

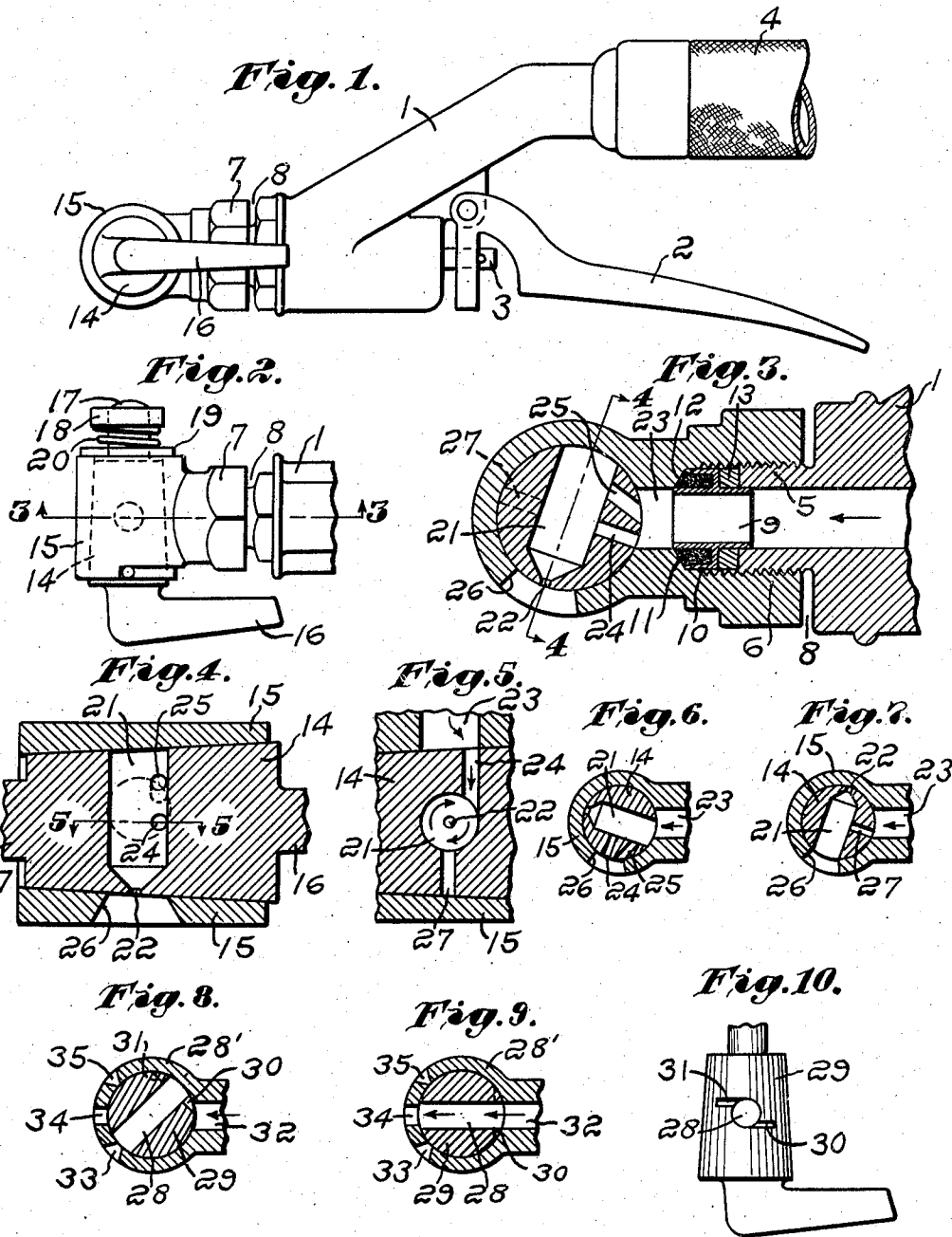
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SPRAYING NOZZLE

