April 24, 1962 D. R. HOLDREN 3,031,148

SPRAY BALL CONSTRUCTION

Filed March 25, 1959 4 Sheets-Sheet 1

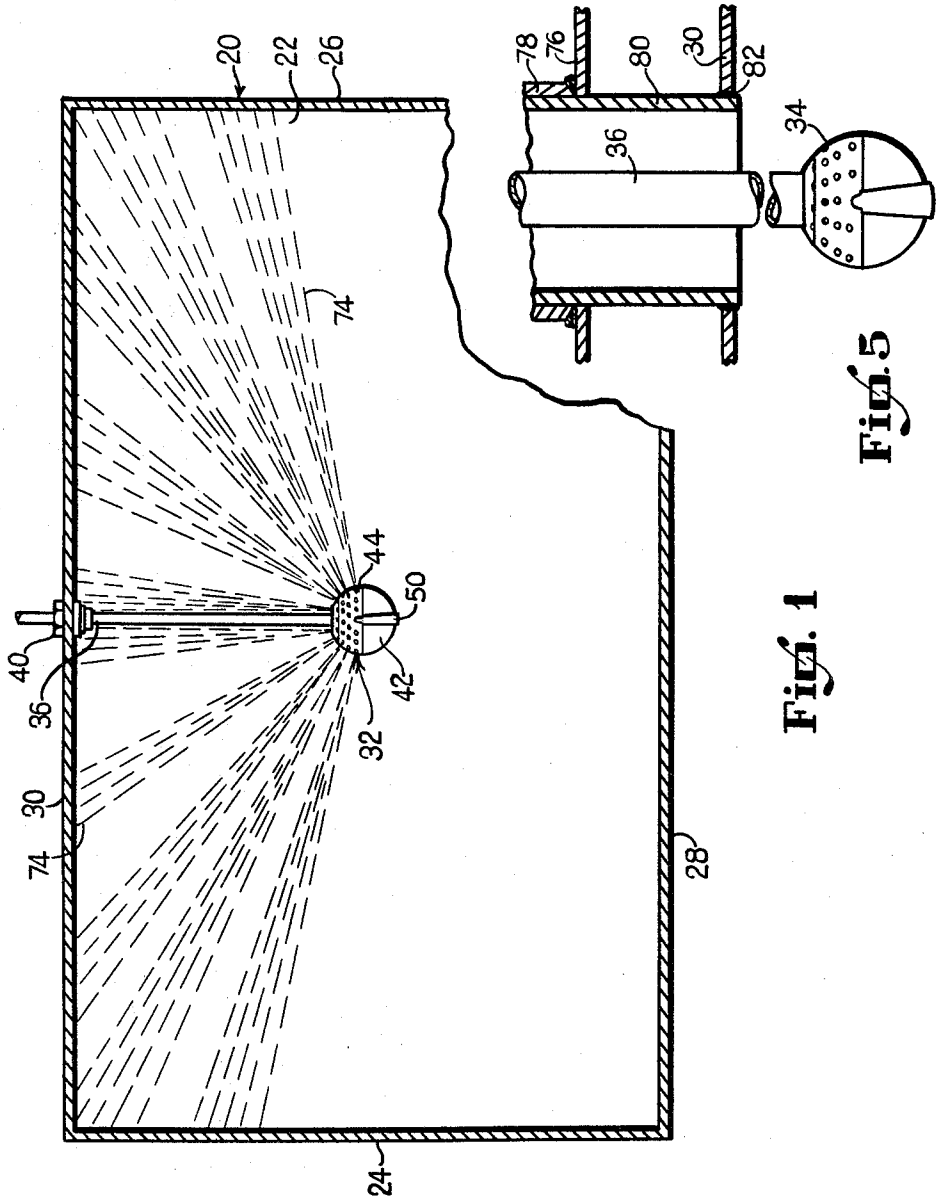


Fig. 1

Fig. 5

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SPRAY BALL CONSTRUCTION

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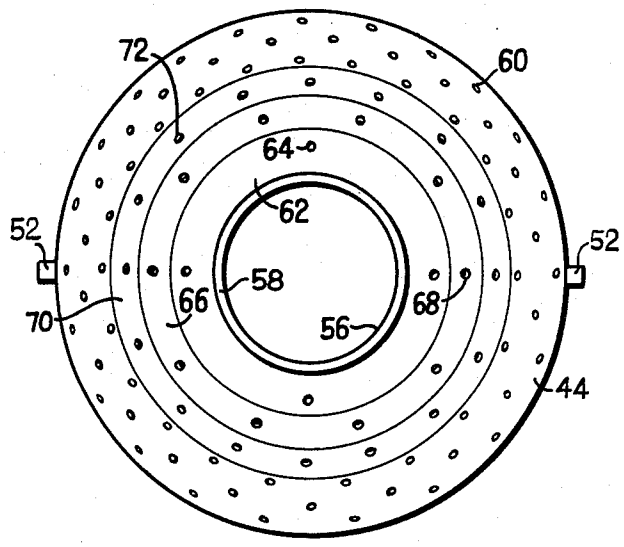


