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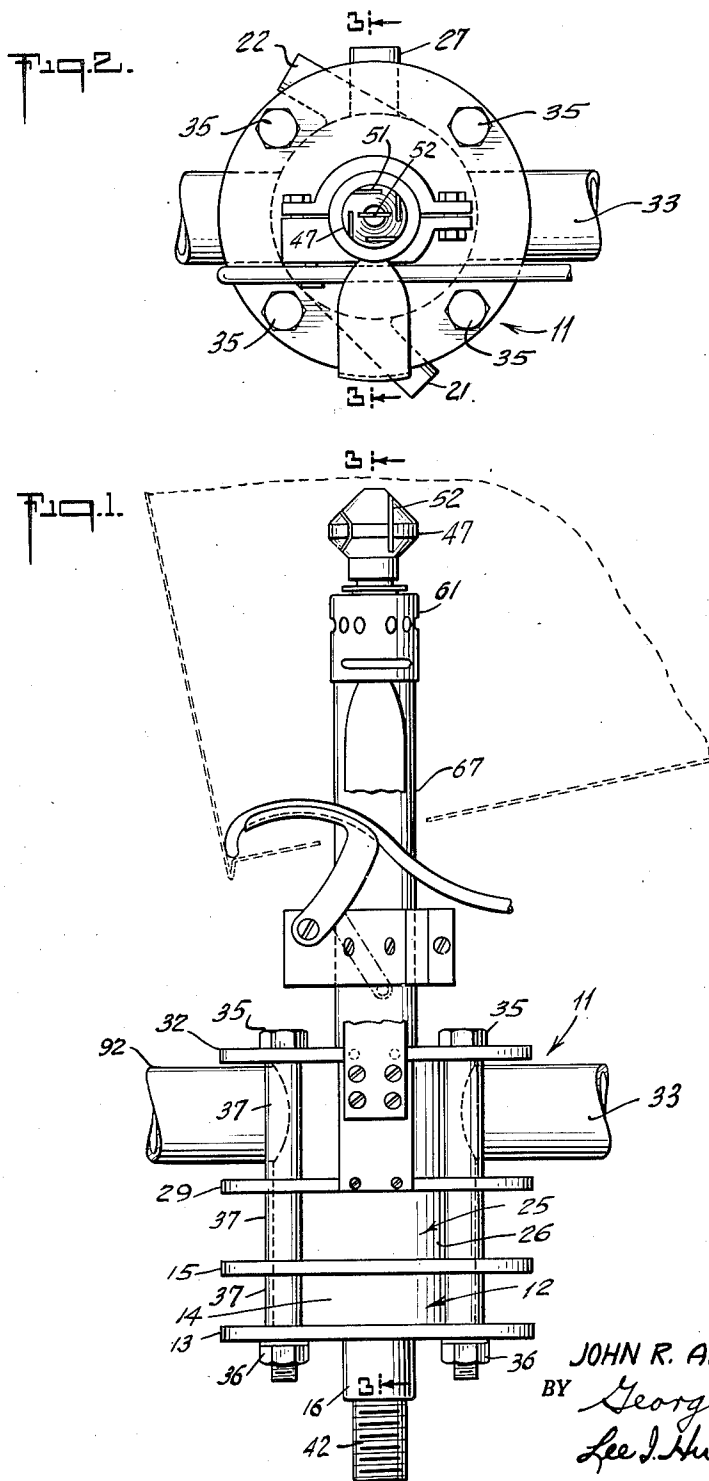
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NOZZLE ASSEMBLY

