June 12, 1962 C. N. HANDBERG 3,038,668

SPRAY NOZZLE

Filed Nov. 14, 1960 2 Sheets-Sheet 1

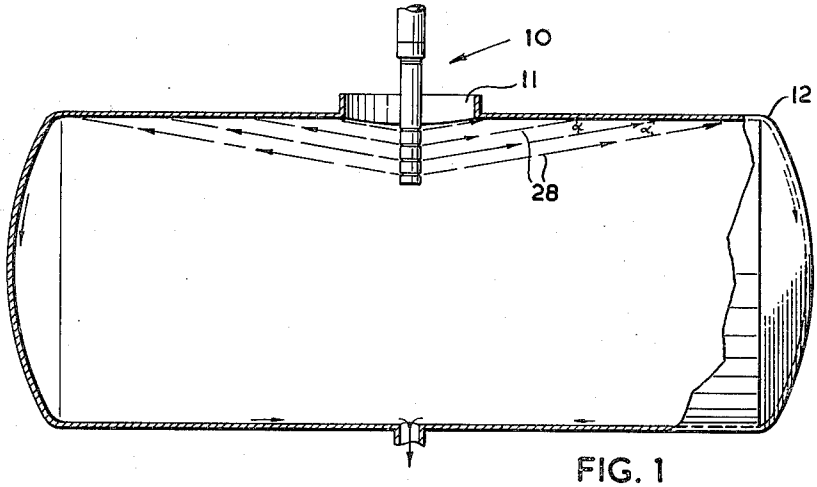


FIG. 1

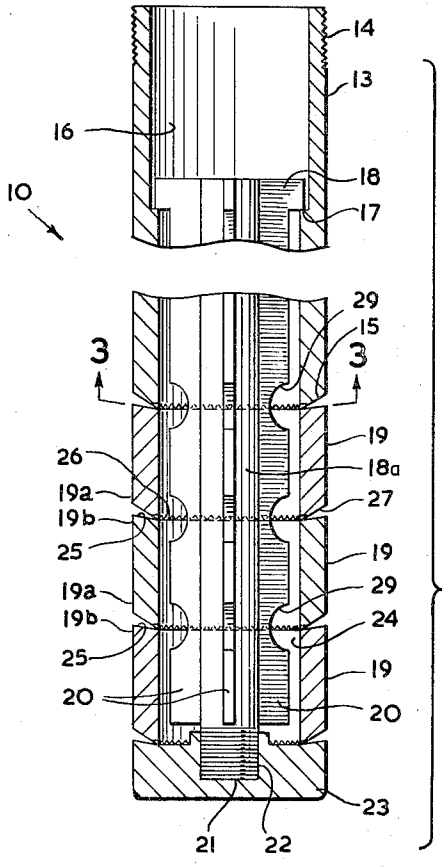


FIG. 2

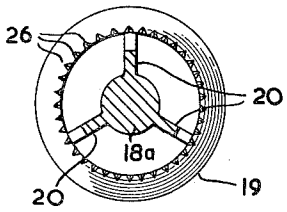


FIG. 3

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SPRAY NOZZLE

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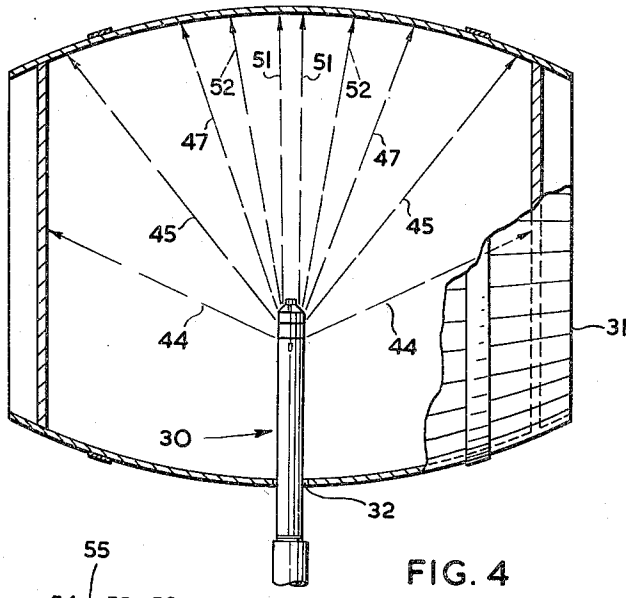


