April 8, 1941. H. M. REYNOLDS 2,237,842

SPRAYING DEVICE

Filed Dec. 16, 1938 3 Sheets-Sheet 1

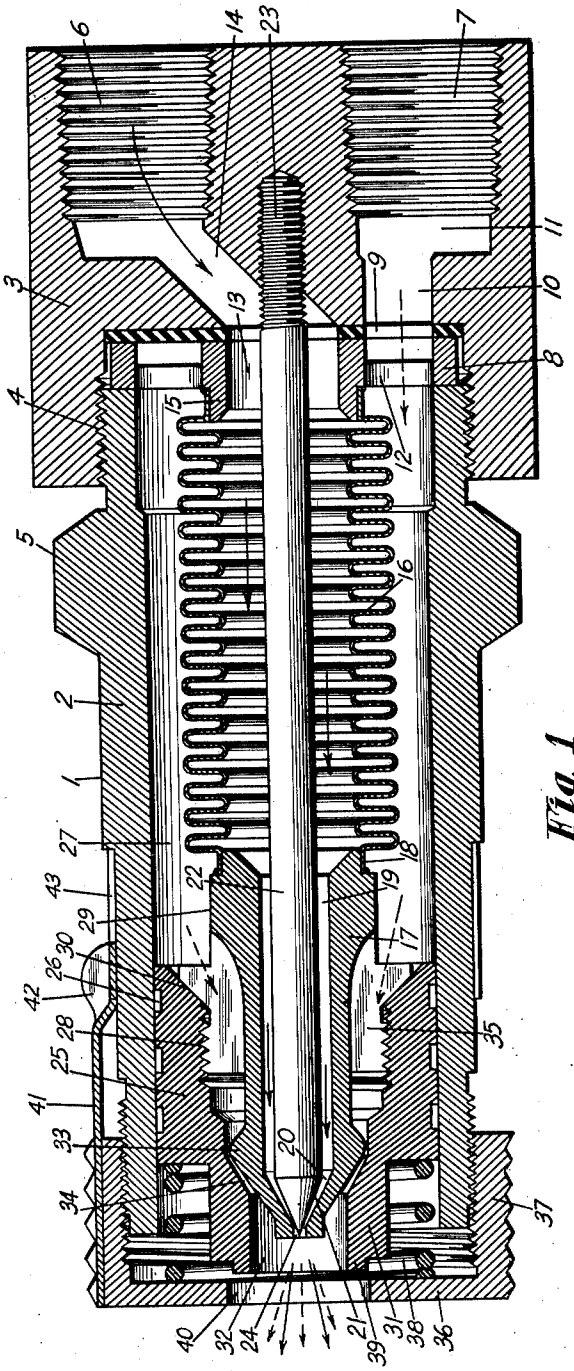


Fig. 1

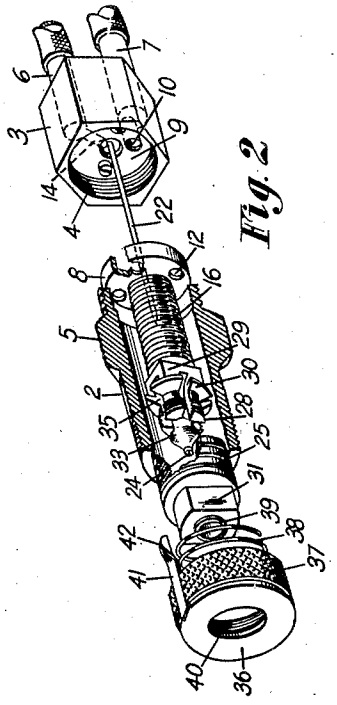


Fig. 2

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April 8, 1941. H. M. REYNOLDS 2,237,842

