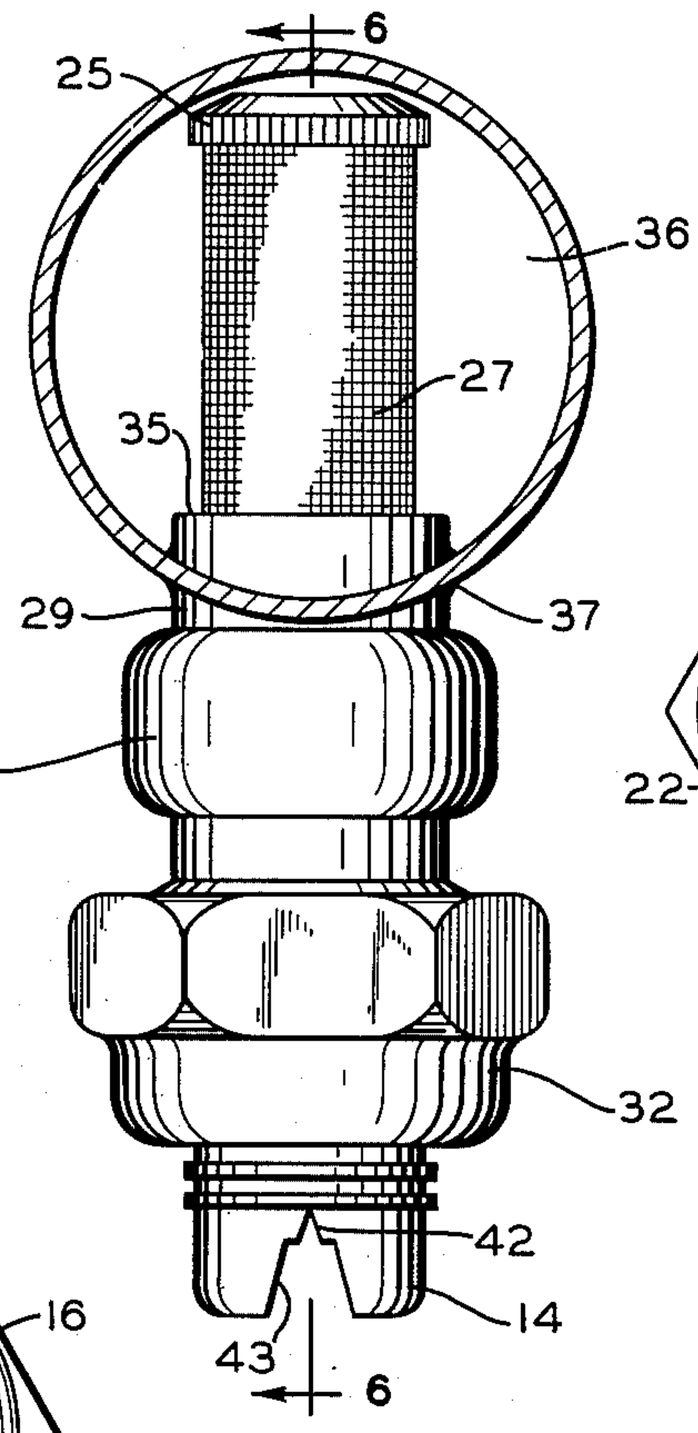
2,629,632

SPRAY NOZZLE

Filed Oct. 28, 1948

2 SHEETS--SHEET 1

FIG. 1.



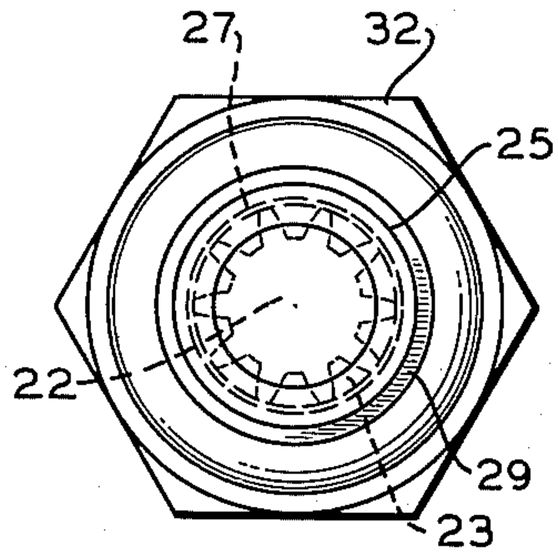


FIG. 3.