FIG. 4

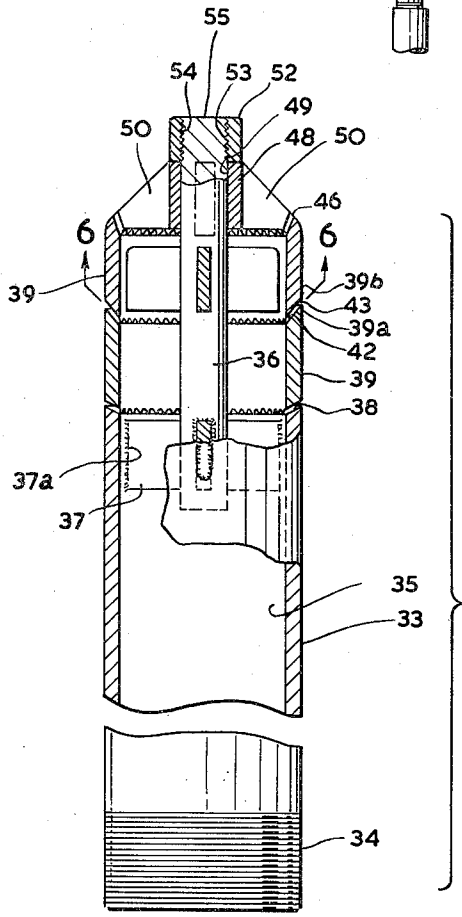


FIG. 5

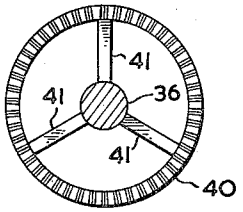


FIG. 6

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SPRAY NOZZLE

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1 Claim. (Cl. 239—554)

This invention relates to spray nozzles and, in particular to a spray nozzle which is adapted to be inserted within a tank, a barrel or the like for the purpose of directing a spray of fluid on the walls of the tank for cleaning purposes.

The present invention has as its object the provision of a spray head which is simple, economical, and compact in construction and which provides for the efficient cleaning of the inside walls of tanks, barrels and the like.

The invention will be described by way of example with reference to two embodiments illustrated in detail in the accompanying drawings in which like reference numerals denote like parts in the various views and in which:

FIGURE 1 is a side elevation view, partly in section, of a spray head inserted in a tank;

FIGURE 2 is a detail section view of the spray head of FIGURE 1;

FIGURE 3 is a section view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a side elevation view, partly in section of a modified form of the spray head inserted in a barrel;

FIGURE 5 is a detail longitudinal section view of the spray head of FIGURE 4, and

FIGURE 6 is a section view taken along line 6—6 of FIGURE 5.

Referring now to the drawings, and in particular, to FIGURE 1, it will be seen that the spray head indicated generally by the reference character **10** is inserted through a manhole opening **11** in a large tank **12**. This tank may be of any form of construction and for any purpose and the nature of the tank is not involved in the present invention.

Turning now to FIGURE 2, the spray head **10** illustrated in FIGURE 1 is shown in longitudinal section and may be seen to comprise a collar **13** which is threaded as at **14** so as to provide means whereby it may be connected to a source of fluid under pressure. Normally, the fluid will be water which may be used alone or, if desired, in combination with a detergent.

The collar portion **13** terminates in an end surface **15** and the collar is provided with a cylindrical bore constituting a flow passage for the fluid which is to be ejected from the nozzle. The internal cylindrical bore **16** of the collar **13** is provided with an inwardly extending shoulder **17** constituting an abutment with which is engaged a spider **18** secured to the end of a longitudinally extending stud **18***a* which extends away from the collar **13** and which is arranged coaxially with the bore **16** and secured in the collar by means of the engagement between the spider **18** and the projection **17**.

A plurality of short, open ended, cylindrical members **19** are provided surrounding the stud and lying in end-to-end abutting relationship as may be seen in FIGURE 2. The short cylindrical members **19** are held in coaxial relationship with one another by means of at least three longitudinally aligned and radially extending fins **20** which are carried by the stud **18***a* as may be more clearly seen in FIGURE 3.

The end **21** of the stud **18***a* is provided with external screw threads **22**. An end cap **23** is provided with an internaly threaded socket so that it may be applied, attached, and adjusted relative to the end **21** of the stud **18***a* as shown in FIGURE 2.

From FIGURES 2 and 3 it will be seen that each of the short, open ended, cylindrical members **19** is hollow and is provided with a central, entirely unobstructed, cylindrical bore **24** which is of substantially the same diameter as the cylindrical bore **16** of the collar **13**. The fins **20** provide for longitudinal flow of fluid within the spray head constituted by the short, open ended, cylindrical members **19** and, accordingly, fluid under pressure entering the collar **13** may pass longitudinally through the entire extent of the head shown in FIGURE 2 without interruption.

