May 22, 1956 C. D. DEMPSEY ET AL 2,746,467

CLEANING APPARATUS

Filed June 11, 1953

Fig. 1.

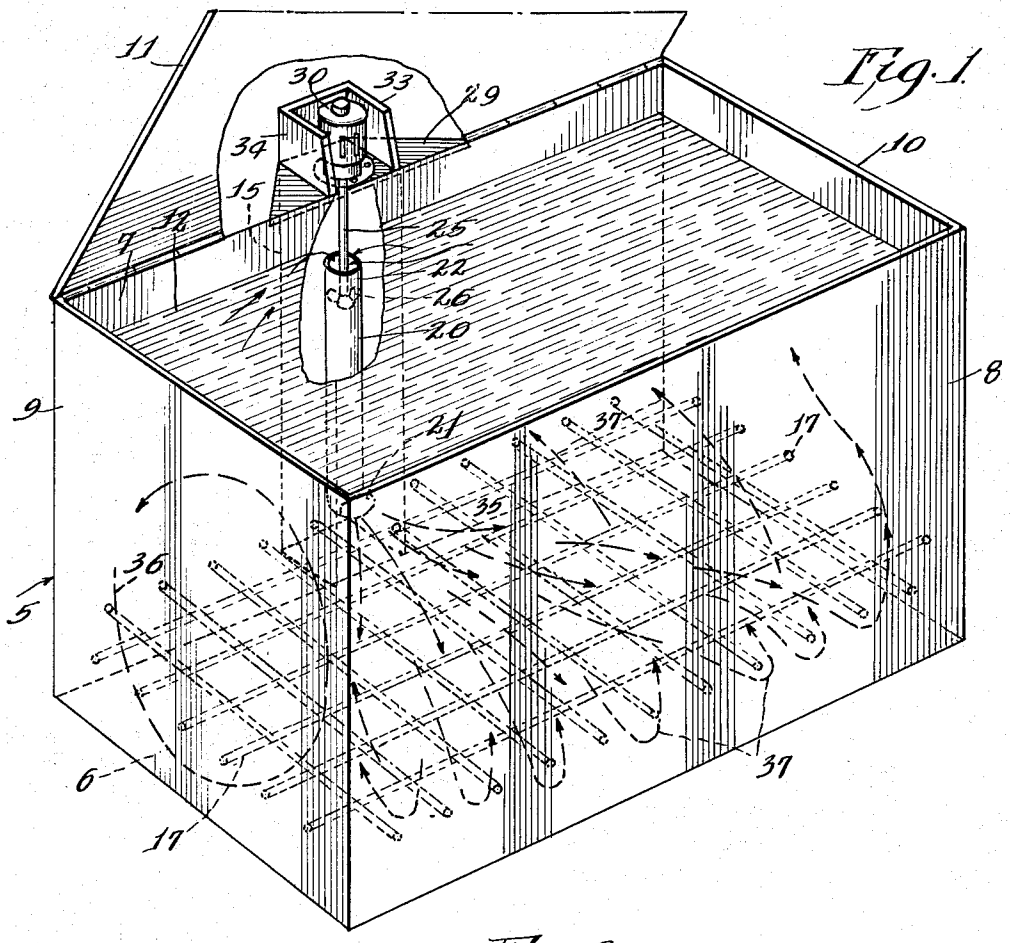


Fig. 2.

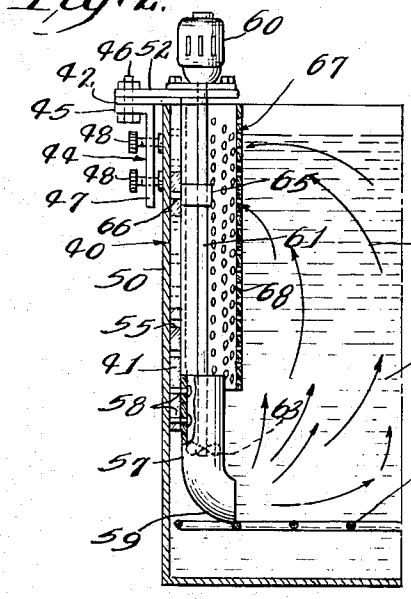


Fig. 3.

