

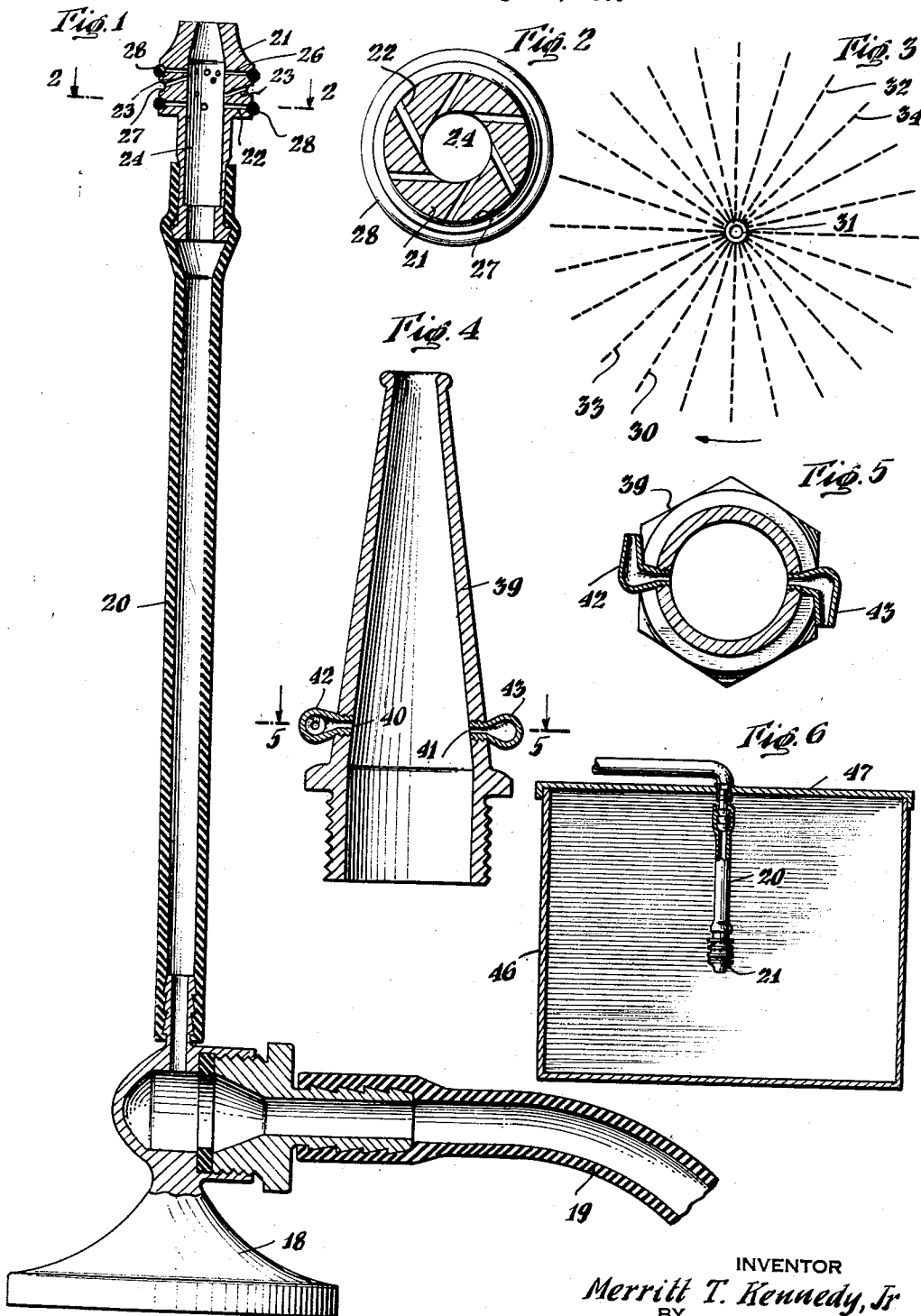
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WRIGGLER TYPE FLUID DISTRIBUTOR

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WRIGGLER TYPE FLUID DISTRIBUTOR

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4 Claims. (Cl. 239—229)

This invention relates to a novel distributor of a fluid and especially liquid, and acts either as a sprinkler or as a cleaner of the interiors of containers. More in particular, the invention pertains to an improved distributing device for spraying, or directing a spray of a fluid, or directing a substantially solid stream of the fluid in a very definite direction, or directions, to form a pattern, as for example, for cleaning the whole inner surface, or surfaces, of a selected or bounded area, or for applying liquid over an area.

The improved distributing device has many important specific uses from acting as a water sprinkler to cleaning the holds of oil tankers, to cleaning milk trucks, and milk containers, and wine casks and wine containers, and for cleaning other containers, and to putting out fires in rooms or cellars that can only be reached through small openings. These are a few of the desirable uses of this novel distributing device.