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SPRAYING NOZZLE

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My invention relates to spray nozzle and more specifically to the whirling-spray type thereof adapted for use in the treatment of plants, shrubbery, trees and the like. One of the novel features of my improved device provides for production of a finer and more evenly distributed spray of the whirling type; that is to say, the particles of liquid are broken into a finer mist, or fog, than has heretofore been possible, which results in better penetration thereof among the leaves of plants and trees. The whirling spray is obviously old in itself, nevertheless, I have discovered, by extensive research and tests, that much better results can be obtained if the vortex of a whirling column of liquid can be maintained in precise axial alignment with the nozzle outlet; that is to say, the center of the nozzle outlet should be maintained at the center of the whirling column of liquid; tests which I have made show that a variation of .001 of an inch from the foregoing will produce a coarser spray and is therefore less desirable; my improved nozzle presents an arrangement whereby this relationship is fixed and therefore affords greatest efficiency at all times.

Another novel feature of this invention lies in the construction and arrangement of parts to greatly facilitate clearing of the nozzle in the event it becomes clogged, due to foreign matter in the spraying solution. This is known to be the most troublesome feature of spraying devices and results in considerable loss of time because clogging cannot be entirely avoided. The usual nozzle, of the whirling spray type, comprises several parts which must be disassembled for clearing purposes. A well known and universally used type of nozzle comprises six parts, some of which are very small, and the unit must be disassembled for clearing. This operation not only requires some time to perform but often results in the loss of some part among plants or shrubbery which causes expensive delays. My improved whirling spray nozzle need not be disassembled for clearing purposes, it merely requires rotation of the control lever and the clearing is positive, a matter of four or five seconds time in the most stubborn cases, and eliminates the danger of lost parts entirely.

Still another feature of the invention relates to the construction of and means by which the nozzle is connected, in a liquid-tight manner, to a valve or pipe line whereby liquid is supplied, under pressure, to said nozzle. A spray nozzle used in connection with an outfit designed to be carried about by the operator should be adjustable for

convenient operation of the spray control lever by the left hand, thus leaving the right hand free to manipulate the supply valve. The practice has been to employ a joint-sealing washer, of leather or similar material, which does not provide a suitable arrangement for this purpose because of the fact that the threaded connection, in combination with such a washer, cannot be depended upon to bring the spray control lever into correct operation position and when the nozzle is backed away to obtain this correct position a leak occurs at the sealing point. With my improved sealing arrangement the nozzle may be adjusted to approximately a full turn without any leakage occurring.

The foregoing features all contribute to provide a whirling-spray nozzle made up of less parts, arranged to be instantly and positively freed when clogging occurs, and which will break the liquid into finer particles thereby producing a fog, or mist, with greater penetrating capacity. One embodiment of such a spray nozzle will be described and shown in the accompanying drawing, in which,

Figure 1 is a side elevation of such a nozzle as applied to the usual control valve element of a portable hand-operated spraying unit.

Fig. 2 is a plan view, in detail, of the nozzle itself.

Fig. 3 is a longitudinal section, on line 3—3 of Fig. 2, of the nozzle shown at enlarged scale.

Fig. 4 is a vertical cross section taken on line 4—4 of Fig. 3.

Fig. 5 is a horizontal section on line 5—5 of Fig. 4 showing the arrangement of passageways in detail.

Figs. 6 and 7 are cross sections, similar to Fig. 3, showing various positions of the rotatable member for cleaning purposes, and

Figs. 8, 9 and 10 illustrate a modified form of nozzle.

In Figure 1 of the drawing I have shown a conventional and well known type of liquid-control element 1 having a hand-controlled trigger 2 which cooperates with a valve-rod element 3 to permit admission of liquid, under pressure, to the spray nozzle. The element, 1, is usually connected to a supply tank by means of a flexible hose member 4 and held in the right hand of the operator by which he manipulates trigger 2.