Fig. 3

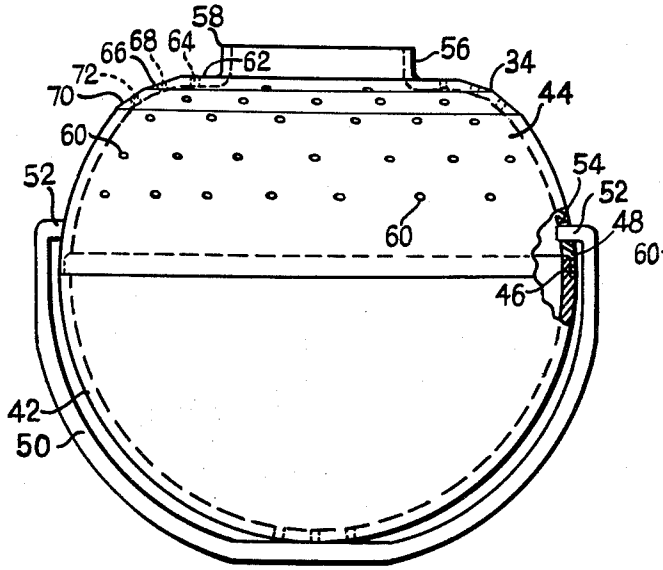


Fig. 4

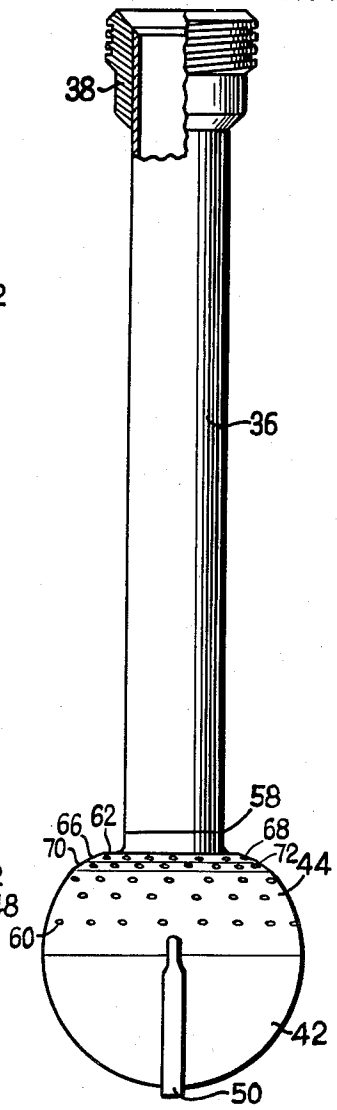


Fig. 2

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SPRAY BALL CONSTRUCTION

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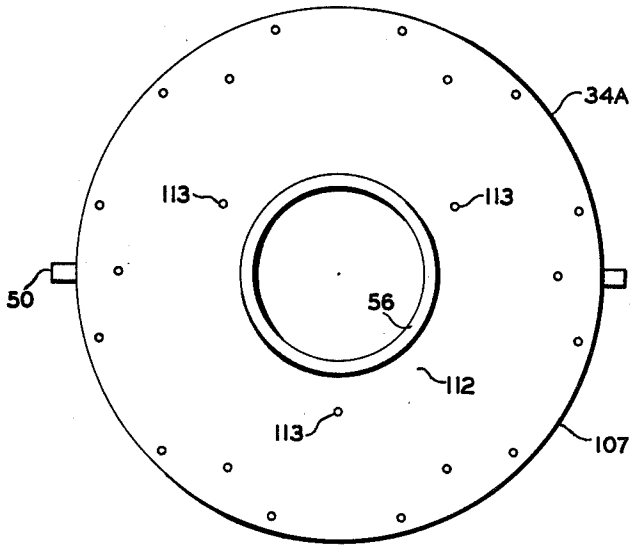


FIG. 7

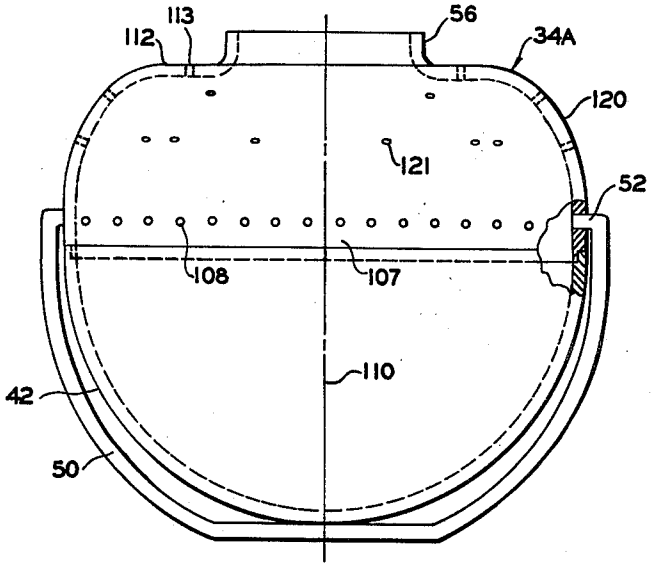


FIG. 6

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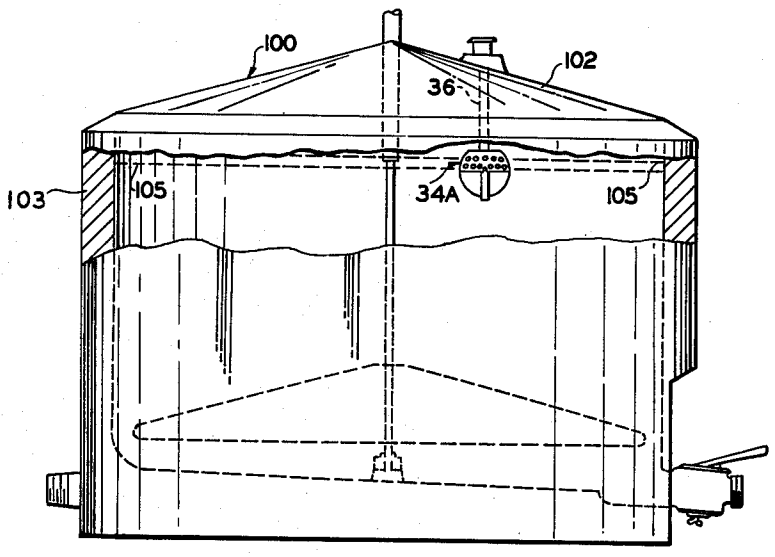


FIG. 8

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3,031,148

SPRAY BALL CONSTRUCTION

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Filed Mar. 25, 1959, Ser. No. 801,890
3 Claims. (Cl. 239—559)

The present invention relates to a cleaner for the interior of storage or processing tanks, tank trucks, tank cars and the like, and more particularly to a spray type cleaner for cleaning an area completely surrounding the same.

The present application is a continuation-in-part of my co-pending application Serial No. 709,159, filed January 15, 1958.

The present invention includes a hollow ball, suitably carried within a tank and having the interior connected with a source of cleansing fluid under pressure. The ball is provided with a plurality of perforations or holes, forming jets for spraying the ceiling and the upper parts of the side walls of the tank.