SPRAYING DEVICE

Filed Dec. 16, 1938 3 Sheets-Sheet 2

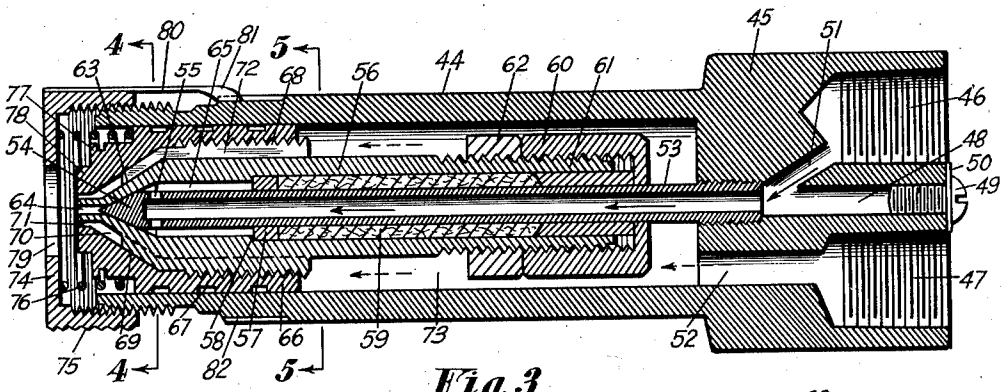


Fig. 3

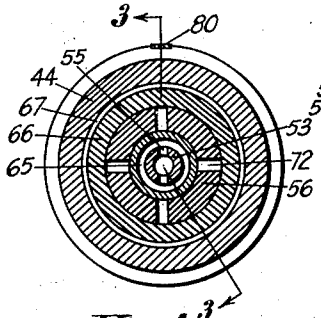


Fig. 4

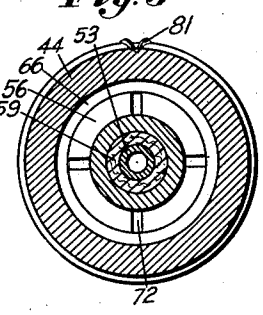


Fig. 5

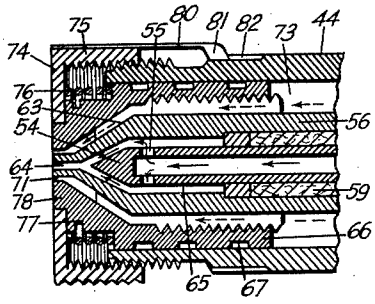


Fig. 6

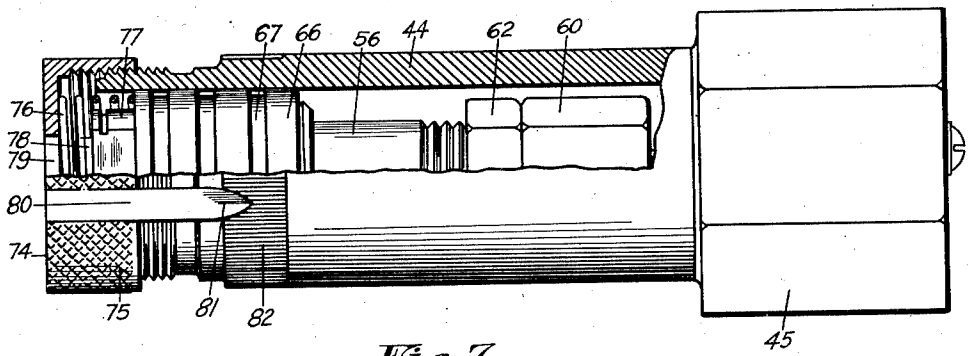


Fig. 7

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SPRAYING DEVICE

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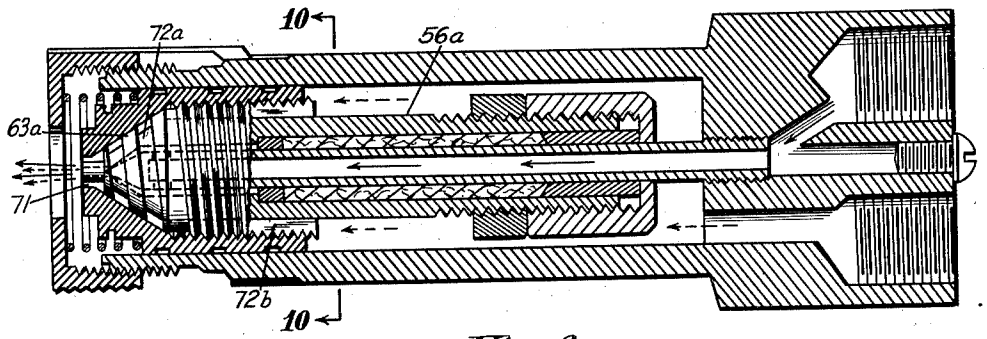