The outer end of element 1 is usually provided with a threaded male portion 5, Fig. 3, adapted to receive the female threaded portion 6 of a spray nozzle. The outer surface of this female portion may be adapted to receive a wrench, as

shown at 7 and it should be noted, Fig. 3, that said portion is spaced away from element 1 as shown at 8. In present day construction this space 8 is occupied by a common leather washer to prevent leakage at this point, the nozzle portion 6 serving to jam the washer between it and the abutting shoulder presented by element 1 as the nozzle is screwed into position on the latter. As the element 1 is mounted in a vertical position, as shown, with reference to the hose 4 and trigger 2, it will be understood that the stream of spray should be in the same vertical plane also in order to obtain best results. In other words, if the line of spray is not in the same vertical plane with element 1 then the operator must continually twist the hose in order to throw a vertical spray. This has always been a fault with the use of a washer as above described because there were few chances that the joint would come tight and the line of spray vertical at the same time, whereupon the nozzle must be unscrewed a little and then a leak occurs at the joint which is not only troublesome but causes a considerable loss of liquid in time.

The present invention discloses a packing device for the foregoing connection which will yield and permit substantially a full rotation of the nozzle, to obtain the above mentioned vertical adjustment, before any leakage occurs although only 180 degrees is necessary. With the old method, and the best washer obtainable, an adjustment of about 20 degrees is the maximum before leakage occurs at the joint.

My improved joint-sealing, or packing device comprises a tubular member 9, preferably arranged to extend into the passageway of incoming liquid, as shown in Fig. 3, and provided with a cup-shaped flange 10 fixedly attached thereto. A compressible washer element 11, such as rubber, is mounted upon tube 9, confined within flange 10 and adapted to engage a shoulder 12 at the bottom of the nozzle threaded portion. This arrangement provides a yieldable seal to prevent liquid from entering the threads at this point. At the opposite side of flange 10 is another washer 13, preferably of fibre or the like, mounted on tube 9 and arranged to engage the end of male portion 5 on element 1 to prevent leakage at this point. When the nozzle is screwed into close contact with element 1 the rubber washer will be compressed longitudinally and fibre washer 13 will permit rotation between the parts and still maintain a tight joint, due to pressure exerted upon it by the rubber washer being under compression, all of which results in the above mentioned advantages.

Referring now to Figs. 3, 4 and 5 of the drawing I have shown one form of my novel whirling-spray mechanism comprising an elongated tapered member 14 mounted for rotation within a casing 15 which is formed integral with the threaded female portion of the nozzle. This member 14 is provided at one end thereof with an operating lever 16, Figs. 1 and 2, while the opposite end may be reduced in diameter and extended to present a threaded stud portion 17 adapted to receive a nut 18. A washer 19 is arranged to seat on one side of casing 15 and a spring 20 is preferably interposed between the washer and said nut 18 whereby the tapered member 14 is held in sealing contact with the tapered bore in said casing. The foregoing construction is obviously old in the sense of an ordinary valve unit, or spigot.

My aim has been to produce a nozzle of the

whirling-spray type wherein the center of the spray outlet is in positively fixed axial alignment with the vortex of a whirling column of water at all times. To accomplish this I provide a cylindrical chamber 21 arranged normal to the axis of member 14, said chamber having one open end arranged to be normally closed by casing 15, when spraying, as shown in Fig. 3. The other end of chamber 21 is tapered and reduced to a desirable spray opening 22, the center of which lies on the axis of chamber 21. The tapered portion of chamber 21 prevents formation of a "neck" in the stream as it emerges from opening 22.

The liquid to be sprayed enters the nozzle unit, under pressure, through the bore, or passageway 23 and is directed therefrom to chamber 21 through bores 24 and 25 which are in communication with bore 23 when the device is being operated for spraying, as shown in Fig. 3. It will be noted that bore 25 is drilled at an angle which directs its stream towards the closed end of chamber 21; this is done to prevent a "dead spot", or pocket, being created at this point and provides a more uniform whirl to the liquid. These bores, 24 and 25, enter chamber 21 tangent to the circular wall thereof as clearly shown in Figs. 4 and 5, the latter of which illustrates, by arrows, how the liquid is transformed from and ordinary stream into a whirling column as it enters said chamber. It will also be clear from Fig. 5 that the vortex of the whirling column is in axial alignment with the center of outlet 22, that this relationship is confined to a single element, viz., the rotatable member 14, and is therefore never disturbed by disassembling the nozzle unit. Present day whirling-spray nozzles are composed of several parts and no means are provided therein to assure the above mentioned axial alignment.

