Aug. 21, 1951 D. L. SPENDER 2,565,457

WHEEL OPERATED ADJUSTABLE SPRAY NOZZLE

Filed Aug. 31, 1946

Fig. 1.

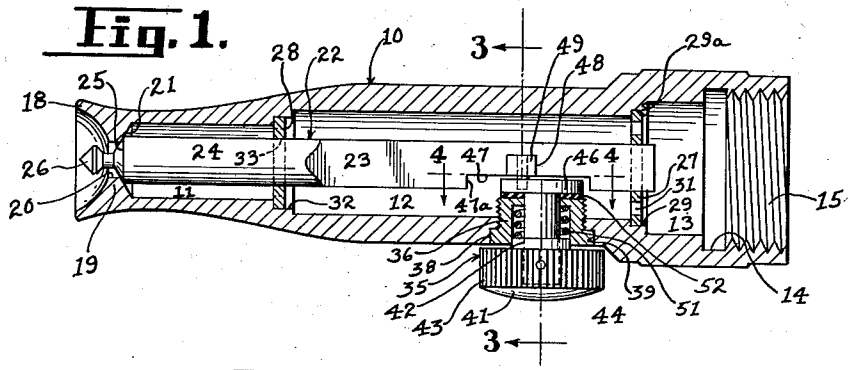


Fig. 2.

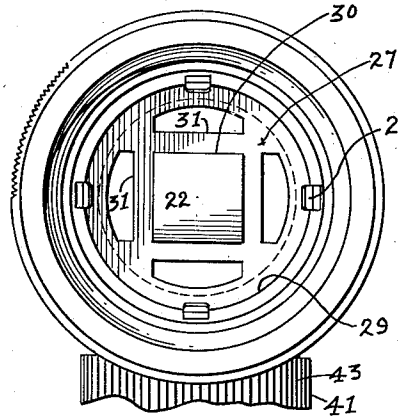


Fig. 3.

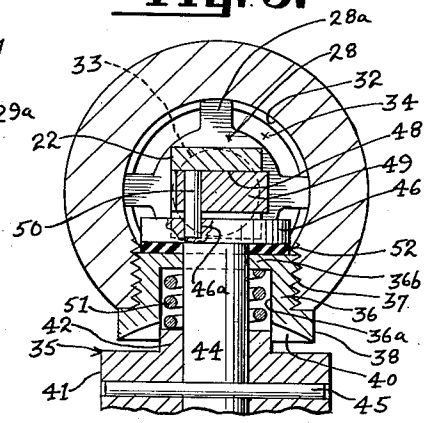


Fig. 5.

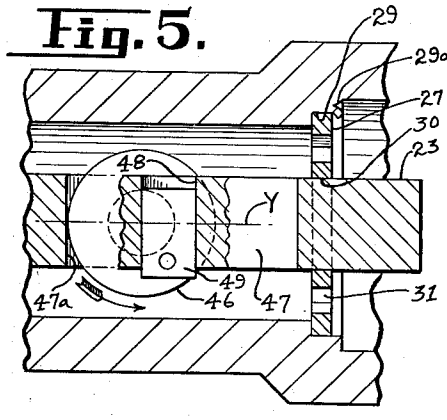
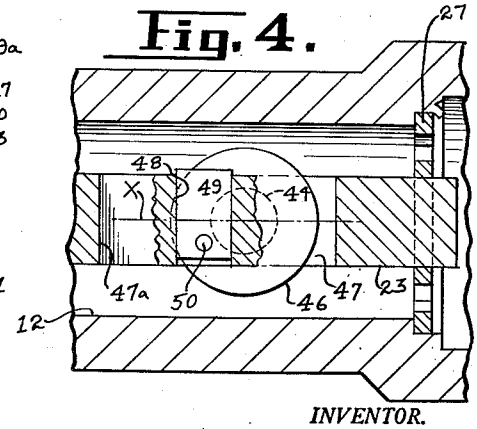


Fig. 4.



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WHEEL OPERATED ADJUSTABLE SPRAY NOZZLE

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Application August 31, 1946, Serial No. 694,214

4 Claims. (Cl. 299—150)

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This invention relates to hose nozzles and particularly to the type used in connection with garden hose equipment.