Filed April 16, 1954

2 Sheets-Sheet 1



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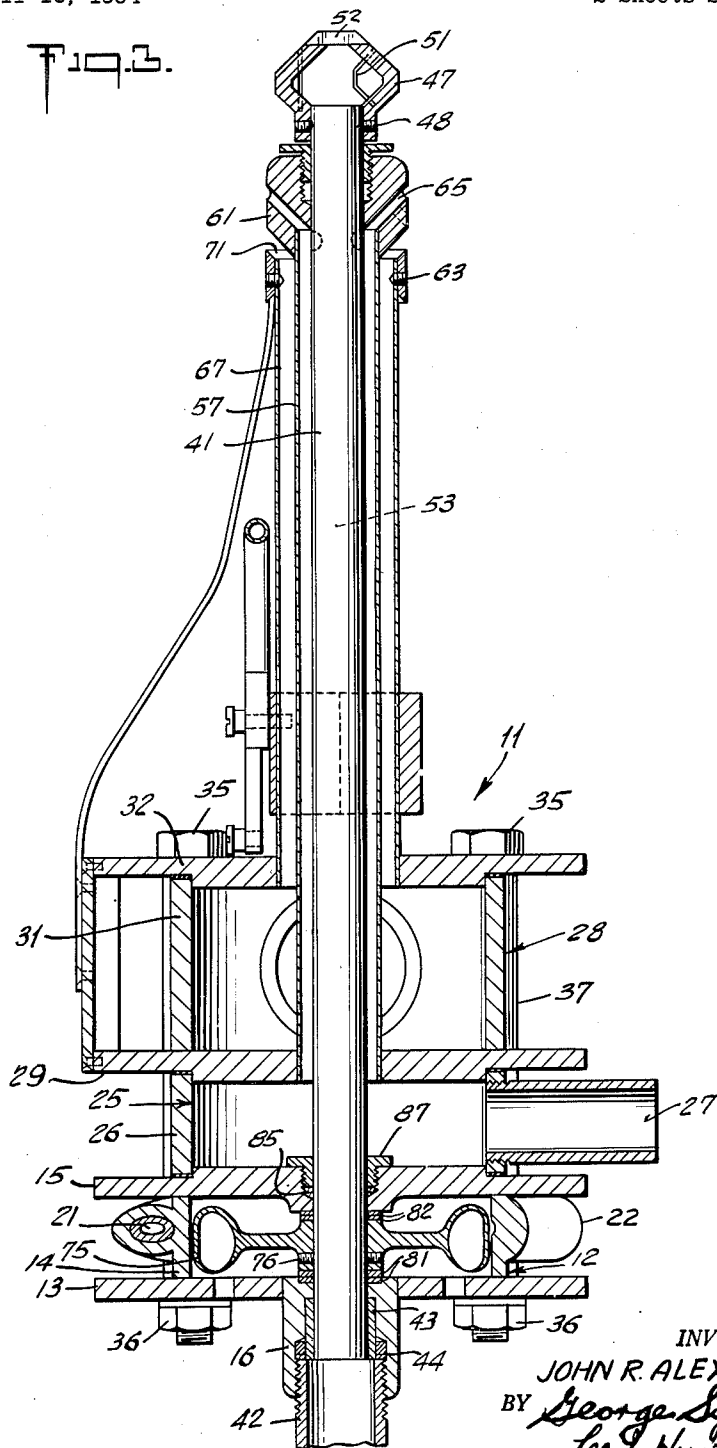
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Fig. 3.



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NOZZLE ASSEMBLY

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11 Claims. (Cl. 299—62)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention concerns a nozzle and in particular, concerns a nozzle assembly that in part rotates and in part is nonrotary.

The invention relates to an improvement in nozzles of the type useful in apparatus for cleaning and conditioning drums and similar containers as described in United States Patent 2,244,040 of June 3, 1941, to John R. Alexander for Apparatus for Cleaning and Conditioning Drums.

In cleaning apparatus of the type described in the above-identified patent, a problem exists because the bung hole in the type of oil drum to be cleaned is located near the periphery of the drum head so that there is difficulty in inserting a nozzle therein and obtaining a substantially uniform impingement and distribution of the cleaning fluids over the interior surfaces of the drum. Proper cleaning will not result unless all of the surfaces and every part thereof are contacted with the cleaning fluids in a satisfactory manner. In addition, several fluids are required to clean, treat, syphon, dry and preserve a drum. In the prior art there have been no satisfactory nozzles for obtaining uniform impingement and distribution of the several cleaning fluids.

This invention provides a novel type of nozzle in which part of the nozzle rotates and part of the nozzle is nonrotary to provide uniform impingement and distribution of cleaning fluids. Furthermore, the nozzles have a multiplicity of individual jets of different sizes and shapes whereby different fluids may pass simultaneously or in sequence through the nozzles. The nozzles because of the numerous sizes and shapes of jets therein may remain in the bung hole of the barrel to be cleaned without removal therefrom during a multiplicity of the cleaning, treating, syphoning, drying and preserving operations.