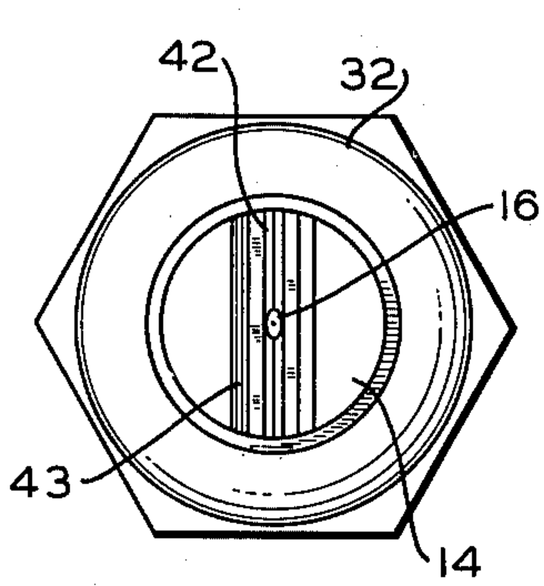
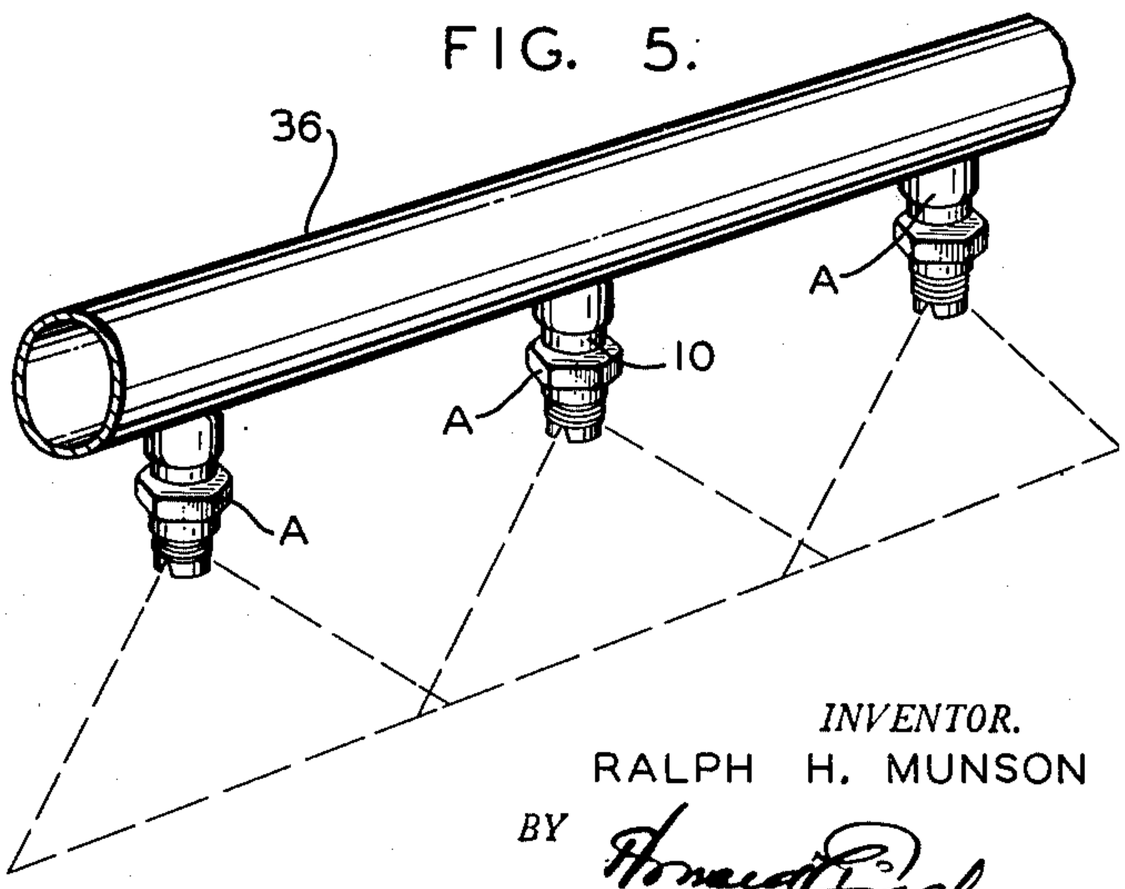


FIG. 2.