Fig. 8

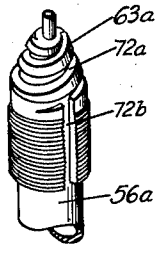


Fig. 9

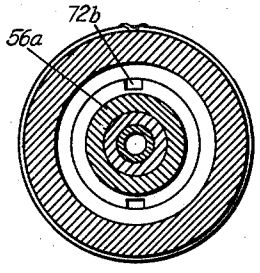


Fig. 10

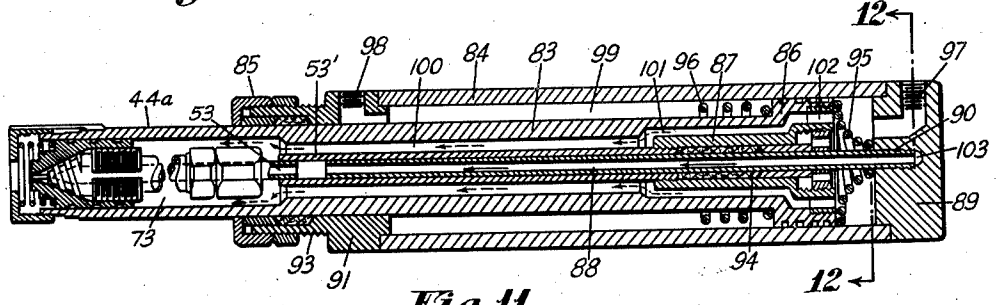


Fig. 11

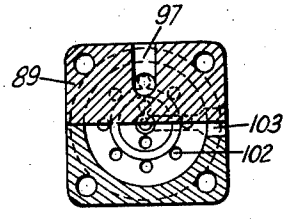


Fig. 12

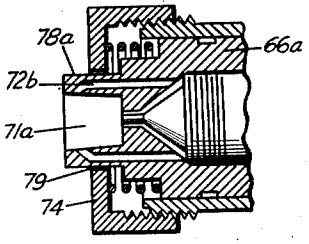


Fig. 13

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Patented Apr. 8, 1941 2,237,842

UNITED STATES PATENT OFFICE

2,237,842

SPRAYING DEVICE

Harry M. Reynolds, Columbus, Ohio

Application December 16, 1938, Serial No. 246,101

3 Claims. (Cl. 299—140)

My invention relates to a spraying device. It has to do, more particularly, with a spraying device for atomizing and projecting into space or against an object a fluid such as oil or water by means of another fluid such as air or gas under pressure.

There have been many different types of spraying devices made in the past for atomizing a liquid by means of air or gas under pressure. However, most of these devices have been of a complicated nature and have not been very compact. Consequently, they are not suitable for certain purposes where the spraying device must operate in a limited space, such as in spraying the interior of molds. Another disadvantage of the prior art devices resides in the fact that most of them must be operated manually. They have not been constructed in such a manner that they could be operated quickly and automatically to atomize and spray the liquid and to interrupt the flow of liquid at the proper intervals. Furthermore, these prior art devices have not been constructed in such a maner that the quantity of the liquid sprayed could be adjusted efficiently and minutely.

In the following description I will refer to the liquid to be atomized and sprayed as oil and to the fluid by means of which it is atomized as air, but it is to be understood that I am not restricted to these particular fluids.

One of the objects of my invention is to provide a simple and compact device for atomizing oil by means of air under pressure, the device being composed of a minimum number of parts so that it can be manufactured cheaply.

Another object of my invention is to provide a spraying device which will operate automatically to atomize and spray the oil and to interrupt the spraying of the oil at the proper intervals.

Another object of my invention is to provide a spraying device which is of such a nature that it may be operated almost instantaneously to spray the oil or to interrupt the spraying of the oil and which is of such a nature that when it is rendered inoperative it will be completely sealed so that there will be no danger of leakage of fluid therefrom.

Another object of my invention is to provide a device of the type indicated which is of such a nature that the amount of oil sprayed therefrom may be minutely adjusted in an easy manner.

Various other objects and advantages will be apparent from the following description.

In its preferred form my invention contemplates the provision of a spraying device having a passage for oil to be atomized and sprayed and a passage for air under pressure which is adapted to atomize and spray the oil at the proper instant. The two passages are so disposed that the stream of oil and the stream of air under pressure will be brought into cooperative relationship at the proper time. The device is operated automatically to atomize and spray the oil by means of supplying the air under pressure thereto and to stop the atomizing and spraying of the oil by means of interrupting the flow of air under pressure to the device. The device is so constructed that it may be easily adjusted to vary the amount of oil sprayed.

The preferred embodiment of my invention is illustrated in the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a longitudinal section taken through a spraying device made in accordance with my invention.

Figure 2 is a view partly in perspective and partly in longitudinal section showing the device of Figure 1 with the parts thereof disassembled.

Figure 3 is a longitudinal section taken along line 3—3 of Figure 4 through a somewhat different form of spraying device made in accordance with my invention.

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

Figure 5 is a transverse section taken substantially along line 5—5 of Figure 3.