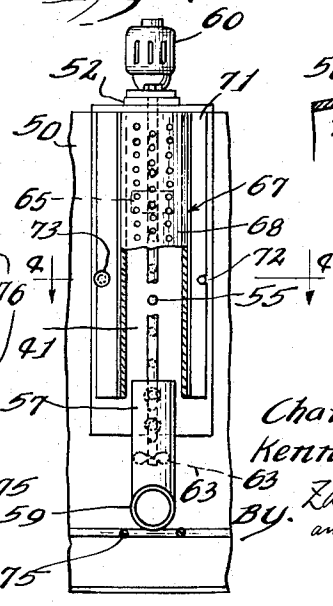
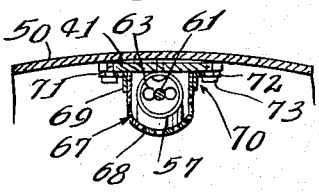


Fig. 4.



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CLEANING APPARATUS

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3 Claims. (Cl. 134—111)

Our invention relates to cleaning apparatus, and more particularly to apparatus adapted to clean foreign matter from objects such as machinery and parts thereof.

Various cleaning compounds are available which are capable of removing grease, oil, carbon, rust, paint and other impurities from the surface of metal objects. These cleaning compounds may be applied to the objects in various ways. Usually a certain amount of brushing, wiping or other form of agitation is required in connection with the cleaning process. In many instances the most satisfactory procedure is to immerse the objects to be cleaned in a liquid containing the cleaning compound, and to subject the liquid to agitation for a period of time.

One object of our invention is to provide a cleaning apparatus which is effective to impart a highly efficient form of agitation to a body of cleaning fluid.

Another object is to provide such apparatus in combination with a container adapted to receive cleaning fluid and objects to be cleaned.

Still another object of our invention is to provide a cleaning apparatus which is portable in character and which may be utilized with containers of various types such as metal barrels of varying sizes.

Another object is to provide apparatus of this character which is simple in construction, inexpensive to manufacture and capable of a long, trouble free useful life.

In brief, the invention comprises a vertically disposed tube adapted to lie along one side of a container filled with cleaning fluid. The lower end of the tube terminates just about the container bottom, say from two to twelve inches, and it is shaped to discharge fluid in a direction generally normal to the tube axis, i. e., toward the opposite side of the container. A drive shaft extends downwardly into the upper end of the tube, and a fluid driving impeller is carried on the shaft within the tube. A suitable motor is arranged in driving relation with the shaft. The level of the cleaning fluid in the container is somewhat above the top of the vertically disposed tube.

In operation, the impeller is effective to force liquid to flow down the tube and out the lower end at a substantial velocity. The reduced pressure above the impeller insures a constant and adequte flow of fluid into the upper end of the tube. The discharging fluid at the lower end of the tube produces a pronounced rolling motion in the body of the fluid. This rolling motion has been found to produce exceptionally efficient cleaning.

Other objects, advantages and details of our invention will become apparent as the description proceeds, reference being had to the accompanying drawing wherein two forms of the invention are shown. It is to be understood that the description and drawings are illustrative only, and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Fig. 1 is a perspective view of cleaning apparatus constructed according to the invention, the apparatus being shown in combination with a specially designed container;

Fig. 2 is a side elevational view, partly in section, of a more general form of our apparatus, the apparatus being shown applied to any suitable container such as a barrel;

Fig. 3 is a front elevational view, partly in section, of the apparatus shown in Fig. 2, and

Fig. 4 is a sectional view on line 4—4 of Fig. 3.

Referring to Fig. 1, our apparatus is illustrated in combination with a tank or container **5** having a bottom **6**, sides **7**, **8**, **9** and **10**, and a hinged cover **11**. Container **5** is shown filled with cleaning fluid to a level indicated at **12**.

Side **7**, the rear side of the illustrated container, has a central, vertically extending portion **15** offset from the plane of the side in a direction exterior of the container. The purpose of this offset is to provide a region for the reception of parts of the apparatus which will be more or less isolated from the interior of the container. Thus such parts of the apparatus will be protected from possible damage by objects placed in the container.

A screen **17** having interstices of substantial size is located in the lower portion of container **5**. It is constructed of rigid material, such as bar steel, and is supported a short distance above bottom **5** in a rigid manner. Objects to be cleaned rest on screen **17**, which in effect is a false bottom, and thus are kept out of engagement with main bottom **6**.

A vertically disposed tube **20** is located more or less centrally in the region defined by offset portion **15** of container side **7**. Tube **20** is rigidly mounted in proper position by suitable supporting structure (not shown).

The lower end **21** of tube **20** is shaped to discharge fluid in a direction generally normal to the tube axis, and the tube is oriented so as to discharge fluid toward the opposite side of the container, namely, front side **8**.