It is one of the objects of this invention to provide a hose nozzle having a control means on the side of its body in the form of a hand operated wheel. The design of the nozzle is such that it may be conveniently held and operated to control the stream of water discharge therefrom by the same hand.

This nozzle construction is an improvement over applicant's prior application, Serial No. 600,173, filed June 18, 1945, and possesses all the advantages set forth in the above referred to application. The improvement in this case resides particularly in the bearing construction wherein the hand control mechanism is connected into the valve or plunger stem of the nozzle.

Another improvement in this construction resides in the manner in which the hand operated wheel can operate only between specific limits and always in the same order for the opening and closing of the valve element.

The full nature of this invention, along with other objects and various advantages thereof, will be more apparent from a consideration of the following description when read in connection with the accompanying drawing, in which—

Fig. 1 is a longitudinal sectional view taken through the nozzle that forms the subject matter of the present invention.

Fig. 2 is a right end view of this nozzle.

Fig. 3 is a transverse sectional view through the same taken along line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary horizontal sectional view taken substantially along the line 4—4 of Fig. 3 to show the relationship of the control bearing block with reference to the valve stem when the latter is in fully closed position.

Fig. 5 is a similar view to Fig. 4, but showing the relative position of the parts when the valve stem is in fully open position.

Referring now to the drawing in which like reference numerals designate like parts throughout the several views, the numeral 10 refers to a nozzle body made in one complete piece and formed with a hollow interior divided into four distinct concentric cylindrical bores designated by numerals 11, 12, 13 and 14, reading from left to right as viewed in Fig. 1. The larger and outermost bore 14 is constructed with an interior thread 15 by means of which the nozzle may be detachably connected to a male nipple such as is customarily supplied on the end of a garden hose. The discharge end of the nozzle is constructed

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with the usual flared end 18 and includes a partition 19 having a central orifice 20. The inner face of the partition 19 is inclined to provide a valve seat 21, the valve seat forming the base of the innermost cylindrical bore 11.

A longitudinal plunger rod or valve stem 22 is axially mounted within the nozzle and is divided into two sections, a portion of which is square in cross-section as indicated at 23, while substantially the remaining portion is of cylindrical shape as indicated at 24. The inner end of the cylindrical shaped rod portion 24 terminates in a conical face providing for a valve element 25 complementary to the valve seat 21. The valve element 25 continues into an arrow shaped point or head 26 that serves to control the type of discharge emitted from the nozzle as determined by the position that the head 26 may assume relative to the orifice 20.

In order to axially mount the plunger rod 22 within the nozzle and allow for reciprocal motion, provision is made of a pair of spaced bearing members which are specifically shown as relatively heavy blank members 27 and 28, the outermost and larger bearing member 27 has a drive or force fit into a counterbore 29 at the base of the cylindrical bore 13. This bearing member 27 is provided with a concentric square piercing 30 to accommodate and support the square end 23 of the plunger rod 22 and serves to prevent the plunger rod from turning within the nozzle. If desired, the bearing member 27 may be anchored more securely in the counterbore 29 to further assure it against rotary motion as by a plurality of staking operations 29a. The bearing member 27 is provided with four relatively large pierced apertures 31 surrounding the bearing piercing 30 and through which the fluid may pass.

The smaller or innermost bearing member 28 similar to the larger member 27 has also a drive fit within the counterbore 32 provided between the bores 11 and 12. The innermost bearing member 28 is provided with a cylindrical piercing 33 to accommodate the cylindrical portion 24 of the plunger rod 22. The bearing member 28 is made preferably in the form of a flat blank having equally spaced radial arms 28a that are the means for engaging by a force fit within the counterbore 32. The arms 28a are of sufficient length so as to provide openings 34 between the blank proper and the interior bore 11 of the nozzle to allow for the passage of fluid therethrough. (See Fig. 3.)