Another problem exists because the bung holes in drums to be cleaned are customarily small and the nozzle must therefore be even smaller because an area of sufficient size must be left between the exterior surface of the nozzle and the inner threaded surface of the bung flange to permit rapid escape and complete drainage of the cleaning fluids and residues from the interior of the container during the draining operation.

The nozzle assembly of the present invention is of minimum size and designed with multiple coaxial pipes constructed of thin walled tubing to permit a large flow of liquids through the pipes to the nozzles and at the same time to provide a maximum area for drainage from the drum being cleaned.

An object of the invention is to provide a nozzle.

Another object is to provide a nozzle having a part that rotates and a part that is nonrotary.

Another object is to provide a nozzle that is suitable for use in apparatus for cleaning and conditioning drums.

Another object is to provide a nozzle that insures sub-

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stantially uniform impingement and distribution of cleaning fluid from the nozzle over the interior surface of the drum to be cleaned.

Another object is to provide a nozzle assembly that can be left in place in the drum to be cleaned while different fluids are fed through different pipes to different jets in the nozzle either simultaneously or in sequence.

Another object is to provide a nozzle assembly that can be placed in a small bung hole of the drum to be cleaned and provide a maximum space between the nozzle assembly and the bung hole to permit drainage of fluid from the drum.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a front elevation of a preferred embodiment of the invention,

Fig. 2 is a top plan view of Fig. 1, and

Fig. 3 is a longitudinal cross-section along line 3—3 of Fig. 1.

In the drawings there is shown a nozzle assembly 11 comprising a turbine casing 12 having a disk-shaped base 13, a cylindrical casing wall 14, and a disk-shaped turbine casing cover 15. A bearing ring 16 depends axially from turbine casing base 13. Turbine casing wall 14 is provided with a turbine casing inlet 21 and a turbine casing outlet 22. Mounted above turbine casing 12 is a steam casing 25 having a cylindrical steam casing wall 26 provided with a steam chamber inlet nipple 27. Turbine casing cover 15 serves as the base for steam casing 25. Above steam casing 25 is located an air casing 28 having a disk-shaped air casing base 29, a cylindrical air casing wall 31 provided with an air inlet pipe 33 and a disk-shaped air casing cover 32. Air casing base 29 serves as the cover for steam casing 25.

Turbine casing 12 and steam casing 25 and air casing 28 are in axial alignment. A plurality of bolts 35 extend through bases 13 and 29 and through covers 15 and 32 peripherally thereof and each bolt 35 is provided with a nut 36 whereby turbine casing 12 and steam casing 25 and air casing 28 are locked together in fluid-tight relation. Spacers 37 are mounted on bolts 35 properly to space the casings with respect each to the other.

A liquid pipe 41 extends axially through the three casings and at its lower end projects downwardly through bearing ring 16 for connection to a liquid nipple 42. A bearing 43 is mounted in bearing ring 16 and supports liquid pipe 41 for rotation relative to the casings. Packing 44 is provided to prevent leakage.

Liquid pipe 41 at its other end projects upwardly beyond air casing 28 and on its upper end is mounted a hollow bulbous nozzle 47 which is locked for rotation with liquid pipe 41 by a set screw 48. Nozzle 47 is provided with planar peripheral slots 51 and a planar terminal slot 52. The planes of peripheral slots 51 are parallel to and spaced from axis 53 of nozzle assembly 11.

A steam pipe 57 is coaxial with liquid pipe 41 and jackets liquid pipe 41 and extends through air casing 28. Steam pipe 57 is fixedly mounted at its lower end in air casing base 29 and opens into the interior of steam casing 25 and into communication with steam chamber inlet 27. Steam pipe 57 at its upper end terminates in a cylindrical nozzle 61 below bulbous nozzle 47. Cylindrical nozzle 61 by means of set screws 63 is mounted in nonrotary relation at the upper end of steam pipe 57. Cylindrical nozzle 61 is provided with a first series of jets 65 that extend radially and are upwardly directed and open outwardly from nozzle 61 and at their inner ends are in communication with the upper end of steam pipe 57.