Upper end **22** of tube **20** terminates at a point which is somewhat below the level **12** of the fluid in container **5**. As here used, the term "upper end" of tube **20** refers to the top of the tube, as shown in the drawing, or to a portion of the tube which is so cut away that fluid may enter the tube at such portion. In other words, the tube may extend upwardly all the way to the top of the container, and in such instance, a portion of the tube is cut away in the region designated **22**. This region, therefore, is the effective upper end of the tube from the standpoint of permitting the entry of fluid.

A drive shaft **25**, aligned with the tube axis, extends from above into tube **20**. A fluid driving impeller **26** is carried on the lower end of shaft **25**, the elevation of impeller **26** being somewhat below upper end **22** of the tube.

Impeller **26** is properly pitched and rotated to move fluid downwardly in tube **20**. Also, the clearance between the blade tips of impeller **26** and the inner wall of tube **20** is maintained as small as possible. Rubbing, of course, should be avoided.

The top of the region defined by offset portion **15** is capped by a plate **29** which is suitably secured to side **7** of the container. The lateral wings of plate **29** serve to brace the assembly.

A motor **30** is mounted on plate **29** and the shaft thereby is suitably connected in driving relation to shaft **25**. With shaft **25** rigidly connected to the motor shaft, the bearings present in the motor usually are adequate to maintain proper alignment of shaft **25**, although an additional bearing may be used if desired.

In the form of the invention shown, plate **29** is provided with spaced upstanding plates **33** and **34**. The latter have front edges which incline rearwardly to provide a convenient back rest for cover **11** so the latter will sustain itself in open position.

In operation, impeller **26** is effective to move fluid downwardly in tube **20** at a substantial velocity. The

fluid is discharged from the lower end 21 of the tube as indicated by arrows 35 toward the opposite, front side 8 of the container. It should be noted that the lower end 21 of the tube is positioned above screen 17.

Fluid discharge from the lower end of tube 20 is effective to impart a rolling motion to substantially all the fluid in container 5. The direction of this rolling motion is generally indicated by the arrow 36 applied to side 9. It also is more or less diagrammatically shown by the arrows 37 distributed throughout the body of the container.

The reduced pressure appearing at the rear of impeller 26 is effective to draw fluid into the upper end 22 of tube 20 in sufficient quantity to sustain the rolling motion, it being remembered that the upper end 22 is located somewhat below the level 12 of the fluid.

Objects to be cleaned, such as machinery or the like, are introduced in container 5 in any reasonable quantity and such objects rest either on screen 17 or on each other. The rotary circulation of the cleaning fluid is somewhat distorted due to the fluid flow against parts of the objects, but the general circulation path is rotary in character. The circulation thus provided has been found to produce an agitation which is effective to clean the objects in a considerably shorter period of time than any form of agitation previously used. In addition, this rolling form of agitation can be produced by our apparatus with comparatively small power consumption.

In Figs. 2 and 3 we have illustrated another form of our apparatus, a more general form than that shown in Fig. 1. This apparatus is adapted to be employed with containers of various shapes and sizes such, for example, as steel barrels. The latter are suggested because of their usual availability in establishments where our apparatus normally is employed.

Our Figs. 2 and 3 apparatus is portable in character, that, it may be moved from container to container. The apparatus includes suitable supporting structure and means whereby it may be clamped detachably to a container side.

As here illustrated, the supporting structure comprises an inverted L-shaped plate member 40, the longer leg 41 of which is vertically disposed and has a length about three-fourths of the depth of a container of average size. The other leg 42 is horizontally disposed and considerably shorter in length, as shown in Fig. 2.

A second inverted L-shaped plate member 44, considerably smaller in size than member 40, has its shorter, horizontal leg 45 secured to the other horizontal leg 42 in any suitable manner such as by bolt 46. Other and vertical leg 47 of member 44 extends in spaced, parallel relation with the upper portion of the other vertical leg 41, as shown in Fig. 2. Clamping screws or the like 48 extend through leg 47 into engagement with container wall 50, the latter being clamped between the screws 48 and vertical leg 41 of member 40.

A plate 52 is positioned on the upper face of horizontal leg 42 of member 40, plate 52 being shown as secured by bolt 46. Plate 52 is of sufficient length to extend a substantial distance beyond the edge of horizontal leg 42, the portion of plate 52 extending beyond the said edge being disposed over the interior of the container when the apparatus is mounted in operating position, as shown.

Vertical leg 41 of member 40 is provided with a vertical row of spaced holes 55, the spacing between the respective holes being uniform. Holes 55 preferably are threaded interiorly.