Figure 6 is a longitudinal section through the forward portion of the device of Figure 3 showing the parts in operative position.

Figure 7 is a plan view partly broken away of the device of Figure 3.

Figure 8 is a view similar to Figure 3 but showing a slightly different device.

Figure 9 is a detail of a portion of the device illustrated in Figure 8.

Figure 10 is a transverse section taken substantially along line 10—10 of Figure 8.

Figure 11 is a longitudinal section illustrating a spraying device associated with means for projecting it into and withdrawing it from the interior of an article to be sprayed such as a mold.

Figure 12 is a section taken substantially along line 12—12 of Figure 11.

Figure 13 is a section of the forward portion of a slightly modified form of my device.

With reference to the drawings, and particularly to Figures 1 and 2, I have illustrated my

spraying device as comprising a housing 1 which is preferably a machine casting. The housing is made in two pieces, namely, a forward portion 2 of substantially tubular form and an enlarged rear portion 3 of hexagonal form. The rear end of the portion 2 threads into the forward end of the portion 3, as at 4. A nut portion 5 is formed on the rear end of portion 2 to facilitate screwing of the rear end of the member 2 into the forward end of member 3. The member 3 has a threaded socket 6 formed in its rear end for receiving the threaded end of an oil conduit and also has a similar threaded socket 7 formed in its rear end for receiving the threaded end of an air conduit. Between the rear end of the member 2 and the base of the cooperating socket in the member 3 is disposed an annular member 8. A gasket 9 is disposed between member 8 and the inner end of the socket in member 3. The member 8 is of such shape that an annular passageway 10 is formed which is in communication with the bore 11 in which the socket 7 is formed. The member 8 is provided with a plurality of circumferentially spaced openings 12 establishing communication between the passageway 10 and the interior of member 2.

The member 8 has a central aperture 13 which is in communication with the inner end of the bore 14 in which the socket 6 is formed. Surrounding this opening 13 and extending forwardly is a collar portion 15. This collar portion 15 receives the rear end of a bellows member 16 which is suitably secured thereto. This bellows member 16 may be made of copper or any other suitable flexible material. The forward end of the bellows is connected to the rear end of a nozzle member 17 as at 18. This nozzle member is preferably of the shape shown and is provided with a central passageway 19. The forward end of the nozzle member converges to form a nozzle portion as at 20 and forms a valve seat with which the point 21 of a needle member 22 cooperates. This needle member is centrally disposed in the passageway 19 of nozzle 17. It extends rearwardly through the bellows member 16, through opening 13 of member 8 and is threaded into member 3, as at 23. A small outlet passageway 24 is provided in the extreme forward end of the nozzle member 17.

The forward end of the nozzle member 17 is carried by a piston 25 which is adapted to reciprocate longitudinally in the tubular member 2. This piston has a plurality of circumferential grooves 26 formed therein at spaced intervals to aid in preventing escape of air from the annular passageway 27 formed in member 2 around the bellows 16 and nozzle 17. The grooves 26 may receive packing rings, if desired. The piston 25 is of annular form and the nozzle member 17 is disposed centrally therewithin. The interior of the piston is threaded, as at 28, adjacent its rear end for receiving a correspondingly threaded portion on the nozzle member 17. This nozzle member has a nut portion 29 formed on its rear end to facilitate screwing of the nozzle into the piston. The piston and nozzle member are provided with cooperating beveled seats 30 adjacent their rear ends. The forward end of the piston is provided with a reduced portion 31 within which an atomizing chamber 32 is formed. At its forward end the nozzle is provided with the enlarged portion 33 which converges at 20 as previously described. Between the portion 31 of the piston and the enlarged portion 33 of the nozzle is an annular inwardly directed space 34 which communicates at its forward end with the chamber 32. The space 34 gradually increases in width so that the air rapidly expands to its maximum velocity as it passes through this space. The rear end of the space 34 is in communication with longitudinally extending grooves 35 which are formed in the exterior of the nozzle member. These grooves are in communication at their rear ends with the annular space 27. The forward end of the member 2 is threaded on its exterior and receives a cap 36, having a threaded skirt 37. A compression spring 38 is disposed in surrounding relationship to the reduced portion 31 of the piston 25 and is located between the cap 36 and the piston proper. The reduced portion 31 of the piston has a further reduced portion 39 on its forward end which is adapted to be projected into the central opening 40 of the cap when the spraying device is operating. As indicated in Figure 2, the cap is knurled to facilitate rotation. It carries a rearwardly projecting leaf spring 41. This spring 41 has a finger 42 on its inner end which is adapted to bear against a knurled or roughened portion 43 formed adjacent the forward end of member 2 and on the exterior thereof. The cap 36 may be adjusted to different positions on the member 2 and normally will be maintained in adjusted position by means of the spring 42 cooperating with the roughened portion 43.

