March 22, 1927. 1,622,090

F. B. COMINS ET AL

SELF CLEANING NOZZLE

Filed May 28, 1921

Fig. 1.

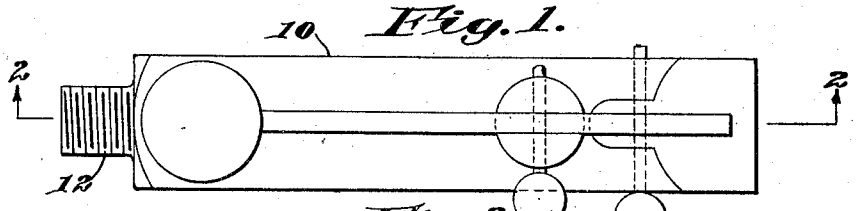


Fig. 2.

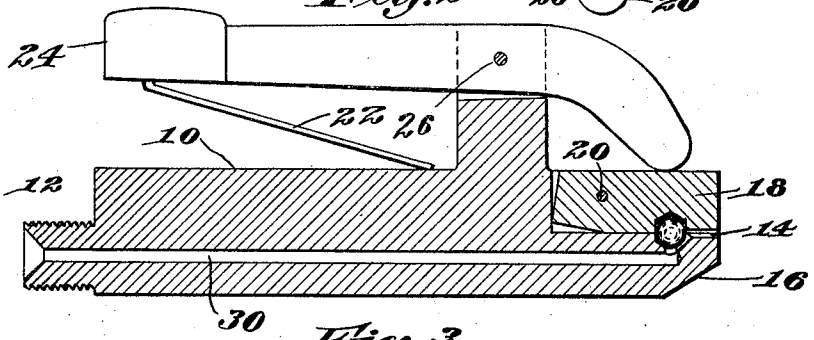


Fig. 3.

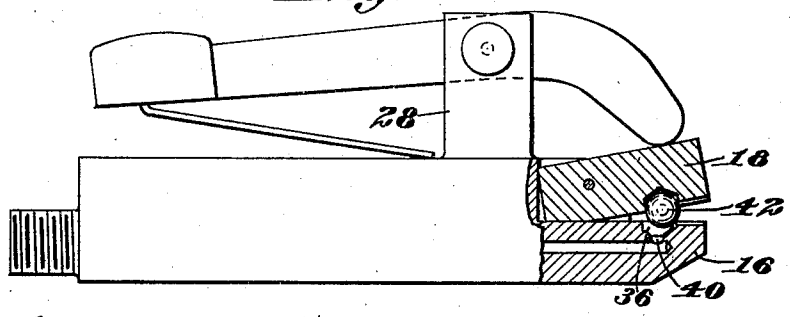


Fig. 4.

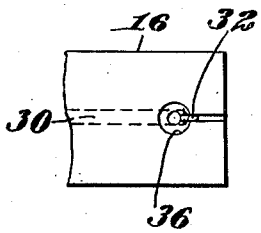


Fig. 5.

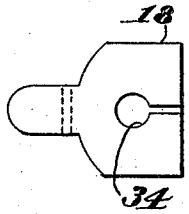


Fig. 6.

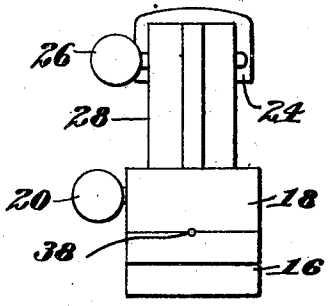
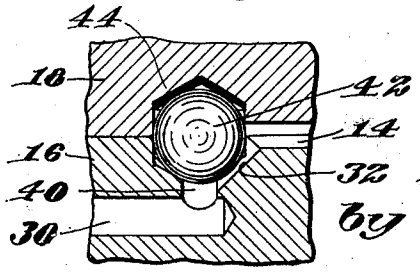


Fig. 7



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Patented Mar. 22, 1927. 1,622,090

UNITED STATES PATENT OFFICE.

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SELF-CLEANING NOZZLE.

Application filed May 28, 1921. Serial No. 473,330.

This invention relates to improvements in self-cleaning nozzles. More particularly it has been developed in connection with air nozzles having a discharge passage of very small cross section, for example in the vicinity of one or two hundredths of an inch diameter, although it is applicable to other fluids and other sizes. Such nozzles are liable to become clogged with solids carried by the fluid in spite of all precautions that may be taken in the direction of filtering; and their cleaning is difficult, especially when installed on the premises of non-expert users at a distance from those who are skilled in handling them. A partial or complete clogging may be expensive to remove, and may be more or less serious because of the effects of stopping the jet which should be discharged by the nozzle. It is an object of the present invention to provide means which any person, without expert knowledge, can operate to relieve such a nozzle, so that the cleaning will be effected automatically.

