Jan. 22, 1924. 1,481,327

H. R. MERSELES

METHOD AND APPARATUS FOR DISTRIBUTING LIQUIDS

Filed Nov. 4, 1922 2 Sheets-Sheet 1

Fig. 1.

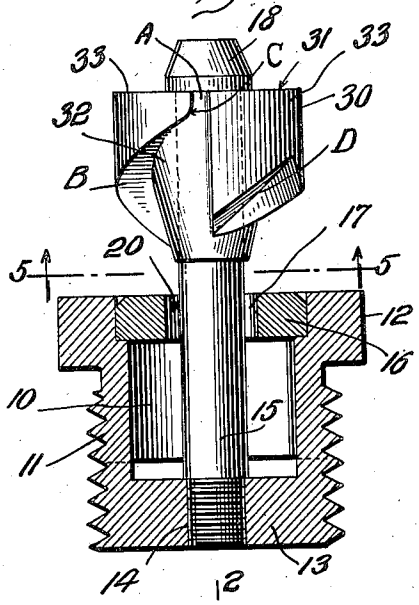
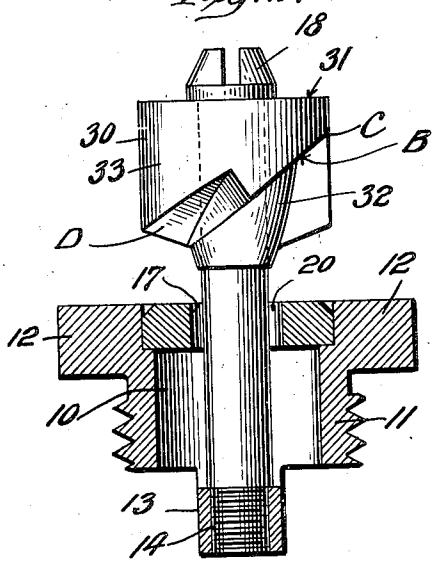


Fig. 2.



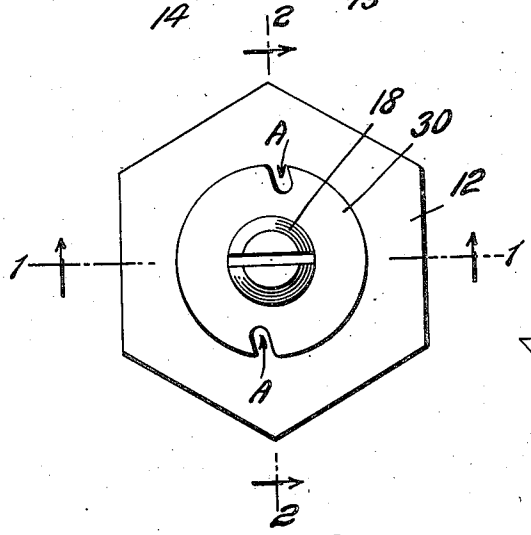
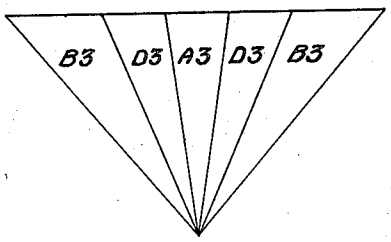


Fig. 3.

Fig. 6.



Inventor.
Henry R. Merseles
By his Attorney
Robert W Byerly

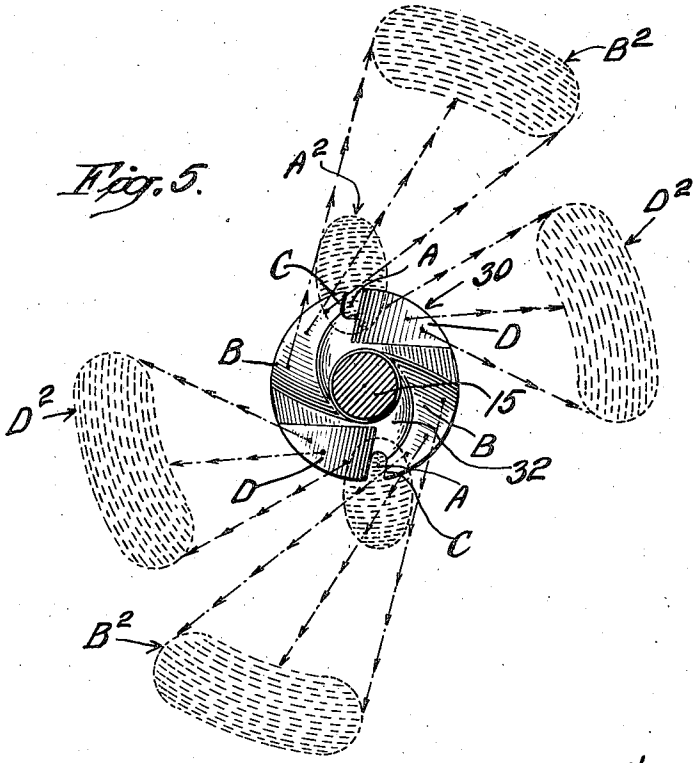
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Fig. 5.