Inasmuch as the ball must be connected with a tube for supplying fluid to the interior thereof, and inasmuch as the radially extending outlets from the ball cannot be provided at the inlet to the ball, the areas immediately surrounding the inlet to the ball are provided with outlet perforations so designed as to direct the fluid to the section of the wall immediately surrounding the inlet tube.

Further objects and advantages will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the invention are illustrated.

In the drawings:

FIG. 1 is a vertical cross-sectional view of a tank showing the improved cleaner therein;

FIG. 2 is a side view of the cleaner ball and the tube leading thereto, the upper part of the coupling for the tube being shown partly in section;

FIG. 3 is a top plan view of the cleaning ball, the inlet tube being removed;

FIG. 4 is a side view of the ball;

FIG. 5 is a fragmentary view of an insulated tank with my improved cleaner therein;

FIG. 6 is a side view of a second cleaner ball constructed in accordance with the present invention and constituting a modification thereof;

FIG. 7 is a top view of the cleaner ball of FIG. 6; and

FIG. 8 is a side elevational view, partially in section, of a tank showing the cleaner of FIGS. 6 and 7.

Referring more in detail to the drawings, the tank is indicated at **20**, three of the side walls being shown at **22**, **24** and **26**; the bottom wall is shown at **28**, and the top wall at **30**. The cleaner assembly **32** includes a ball **34** and an inlet tube **36** for the interior of the ball. A threaded coupling **38** is suitably connected in sealing relation with the top of the tank **30** by a nut **40**.

The ball **34**, as is more clearly shown in FIG. 4, is hollow and comprises a lower semi-spherical section **42** and an upper section **44** which is partly semi-spherical in shape, it being distorted near the upper part for the purpose hereinafter described. Section **42** is formed with an upwardly extending lip **46**, and section **44** is provided with a downwardly extending lip **48**. These lips are in complementing relationship and are sealingly held in such relationship by a clip **50**. This clip **50** is substantially semi-circular and is provided with ends **52** which are pivotally mounted in openings **54** in the ball section **44**. The clip **50** extends around the bottom of ball section **42**, and, when in vertical position, clamps lip **46** in sealing relationship with lip **48**.

Ball section **44** is provided with a neck **56** which is suitably secured to the tube **36** as at **58**, for example, by butt welding.

The lower section **42** and the lower part of the upper section **44** of the ball **34** are impervious; the upper section **44** is provided with a plurality of perforations **60**; those perforations in the lower three rows in the upper section **44** extend radially.

It is highly desirable to thoroughly cover the entire surface of the ceiling and upper side walls with the spray of cleaning fluid; such fluid, when so sprayed, will flow down the side walls and over the floor to clean these walls and floor. Inasmuch as the neck **56** and tube cover a large area of the top of the ball and therefore cannot include jets or openings, other means must be adopted to spray the ceiling immediately about the tube **36** and particularly above the irregular coupling. To this end, I distort the upper part of section **44** so as to provide the correct angle of wall surface whereby holes drilled therethrough, at right angles to the surface, will direct the spray to where it is desired, namely substantially parallelly of the tube **36**. One form of distortion from spherical is by providing a substantially horizontal and flat ring portion immediately surrounding the neck **58**, and the holes **64** therein extend vertically.

The so spacing of the holes **64**, without rearranging the aim of the next adjacent lower circle of holes from radial distribution, would rob the circular area surrounding the area sprayed through holes **64**, of the required cleansing spray. Therefore, the portion **66** immediately surrounding the portion **62** is also flat, but is disposed at an angle of approximately 18 degrees from the horizontal portion **62**. The holes **68** therein are arranged at right angles with respect to the surface of the portion **66**. To further equalize the spray, i.e., provide for the proper distribution for the area immediately surrounding the area sprayed through holes **68**, the portion **70** immediately surrounding the portion **66** is also flat, but is disposed at an angle of substantially 18 degrees from the portion **66** and substantially 36 degrees from the portion **62**. The holes **72** in the portion **70** are at right angles to the surface of said portion **70**. By so arranging the holes **60**, **64**, **68**, and **72**, substantially equal distribution is effected onto the ceiling and the upper parts of the side walls including the area immediately surrounding tube **36**. The dash lines **74** in FIG. 1 merely indicate the main streams, it being understood that some of the fluid will be directed between the dash lines and onto the ceiling and walls. Thus although a large portion of the ball **34** lacks a distributing area because of the inlet tube **36**, nevertheless by positioning the holes **60**, **64**, **68**, and **72** as herein shown, the entire upper part of the tank including the portion immediately surrounding the tube **36** is subjected to jets of cleansing fluid.