Oil will be supplied to this device through the line connected to the socket 6, through bore 14, through opening 13, through the bellows 16, through the passageway 19 in nozzle 17 which will be normally closed at its forward end due to the fact that the portion 20 of nozzle 17 will be seated on the point 21 of needle 22. As long as the piston 25 is held in its rearwardmost position by the spring 38, the oil will not escape. The bellows serves as effective means for preventing escape of oil into the air passageways and for preventing passage of air into the oil passageways.

When the device is to be operated to atomize and spray the oil, air under pressure is supplied thereto by means of the line which is connected to the socket 7. Suitable means may be provided for controlling the supply of this air under pressure. The air under pressure passes through the bore 11, around through the passageway 10, forwardly through openings 12 and forwardly through the annular chamber 27 within the member 2. This air will force the piston 25 forwardly unseating the forward end of the nozzle from the point 21 of the needle 22. Part of the air will also flow forwardly through the grooves 35 into the annular space 34 and then into the chamber 32 and outwardly through the opening in the cap. At the same time, the oil will flow between the point 21 and the converging portion 20 of the nozzle, being sucked forwardly through the outlet 24 by the air stream, and the oil will be atomized by the air flowing from the surrounding passageway 34. The air under pressure which moves the piston 25 is sufficient to overcome the resistance of the spring 38 and to compress it. Consequently, as soon as the flow of air under pressure through the device is interrupted, the spring 38 will expand, forcing the converging portion 20 of the nozzle against the point 21 and stopping the flow of oil. When the device is operating, the reduced portion 39 of the piston will project into the opening 40 of the cap. The amount of oil atomized and sprayed from this device may be adjusted easily merely

by turning the cap 31 in order to vary the distance the piston must travel before striking the cap. This in turn will vary the size of the space between the portion 20 of the nozzle and the point 21 of needle 22 when the device is operating.

In Figures 3 to 7, I have illustrated a different form of my spraying device. It comprises a housing 44 which is preferably a machine casting. The main portion of this housing is of substantially tubular form. It has an enlarged rear portion 45 of hexagonal form. The portion 45 has a threaded socket 46 formed in its rear end for receiving the threaded end of an oil conduit and also has a similar threaded socket 47 formed in its rear end for receiving the threaded end of an air conduit. A centrally disposed bore 48 is also formed in the portion 45 of the housing. The rear end of this bore 48 is normally closed and sealed by means of a screw 49 which is threaded in the rear end thereof and a cooperating gasket 50. The inner end of the socket 46 is in communication with the bore 48 by means of a passageway 51. The inner end of the socket 47 is in communication with the interior of the housing 44 by means of a passageway 52.

The forward end of the bore 48 receives the threaded rear end of an oil tube or needle 53. This tube or needle 53 extends forwardly through the tubular portion of the housing 44 substantially throughout the length thereof. It is centrally disposed therewithin. The forward end of the tube 53 is closed and has a point 54 formed thereon. However, transverse outlet openings 55 are provided in the wall of the tube 53 just behind the point 54. A tube 56 is disposed in surrounding relationship to the tube 53 and is of somewhat larger diameter than the tube 53. A spacer washer 57 is provided between the tube 53 and the tube 56 and a shoulder 58 formed on the interior of tube 56 adjacent its forward end limits forward movement of this washer 57. Behind the washer 57 packing 59 is disposed in the space between the tubes 53 and 56. The rear end of the tube 56 is threaded on its exterior and receives a threaded packing nut 60. This nut 60 abuts a sleeve 61 which extends into the annular space between the tubes 53 and 56 and will serve to compress the packing 59. A lock nut 62 is disposed on the tube 56 for locking the gland 60 in adjusted position. As will be apparent hereinafter, the packing 59 will serve to prevent oil from escaping rearwardly along the tube 53 and air from entering the oil passageways.

The forward end of the tube 56 converges to form a nozzle portion, as at 63, and forms a valve seat against which the point 54 of tube 53 normally seats itself. A small outlet passageway 64 is provided in the extreme forward end of the tube 56. It will be noted that there is an annular chamber or space 65 formed between the forward end of the tube 56 and the tube 53 in front of the washer 57.