A relatively short-length cylindrical tube 57 is attached to vertical leg 41 of member 40 by means of suitable screws 58. The latter pass through a cooperating pair of spaced holes in tube 57 into threaded relationship with any pair of adjacent holes 55 in leg 41. Lower end 59 of tube 57 is shaped to discharge fluid in a direction generally normal to the tube axis.

In the usual case, it is desired that the lower end of tube 57 be located near the bottom of the container. The row of uniformly spaced holes 55 in leg 41 and the cooperating pair of similarly spaced holes in tube 57 enables the latter to be positioned with its lower end near the container bottom regardless of variations in depth of different containers. Any appropriate pair of holes in leg 41 may be used for securing tube 57 which will properly position the tube.

A motor 60 is mounted on plate 52 in position to drive a shaft 61 which extends in spaced parallel relation with leg 41 of member 40. Shaft 61 is aligned with the axis of tube 57, as shown, and it carries an impeller 63 at or near its lower end. Impeller 63 is located within tube 57, and it is adjustable along shaft 61 to accommodate various positionings of the tube on leg 41.

An adjustable bearing 65 is provided for shaft 61. Bearing 65 has a threaded extension 66 which is receivable in any one of the holes 55 in leg 41 to enable the bearing to be located in proper vertical position depending on the length of shaft 61 and the positioning of tube 57. Adjustable bearing 65 and the bearings of motor 60, and perhaps a bearing plate 52, are sufficient to insure proper support of shaft 61.

A removable screen or perforated sheet metal filter 67 is mounted on leg 41 in surrounding relation with shaft 61. Filter 67 extends generally from the top of tube 57 to the top of the container.

Filter 67 has several functions. Firstly, it protects shaft 61, bearing 65 and the upper part of tube 57 by physically shielding them from the heavy objects introduced into the container for cleaning. Secondly, it prevents solid foreign matter given up by the work during the cleaning operation from entering tube 57 and damaging impeller 63 or its action. Thirdly, it catches such foreign matter, and enables removal of same from the bath by merely removing the filter and washing it off. Thus the bath conveniently can be kept relatively free of refuse.

As shown, filter 67 comprises a perforated metal sheet 68 formed in generally semi-cylindrical shape. Each longitudinal edge of sheet 68 has attached thereto a leg 69 (Fig. 3) of an angle iron 70 which may extend the full length of sheet 68. The other leg of each angle iron 70, namely leg 71, extends laterally outwardly from the sheet edge, as shown in Fig. 3.

Leg 71 of each angle iron is provided with a recess 72 which receives a headed stud 73 such as a carriage bolt carried by leg 41 of the supporting structure. Metal sheet 68 is sufficiently resilient so that the angle irons 70 may be moved toward each other to effect disengagement of the headed studs 73, thus readily releasing filter 67 for removal and cleaning. With this arrangement, filter 67 is readily remounted in operating position.

The portable apparatus of Figs. 2 and 3 is originally manufactured and sold in such size as to be accommodated in containers of greater than average depth. The variable length features are such that the apparatus may be adjusted easily for use in containers of average depth and slightly below. In case it is desired to use the apparatus with a container having a depth substantially below average, it is a simple matter to cut off short lengths of leg 41, shaft 61 and filter 67 so as to adapt the apparatus for such a container.

A screen 75 preferably should be used to provide a false bottom in the container below the lower end 59 of tube 57 to trap sediment. Articles to be cleaned rest on this screen and on each other.

Operation of this form of our invention is essentially the same as that previously described. The cleaning fluid is circulated with a rolling motion as indicated by the arrows 76, this motion providing an agitation which produces highly efficient cleaning.

From the above description it is thought that the construction and advantages of our invention will be readily

apparent to those skilled in the art. Various changes in detail may be made without departing from the spirit or losing the advantages of the invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Cleaning apparatus for attachment to one side of a container comprising clamp structure including an elongated leg adapted to extend vertically along the inner surface of said container side, said leg having a vertical row of uniformly spaced holes therein, a tube having a pair of securing means extending into an adjacent pair of said leg holes to adjustably mount said tube on said leg with the lower tube end near the container bottom, said lower tube end being shaped to discharge fluid in a direction generally normal to the tube axis and toward the opposite side of the container, a drive shaft extending into the upper end of said tube, an impeller within said tube and adjustably mounted on said shaft, and a motor carried by said clamp structure in driving relation with said shaft.

2. The combination of claim 1 with the addition of a bearing to support said shaft between said motor and said tube, said bearing having an extension received in one of the several holes in said leg.

3. The combination of claim 1 with the addition of a removable filter screen extending generally from the top of said tube to the top of said container and functioning to protect said shaft and prevent solid foreign matter from entering said tube.

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