Returning now to FIGURE 2, it will be seen that the adjacent ends **19***a* and **19***b* of each pair of short cylindrical members **19** carry complementary means to define a multiplicity of separate circumferentially spaced spray nozzles each capable of directing a fluid spray radially of the spray head. The complementary means may be seen, in FIGURES 2 and 3, to constitute a smooth surface of revolution **25** carried by one end **19***b* of each cylindrical member **19** and, a multiplicity of closely spaced radially aligned notches **26** carried by the adjacent end **19***a* of an adjacent short cylindrical member **19**.

The abutting notched and smooth surfaces **19***a* and **19***b* respectively define a multiplicity of separate, circumferentially spaced nozzles which will each direct fluid radially of the spray head in a spray form. The smooth surface of revolution **25** is a conical surface and the end **19***a* carrying the notches **26** is also a conical surface with the notches **26** being formed in the radially inner edge of the conical surface where it makes an acute angle with the adjacent internal wall of the short cylindrical member **19**. Thus, each notch **26** defines a nozzle adjacent the inner wall of the short cylindrical member **19** in which it is formed and the spray is directed outwardly to the nozzles through a diverging annular space between the smooth surface of revolution **25** on end **19***b* of the short cylindrical member **19** and the surface **27** on end **19***a* of the adjacent short cylindrical member **19**.

Returning now to FIGURE 1, it will be seen that there are shown arrows **28** which indicate the paths taken by the spray ejected from the spray head **10**.

It has been found that, in many instances, a more efficient cleaning of the walls of the tank **12** may be achieved if the spray is directed against the walls at an oblique angle with a small angle of incidence as shown at α in FIGURE 1. The reason for this is apparently that the fluid, impinging upon the surface of this angle, flushes the contaminating material off the surface whereas if the spray were directed against the surface at right angles or nearly at right angles, there would be a tendency for the spray to drive the contaminating material into more intimate contact with the surface rather than to flush it away.

As a result, the apical angle of the conical smooth surface of revolution **25** associated with the end **19***b* of each short cylindrical member **19**, will be selected so as to provide for the desired angle of incidence of the spray with respect to the wall of the tank which it is desired to clean. Clearly, tanks of different internal configuration will require different angles in the conical surfaces **25** and, as a result, a spray head **10** which is suitable for cleaning a tank such as that shown in FIGURE 1 may not be suitable for cleaning a different size, shape or type of tank. Similarly, it may be desirable that the apical angle of conical surface **25** which is associated with one short cylindrical member **19** may be different from the apical angle of the conical surface of revolution **25** associated with the next adjacent short cylindrical member **19**. Alternatively, conditions may dictate that all of the apical angles of all of the conical surfaces of revolution **25** in any given spray head may be the same.

In order to ensure that a substantially uniform spray is distributed from each of the multiplicity of circumferentially spaced spray nozzles throughout 360° in a generally radial plane, each of the fins **20** may be provided with a recess **29** over that portion of its length which lies adjacent the notches **26** internally of the spray head. Thus the edges of the fins **20** do not block off some of the notches **26** as would otherwise be the case.

Referring now to FIGURES 4, 5 and 6, an alternative embodiment of the invention will now be described.

In FIGURE 4, a spray nozzle **30** is indicated generally as being inserted within a barrel **31** through an opening **32** which is normally provided in such containers. The spray nozzle illustrated in FIGURE 4 embodies the principle of the invention as does the embodiment illustrated in FIGURES 1, 2 and 3. This spray nozzle, as shown in FIGURE 5, is provided with a collar **33** which is provided with screw threads as at **34** whereby the collar **33** may be connected to a suitable source of fluid under pressure. The collar **33** is provided with an internal cylindrical bore **35** which constitutes a flow passage for fluid entering the spray nozzle and the collar is provided with a longitudinal stud **36** which extends away from the collar **33** coaxially therewith. The stud **36** may, in this case, be conveniently secured within the collar by means of a supporting spider **37** which may be secured to stud **36** by any convenient means such as, for example, welding. The radially outer ends **37***a* of the arms of the spider **37** are also welded to the collar **33** and a convenient method of achieving this is to provide a series of apertures in the wall of the collar at those points which are contacted by the ends **37***a* of the web **37**. These holes may then subsequently be plugged by welding material which will adhere the ends **37***a* of the webs **37** to the wall of the collar **33** while, at the same time, plugging the holes to provide for a fluid tight flow passage within the hollow bore **35**.

The collar **33** terminates at point **38** and, surrounding the stud **36**, there are provided a plurality of short cylindrical members **39** each of which is provided, at one end, with a smooth surface of revolution and, at the other end, with a series of generally radially aligned notches as illustrated in FIGURE 6 by reference character **40**. The short cylindrical members **39** may be held concentric and coaxial with the stud **36** by means of a suitable spider or fin arrangement comprising members **41** as shown in FIGURE 6 or, alternatively, they may be held concentric with one another and with the stud **36** on the collar **33** by means of the mating engagement between the adjacent conical surfaces which will be described below.