An example of relative sizes and number of jets is as follows: In a ball having approximately 4 inch horizontal diameter, four equally spaced holes **64** are provided; ten equally spaced holes **68** are provided; fifteen equally spaced holes **72** are provided. The row of holes immediately below the portion **70** includes twenty equally spaced holes; the next row below includes twenty-five equally spaced holes; the lowermost row of holes in the section **44** contains thirty equally spaced holes. A 5/64 drill is employed for all of the holes.

The interior as well as the exterior of the ball is polished, before welding, to a number 4 finish. Preferably the ball and the tube are formed of stainless steel.

I have shown the ball **34** in an insulated type of tank in FIG. 5. Here the inner walls, illustrated by the top wall **30**, are surrounded by outer walls, one of which is shown at **76**, there being air or other insulating material sealed between the inner and outer walls of the tank.

Here tube 36 and ball 34 are suitably suspended by a fitting, the lower part of which is shown at 78. Aligned holes are cut through walls 76 and 30 for receiving a tube 80. The lower end of tube 80 is sealed with and secured to inner wall 30 by welding 82, and the lower part of fitting 78 is sealed with and secured to upper wall 76 by welding 84. Tube 80 is sealingly secured to fitting 78. By the present invention cleansing spray can be conducted into the tube 80 and over the welding 82.

Reference is next made to FIGS. 6 through 8 which illustrate a second embodiment of the present invention which is particularly adaptable for cleaning dairy tanks of the type indicated generally at 100 in FIG. 8. Tanks of this general type includes a removable lid 102 and a vertical side wall 103 it being desirable to concentrate the majority of the cleaning effect of the ball 34–A on the vertical side wall 103. This is best accomplished by concentrating most of the spray, released from ball 34–A, on the upper inner surface of side wall 103 at the locations 105.

At the same time it is also desirable to direct a small portion of the spray vertically upwardly in a direction parallel with the longitudinal axis of tube 36.

With reference to FIGS. 6 and 7, ball 34–A includes a side wall portion 107 provided with a plurality of orifices 108 directed radially outwardly in a direction substantially normal to an axis 110 extending vertically through the ball.

Ball 34–A also includes a flat top wall portion 112 provided with a second plurality of orifices 113. Top wall portion 112 is preferably formed as a thin wall section lying in a plane substantially normal to vertical axis 110. The orifices 113 can then be formed to direct a spray vertically upwardly by punching or drilling holes normal to top wall portion 112.

In order to concentrate most of the water spray on the upper portions of side wall 103 of tank 100 the total cross-sectional area of laterally directed orifices 108 is made substantially greater than the total cross-sectional area of vertically directed orifices 113.

The wall portion 107 is preferably formed as a right circular cylindrical section so that holes can be punched or drilled perpendicularly through the section to provide orifices that will direct spray in a direction substantially normal to vertical axis 110.

Ball 34–A also includes an intermediate wall portion 120 provided with a plurality of orifices 121 that are directed radially outwardly and upwardly. Here again the total cross-sectional area of orifices 121 is substantially small as compared with the total cross-sectional area of orifices 108 so that most of the spray will be released from orifices 108 and directed against the interior of the tank at the locations 105 as previously described.

It will be understood that in the preferred embodiments the control of the direction at which spray is released is achieved by forming a thin wall portion normal to the desired direction and by forming an orifice normal to said thin wall portion.

The direction at which the spray is released can also be controlled by forming relatively thick wall sections and drilling or punching holes through such relatively thick wall sections in the desired direction, not necessarily perpendicular to the wall section, the control of direction being achieved here by the formation of a passage having axial length rather than by an orifice through a thin wall.

