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CLEANING EQUIPMENT

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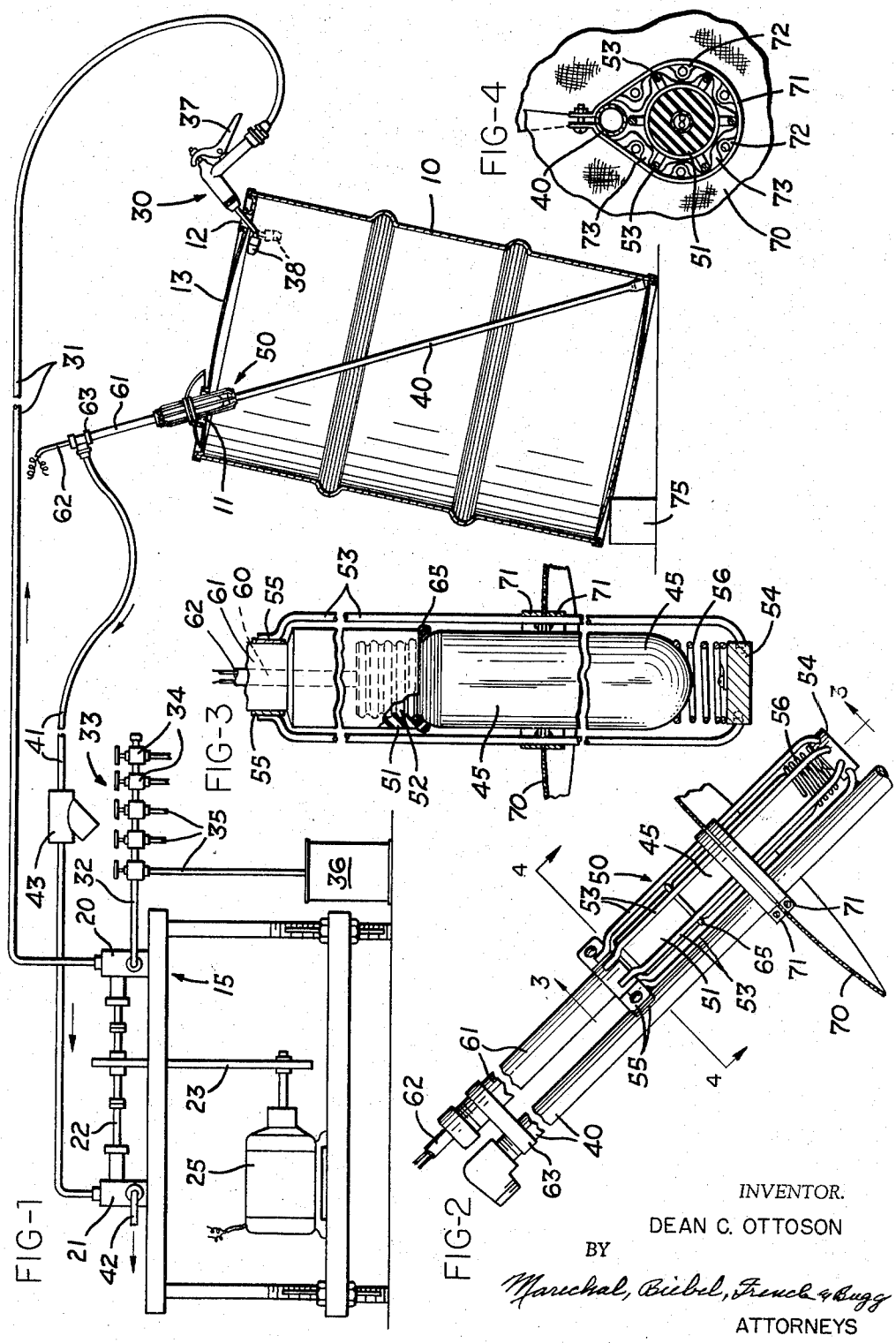

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CLEANING EQUIPMENT

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This invention relates to cleaning equipment.

The invention has particular relation to the cleaning for re-use of large barrels or drums which have contained substances capable of removal by means of volatile solvents. For example, the invention is concerned with the cleaning of drums which have contained alcohol or petroleum solvents in order to permit re-use thereof, and which must therefore be completely cleaned of any contamination of the interior of the drum by other substances which may have become mixed with the original contents.