As may be seen in FIGURE 5, the end **39***a* of the short cylindrical member **39** is provided with a conical surface of revolution bearing reference character **42**. The end **39***b* of the next adjacent short cylindrical member **39** is provided with a similar conical surface **43** which, in addition, is provided with generally radially aligned notches bearing reference character **40** as shown in FIGURE 6. The crests of the notches **40** lie on a conical surface which is similar to the conical surface **42** and the mating engagement between these two conical surfaces provides for the proper centering and coaxial alignment of the two adjacent short cylindrical members **39**.

It will be observed that the apical angle of the conical surface **38** with which the collar **33** ends, differs from the apical angle of the conical surface **42** which defines the end of the first short cylindrical member **39**. Thus, as seen in FIGURE 4, the arrows **44**, indicating the spray which issues from the multiplicity of spray nozzles defined by the surface **38** and the adjacent notches **40** in short cylindrical member **39**, emerge from the spray head **30** at a different angle from that of the arrows **45** indicating the spray issuing from the nozzles defined by the surfaces at the opposite end of the short cylindrical member **39**. Similarly, the third set of circumferentially spaced spray nozzles indicated in FIGURE 5, at **46**, may also be seen to follow a different path as is indicated by the arrows bearing the reference character **47** in FIGURE 4.

In the embodiments shown in FIGURE 5, the end cap corresponding to cap **23** in FIGURE 2 is shown at **48** and it is provided with a non-threaded aperture **49** coaxial therewith which merely is a sliding fit over the end of the stud **36**. The end cap **48** is, in this instance, provided with a conical surface adapted to mate with the conical surface defining the end of the adjacent cylindrical member **39** and this conical surface is provided with a multiplicity of generally radially aligned notches in accordance with those shown in FIGURE 6, to provide for a multiplicity of circumferentially arranged spray nozzles. In addition, it is provided with a plurality, preferably four, although any other number would be suitable, of radially aligned notches shown in FIGURE 5 by the reference character **50**. These slots **50** provide for a jet or spray of fluid to issue in a direction generally axially of the spray head **30**. The fluid issuing from the slots **50** will be seen to cover the range lying between arrows **52** and **51** in FIGURE 4.

Finally, the end cap **48** is secured in position by a nut **52** which is internally threaded at **53** to engage external threads **54** carried by the end **55** of the stud **36**.

As mentioned, the cleaning of different types of containers may require spray nozzles of differing spray characteristics, all of which may be provided by the invention disclosed herein. Thus as shown in FIGURE 1 a spray nozzle having a spray pattern as indicated by the arrows **28**, is suitable for the purpose of cleaning the type of tank shown here, a tank such as a barrel may be more readily cleansed by a spray nozzle having a spray pattern such as that indicated by the arrows **44** to **52** inclusive, in FIGURE 4.

Both embodiments, however, provide for the definition of a multiplicity of separate, circumferentially spaced nozzles by the same means and accordingly, the present description is intended to be construed as illustrative of the invention rather than limiting. Minor modifications of the structure, proportion, and arrangement of parts is contemplated within the spirit of the invention and the scope of the sub-joined claim.

What I claim as my invention is:

A spray head comprising a collar provided with means whereby it may be connected to a source of fluid under pressure, and having an internal bore constituting a fluid flow passage, a stud extending away from the collar and arranged coaxially with the bore and having a spider secured to one end and extending radially therefrom whereby said one end may engage an inwardly extending abutment in the bore and be retained therein, a plurality of short, open ended, cylindrical members surrounding the stud and held coaxially therewith by means of at least three radially extending fins on the stud, the short cylindrical members lying in end-to-end abutting relationship, each cylindrical member having an internal diameter substantially equal to the diameter of the bore in the core, a cap carried by the end of the stud remote from the collar and carrying means to engage the stud remote from the collar whereby the cap may be adjusted longitudinally of the stud, the cap having a surface adapted to tightly engage the adjacent end surface of the adjacent cylindrical member and, by adjustment longitudinally of the stud, to move each of the short cylindrical members into tight, contacting, end-to-end abutment with one another and with the collar, one end surface of each short cylindrical member being a smooth surface of revolution coaxial with the bore and the other end surface being conical, the apex pointing away from the collar, the conical surface having a multiplicity of closely spaced radially aligned notches in its radially inner edge, the cylindrical members being arranged so that the notched end of one member seats on that end surface of an adjacent cylindrical member which is a smooth surface of revolution thereby to define a multiplicity of separate,

circumferentially spaced spray nozzles each to direct a fluid spray radially of the spray head.

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