FIG. 5.



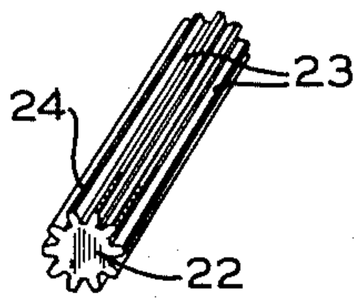


FIG. 4.

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2 SHEETS—SHEET 2

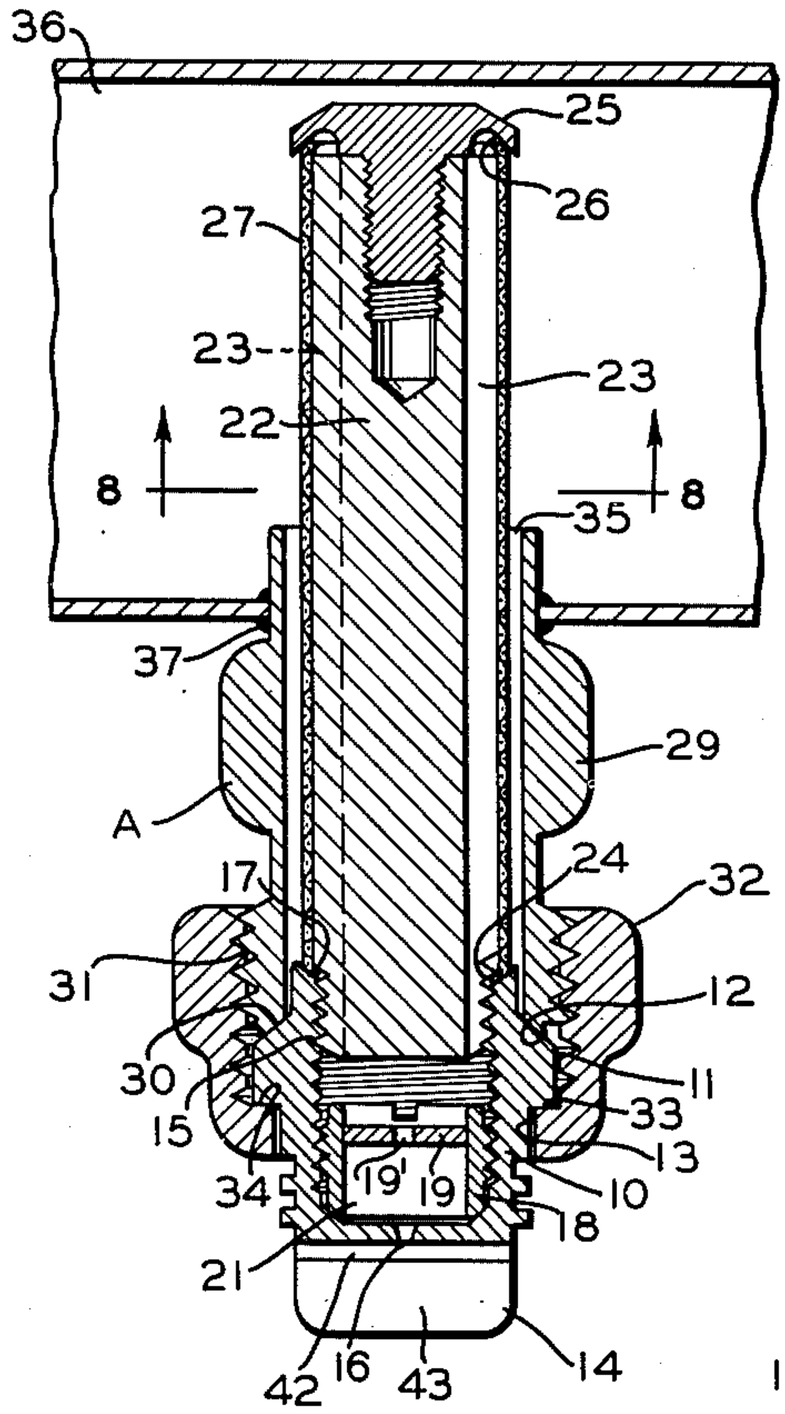

FIG. 6.