Cleaning operations for this purpose may be effectively carried out by flushing the interior of the drum with volatile solvents such as naphtha, toluene, xylene, and a variety of aromatic solvents. For example, the drum may be flushed and rinsed with one of this class of solvents with which the drum is thereafter to be refilled for shipment. However, solvents of this class are highly inflammable as well as volatile, and their use involves corresponding danger of explosion and fire. In addition, this type of drum commonly has two relatively small bung openings as the only means of access thereto, and it is difficult to determine accurately when the interior of the drum is clean, particularly because of inadequate illumination for visual inspection. At the same time, it is of practical importance to stop the cleaning operation as soon as possible, since continued unnecessary flushing constitutes a waste of relative costly solvent.

It is a primary object of the present invention to provide cleaning equipment for drums of the type outlined above which is especially designed for simultaneous or alternate flushing of the interior of the drum with fresh solvent and withdrawal of the contaminated solvent and dissolved or entrained residue through the two bung openings in the top of the drum, and it is also an object of the invention to provide such equipment which is constructed to give continuous illumination of the interior of the drum for visual inspection simultaneously with the cleaning operation.

An addition object of the invention is to provide equipment for the purpose outlined above which incorporates an electric light mounted for insertion through one of the bung openings to illuminate the interior of the drum during the cleaning operation, and which also is constructed to prevent the possibility of contact between the electrical connections for the light and the solvent spray or vapor within the drum and thereby to minimize the possible danger of explosion or fire.

Another object of the invention is to provide equipment of the character outlined above which includes provision for quickly and easily changing the solvent being used for cleaning without otherwise altering the equipment or the mode of operation thereof.

Further objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing—

Fig. 1 is a somewhat diagrammatic view illustrating

the overall construction and mode of operation of apparatus in accordance with the invention;

Fig. 2 is an enlarged fragmentary view in section showing details of construction of the suction probe in the apparatus of Fig. 1 and its associated electric light bulb and mounting therefor;

Fig. 3 is a further enlarged fragmentary section on the line 3—3 of Fig. 2; and

Fig. 4 is a section on the line 4—4 of Fig. 2.

Referring to the drawing, which shows a preferred embodiment of the invention, the drum **10** in Fig. 1 illustrates the type of drum which the equipment of the invention is particularly designed to clean. It is shown as an I.C.C. 17E drum of 55-gallon capacity having a pair of bung openings **11** and **12** in the top **13** thereof which are respectively 2 inches and ¾ inch in diameter. The overall diameter of this drum is approximately 24 inches, the overall length is approximately 36 inches, and the maximum diagonal distance from one end to the other is therefore approximately 43 inches.

The cleaning equipment of the invention is shown in Fig. 1 as mounted on a common stand or table **15** of convenient construction and includes a pair of pumps **20** and **21** having a common drive shaft **22** driven through a belt drive **23** by a motor **25**. The pump **20** acts as the pressure pump to supply solvent to a nozzle unit **30** through a hose **31** from a supply line **32** connected with a suitable source of solvent through a manifold **33**. This manifold includes a plurality of individually operable valves **34** each of which has its own supply line **35** from a separate container of solvent, one of which is shown at **36**. The nozzle unit **30** is shown as incorporating a shut-off valve having an operating handle **37**, and the discharge end of the nozzle is shown as including a curved section **38** which facilitates spraying the solvent in any direction within the interior of the drum, including upwards toward the under surface of the top **13** when the nozzle is in the position shown in full lines in Fig. 1.

The pump **21** acts as the suction pump for withdrawing the contaminated solvent, and the foreign matter dissolved or entrained therewith, from the interior of the drum **10**. The pump **21** cooperates with the suction probe **40** which is connected by a hose **41** with the suction side of pump **21**, and the discharge line **42** from pump **21** leads to any suitable waste receptacle. The hose **41** is also shown as connected with a suitable filter **43** to screen solid matter from the pump, and satisfactory results have been obtained with such filter of conventional construction provided with a 200-mesh wire screen.

The suction probe **40** also incorporates the light source for illuminating the interior of the drum, and these parts are constructed in predetermined relation such that the electrical connections for the light source are never exposed to the solvent-filled atmosphere within the interior of the drum and the resulting danger of explosion or fire. Referring particularly to Fig. 2, the light source is in the form of an elongated tubular incandescent bulb **45**. The bulb **45** is mounted within a protecting cage indicated generally at **50** by means of a molded rubber case **51** which encloses the socket **52** for bulb **45**. The cage **50** includes a plurality of wire ribs **53** which extend from an outer end plate **54** to means such as a pair of complementary clamp members **55** for releasably securing case **51** within the cage, and a supporting spring **56** may be positioned shown between the end of bulb **45** and the cage end plate **54**.