In my device, the normal stream upon entering chamber 21 does not encounter projections of any nature to retard its progress and is therefore gradually transformed into a whirling column of liquid by the use of a one-piece element. Particular attention is called to the position of bores 24 and 25, in Fig. 5, relative to passageway 23, they being adjacent the right hand wall thereof; this will permit grinding, or reseating, of tapered member 14, which would cause it to move to the left when again replaced within the casing; by this arrangement bores 24 and 25 would then be moved towards the center of bore 23 and away from said right hand wall. An opening 26, in casing 15, serves only as an exit for the spray stream, in this case, but is used for clearing purposes as will be presently described; that is to say, in this preferred form, the opening 26 does not cooperate in any way to produce the spray, this being accomplished entirely by chamber 21 and associated bores. Another radial bore 27 in member 14 is used only for clearing purposes.

Operation.—The lever 16 is rotated to the horizontal position shown in Fig. 1 which will bring the spray opening 22 in line with exit 26 in the casing, and also cause bores 24 and 25 to form communication between bore 23 and chamber 21, see Fig. 3. The operator then controls the spraying operation by manipulation of the trigger 2 on element 1, thereby permitting liquid, under pressure, to enter the nozzle at will, no further attention to lever 16 being necessary unless clogging occurs.

Figs. 6 and 7 illustrate two different positions of rotatable member 14 during the process of clearing the nozzle when clogging thereof occurs. It will be seen that there are two places subject

to clogging, viz., at the entrance to ports 24 and 25, adjacent passageway 23, and at the chamber-end of spray opening 22, as seen from Fig. 3 showing spraying position of member 14. By manipulation of lever 16, to rotate member 14 into the position shown in Fig. 6, two events take place; first, any foreign matter deposited at the entrance to ports 24 and 25 will be sheared, or wiped, off the periphery of member 14 and the open end of chamber 21 is presented to intake passageway 23 and becomes an inlet to said chamber; second, the normally inlet ports 24 and 25 become outlet ports and the direction of flow through them is now reversed, whereby, any foreign matter may be blown to the atmosphere through exit 26 and chamber 21 will be thoroughly flushed from within. The foregoing operation will immediately clear the passageways in most cases; however, in more severe cases the member 14 may be easily rotated to the position shown in Fig. 7 wherein the open end of chamber 21 becomes exposed to the atmosphere and auxiliary bore 27 serves as an inlet thereto, whereby, chamber 21 may be thoroughly flushed resulting in a quick and efficient operation, under pressure. It will be understood that member 14 is easily rotated and the above operation can be accomplished by one or two rotations thereof with the left hand while trigger 2 is held in open position by the right hand, the entire lapse of time required being a matter of seconds.

The position of member 14 as shown in Fig. 6 may also be utilized for fire fighting, or the like. Ports 24 and 25 may be utilized in this case to provide a non-whirling spray created by the non-parallel relationship thereof, or, slight rotation of member 14 will close port 25 and produce a straight stream for greater distances.

Figs. 8, 9 and 10 illustrate a modified form of nozzle wherein the spray opening is formed in the casing 28, the advantage being that several different sizes of whirling spray openings may be obtained in one nozzle unit, and also, a normal non-whirling stream may be had. In this arrangement of nozzle I prefer to provide a whirl-creating chamber comprising a single bore 28, positioned transverse to the axis of the tapered rotatable member 29, as in the previous case, but this bore has both ends open, except when closed by the casing. At one end of this bore 28 I provide a pair of slots, or grooves 30, 31, Fig. 10, arranged tangent to the wall of said bore and diametrically disposed as shown. It will be clear that liquid entering bore 28 from either groove will create a whirl within said bore. When member 29 is turned to the position shown in Fig. 8 groove 30 is presented to inlet bore 32 and the opposite end of bore 28 is brought into axial alignment with a spray opening 33 of one desired diameter.