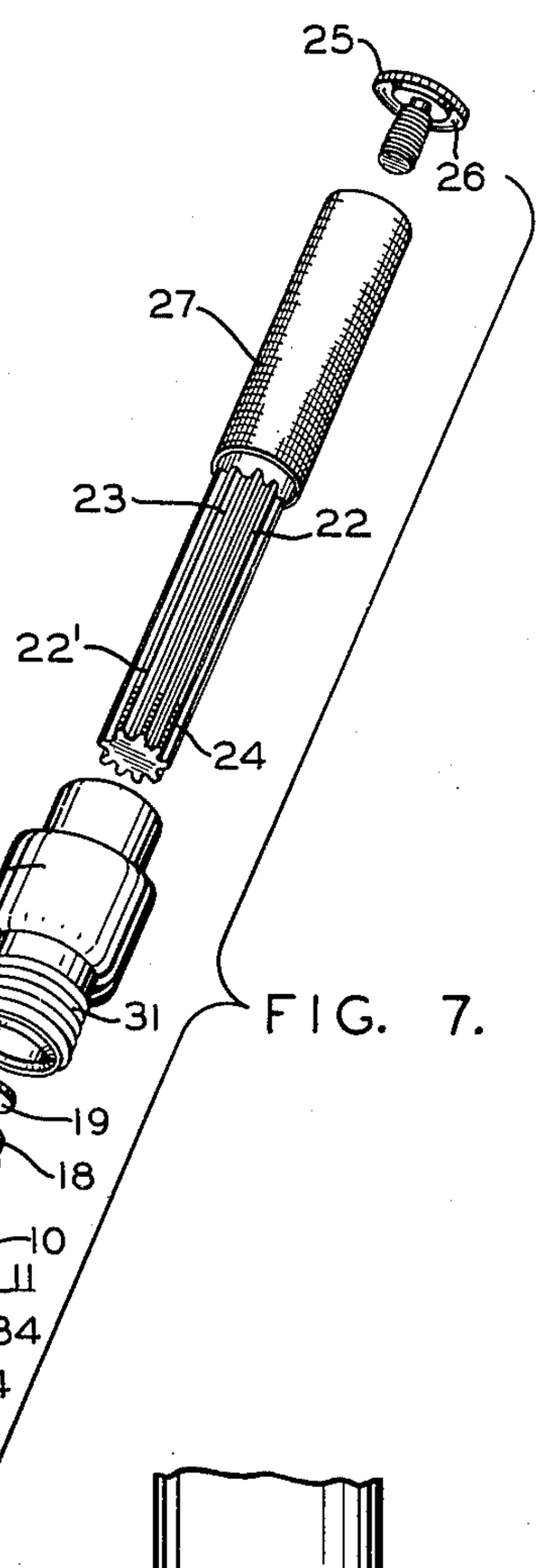

FIG. 7.

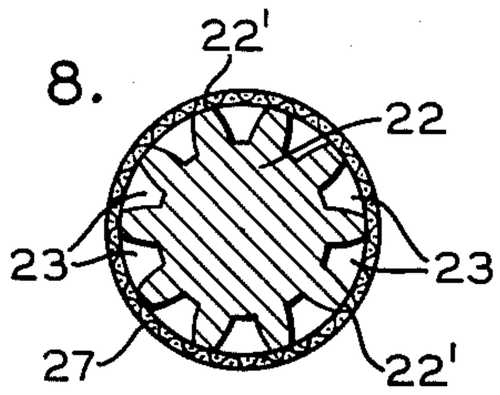

FIG. 8.