One of the features of this invention is the provision of an improved fluid distributor or distributing device that is composed of several cooperating parts that cause the fluid passing out of the distributor to flow in predetermined directions and to cover a selected area in a predetermined manner.

A further feature of the improved distributor is to provide a novel distributing device with a holding part, a flexible part, and a nozzle that is perforated at predetermined places to cause the device to move in predetermined paths so that the sprinkling fluid or water, or a cleaning fluid will pass out of the device in varied paths, usually forming a definite pattern.

Another feature of this novel distributor is to provide in the nozzle or head thereof, a series of relatively small openings through which some of the fluid or liquid passes, thus causing the distributor to flex and move in predetermined paths. These perforations are positioned to create definite patterns of movement of the free end of the distributor under various pressures of the fluid or water passing through the distributing device.

Still another feature of this improved invention is the positioning of the perforations in the nozzle or head or guide element so that there will be a series of definite temporary twists or torques developed in the flexible part or element or tubing of the distributor.

A further feature of the invention is the provision of a novel type of distributor that provides for exits of small amounts or streams of the fluid being distributed so as to cause the nozzle or guide element to whip in various paths under varying conditions of pressure of the fluid flowing through the distributor. Usually, the small exits or streams are relatively small in size or diameter in respect to the diameter of the stream which leaves the main opening of the nozzle or guide member.

Another feature of the invention is the provision of definite small channels in the nozzle in positions to cause a temporary torque or twisting of the flexible part of the distributor about its longitudinal axis, and to form these small channels for that purpose in a non-radial

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direction and preferably tangentially to the main opening in the nozzle. When a nozzle is not used the small channels may be found in the flexible part near its free end.

Other features and advantages of the invention herein will be noted by reading the detailed description below and by referring to the drawings, wherein:

Fig. 1 is a sectional view of the distributor;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, showing the relatively small holes or openings as preferably tangentially positioned in respect to the main opening in the nozzle;

Fig. 3 is a diagrammatic view of the paths that the distributor nozzle takes during its operation when the fluid is under a predetermined pressure;

Fig. 4 is a sectional view of a water or cleaning nozzle, preferably having two exits in the side thereof for receiving directional pieces which cause the nozzle to whip in a definite manner;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4; and

Fig. 6 shows the fluid distributor mounted within a container for the purpose of cleaning the inner walls of the container.

Referring now to these drawings disclosing structures in which the invention is incorporated, an improved fluid distributor preferably comprises a holder 18 for receiving a fluid supply inlet hose 19, and a flexible tube or element 20, which is preferably an elastic one made of rubber or other suitable elastomeric material, and which has a guide member or nozzle 21 affixed thereto. The nozzle 21 is provided with a main central opening 24 and preferably with three series of peripheral torque applying discharge passageways or holes 22, 23, and 26.

The type of structure shown in Fig. 1 preferably constitutes a water sprinkler. The base 18 is sufficiently heavy to successfully support the flexible element 20 and the nozzle 21 during the various flexing of the distributor.

The flexible element 20 is of such length and elasticity that it may oscillate back and forth about its support 18 by the action of the main stream passing through and discharging from said element, through the main central opening of the nozzle 21. The peripheral channels or holes are formed in the nozzle 21 so that they are non-radial and are preferably tangential to the main opening 24 in the nozzle. These holes or channels may be formed at any particular angle to the radii of the nozzle 21, and usually are in the same horizontal plane as shown in Fig. 2, but may be positioned at angles to a horizontal plane as shown by the positions of the holes 23 in Fig. 1. These holes 22 and 23 are preferably of uniform diameter and positioned at substantially the same tangential angles to the main channel 24 of the guide element, thus balancing the effect of each hole or channel. The functioning of the streams of the fluid passing through these holes causing the torque twist in the flexible element 20, proceeds in a definite manner so long as there is no particular change in the positioning of the holes or channels 22 or 23 nor in the changes in their diameters. It will be noted, however, that various diameters and positioning of the channels 22 and 23 may cause the distributor to flex in various ways in operation.

The number of channels in the head, nozzle or guide element 21 also controls the twisting torque and thereby the throw of the nozzle 21. In order to create selective variations in the amount of twist in the flexible member 20, according to the pattern of distribution desired, it is preferable that the guiding element or nozzle 21 have a number of series of peripheral holes, any series of which can be blocked off. It is preferred that the number of holes in each series vary and that the number of holes in the series decrease as the outer end of the nozzle 21 is

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approached. In the specific example illustrated in Figs. 1 and 2, the series of holes 22 extend in a plane at right angles to the axis of the nozzle 21 and consist of eight holes, the series of holes 23 are inclined in relation to the axis of the nozzle and consist of six holes and the series of holes 26 extend in a plane at right angles to the axis of the nozzle and consist of four holes.