In order to provide for a reciprocal axial move-

ment of the plunger rod 22 in obtaining a complete shutoff or a variable control of the fluid emitted from the nozzle, provision is made of a manual hand wheel control unit generally indicated by the numeral 35, which is located and operated from one side of the nozzle 10 in a position most convenient for the user's hand. As best shown in Figs. 1 and 3 the hand wheel control unit 35 comprises a cup-shaped threaded bushing 36 engaging in a tapped hole 37 in the nozzle body 10. The bushing is formed with an enlarged head 38 that seats into a counterbore 39 in the wall of the nozzle body 10, and the head 38 is provided with a kerf 40 (see Fig. 3) in its outer face for convenience in the assembly and disassembly of said bushing by a suitable tool. A hand wheel knob 41 is provided with a cylindrical neck portion 42 that rotatably fits within the open end of a hollow chamber 36*a* provided in the threaded bushing 36. The peripheral surface of the knob 41 may be knurled as at 43 for convenience in operating the same. The knob 41 is rigidly secured to the outer end of a spindle 44 as by means of a cross pin 45 in the manner as shown in Fig. 3. The spindle 44 passes through the apertured base end 36*b* of the bushing 36 as a bearing means, and the inner end of the spindle is formed with an integral crank disc or plate 46 having a socket 46*a* in its outer exposed face eccentrically positioned relative to the axis of the spindle 44. The plunger rod 22 in its square section 23 is provided with a relatively long cut-out or recess 47 within the area of which operates the crank plate 46 for reasons which will be explained later.

In order to assure a relatively good bearing connection between the plunger rod 22 and the hand control unit 35 a bearing cross slot 48 is formed in the rod 22 opening through the face of the long recess 47. Within this cross slot 48 operates a slide bearing block 49 having a projecting pin 50 that engages within the crank plate socket 46*a*. The location of the axis of the hand wheel control unit 35 and the relative distance between the valve means 25 and the cross slot 48 is such that the crank plate cannot make a complete swing in its inner stroke of a character that would carry the connecting pin 50 through dead center as represented by the dot-and-dash center line X, but comes to a stop substantially in a position as shown in Fig. 4 by reason of the fact that the valve element 25 of the plunger rod 22 abuts against the valve seat.

In order to have the hand wheel operate between predetermined points so that its cycle of operations will always be the same in moving the valve rod 22 from open to closed position and vice versa, as mentioned above, the crank plate 46 is designed to operate within the area of the long recess 47. In effecting this control the position of the foremost face or end 47*a* of the recess 47 in rod 22 is such that, when the rod 22 is being moved to open position through the control unit 35, the crank plate 46 will rotate in the direction shown by the arrow in Fig. 5 and will come into contact with the face 47*a*, stopping any further rearward travel of the bearing block 49 and the plunger rod 22. The crank plate thus operates between prescribed limits and the pin 50 carried by said plate in its rearward stroke cannot reach and pass through its dead center, as represented by the dot-and-dash center line Y in Fig. 5.

The design of having the crank plate 46 come to a stop and not carry the pin 50 through dead center line X of Fig. 4 in its innermost or valve

shut-off position is to assure that a positive sealing can be effected, in that the operator can exert a manual force on the hand wheel knob 41 in bringing the valve element on the rod 22 to a complete shut-off in seating against the valve 21 in addition to the pressure head of water that would normally be exerted against the inner end of the plunger rod 22. The fact that the connecting pin 50 is positioned relatively close to dead center, when the nozzle valve is shut off, makes it much easier for the operator to open the nozzle valve against any head pressure of water that may occur within the nozzle. By reason of this construction, another favorable point advanced is that considerable more leverage is obtained in "braking" the valve against a pressure head of fluid and also renders the operation of the valve easier especially when it is desired to obtain a finer spray of fluid which becomes finer the closer the valve is to shut-off position.

As a means of tensioning the hand wheel control unit 35 so that the plunger rod 22 may be held in any set position without the necessity of the operator constantly holding onto the knob 41, at least three force factors are employed to build up frictional resistance in said hand wheel control unit 35. One of the force factor means is in the use of a coiled expansion spring 51 located in the bushing chamber 36*a* and surrounding the spindle 44. The spring 51 is adapted to be compressed between the adjacent end of the hand wheel cylindrical neck 42 and the base end 36*b* of the threaded bushing 36. Surrounding the spindle 44 and compressed between the inner face of the bushing base end 36*b* and the adjacent face of the crank disc 46 is a sealing washer 52 which serves as a second frictional means. The expansive force of the spring 51 will normally tend to urge the spindle 44 outwardly and consequently cause the crank disc 46 to bind against the washer 52 and thereby create a further frictional factor other than that created by the spring itself bearing against the complementary opposed bearing members, namely the knob neck 42 and the base of the bushing 36*b*. Also the relatively large disc 46 incidentally serves to take advantage of the water pressure occurring in the nozzle and further urges the crank disc 46 against the washer 52 more tightly with increasing pressure, which may be considered the third frictional force factor created in the hand wheel control unit.