To this end the invention in forming the characteristic small bore nozzle comprises a split discharge passage of the nozzle, the two halves of which are set together to make the normal discharge passage, but which can be separated to make a wide open mouth and by which the throat or entrance to the discharge passage from the interior to the nozzle, can also be thrown wide open. The invention further comprises means by which the opening of these parts is effected automatically by the fluid which is passing through the nozzle, whenever the operator gives the opportunity. And the fluid, being present under relatively high pressure, acts as a scouring agent to clean away the clogging material. In the particular form in which the invention is preferably constructed the nozzle is held normally closed by a spring whose tension, although weak, is nevertheless so proportioned to the areas exposed within as to overcome the opening pressure of fluid; and a finger lever is provided by which an operator may overcome the spring, thus allowing the fluid to open and scour the nozzle, after which the nozzle closes when the operator removes his finger. It is intended that the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty exist in the invention disclosed.

In the drawings:

Figure 1 is a plan of a nozzle embodying the invention, greatly enlarged;

Figure 2 is an elevation partly in section on line 2—2 of Figure 1, showing the parts in their relative position when the nozzle is normally operative;

Figure 3 is similar to Figure 2, but shows the position of the parts when the cleaning action takes place;

Figure 4 is a plan of the lower section of the discharge end of the nozzle;

Figure 5 is a plan viewed from below of the upper section of the discharge end of the nozzle;

Figure 6 is an end elevation; and

Figure 7 is an enlarged elevation of a portion of the passage through the nozzle.

Referring to the drawings, the nozzle comprises a head portion 10 having an inlet through an exteriorly threaded neck 12 adapted to be connected in any convenient manner to a fluid supply system (not shown), and having an outlet through a discharge passage 14 formed between two jaw-like members 16 and 18 normally pressed together but capable of being automatically separated to increase the capacity of discharge. The lower jaw 16 is fixed, being integral with the head portion. The upper jaw 18 has a tenon retained within a mortice of the head by a pin 20, about which the jaw may swing away from and back to the fixed jaw; but this jaw is normally held in close contact with the other by means of a spring 22 acting on the upper surface of the jaw through the medium of a finger lever 24 fulcrumed about a pin 26 in a slot of a projection 28 from the head, one end of the lever being against the movable jaw 18 and the other end being pressed by the spring.

The fluid entering the nozzle under pressure through the neck 12 flows along a comparatively large inlet and supply passage 30, too large to be clogged, and then through a restricted connection 32 into the relatively small outlet or nozzle discharge passage 14. This restricted connection between the inlet and outlet passages is part of a vestibule or chamber of such shape that the greater part of it can be filled, and closed off, by a spherical body 42. It is formed by the two jaws, one half 34 of the chamber being in the up-

per jaw and the other half 36 being in the lower, from each of which the respective parts of the discharge passage on each jaw lead to the discharge orifices 38, although it may incidentally be mentioned that the actual connection of the upper half with the vestibule is a measure of convenience in construction rather than of any necessity in operation. The chamber may be made by merely drilling holes in the two jaws, which leaves a conical end at the bottom of each. This conical surface in the fixed jaw provides a desirable seat for the spherical body 42 so that upon the jaws being closed the said body effectively closes the end of the lower half of the chamber and prevents escape of fluid around itself into the chamber or out between the jaws except as the fluid is permitted to pass to the nozzle discharge passage. This latter outlet is short and direct to the atmosphere thereby offering the path of least resistance to the rapid discharge of the fluid and making maximum concentration of flow in the groove and minimum dispersion by leakage sidewise through the cleft between the two blocks. In the upper end of the chamber, a resilient backing 44 of any suitable material, as for example a wafer of cork, is provided to permit a slight yielding of the ball 42 with respect to the upper jaw, so that the latter is pressed down to contact with the lower jaw by the spring after the ball is seated; and the stiffness of this cushioning material must be sufficient to keep the ball firmly on its lower seat against fluid pressure from below, but not too stiff to prevent the jaws from being tightly closed together by the spring actuated lever. The chamber is at 40 connected directly with the inlet passage, below the place where the ball 42 seats within the chamber against the conical end thereof. The discharge passage being above this ball seat, the channel 32 past the ball seat is cut thereto. This channel may be so restricted as to constitute a sort of reducing valve, so that a restriction to very small flow is obtained, and yet the passage is easily cleanable as hereinafter explained. In the apparatus illustrated, however, the full drive of the pressure supply is desired in the discharge part of the nozzle and therefore the groove 32 is made large enough to equal the capacity of the discharge passage 14. The spring 22 is strong enough to maintain the two parts 16 and 18 together.

When the finger lever is depressed at its spring supported end, the pressure of the supply fluid which, in the particular case for which the apparatus thus far constructed is designed is air at a pressure of about 15 pounds per square inch above atmosphere, acts on the ball and through it on the movable jaw, swinging the latter about the pin 20, and lifting the ball from its seat in the fixed jaw thereby opening the connection into the lower half of the chamber. The fluid thus permitted to enter the chamber rushes therethrough in considerable volume from the relatively large supply passage 30 against the spherical face of the ball, and is deflected in all directions, and especially outward through the now wide opening between the jaws. It is this flooding and scouring out-rush of fluid through the separated parts of the nozzle which clears away any solids which may have collected there while the jaws were closed and the passage was restricted. Upon removal of the finger of the operator, the force of the spring closes the upper jaw, thereby again seating the ball on the bottom of the chamber and stopping the escape of fluid except through the groove 32 and discharge passage 14.