It is preferred at each plane where the channels or holes 22, 23 and 26 are formed that there be grooves 27 for receiving O-rings 28 for closing the outlet of the holes in any horizontal plane. These O-rings 28 are desirably of flexible material, such as neoprene (chloroprene) to permit them to be slipped off any set of holes by merely twisting them and moving them axially out of hole blocking position. As shown in Fig. 1, two O-rings 28 are provided and they close off the upper and lower channels 22 and 26, leaving the channels 23 exposed. If desired, however, one or both of these O-rings may be removed, thus allowing the complete number of channels to permit the exit of the fluid. Variation in the number of holes through which the fluid passes usually causes the distributing device to whip or throw in different patterns and thereby causes different patterns of the cleaning stream on the container walls, or causes the water spray of the sprinkler to cover an area with different distributions.

In the general operation or functioning of this particularly preferred distributing device shown in Fig. 1 as a water sprinkler and with the two O-rings 28 included, it has been found that the distributing device or sprinkler may operate in various patterns of movements due to the number of holes or channels 22, 23 and/or 26 that are used and due to the length of the flexible element 20 and sometimes by reason of the elasticity of the flexible element 20, and in some instances due to the water pressure set up.

While the exact operation of this particular water sprinkler device is not susceptible of definite description and theory at this time, it has been found that the device operates by throwing or whipping the nozzle or guiding element 21 in various patterns due to the pressure of the water flowing through the main central passageway of the flexible element 20 and the nozzle 21, and due to the torsional effect on the flexible element resulting from the pressure of the water passing through the peripheral holes. Without these peripheral holes, the flexible element 20 will oscillate back and forth in the same plane when liquid flows through its central passageway and is discharged from its axial opening. The peripheral holes cause the flexible element 20 to change its planes of oscillation.

In actual use it has been found that with a low water pressure that the main channel 24 will throw a stream of water substantially vertical with small streams issuing out of the channels 22, 23 and/or 26. As the water or fluid pressure increases, the guiding element or nozzle 21 will tend to apparently revolve in a small diameter circle and this diameter will increase to a point as the water or fluid pressure increases.

With greater pressure of the water or cleaning fluid, there will be torque created in the flexible member 20, and the flexible member and the nozzle or guide member will oscillate in definite paths about the holder 18 as a pivot point, the planes of oscillation changing around 360° to cover an area of this extent.

From actual experience, when the water or cleaning fluid pressure is high, the nozzle and the flexible member will throw back and forth in a substantially vertical plane. However, the water issuing through channels 22, 23 and/or 26 will create a torque in the flexible member 20 and there will be a twist which will only be balanced by the strength of the flexible member and then the flexible member and the nozzle or guide element will "jump" back to its normal position and in this throw it will go beyond the normal vertical position and carry

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through the substantially vertical plane so that the nozzle will throw toward the ground in the opposite direction. This procedure may be best explained by reference to Fig. 3, wherein a throw of the flexible member and the nozzle element will move through a substantially vertical plane 30 away from the center 31 until the nozzle throw is somewhat toward the ground and then in moving back upwardly it comes to the substantially vertical position 31, and as it is understood, at this time the flexible member 20 and the nozzle 21 will snap back to their normal position but will also be thrown to the other side of the vertical as represented by line 32 in Fig. 3.

Normally, it would be expected that the throw would be back and forth in the substantially vertical planes represented by lines 30 and 32. However, it is found that the various throws of the flexible member 20 and the nozzle 21 move into different substantially vertical planes which may be represented by lines 33 and 34 and the device will continue to travel in the various vertical planes shown in Fig. 3 of the drawing, and will continue in a clockwise direction around 360° if the holes 22, 23 and/or 26 are in the direction indicated, or in the opposite direction if the direction of these holes is reversed, until it again gets around to planes 30 and 32. The reason for the sprinkling of the water or fluid and for causing the flexible member and the nozzle or guide element 21 to move in the various vertical planes is not apparent at this time, but actual experience has shown that there is such a movement and distribution of the liquid.

Specific example

A specific example of a distributing device which will operate has a rubber tube 20 of neoprene, its unsupported section from the holder 18 to the nozzle 21 being about ten inches long. This rubber tube 20 has an inside diameter of $\frac{3}{8}$ inch, an outside diameter of $\frac{5}{8}$ inch and an elasticity count of 50 durometer, as measured on a Shore "A" instrument. The nozzle 21 is about $1\frac{1}{2}$ inches from the end of the tube to the tip of the nozzle and its central passage 24 at its discharge end is about $\frac{1}{16}$ inch in diameter.