The control of direction of the sprays released from the ball can also be accomplished by forming a perfectly spherical ball, without the flat top and side wall portions of FIGS. 6 and 7, but with a thin wall of the type shown in FIGS. 6 and 7. The thin side wall of the spherical ball can then be provided with small round dimpled areas at each orifice location so that each dimpled area departs from the general spherical shape of the ball and lies in a plane normal to the direction at which the spray is to be released. Each dimpled area is next provided with a punched or drilled hole formed perpendicular through the dimpled area to provide an orifice which will release spray in a direction perpendicular to the surface of the dimpled area.

While the forms of embodiments herein shown and described constitute preferred forms, it is to be understood that other forms may be adopted falling within the scope of the claims that follow.

I claim:

1. An apparatus for cleaning the interior of a tank comprising a hollow spray head formed of thin walled sections; means for joining said sections together at a junction; means for supporting said spray head within the tank and spaced from the interior walls of the tank, said means including a fluid inlet tube for supplying cleansing fluid to the interior of the spray head, the top of said spray head including a thin wall portion surrounding said inlet tube and provided with a plurality of orifices the planes of tangency to said thin wall portion at said orifices being substantially normal to the longitudinal axis of said inlet tube whereby jets of liquid released from said orifices are directed substantially parallel to said tube, said spray head including a thin cylindrical side wall portion provided with a plurality of orifices, the planes of tangency to said wall portion at said orifices being substantially parallel with the longitudinal axis of said inlet tube whereby jets of liquid are released in directions substantially normal to said longitudinal axis, the bottom of said spray head being substantially free of orifices whereby most of the cleansing fluid is released from the upper portion of said spray head for impingement on the upper regions of a tank.

2. An apparatus for cleaning the interior of a tank comprising a hollow spray head formed of thin walled sections; means for joining said sections together at a junction; means for supporting said spray head within the tank and spaced from the interior walls of the tank, said means including a fluid inlet tube for supplying cleansing fluid to the interior of the spray head, the top of said spray head including a thin walled top wall portion surrounding said inlet tube and provided with a plurality of upwardly facing orifices for releasing jets of liquid in directions substantially parallel with said inlet tube, said spray head including a thin cylindrical side wall portion provided with a plurality of orifices, the planes of tangency to said wall portion at said orifices being substantially parallel with the longitudinal axis of said inlet tube whereby jets of liquid are released in directions substantially normal to said longitudinal axis, the bottom of said spray head being substantially free of orifices whereby most of the cleansing fluid is released from the upper portion of said spray head for impingement on the upper regions of a tank, the upper portion of said sray head also including orifices each of which are directed uwardly and outwardly in an intermediate wall portion.

3. An apparatus for cleaning the interior of a tank comprising, in combination, a cleansing fluid inlet tube for extension through the wall of a tank, said tube including a longitudinal axis; and a thin walled hollow spray head including an annular thin walled top wall section provided with a plurality of perforations, said top wall section being substantially normal to said longitudinal axis whereby said perforations direct jets of cleansing fluid in directions substantially parallel with said inlet tube; said spray head also including an intermediate wall section provided with a second plurality of perforations, said upper wall section being extended outwardly and downwardly from said top wall section whereby said second plurality of perforations direct jets of cleansing fluid upwardly and outwardly at inclined angles, said spray head including a lower wall section substantially free of perforations whereby at least most of the cleansing fluid from the upper portion of the spray head impinges on the upper regions of the tank, and said spray head including a wall section between said

intermediate and lower wall section and provided with a third plurality of perforations, said intermediate wall section being substantially parallel with said longitudinal axis whereby said third plurality of perforations direct jets of cleansing fluid in directions substantially normal to said intake tube.

References Cited in the file of this patent

UNITED STATES PATENTS

822,546 Newman ---------- June 5, 1906
909,654 Oliver ---------- Jan. 12, 1909
1,444,889 Sladden ---------- Feb. 13, 1923
1,749,312 Blair ---------- Mar. 4, 1930
1,799,525 Morgan ---------- Apr. 7, 1931
2,213,627 De Baugh ---------- Sept. 3, 1940
2,895,688 Seiberling et al. ---------- July 21, 1959

FOREIGN PATENTS

13,997 Germany ---------- July 11, 1881
177,517 Germany ---------- Nov. 1, 1906