It is obvious that the particular type of nozzle shown is merely illustrative and that other adaptions of the invention might be made without departing from the scope thereof. Although shown with the movable jaw upward, the nozzle would operate in other positions. The feature by which the discharge passage is made in two parts separable by the fluid on proper occasions, yet normally closed to make the desired steady discharge when in use is one of importance. In apparatus having such minute dimensions as that for which the invention has been particularly designed, the superiority of this over the regulation method of inserting a wire for cleaning is manifest, for not only is a powerful, searching, and all inclusive fluid force applied, but the clogging matter is simultaneously released from the obstacles that were holding it, by the spreading apart of the walls of the various passages as far back as the relatively large supply passage, whose diameter is too great for clogging to occur.

We claim:

1. A nozzle comprising a fixed member and a movable member, one having a groove and the other closing the top of the groove to form a discharge passage open normally only at its ends for discharge, the said movable member being adapted to be spread away from the fixed member by force of the fluid which is discharged to permit discharge away from the nozzle sidewise, combined with yielding means exteriorly arranged on the nozzle for normally holding said movable member in its non-spreadaway state.

2. A nozzle comprising two pivotally connected blocks, one having a groove and the other closing the top of the groove to form a discharge passage open normally only at its ends for discharge, one of said blocks being adapted to be rocked by force of the fluid which is discharged to open the passage for discharge away from the nozzle sidewise, combined with yielding means ex-

teriorly arranged on the nozzle for normally holding the blocks in their non-spread state.

3. The combination of two blocks, one having a small groove and the other closing it to make a nozzle passage, one of said blocks being fixed and the other block at will capable of being spread away from it; there being a supply passage through the fixed block sufficiently large to be free from danger of being clogged; a chamber between the passages, of which both blocks constitute walls; and a valve in said chamber closing said supply passage except a groove in the wall of said chamber which groove leads to the nozzle passage for normal flow.

4. The combination of two plugs, one having a small groove and the other closing it to make a nozzle passage, one of said blocks being fixed and the other block at will capable of being spread away from it; there being a supply passage through the fixed block sufficiently large to be free from danger of being clogged; a chamber between the passages, of which both blocks constitute walls; and a valve in said chamber closing said supply passage except a groove in the wall of said chamber which groove leads to the nozzle passage for normal flow, said valve being openable by the pressure in the supply passage and maintained closed by the movable block when the latter is against the fixed block.

5. A nozzle comprising two portions, each having a groove registering with the groove of the other to form a small nozzle passage, one portion being fixed and containing a large supply passage, the other portion being movable to and from the fixed portion; a chamber at the entrance of the nozzle passage having an end in each of said portions, the end in the fixed portion having an opening from the supply passage and a groove in its wall leading to the discharge passage; a ball in the chamber adapted to close the said opening except for said wall groove; and a cushion in the movable end of the chamber pressing said ball into said closing position; said ball receding with the movable portion, and deflecting the flow in different directions between the separated portions of the nozzle.

6. The combination of two blocks, one having a small groove and the other closing the top of the groove throughout its extent to make a nozzle passage open normally only for concentrated delivery, one of said blocks being fixed, the other block being movable to spread the passage open to permit discharge sidewise; and a spring finger key arranged exteriorly of the nozzle and back from its discharge end normally pressing the movable block toward the fixed block with sufficient force to overcome the pressure of fluid that tends to open them.

7. Two blocks, one having a small groove and the other lying along the groove to make a nozzle passage; one of said blocks being fixed, and the other pivoted so as to have a limited swing away from the fixed block thus opening the passage longitudinally; the fixed block having a supply passage; and there being a chamber connecting the passages, having an end in each block; combined with a ball in the chamber adapted to close it as a connection except for a small wall groove therein; the said ball receding with the movable block to open the connection for blast of fluid, and being retained by the limited swing of the pivoted block.

8. A block having a fluid supply passage and, offset thereform, a superficial groove constituting one wall of a diminutive discharge passage; another block, pivoted thereon, covering the surface wherein said groove is, and having a groove registering therewith, to complete said discharge passage; there being in said blocks relatively large drill holes registering together, thus constituting a chamber extending between said passages; and a ball valve in said chamber held by the top of one hole to a seat in the bottom of the other hole when the blocks are together; there being a groove in the chamber wall past the ball; and a spring pressed finger lever pivoted on the first mentioned block and pressing the second mentioned block about its pivot upon the first mentioned block to constitute said passage, the block being forced away by the fluid pressure when relieved of the lever.

9. A nozzle having a small discharge passage which is normally open only at its end for discharge and is capable of being opened for discharge back from its end by force of the fluid which it discharges, combined with yielding means normally holding said backward discharge opening closed, with force exceeding the opening force of the fluid exerted upon it when the passage is clogged, and adapted for manual control for the release of said normal holding.

Signed at Boston, Massachusetts, this 23rd day of May, 1921.

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