Rotation of member 29 to the position shown in Fig. 9 produces a non-whirling stream as bore 28 is brought into alignment with inlet bore 32 and an outlet opening 34 of substantial diameter. Further rotation of member 29 will bring bore 28 into axial alignment with another spray opening 35 of smaller diameter than opening 33, thereby providing a variable spray instantly without a change of parts; it will be clear that this latter position will bring groove 31 into operating relationship with inlet bore 32 and therefore produce a whirling spray again in this case. This type of nozzle may be cleared, after clogging, in the same manner as described in connection with the preferred form.

The use of this whirling-spray nozzle is not, of course, confined to association with a portable unit such as disclosed, but is equally as well adapted to be applied in connection with a stationary outfit, or one wherein a series of nozzles are supplied from one or several pipe lines, such as a spray boom having any number mounted thereon. The great saving of time and labor, with a series of six or more nozzles, can be appreciated in the case of clogging when this improved device is employed; one or two oscillations of lever 16 and the nozzle is free again.

It is also important that all nozzles mounted upon a spray boom be adjustable at their respective threaded portions, where attached to the pipe line, and here again my improved sealing unit is of great advantage and can be applied to any standard unit now in use. While the initial cost of this seal is necessarily more than a leather washer it has proven itself to be cheaper in the end due to the saving of time and liquid; there are no parts to wear, because all friction during adjustment is taken up by the fiber washer and prolongs the life of the rubber washer which merely compresses to form a seal. The nozzle itself is very economical to manufacture, will last for years because there is practically no wear on the parts, and the danger of losing any parts by disassembling of the unit is reduced to the minimum degree.

I claim:—

1. In a whirling-spray nozzle, in combination, a casing member, and a circular element mounted for rotation within the casing member, said element being provided with a circular chamber having an axially disposed outlet and, an inlet passageway entering said chamber in a line substantially tangent to the circular wall thereof, whereby a normal stream of liquid upon entering the chamber will be transformed into a whirling column, for the purpose set forth.

2. A whirling-spray nozzle comprising, in combination, a casing member having an outlet therein, a circular chamber in said casing, an inlet passageway leading to said chamber, and a circular element mounted for rotation within the circular chamber, said element having a diametrically disposed bore arranged for communication with the outlet in said casing and a smaller bore arranged to simultaneously provide communication between the first named bore and the inlet passageway in said casing, said smaller bore being arranged relative to the diametrical bore so that a normal stream of liquid emerging from the former into the latter bore will be transformed into a whirling column to be utilized as a spray.

3. A whirling-spray nozzle comprising, in combination, a casing member having an outlet therein, a circular chamber in said casing, an inlet passageway leading to said chamber, and a circular element mounted for rotation within the circular chamber, a diametrically disposed bore in said circular element having an exit of reduced diameter arranged for communication with the outlet in said casing, a bore arranged tangentially to said diametrical bore to simultaneously provide communication between the diametrical bore and the inlet passageway in said casing, and a normally inoperative bore in said element arranged to provide communication between said diametrical bore and the inlet passageway only when the circular element is rotated to relieve clogging.

4. In a spray nozzle comprising a casing member, a plurality of outlets in the casing member, a circular element mounted for rotation within

- the casing, an inlet passageway in the casing, a diametrically disposed passageway in said element, an inlet passageway in the element arranged tangent to said diametrical passageway, said passageways being arranged to provide a normal stream of fluid, a whirling stream of one volume and another whirling stream of a different volume according to selective rotative positioning of said element.
5. A whirling spray nozzle comprising a casing member having an inlet port and an outlet port therein arranged in non-axial alignment, an elongated circular element mounted for rotation within the casing, a major bore diametrically disposed within said circular element, and a minor bore also disposed within said element arranged substantially tangent to the wall of said major bore and extending therefrom to the periphery of the circular element, the major and minor bores being so arranged relative to said inlet and outlet ports that when the major bore is presented directly to the inlet port the minor bore will be presented directly to said outlet port.

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