The forward end of the tube 56 is carried by a piston 66 which is adapted to reciprocate longitudinally in the tubular or cylindrical portion of the housing 44. This piston has a plurality of circumferential grooves 67 formed therein at spaced intervals, which may receive packing rings, to aid in preventing escape of air from the interior of the housing 44 past the piston. The piston receives the enlarged exteriorly threaded portion 68 of the tube 56. It will be noted that the forward portion of the piston 66 has an inner surface which converges as indicated at 69 and an annular space 70 is formed between the converging portions of the piston and the correspondingly converging portions 63 of the tube 56. A small annular passageway 71 surrounds the outlet passageway 64 of tube 56. A plurality of longitudinally extending grooves 72 are formed in the exterior of the threaded enlarged portion 68 of tube 56 in order to connect the space 73 behind the piston with the annular passageway 70.

The forward end of the housing 44 is threaded on its exterior and receives a cap 74 having a threaded skirt 75. A compression spring 76 is disposed between the cap 74 and the piston 66. The spring 76 surrounds a reduced portion 77 of the piston. The piston has a further reduced portion 78 which is adapted to be projected into the central opening 79 in the cap when the spraying device is operated. As indicated in Figure 7, the cap is knurled to facilitate rotation. It carries an inwardly projecting leaf spring 80. This spring has a finger 81 on its inner end which is adapted to bear against a knurled or roughened portion 82 formed adjacent the forward end of the housing 44 and on the exterior thereof. The cap 74 may be adjusted to different positions on the housing and will be normally maintained in adjusted position by means of the spring 80 cooperating with the roughened portion 82.

Oil will be supplied to this device through the line connected to the socket 46, through passageway 51, bore 48, to the tube 53. It will pass through this tube and will pass outwardly therefrom through the openings 55 into the annular space 65. The converging nozzle portion 63 of tube 56 will normally be seated on the point 54 of tube 53 by means of spring 76. This spring will normally force the piston 66 and the tube 56 which is carried thereby, rearwardly so that the portion 63 of tube 56 will seat on the point 54 of tube 53. It will be apparent that the unit comprising piston 66, tube 56 and packing nut 60 and associated parts may reciprocate in the housing 44 relative to the tube 53.

Thus, normally when the device is inoperative the oil will be in the tube 53 and in the annular chamber 65 surrounding its forward end. However, it cannot escape.

When the device is to be operated to atomize and spray the oil, air under pressure is supplied thereto by means of the line which is connected to the socket 47. Suitable means may be provided for controlling the supply of this air under pressure. The air under pressure passes through the passageway 52 into the chamber 73 within the tubular portion of the housing 44. This air will force the piston 66 forwardly unseating the nozzle portion 63 of the tube 56 from the point 54 of the tube 53, as indicated in Figure 6. Part of the air will flow forwardly through the grooves 72 into the annular space 70 and then outwardly through the annular passage 71. At the same time the oil will flow between the point 54 and the portion 63 of tube 56 and will be sucked outwardly through the outlet 64 by the air stream. As it flows from the outlet 64, it will be atomized by the air flowing from the surrounding passageway 71. The air under pressure which moves the piston 66 is sufficient to overcome the resistance of the spring 76 and to compress it. Consequently, as soon as the flow of air under pressure to the device is interrupted

the spring 76 will expand forcing the nozzle portion 63 of tube 56 against the point 64 and stopping the flow of oil. When the device is operating, the reduced portion 78 of the piston will project into the opening 79 of the cap. The amount of oil atomized and sprayed from the device may be easily adjusted merely by turning the cap 74 in order to vary the distance the piston 66 and associated parts must move before the piston strikes the cap.

The nozzle portion 63 of the device just described is so formed that the spray will be merely directed forwardly. However, this nozzle may be varied in the manner illustrated in Figure 8 so that the air will spin as it issues from the nozzle in order that there will be a bushier spray or a spray that covers an angle of 360 degrees in a direction perpendicular to the axis of the spray.

Thus, the device illustrated in Figure 8 is exactly the same as that illustrated in Figure 3 with the exception that the nozzle portion 63*a* of the tube 56*a* has a spiral groove 72*a* formed in its exterior. The air will pass through the longitudinal grooves 72*b* and then through the spiral groove 72*a*. It will be caused to swirl as it passes through the outlet 71 and will consequently produce a swirling spray. The device of Figure 1 may also be provided with this type of nozzle portion, if desired.