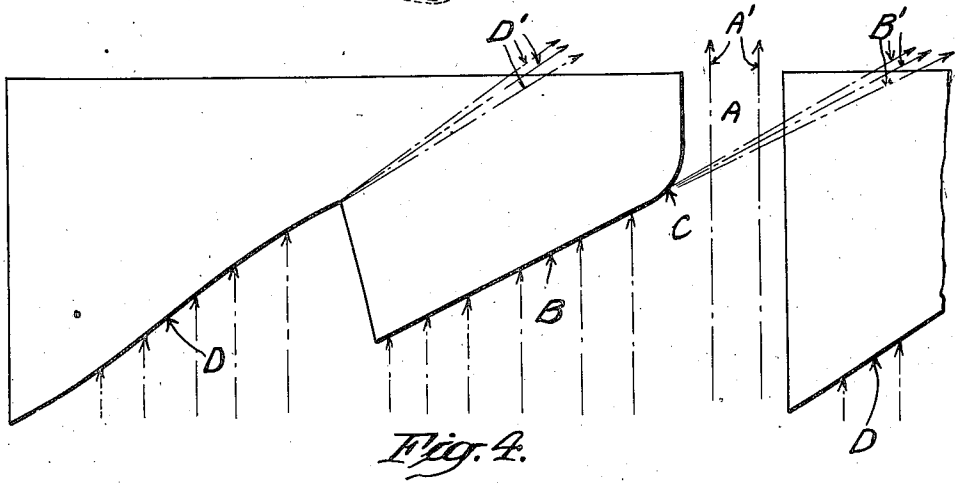


Fig. 4.

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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR DISTRIBUTING LIQUIDS.

Application filed November 4, 1922. Serial No. 599,138.

To all whom it may concern:

Be it known that I, HENRY R. MERSELES, a citizen of the United States, residing at Bronxville, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods and Apparatus for Distributing Liquids, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a method and apparatus for distributing a liquid and aims to form a solid cone of spray with the use of a small flow of liquid.

Solid cones of spray have heretofore been formed by manipulating a solid stream of liquid within the body of a nozzle. The successful operation of such nozzle, however, necessitates a comparatively large flow of liquid. For distributing rinsing fluid in washing machines, where the fluid is frequently supplied from domestic water pipes, and for other purposes, such nozzles cannot be used owing to the small flow of liquid available.

The present invention aims to distribute a small flow of liquid in a uniform solid cone of spray. In accordance with the invention, the liquid is first formed into a hollow stream. The hollow stream may be made very thin so that the liquid is projected forcibly even when only a small flow of the liquid is available. The hollow stream of liquid is then converted into a solid cone of spray by permitting portions of it to proceed axially while deflecting other portions of it outwardly at different angles to its axis.

In carrying out the invention in the manner which I now consider most desirable, the liquid is discharged through a narrow annular orifice in the body of a nozzle so that it takes the form of a hollow cylindrical stream. This stream is then converted into a solid cone of spray by means of a rotary deflecting member or spinner located outside the body of the nozzle and provided with passages and deflecting surfaces which permit a portion of the hollow cylindrical stream to proceed axially while deflecting other portions of the stream outwardly at different angles. In order that the force of the hollow cylindrical stream may be utilized as effectively as possible to rotate the spinner, the deflecting surfaces of the spinner are made up of line elements substantially perpendicular to the axis of the spinner. This results in deflecting portions of the hollow cylindrical stream tangentially outward as distinguished from radially outward, and causes the spinner to rotate under the impulse of the portions of the stream which strike the deflecting surfaces. The deflecting surfaces and passages are so arranged that when the spinner rotates the hollow cylindrical stream is transformed into a substantially uniform solid cone of spray.

In the accompanying drawings I have illustrated a spray nozzle which may be used for carrying out the method of the invention and which is a specific embodiment of the apparatus features of the invention. In the drawings:—

Fig. 1 is a side view of the nozzle showing the body of the nozzle sectioned on the line 1—1 of Fig. 3;

Fig. 2 is a side view of the nozzle showing the body of the nozzle sectioned on the line 2—2 of Fig. 3;

Fig. 3 is an outer end view of the nozzle.