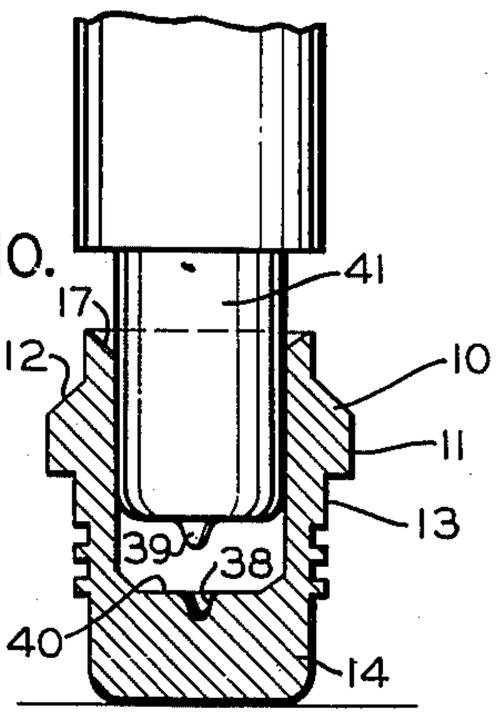

FIG. 10.

FIG. 9.

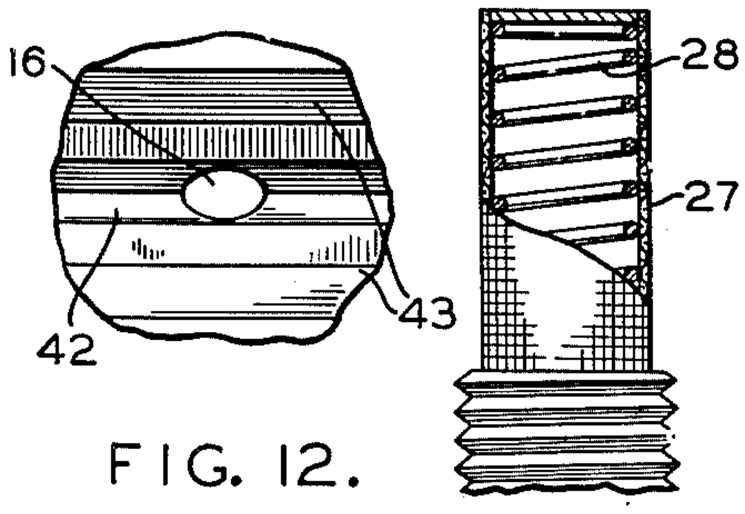

FIG. 12.

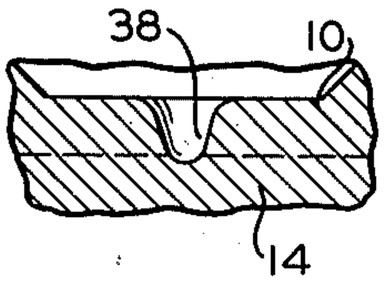

FIG. 11.

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UNITED STATES PATENT OFFICE

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SPRAY NOZZLE

Ralph H. Munson, St. Paul, Minn.

Application October 28, 1948, Serial No. 57,101

2 Claims. (Cl. 299—106)

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My invention relates to an improvement in a spray nozzle and a method of forming the orifice of the nozzle.

It is an object of my invention to provide a nozzle which produces an even and consistent spray of liquid material, and which allows long periods of use with a minimum of cleaning and wear.

It is a further object of my invention to provide a nozzle which will direct a spray within a given area and at a selected angle. It is an additional object of my invention to provide a nozzle having a screen of sufficient area to prevent foreign matter in suspension in a liquid from clogging the respective parts of the nozzle.

It is a further and primary object to provide an adequate support for the screen, which in addition to supporting the screen, directs the flow of liquid in a straight path to the orifice of the nozzle, it having been found that the straighter the path of the flow of the liquid, the less tendency of particles to come out of suspension and thereby clog the nozzle.

An additional feature lies in providing chamfered edges in the screen receiving means so that foreign particles cannot pass around the edges of the screen and be carried to the orifice of the nozzle.

It is a primary feature of my invention to provide a metering jet disc having a metered hole therein which controls the amount of liquid going to the nozzle orifice and which also creates a stream which flows from the hole in the metering disc to the orifice through the liquid present between the metering disc and the nozzle orifice. A turbulence is set up around the stream or flow from the metering disc hole to the orifice. This turbulence prevents particles in suspension from coming out of suspension and piling up near the orifice and thereby clogging the same.