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An air pipe 67 is coaxial with steam pipe 57 and jackets steam pipe 57. Air pipe 67 is fixedly mounted at its lower end in air casing cover 32 and opens into the interior of air casing 28 and in communication with air inlet pipe 33. Air pipe 67 at its upper end terminates in cylindrical nozzle 61 which is provided with a second series of jets 71 that extend radially and are upwardly directed below jets 65 and open outwardly from nozzle 61 and at their inner ends are in communication with the upper end of air pipe 67.

A turbine wheel 75 is mounted on liquid pipe 41 for rotation therewith and is locked in place by set screw 76. Turbine wheel 75 is located in turbine casing 12 and is adapted to be driven by fluid passing from turbine casing inlet 21 through turbine casing 12 to turbine casing outlet 22. Rotation of turbine wheel 75 causes rotation of liquid pipe 41 and bulbous nozzle 47 carried thereby. Thrust washers 81 and 82 are provided adjacent to hub of turbine wheel 75 and packing 85 and gland nut 87 are provided for preventing leakage of fluid.

A pipe support 92 is affixed to the air casing wall 31.

In operation the lower end of liquid pipe 41 is connected by means of nipple 42 with a suitable source of liquid, steam chamber inlet nipple 27 is connected to a suitable source of steam, and air inlet pipe 33 is connected to a suitable source of dehydrated air. Conventional valves (not shown) are used to regulate flow of liquid, steam, and dehydrated air to clean and condition a drum. Turbine casing inlet 21 is connected to a suitable source of compressed air and is regulated by a conventional valve (not shown) to rotate turbine wheel 75.

Liquid fed into nipple 42 and liquid pipe 41 passes upwardly and sprays outwardly through slots 51 and 52 of bulbous rotary nozzle 47. Steam passing inwardly through steam chamber inlet nipple 27 passes upwardly through steam pipe 57 and sprays outwardly through jets 65 in cylindrical nonrotary nozzle 61. Dehydrated air passing inwardly through air inlet nipple 33 passes upwardly through air pipe 67 and sprays outwardly through jets 71 in cylindrical nonrotary nozzle 61. Compressed air passing through turbine casing inlet 21 drives turbine wheel 75 to rotate turbine wheel 75 and thereby cause rotation of nozzle 47. Outward spraying of liquid, steam, and dehydrated air can be simultaneous or in sequence.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A nozzle assembly comprising a first casing having an inlet and outlet, a second casing mounted on said first casing and having an inlet, and a third casing above said second casing and having an inlet; said first casing and said second casing and third casing being in axial alignment, and means to lock said casings together in fluid tight relation; a first pipe extending axially through said casings, said pipe at its lower end projecting downwardly through said first casing, a bearing supporting said first pipe for rotation, said first pipe at its other end projecting upwardly beyond said third casing, and a hollow bulbous nozzle mounted on the upper end of said first pipe; a second pipe coaxial with said first pipe and jacketing said first pipe and extending through said third casing, said second pipe at its lower end being fixedly mounted and opening into the interior of said second casing and its inlet, said second pipe at its upper end terminating in a second nozzle below said first nozzle; a third pipe coaxial with said second pipe and jacketing said second pipe, said third pipe at its lower end being fixedly mounted and opening into the interior of said third casing and its inlet, said third pipe at its upper end terminating in said second nozzle; and a turbine wheel

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mounted on said first pipe for rotation therewith and disposed in said first casing.

2. The nozzle assembly of claim 1 in which said three casings are cylindrical.

3. The nozzle assembly of claim 1 in which said first casing is cylindrical and has a disk-shaped base and a cylindrical wall and a disk-shaped cover; said second casing is cylindrical and has a cylindrical wall; and said third casing is cylindrical and has a disk-shaped base, a cylindrical wall and a disk-shaped cover.

4. The nozzle assembly of claim 3 in which the means to lock said casings together comprises plural bolt means extending through said bases and covers peripherally thereof to lock said casings together in fluid-tight relation.

5. The nozzle assembly defined in claim 4 in which the nozzle mounted on the upper end of said first pipe comprises a hollow bulbous nozzle mounted for rotation with the first pipe, said nozzle having planar peripheral slots and a planar terminal slot with the planes of said peripheral slots being parallel to and spaced from the axis.

6. The nozzle assembly defined in claim 5 in which said second nozzle is cylindrical and nonrotary and has radial upwardly directed jets extending outwardly from said nozzle and at their inner ends in communication with the upper end of the said second pipe.