In the specific example, the series of holes 22 consists of eight holes equally spaced and extending tangentially from the center passage 24 in a plane at right angles to the axis of the nozzle 21. These holes are about $\frac{1}{16}$ inch diameter. The intermediate series of holes 23 consists of six equally spaced holes of $\frac{1}{16}$ inch diameter extending in directions inclined with respect to the axis of the nozzle 21 and tangential to the central passageway 24 thereof and the end series of holes 26 consists of four equally spaced holes of $\frac{1}{16}$ inch diameter extending tangentially from the central passage 24 in a plane at right angles to the axis of the nozzle 21. The greater the water pressure used, the faster the oscillating operation of the device. Pressure derived from the ordinary city water supply system is sufficient to impart useful oscillations and variations in the planes of these oscillations. Faster oscillations or larger devices can be operated by employing water supplied from a pump.

The amplitude of oscillation of the tube 20 is controlled by the pressure of the liquid, the length of the rubber tube, the flexibility and resiliency of the rubber tube and the size of the discharge end of the main passage 24 in the nozzle 21. The angular distance or the angular increment between strokes is controlled by the number of lateral holes 22, 23 and 26 and the sizes of these holes.

Referring now to Figs. 4 and 5, a fire hose nozzle 39 is shown in modified form by having openings 40 and 41 formed therein for receiving directional pieces 42 and 43 bent so that small streams will issue from them and cause the nozzle to twist so that the hose to which the nozzle is attached will twist and cause the nozzle to throw usually in the paths represented in Fig. 3. Such an operation is particularly desirable in fire fighting work

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where heretofore it has been very difficult to properly throw water toward the walls of a cellar room, or of a closed room in a house, or storage vault, or the like. This type of use for fire fighting purposes is most helpful and satisfactory.

While the device shown in Fig. 1 may be considered as a lawn sprinkler, the functioning of this device by turning it upside down and placing it in a closed container 46, is shown in Fig. 6, where it functions in substantially the same manner as heretofore described and will quickly clean the walls of the container. The particular container 46 has a cover 47 for receiving and holding the pivot point of the cleaner.

By varying the pressure of the cleaning fluid and using the preferred number of channels 22, 23 or 26, in the guide member 21, different cleaning patterns of the throw of the streams of the fluid may be obtained, and the cleaning of the walls of the container may be accomplished in a very short time, or a longer time, depending upon the material which has been in the container.

It will be particularly noted that this type of device and its functioning and operation will permit relatively quick cleaning of milk trucks, and other like milk containers, as well as being usable in the wine industry for cleaning containers used in that industry. The device in its functioning may also be used in many other places.

From the foregoing description it will be noted that the distributing device performs in a very satisfactory manner and may be varied by reason of fluid pressure and by the use of the number of openings or channels 22, 23 and 26 to give different spraying when using it as a water sprinkler or for cleaning enclosures or containers or for particular use in fire fighting apparatus. It will further be noted that the patterns of movements of the streams of the fluid thrown may be changed easily and thus obtaining desired results in a very short time.

It will further be noted that the device is simple of construction, and of few number of parts, which are quickly and easily assembled.

It will be understood that various modifications and changes may be made in the preferred form of the invention herein, and such modifications and changes are to be understood as part of this invention, as outlined in the following claims.

The invention claimed is:

1. A liquid distributor comprising a holder for receiving a stream of liquid, a nozzle for said liquid, means for oscillating said nozzle about the holder back and forth and comprising a tube attached at one end to said holder and at the other end to said nozzle and flexible and resilient enough to swing about said holder, said nozzle having a main central passage communicating at its inlet end with the hollow of said tube and provided at its

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other end with a central outlet sufficiently large to cause said nozzle to discharge a main central stream and said tube to oscillate about said holder back and forth upon the passage of liquid of sufficient pressure through said tube independently of any other outlets from said central passage, and means for imparting to said tube torsion causing the planes of oscillation of the tube and in turn of the nozzle to vary by successive angular increments upon the passage of liquid of said pressure through said tube, and including a plurality of peripheral non-radial discharge passageways in said nozzle extending from said main central passage transversely to said main central passage to project streams transverse to the main stream and having diameters smaller than that of said central outlet.

2. A liquid distributor as described in claim 1, wherein said discharge passageways are arranged in different series, and wherein means are provided for selectively blocking any of said series of passageways according to the liquid distribution pattern desired.

3. A liquid distributor as described in claim 1, wherein said discharge passageways are arranged in different series at different levels along the nozzle, the outlet ends of the passageways of each series extending in a plane at right angles to the axis of said nozzle, and wherein means are provided for selectively blocking any of said series of passageways according to the liquid distribution pattern desired and comprising a ring adapted to be removably fitted around the nozzle against the outlet ends of one of said series of passageways to block liquid discharge from the latter series of passageways.

4. A liquid distributor as described in claim 3, wherein the passageways of each of said series have their outlet ends extending into a channel on the periphery of the nozzle in a plane at right angles to the axis of the nozzle, and said ring is a resilient O-ring adapted to be slipped axially on and off any channel.

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