A further feature resides in providing a threaded cylinder supporting collar which supports the metering jet disc. The supporting collar is threadedly engaged within the nozzle tip thereby allowing removal for cleaning the same and also the area adjacent the inner end of the tip orifice. It is a feature to engage the nozzle tip with the nozzle tip adapter by means of a nozzle tip retaining compression nut so that the tip may be adjusted with relation to the remainder of the nozzle.

It is a further primary object of my invention to provide a method for forming the orifice of the nozzle tip which consists in hobbing a depression in the inner bottom surface of the nozzle

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tip by means of a punch press or similar means actuating the hobbing element. The hobbed hole is parabolically curved in the bottom thereof. A milled V-cut is then made through the tip of the nozzle of such a depth that a portion of the bottom of the hobbed depression is thereby exposed forming the nozzle orifice. The size and shape of the orifice depends upon the amount of the hobbed depression being milled away. An elliptical orifice is created when it is desired to produce a fan spray, and the elliptical orifice is produced when the lower portion of a parabolically curved hobbed depression is cut away. The metal surrounding the hobbed depression or recess has increased density as a result of the hobbing and as a result is hardened. The orifice subsequently made by milling a channel or cut through the bottom of the hobbed recess has hardened edges which give long life to the orifice in resisting the wearing action of the spray liquid on the edges of the orifice.

These objects, together with other details and objects will be more clearly defined in the following specification and claims.

Figure 1 is a longitudinal view of the nozzle inserted in a supply pipe boom shown in section.

Figure 2 is a bottom end view thereof.

Figure 3 is a top end view thereof.

Figure 4 is a perspective view of the fluted screen support.

Figure 5 is a perspective view of a series of nozzles supported by a supply pipe boom showing a manner of spraying.

Figure 6 is a section on the line 6—6 of Figure 1.

Figure 7 is an exploded perspective view of the nozzle and its component parts extended in alignment with each other.

Figure 8 is a section on the line 8—8 of Figure 6.

Figure 9 is an alternative form of screen support.

Figure 10 is a section of the nozzle tip showing the hobbed recess formed therein with the hobbing tool partially elevated.

Figure 11 is an enlarged section of a portion of the nozzle tip showing the shape of the hobbed recess formed in the nozzle tip.

Figure 12 is an enlarged detailed portion of the bottom of the nozzle illustrating the elliptical orifice therein.

My nozzle A consists of a nozzle tip 10 which was formed thereon the annular shoulder 11. The angular chamfered shoulder 12 is formed adjacent the annular shoulder 11. The forward portion 13 of the nozzle tip 12 adjacent the an-

nular shoulder 11 is of a diameter less than the shoulder 11. The extreme lower end 14 of the nozzle is cylindrical in shape. The nozzle tip 10 has the threads 15 formed internally thereof. The orifice 16 is formed centrally through the tip end 14 in a manner hereinafter described. The inner end of the nozzle tip 10 has a chamfered shoulder formed therein as at 17.

A threaded cylindrical supporting collar 18 is threadedly engaged with the threads 15 of the tip 10, and positioned in the inner bottom of the nozzle tip 10. The collar 18 has secured therein, the metering jet disc 19 in which is formed the metered hole 19'. The collar 18 is screwed into the tip 10 by means of the slots 20 formed in the upper rim of the collar 10 and thus may be removed for cleaning of the area adjacent the inner end of the orifice 16. The disc 19 is positioned away from the lower edge of the support collar 18 thereby forming the compartment 21 just above the orifice 16. The spray fluid fills the compartment 21 when the nozzle is in operation, there being a stream or flow of fluid from the metered hole 19' directly to the orifice 16. In addition to the flow above-mentioned, turbulence is set up in the compartment or chamber 21, which turbulence will tend to dislodge any foreign particles or particles of chemical out of suspension which may be lodged adjacent the inner opening of the orifice 16.