In Figure 13 I show a slightly different form of nozzle structure for obtaining a different type of spray. In this instance the piston 66*a* is provided with a reduced extension 78*a* which always projects through the opening 79 in the cap 74. The piston 66*a* and the extension 78*a* are provided with auxiliary jets 72*b* which are directed inwardly at their outer ends. A chamber 71*a* is formed within the outer end of extension 78*a*. It will be apparent that when the piston is moved forwardly, in addition to the main stream of air and oil ejected from the nozzle, there will be auxiliary streams of air which pass forwardly through the jets 72*b*. These auxiliary jets are disposed diametrically opposite each other and will serve to flatten the main stream producing a fan shape spray. Different arrangements of auxiliary jets may be provided for producing sprays of different shape.

In Figure 11 I have illustrated means which I preferably provide for passing my spraying device into and withdrawing it from an object to be sprayed such as the interior of a mold. The spraying device shown is practically the same as that illustrated in Figures 3 to 8. However, it may be the same as that shown in Figure 1 or Figure 3. The housing of the spraying device is changed somewhat.

The housing 44*a* does not have the enlarged hexagonal portion at its rear end but instead is continued rearwardly to form a long tubular portion 83 which constitutes a hollow piston rod. This rod 83 projects into a cylinder 84. A packing gland 85 is provided at the forward end of the cylinder 84. The rod 83 and the spraying device are thus mounted for reciprocation relative to the cylinder 84. The rear end of the rod 83 has a piston 86 formed thereon. This piston fits tightly within the cylinder 84.

The rear end of the tube 53 of the spraying device is threaded, brazed or soldered into the forward end of a tube 53'. This tube 53' has its rear end threaded, brazed or soldered into a tubular portion 87 which is disposed within the piston rod 83 and piston 86 and is a part thereof. A tube 88 is disposed within the tube 53' and is free to slide therein. This tube has its rear end threaded, brazed or soldered into the head 89, as at 90. This head 89 closes the rear end of cylinder 84. A similar head 91 is provided at the forward end of the cylinder but is provided with an opening through which the rod 83 passes. The packing gland 85 is mounted on a threaded extension 92 of the head 91. A packing gland 94 is provided within member 87 around the tube 88. The piston 86 is provided with a coil spring 95 at its rear side which serves as a cushion to prevent the piston from striking the head 89. A compression spring 96 is provided in front of the piston 86 and in surrounding relationship to the rod 83 to prevent the piston from striking the head 91.

An inlet 97 for air pressure is provided in the head 89. An inlet 98 for air under pressure is provided in the head 91. It will be noted that there is an annular chamber 99 formed between piston rod 83 and cylinder 84. It will also be noted that there is an annular chamber 100 formed between piston rod 83 and tube 53'. The forward end of this last chamber is in communication with the chamber 73 of the spraying device while the rear end of chamber 100 is in communication with the space behind piston 86 by means of passageway 101 and holes 102 shown in Figures 11 and 13.

Air under pressure is normally supplied through the inlet 98 to the chamber 99. This will keep the piston 86 in its rearwardmost position as indicated in Figure 11. If the device is being used for spraying molds, it will be mounted over the mold cavity and the piston 86 will normally be in its uppermost position. When it is desired to spray the mold cavity, air is supplied under pressure through the inlet 97. The pressure of this air may be the same as that supplied through the inlet 98. Suitable means may be provided for supplying and interrupting the supply of air through the inlet 97. The air entering through opening 97 will pass into the cylinder 84 behind the piston 86. Since it will act on a greater area of the piston than does the air within the chamber 99, it will force the piston 86 outwardly. At the same time the air will flow through openings 102, passage 101, chamber 100 and into the chamber 73 of the spraying device and will operate the spraying device in exactly the same manner as previously described.

At the time that the piston 86 moves outwardly, the rod 83 which carries the spraying device slides outwardly through the forward end of the cylinder so as to project the spraying device into the mold cavity. When the rod 83 moves outwardly, the tube 53' moves therewith and slides longitudinally on the tube 88. The tube 88 is stationary since it is threaded into the head 89. The tube 53' and the tube 88 will always telescope with each other. The tube 88 receives the oil through an oil supply passageway 103 which is provided in the head 89.

When the spraying operation is completed, the supply of air through the inlet 97 is stopped and the air is permitted to exhaust through said opening. This will permit the air in chamber 97 to force the piston 86 rearwardly to the piston indicated in Figure 11. This will cause the spraying device to be withdrawn from the mold. Furthermore, the spraying operation will be simultaneously interrupted.

It will be apparent that with this device the spraying head may be caused to enter the mold and simultaneously the spraying operation will be initiated. When the spraying operation is

completed, the spraying device will be withdrawn from the mold cavity and simultaneously the spraying operation will be stopped.