Fig. 4 is an enlarged diagrammatic developed side view of the spinner indicating the angles at which the liquid is deflected by the different parts of the spinner;

Fig. 5 is an inner end view of the spinner showing the bolt on which the spinner is mounted sectioned on the line 5—5 of Fig. 1 and indicating the portions of a plane in front of the nozzle upon which liquid is projected from different portions of the spinner when the spinner is held stationary; and

Fig. 6 is a diagrammatic side view of the spray formed by the nozzle when the spinner is rotating.

The body 10 of the nozzle includes a hollow cylindrical portion or pipe 11 which is externally threaded in order that it may be screwed into the outer end of a liquid delivery pipe. To facilitate this the outer end of the pipe 11 is provided with an external flange 12 which is formed for the engagement of a wrench. A bar 13 extends diametrically across the inner end of the pipe 11 and contains a tapped hole 14 located centrally in the pipe 11. The inner end of a bolt 15 is screwed into the hole 14 so as to

retain the bolt axially in the pipe 11. The bolt 15 projects beyond the outer end of the pipe 11. In the outer end of the pipe 11 is seated a disk 16 containing a central hole 17 which surrounds the shank of the bolt 15. The space between the periphery of the hole 17 and the shank of the bolt 15 forms a narrow annular orifice 20 through which the liquid forced into the inner end of the pipe 11 emerges in the form of a hollow cylindrical stream.

The deflecting member or spinner 30 is rotatably mounted on the bolt 15 outside of the body 10. The outer end 31 of the spinner bears against the head 18 of the bolt 15. It may be noted that when the nozzle is directed upwardly, as shown in the drawings, the spinner is not brought against the head of the bolt except when it is forced upwardly by the stream of water projected against it through the orifice 20.

The spinner 30 is provided with a core portion 32, and with outer portions 33 which are formed to provide the deflecting surfaces hereinafter described. The entire spinner is usually formed of a single piece of metal so that the outer portions 33 are integral with the core portion 32. The core 32 is shaped so as to deflect the hollow cylindrical stream which merges from the orifice 20 as little as possible. In the form illustrated, the core 32 tapers outwardly to a slight extent towards the outer end of the spinner. This serves to spread the hollow stream of liquid, which surrounds the bolt 15 at the inner end of the spinner, sufficiently to permit it to pass clear of the head 18 of the bolt. This arrangement simplifies the construction of the nozzle by making it possible to use the outer surface of the shank of the bolt as the inner wall of the annular orifice 20. If the inner periphery of the orifice is made of a circumference as large as that of the head 18 of the bolt, the core 32 may be made cylindrical. In the form illustrated, it is so near cylindrical that the portions of the hollow cylindrical stream which encounter only the surface of the core are not deflected away from the axis to any material extent but proceed in a substantially axial direction.

The outer portions 33 of the spinner are spaced so as to provide two passages A which are approximately parallel to the axis of the spinner. Each of the outer portions 33 is formed to provide a deflecting surface BC and a deflecting surface D. Both sets of deflecting surfaces are made up of line elements substantially perpendicular to the axis of the spinner. To facilitate manufacturing the spinner by means of dies, however, the deflecting surfaces may be outwardly inclined to a slight extent.

Each deflecting surface BC comprises a substantially helical surface B which is inclined at a large angle to the axis of the spinner and an outwardly curved surface C which terminates at one of the passages A.

Each of the deflecting surfaces D is inclined to the axis of the spinner at a lesser angle than the surfaces B. Each deflecting surface D is substantially straight throughout its length. Each is widest at its inner end and tapers off to a point at its outer end.

The operation of the nozzle may best be explained by first describing its operation when the spinner 30 is held stationary. As seen in the developed view, Fig. 4, portions of the cylindrical stream discharged through the orifice 20 pass through the passages A and proceed in directions substantially parallel to the axis of the spinner as indicated by the arrows A^1. Other portions of the cylindrical stream encounter the deflecting surfaces B and are deflected outwardly in directions tangential to the stream and inclined to the axis of the spinner, as indicated by the arrows B^1 in Fig. 4. Still other portions of the cylindrical stream encounter the deflecting surfaces D and are deflected tangentially outward at a lesser angle to the axis as indicated by the arrows D^1 in Fig. 4. A little of the stream is directed outwardly from the curved surfaces C at about the same angle as the liquid which strikes the deflecting surfaces D. The shaded areas A^2, B^2 and D^2 in Fig. 5 indicate the portions of a plane in front of the nozzle which receive liquid from the passages A and the deflecting surfaces B and D respectively, when the spinner is held stationary. It will be seen from this figure that the portions of the plane against which the liquid is projected from different portions of the spinner are so arranged that when the spinner rotates the liquid will be distributed very uniformly over a circular area upon the plane.