The screen support 22 is cylindrical in shape and has the flutes 23 formed longitudinally in the outer surface thereof. Formed on the lower end of the screen support 22 are the threads 24 which engage with the threads 15 formed in the nozzle tip 10, thereby supporting the screen support 22 on the nozzle tip 10. It is obvious that the threads 24 may not be formed as deeply as the flutes 23 so that there may be a passage of fluid down the flutes and beneath the joinder of the threads 15 and 24. The upper end of the screen support is drilled and tapped to receive the screw cap 25. An annular beveled or chamfered edge 26 is formed on the under side of the screw cap 25 which engages and tends to crimp slightly the upper end of the cylindrical screen 27 when the cap 25 is screwed tightly upon the upper end of the screen support 22. As a result, the screen is securely held upon the screen support 22 and the above mentioned crimp of the screen against the annular shoulder 26 thereby prohibits the upper end of the screen 27 from becoming frayed and makes a positive contact between the upper end of the screen 27 and the cap 25. The lower edge of the screen 27 is forced against the chamfered annular shoulder 17 to force the edge of the screen inwardly against the screen support 22, and also to prevent the lower edge of the screen 27 from being frayed and admit particles to the nozzle tip. The lower edge of the screen 27 is forced against the shoulder 17 when the screen 27 is placed on the support 22 and the support 22 is screwed into the threads 15, the cap 25 being in a tightened position.

The screen 27 is evenly and firmly supported throughout by the longitudinal top surface portions 22' which separate the flutes 23. Collapse of or injury to the screen is virtually impossible. As the liquid passes through the screen 27, it flows downwardly through the flutes 23 in a straight path towards the metering disc 19 and the orifice 16. It has been found that the straighter the path of the flow of liquid, the less the tendency for the chemical in suspension to come out of suspension. It has been found that

where the flow of liquid mixture is more or less circuitous, the particles in suspension may come out of suspension and pile up at points of curve in the flow of the liquid.

An alternative form of screen support is shown in the form of a helical spring 28 which is positioned within the screen 27.

The nozzle tip adapter 29 is generally cylindrical in shape and has formed on the lower inner edge thereof, the bevelled shoulder 30 which is adapted to engage with the shoulder 12. The threads 31 are formed on the lower portion of the nozzle tip adapter 29 and adapted to engage with the threads formed on the inner surface of the nozzle tip retaining nut 32. The retaining nut 32 has formed therein the shoulder 33 which engages with the lower shoulder 34 of the nozzle tip 10. As the retaining nut 32 is drawn up on the threads 31 of the nozzle tip adapter 29, the chamfered or bevelled shoulder 12 is brought into contact with the bevelled shoulder 30 and, at the same time, the shoulder surface 33 contacts the shoulder surface 34. Thus, the nozzle tip 10, together with the collar 18 having the metering disc 19, and the screen support 22 and screen 27 are thereby supported within the nozzle tip adapter 29. The screen support 22, together with the screen 27, project outwardly from the inner open end 35 of the nozzle tip adapter 29.

The open end 35 may be inserted within a hole in a boom supply pipe such as 36, and is brazed or welded thereto as at 37 to make for positive positioning of the adapter 29 in the supply pipe 36. Old forms of nozzles have an adapter which is screwed into the supply pipe, and as a result of frequent removals, the positioning of the adapter upon tightening is thereby changed.

An important feature of my nozzle is the orifice 16 and the method of forming the same. The orifice 16 is formed in the following manner: The hobbed depression 38, as illustrated in Figure 10, is formed in the end 14 of the nozzle tip 10 by forcing the hardened hob tip 39 into the inner surface 40 of the tip 14. This is done by inserting the hob 41 in a press and bringing the hob tip 39 against and into the surface 40 and forming the hobbed recess 38. The hob 41 is inserted within the tip 10 and the hobbed recess 38 formed before the threads 15 are formed in the nozzle tip 10, allowing the hob 41 to fit fllush with the inner surface of the tip 10, thereby positioning the hob tip 39 accurately upon the surface 40. As a result of the hobbing of the hole or recess 38, the density of the metal surrounding the hole 38 is thereby increased and as a result is hardened.

After the hobbed hole or recess 38 is formed, the transverse V-shaped mill cut or a cut formed in any other manner 42 is made in the forward end 14 of the nozzle. The depth of the mill cut 42 is of such a depth that the lower portion of the hobbed hole 38 is thereby exposed forming the orifice 16. When the hobbed hole 38 is curved, as illustrated in Figure 10, the orifice formed by cutting therethrough with the V-shaped mill cut 42 is elliptical in shape, as shown in Figures 2 and 12, and thereby produces a fan-type spray. The mill cut 42 is broadened as at 43 for the purpose of confining or directing the spray issuing from the orifice 16. The bottom of the mill cut 42 is illustrated by dotted lines, as in Figure 11.