From the above description it will be apparent that I have provided a device having many advantages. The device is very simple and compact. It can be used where space is limited. It will operate automatically to atomize and spray the oil and to interrupt the spraying of the oil at the proper intervals.

In the preceding description, I refer to oil as the fluid being atomized and air as the fluid which is used to atomize the oil. Also in the claims I use these terms. However, it is to be understood that I am not limited to oil and air but intend to cover other fluids which might be used.

Having thus described my invention, what I claim is:

1. A spraying device of the type described comprising a substantially cylindrical housing, a stationary needle member centrally disposed within said housing, a nozzle member mounted on said needle member and being free to move longitudinally thereon, said nozzle member having a portion which fits tightly within said housing and serves as a piston, said nozzle member having a tapered discharge orifice through which oil to be atomized is adapted to be discharged, said needle member extending to the forward end of said housing and having a tapered portion normally projecting into the tapered discharge orifice of said nozzle member and contacting with the surface thereof so that said orifice will be normally closed, said nozzle member having a passageway associated therewith for conducting oil into said nozzle member, said nozzle member having a passageway therein for receiving air under pressure and directing it adjacent said discharge orifice to atomize oil discharged through said orifice, means for supplying air under pressure to the interior of said housing, the air under pressure acting on said piston portion of said nozzle to move the nozzle forwardly on said needle and permitting the oil to issue through said discharge orifice, a portion of the air also passing through said passageway in said nozzle, a cap member threaded on the forward end of said housing and having an opening through which the fluid passes, said cap member having a portion contacted by said nozzle member when it moves to its forwardmost position, a compression spring disposed between said cap member and said nozzle member for resisting movement of said nozzle member on said needle member, and means for maintaining said cap in any position to which it is rotated to limit the movement of said nozzle member to a preselected degree and consequently to produce a predetermined spacing of the cooperating tapered surfaces of the nozzle member and the needle member.

2. A spraying device of the type described comprising a nozzle, a movable nozzle member disposed within said housing adjacent the forward portion thereof and having a piston portion thereon fitting tightly within the housing, said movable nozzle member having a discharge orifice through which oil to be atomized is adapted to be discharged, a stationary needle member mounted within the housing and having a portion which normally contacts with a cooperating surface of said orifice so that the needle will close said discharge orifice, said needle member having a passageway for oil associated therewith, means for supplying oil to said passageway, said nozzle member being provided with a discharge orifice for air which is disposed adjacent said oil discharge orifice so that it will atomize any oil which issues through said orifice, means for supplying air under pressure into said housing behind the piston portion so that it will act on said piston portion to move the nozzle member relative to said stationary needle and will permit the oil to be discharged through said oil discharge orifice and to cause air to be discharged through said air discharge orifice in the nozzle member to atomize the oil, a compression spring disposed within said housing and normally pressing against the forward end of said piston portion to resist movement of said nozzle member relative to said needle member, and means for varying the extent of movement of said nozzle member relative to said needle member to vary the space between the surface of said nozzle orifice and the cooperating portion of said needle and consequently to vary the amount of oil sprayed from the device, said means comprising an adjustable stop member with which said nozzle member contacts when it reaches its forwardmost position.

3. A spraying device of the type described comprising a substantially cylindrical housing, a stationary needle member centrally disposed within said housing, a nozzle member disposed in surrounding relationship to said needle member and being free to move longitudinally thereof, said nozzle member having a piston portion formed thereon which fits tightly within said housing and serves as a piston, said nozzle member having a discharge orifice through which the oil to be atomized is adapted to be discharged, said needle member extending to the forward end of said housing and normally projecting into the discharge orifice of said nozzle member so that said orifice will be normally closed, a bellows member disposed in surrounding relationship to said needle, said bellows being connected at its forward end to said nozzle member and being anchored at its rear end to said housing, means for supplying oil into said bellows, said nozzle member having a passageway therein for receiving air under pressure and directing it adjacent said oil discharge orifice to atomize oil discharged through said orifice, means for supplying air under pressure to the interior of said housing behind said piston portion so that it will act on the piston portion to move the nozzle member relative to said stationary needle forwardly permitting the oil to issue through said oil discharge orifice and causing air to be discharged through said discharge orifice in the nozzle member to atomize the oil, a cap member threaded on the forward end of said housing and having an opening through which the fluid passes, a compression spring disposed between said cap member and the forward end of said piston portion for resisting movement of said nozzle member relative to said needle member, and means for maintaining said cap member in any position to which it is rotated to limit the movement of said nozzle member to a preselected degree.

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