It is also to be noted that the comparative area of the exposed crank disc face as to the area adjacent the washer 52 is proportionately greater so that any tendency for the fluid to leak in between the adjacent surfaces of the plate 46 and washer 52 is offset by the greater pressures exerted on the outer face of the disc 46. Consequently the greater the pressure of fluid within the nozzle, the more tightly will the disc 46 be forced against the washer and compress the same, thus increasing its sealing efficiency.

While the form of the invention herewith shown and described embraces a preferred embodiment of the same, it is to be understood that the construction may be varied as to mechanical details without departing from the spirit of the invention and the scope of what is claimed.

I claim:

1. In a spray nozzle construction comprising a unitary body formed with a hollow interior divided into several hollow compartments progressively becoming smaller from the inlet end to the discharge end of said body; a countersunk

cylindrical recess disposed between two adjacent innermost hollow compartments and another countersunk cylindrical recess located between two adjacent outermost compartments, a plunger rod having a square shaped longitudinal portion and a cylindrical shaped longitudinal section, and a pair of support members forming bearing means for axially mounting said plunger rod in said body, said support members having a telescopic drive-fit into said countersunk recesses, both of said support members having fluid passageway means, one of said members having a bearing support for said plunger rod cylindrical section and the other of said members having bearing means for non-rotatably supporting said plunger rod square shaped section.

2. A hose nozzle construction comprising a hollow body, a valve rod, support bearings axially supporting said rod in said body, a portion of said rod having a longitudinal squared section, one of said support bearings engaging said squared section to prevent rotation of said rod, an elongated recess provided in one face of said squared section and a cross slot provided in the base of said recess, a valve rod control unit mounted transversely in said body on an axis normal to said valve rod and comprising a spindle rotatably mounted in said unit, an exterior handle member connected to the outer end of said spindle, a crank plate attached to the inner end of said spindle and operating within the area of said elongated recess, a bearing block slidably mounted in said cross slot, a pin member connecting said block to said crank plate, and the position of said cross slot relative to the valve end of said rod being such that the operating means on said crank plate cannot operate through the dead center axis of said crank plate when the latter is being rotated to advance said rod to its forward valve shut-off position.

3. A hose nozzle construction comprising a hollow body, a valve rod, support bearings axially supporting said rod in said body, a portion of said rod having a longitudinal squared section, one of said support bearings engaging said squared section to prevent rotation of said rod, an elongated recess provided in one face of said squared section and a cross slot provided in the base of said recess, a valve rod control unit mounted transversely in said body on an axis normal to said valve rod and comprising a spindle rotatably mounted in said unit, an exterior handle member connected to the outer end of said spindle, a crank plate attached to the inner end of said spindle and operating within the area of said elongated recess, a bearing block slidably mounted in said cross slot, a pin member connecting said block to said crank plate, and means preventing the crank plate from swinging through its dead center axis in its rearward or valve open position, said latter means effected by the relative position of one edge of said elongated recess contacting the periphery of said crank plate before the connecting pin can swing through dead center of said valve rod.

4. In a spray nozzle construction comprising a unitary body formed with a hollow interior divided into several hollow compartments progressively becoming smaller from the inlet end to the discharge end of said body, an innermost countersunk cylindrical recess disposed between two adjacent innermost hollow compartments and an outermost countersunk cylindrical recess disposed between two adjacent outermost hollow compartments, a plunger rod having a square-shaped longitudinal section and a cylindrical shaped longitudinal section, and a pair of relatively thick stamped flat blanks forming bearing means for axially mounting said plunger rod in said body, one of said blanks having a central cylindrical piercing for slidably receiving the cylindrical portion of said rod and provided with radial fingers dimensioned for a drive fit engagement in said innermost countersunk recess and providing for fluid passage spaces between said fingers, the other of said blanks being cylindrical shape and having a drive-fit into said outermost countersunk recess and having a square central piercing for non-rotatably receiving the squared portion of said rod, other fluid passage piercings provided in said latter blank, and stake means for holding said latter blank against rotation in its respective countersunk recess.

DONALD L. SPENDER.

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