The impulse of the liquid upon the deflecting surfaces B and D causes the spinner to rotate. Owing to the motion of the deflecting surfaces during the rotation of the spinner, the portion of the stream which encounters each surface is deflected from the axis to a slightly less extent than it would be if the spinner were held stationary. The form of spray produced when the spinner is allowed to rotate is shown in Fig. 6. The liquid encountering the deflecting surfaces B is distributed in the outer zone B^3. The liquid encountering the deflecting surfaces D, as well as the small quantity of liquid which is thrown off by the curved surfaces C, is distributed in the zone D^3. The liquid from the passages A is distributed in the central zone A^3. These three zones make up a substantially uniform solid cone spray.

The solid cone of spray may be formed with a very small flow of liquid as the annular orifice 20 is sufficiently narrow to project the liquid forcibly even when the flow

is small. It will be understood that the width of the annular orifice may be proportioned to the flow of liquid available, so as to obtain a hollow stream having sufficient force to rotate the spinner, no matter how small the flow of liquid available may be. Thus by first forming a hollow stream and then deflecting portions of this stream, I have provided a method and means by which a very small flow of liquid may be converted into a solid cone of spray.

What is claimed is.

1. A method of distributing liquid, which comprises forming the liquid into a hollow stream, and forming said hollow stream into a solid cone of spray by deflecting different portions of the hollow stream outwardly from the axis of the stream through different acute angles while permitting another portion of the stream to proceed axially.

2. A method of distributing liquid, which comprises forming the liquid into a hollow stream, and forming said hollow stream into a solid cone of spray by permitting a portion of the stream to proceed axially and deflecting other portions of the stream tangentially outward at different acute angles to the direction of flow of the hollow stream, while continuously changing the portions of the stream thus deflected.

3. A spray nozzle, comprising a body having an annular orifice adapted to discharge a hollow cylindrical stream of liquid, and a spinner coaxial with the orifice and providing a passage permitting a portion of the hollow stream to proceed substantially axially and deflecting surfaces located in the path of the remaining portions of the hollow stream and inclined to deflect different portions of the stream outwardly in directions substantially tangential to the hollow stream and at different acute angles to the direction of flow of the hollow stream.

4. A spray nozzle comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with passages substantially parallel to its axis and with deflecting surfaces having curved outer portions terminating at said passages, and other deflecting surfaces tapering outwardly to points at the periphery of the spinner.

5. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with passages substantially parallel to its axis, and a plurality of deflecting surfaces inclined to the axis of the spinner, some of said surfaces terminating at said passages, and others of said surfaces terminating at points of the periphery of the spinner.

6. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with passages substantially parallel to its axis and with deflecting surfaces having curved outer portions terminating at said passages, and other deflecting surfaces tapering outwardly to points at the periphery of the spinner, some of said deflecting surfaces being made up of line elements approximately perpendicular to the axis of the spinner.

7. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with passages substantially parallel to its axis, and a plurality of deflecting surfaces inclined to the axis of the spinner and made up of line elements approximately perpendicular to the axis of the spinner, some of said surfaces terminating at said passages, and others of said surfaces terminating at points of the periphery of the spinner.

8. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with passages substantially parallel to its axis and with deflecting surfaces having inner portions inclined to the axis of the spinner at a large angle and outwardly curved outer portions terminating at said passages, and other deflecting surfaces at a lesser angle to the axis and straight throughout their length, all of said deflecting surfaces being made up of line elements substantially perpendicular to the axis of the spinner.

9. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and provided with convexly curved deflecting surfaces made up of line elements approximately perpendicular to the axis of the spinner and located in the path of liquid issuing from said annular orifice.

10. A spray nozzle, comprising a body having an annular discharge orifice, and a spinner outside said body, coaxial with said orifice, and formed to provide open passages substantially parallel to its axis and convexly curved deflecting surfaces terminating at such passages.

11. A spray nozzle, comprising a body having an annular discharge orifice formed to project a hollow cylindrical stream, and a spinner outside said body, coaxial with said orifice, and consisting of a core, and spaced outer portions projecting from said core, located so as to provide passages between them substantially parallel to the axis, and formed so as to provide deflecting surfaces made up of line elements approximately perpendicular to the axis of the spindle.

12. A spray nozzle, comprising a hollow body having a circular opening, a bolt secured in said body and having a smooth

cylindrical shank projecting through the center of said opening and a head at the outer end of the shank, and a spinner rotatably mounted on said bolt outside said body and comprising a core portion tapering outwardly from a diameter substantially equal to that of the shank of the bolt to a diameter as great as that of the head of the bolt, and outer portions projecting from said core portion, spaced to provide passages approximately parallel to the axis of the spinner, and formed to provide deflecting surfaces inclined at different angles to the axis of the spinner.

In testimony whereof I have hereunto set my hand.

HENRY R. MERSELES.