7. The nozzle assembly defined in claim 6 in which said second nozzle has second radial upwardly directed jets below said first jets and opening outwardly from second nozzle and at their inner ends in communication with the upper end of said third pipe.

8. A nozzle assembly comprising a first nozzle formed with an interior chamber and a plurality of discrete fluid passages communicating with the chamber and variously directed outwardly of said first nozzle, a first pipe secured and sealed at one end to said first nozzle in fluid communication with the chamber, a second nozzle formed with a bore extending therethrough whose diameter for at least a portion thereof is substantially equal to the outside diameter of said first pipe, said second nozzle being further formed with a plurality of discrete fluid passages around the bore and separated from the bore and extending from one end of said second nozzle variously directed outwardly thereof, said second nozzle being positioned on said first pipe in substantially fluid-tight relationship therewith, said second nozzle being displaced from said first nozzle axially of said first pipe, the other end of said second nozzle being adjacent said first nozzle, and a second pipe jacketing said first pipe and secured and sealed at one end with the one end of said second nozzle and in fluid communication with the fluid passages in said second nozzle.

9. A nozzle assembly as defined in claim 8 wherein said second nozzle and said first pipe are relatively rotatable, and further comprising means spaced from said nozzles for retaining said pipes coaxial and for permitting relative rotation between said pipes, the other ends of said pipes adapted for connection in communication with sources of fluid.

10. A nozzle assembly adapted for use in cleaning the interior of containers comprising a first pipe adapted for connection at one end to a source of fluid, a first nozzle defining an axis and formed with an interior chamber and further formed with a plurality of discrete passages extending from the interior chamber and variously directed outwardly relative to the axis of said first nozzle, said first nozzle secured and sealed to the other end of said first pipe coaxially therewith whereby the interior of said first pipe is in communication with the interior chamber of said first nozzle, a second pipe positioned around said first pipe coaxial therewith, a third pipe positioned around said second pipe coaxial therewith, means spaced from said first nozzle supporting said second pipe and said third pipe in fixed relationship relative to each other and said first pipe rotatably relative to said

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second pipe and said third pipe, said second pipe adapted for connection to a source of fluid located beyond said means, said third pipe adapted for connection to a source of fluid located beyond said means, a second nozzle defining an axis and formed with an axial bore that is stepped from a first inside diameter that is substantially equal to the diameter of said first pipe to a second inside diameter that is substantially equal to the outside diameter of said second pipe to a third inside diameter that is substantially equal to the outside diameter of said third pipe, said second nozzle formed with a first set of discrete fluid passages around the bore but separated therefrom and extending through said second nozzle from the step between the portions of first and second inside diameters and variously directed outwardly relative to the axis of said second nozzle, said second nozzle being further formed with a second set of discrete fluid passages around the bore but separated therefrom and extending through said second nozzle from the step between the portions of second and third inside diameters and variously directed outwardly relative to the axis of said second nozzle, said second nozzle being mounted on said first pipe in substantially fluid tight relationship therewith and for rotation relative thereto, said second nozzle being positioned adjacent said first nozzle whereby its end of largest inside diameter is directed away from said first nozzle, said second nozzle being displaced from said first nozzle axially of said first pipe, the other end of said second pipe terminating in and secured and sealed to the portion of said second nozzle of second inside diameter in communication with the first set of fluid passages, and said

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third pipe terminating in and secured and sealed to the portion of said second nozzle of third inside diameter in communication with the second set of fluid passages.

11. A nozzle assembly as defined in claim 10 wherein
 5 said means comprises a first casing having an inlet and an outlet, a second casing mounted on said first casing and having an inlet, a third casing mounted on said second casing and having an inlet, a bearing mounted on said first casing, said first casing and said second casing
 10 and said third casing and said bearing being in axial alignment, means locking said casings together in fluid tight relationship; said first pipe extending axially through said casings and in registration with said bearing for rotation therein; said second pipe extending through said
 15 third casing and secured and sealed to said second casing and opening into the interior of said second casing; said third pipe secured and sealed to said third casing and opening into the interior of said third casing; and a turbine wheel mounted on said first pipe for rotation therewith and disposed in said first casing.
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