It is apparent that the recess 38 may be formed in hardened metal by means of cutting or grinding the same or by any other appropriate method.

My spray nozzle A is assembled by first screwing the support collar 18 into the bottom of the nozzle tip 10. The cylindrical screen 27 is then slipped onto the fluted screen support 22 while the cap 25 is then screwed against the upper end of the screen 27 and the support 22. The screen support is then screwed into the upper inner end of the tip 10 as illustrated in Figure 6. The above unit is then slipped into the adapter 29 until the shoulders 12 and 30 come into contact. The compression retaining nut 32 is then slipped over the end 14 of the tip 10, and engaged with the threads 31 of the nozzle tip adapter 29, and drawn up tightly with the end 14 in position to direct a spray at the desired angle.

With an elliptical orifice 16, as hereinbefore described, the nozzle A may be positioned in a boom supply pipe at spaced intervals, as shown in Figure 5, giving complete spray coverage of ground area by means of the slightly overlapping fan spray areas created by each of the nozzles. My nozzle is used principally with selective plant exterminating chemical, such as 2–4D as known in the trade, or any other liquid or liquid mixture to be sprayed.

My nozzle may be used for spraying material of high viscosity or any application of liquid material containing a high concentration of solids in suspension, because of the self-cleaning action due to the design and construction of the parts of the nozzle.

The advantage of the nozzle tip 10 having the bevelled surface 12 which contacts the bevelled surface 30 of the adapter sleeve 29 is apparent when it is desired to align the tips 10 with the adapter sleeve 29 or a supply pipe boom supporting the adapter. The shoulders 12 and 30 are brought into light contact with each other by means of the locking nut 32. Because of the light contact of the shoulders, the tip 10 may then be rotated into correct desired pre-determined position, following which the nut 32 is drawn into tightened position, thus bringing the shoulders 12 and 30 into tight contact with each other. As a result of the above-mentioned bevelled shoulder contact wedging of the tip with the sleeve, the tip 10 remains in the position in which it is placed under light contact and is not rotated by the tightening up of the locking nut 32. Where the shoulders 12 and 30 are formed right-angular, the tightening of the locking nut will rotate the nozzle tip from its desired position.

I claim:

1. A spray nozzle including a nozzle tip, a metering disc removably supported within said nozzle tip, a nozzle tip adapter adapted to engage with said nozzle tip, means for maintaining the engagement of said nozzle tip and said nozzle tip adapter, a screen support having flutes formed longitudinally thereon and removably secured to the upper inner end of said nozzle tip, a screen positioned on said screen support, and an annular bevelled edge formed on the upper

end of said nozzle tip to contact and confine the lower edge of said screen, a screw cap removably secured to the upper end of said screen support, an annular bevelled edge formed on the under surface of said cap engageably with the upper edge of said screen, an orifice formed in the lower end of said nozzle tip, and a channel formed in said tip intersecting said orifice.

2. A sectional spray nozzle including a tip member, a small orifice centrally disposed through the end of said tip, a transverse slot intersecting said orifice in said tip, a turbulence chamber formed in said tip adapted to cause liquid injected into said turbulence chamber to wash said chamber clean of any residue, an adapter sleeve adapted to receive the inner end of said tip member, bevelled surfaces formed on said tip and the end of said sleeve which are adapted to engage one with the other, a locking collar adapted to draw said bevelled surfaces into contact with each other to form a liquid tight joint in connecting said members, an elongated longitudinally extending screen for straining the liquid before entering said turbulence chamber, a bevelled inner surface on the inner end of said tip adapted to engage one end of said screen, a fluted longitudinally extending core member threadedly engaging with the inner end of said tip and adapted to support said screen with longitudinally extending flute recesses, a screen locking head having an annular inner bevelled surface adapted to engage the inner end of said screen and threaded to said core to lock said screen with one end thereof bearing against said bevelled surface on the inner end of said tip and the other end thereof bearing against said bevelled surface on said locking head.

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