The cage **50** is secured on probe **40** in parallel relation therewith by welding or soldering one or two of the ribs **53** to the probe, and the proportions of the cage are coordinated with relation to the diameters of the probe and of the bung opening **11** to allow the entire unit to be inserted through this opening as indicated

in Fig. 1 to support the bulb 45 in illuminating relation with the interior of the drum. The electric leads 60 for the bulb 45 extend rearwardly from the socket 52 through an integral extension 61 of case 51 to a line 62 for connection to a wall receptacle or other supply source, and the extension 61 may have a bracing connection 63 with the upper end of probe 40. Additional protection against possible access of solvent to the electrical connections is provided by a gasket 65 covering the junction between bulb 45 and socket 52.

This construction of the mounting for light 45 is simple and light in weight, and in addition the cage 50 and probe 40 cooperate to provide the maximum protection against the possibility of access by solvent spray or vapor to the electrical connections. More specifically, the cage 50 is located in such spaced relation with the intake or lower end of the probe that the socket end of the light 45 is physically prevented from entering the drum. In other words, the length of the probe 40 from the cage portion 55 to its lower end is sufficiently greater than the maximum straight line distance between bung opening 11 and the bottom of the drum to cause the end of the probe always to strike the interior wall of the drum before the socket end of the light reaches the opening 11. Satisfactory results for this purpose with a drum of the dimensions noted above have been obtained with the length of the probe below parts 55 equal to about 43 inches.

Additional protection of both the electrical connections and the operator against splashing of solvent and contact with the solvent spray is afforded by providing a shield or skirt 70 on the suction probe 40, at a point on the cage 50 below the sealing gasket 65. For example, satisfactory results have been obtained with this skirt 70 formed of heavy fabric such as canvas or rubberized canvas which is cut out in the center to fit around the probe 40 and cage 55, and a convenient mounting for the skirt is shown as a two-piece clamp strap 71 having in-turned tab portions 72 which are riveted together through similar internal tab portions 73 of the skirt. The outer periphery of the skirt 70 may be circular and is preferably of sufficiently greater diameter than the outside of the opening 11 to overlie a portion of the top 13 surrounding opening 11, as shown in Fig. 2, so that the opening remains covered by the skirt skirt through a reasonable range of movement of the probe 40 during a cleaning operation.

In the use of this equipment, it is usually desirable to mount the drum 10 in tilted position as by setting a suitable block 75 below an edge thereof as shown in Fig. 2. The fresh solvent is then sprayed from the nozzle 30 into the interior of the drum while the suction probe 40 and light 45 are in place, and this solvent dissolves or entrains the contaminated material in the drum and causes it to collect in the lower part of the drum for continuous or intermittent removal by the suction probe. With the light available within the drum throughout this operation, the operator can continuously watch conditions within the drum through the bung opening 12, for the purpose both of noting areas which should be particularly flushed and also noting when the cleaning operation has been completed, and this arrangement of the source has been found especially effective in giving adequate illumination free from direct glare.

As previously noted, the cleaned drums are advantageously refilled with a solvent of the class used for the cleaning operation. In order to assure maximum purity of the contents, therefore, it is desirable to use the same solvent with which the drum is to be refilled. On the other hand, it may be that the initial cleaning operation can more effectively be carried out by means of another solvent. The manifold 33 provides for such selective use of one or more different solvents, since each of the valves 34 may be connected to a supply of different solvent, and a selected one or more of these sources can be connected to the intake of the pressure pump in accordance with the particular operation.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Apparatus of the character described for use with an inflammable solvent to clean a drum of predetermined diameter and length having two spaced bung openings adjacent the periphery of the top thereof, comprising a pressure pump having an inlet adapted for connection to a source of solvent, a spray nozzle proportioned to extend through one of said bung openings, means connecting the outlet of said pressure pump to said nozzle to deliver solvent thereto for discharge within the drum, a suction probe receivable through the other of said bung openings and of greater length than the distance from said other opening to the opposite side of the bottom of the drum, a suction pump, means connecting said suction probe to the inlet of said suction pump to withdraw solvent and dissolved material from within said drum, and means carried by said suction probe for illuminating the interior of said drum for visual inspection thereof through said one opening.

2. Apparatus of the character described for use with an inflammable solvent to clean a drum of predetermined diameter and length having two spaced bung openings of predetermined sizes adjacent the periphery of the top thereof, comprising a pressure pump having an inlet adapted for connection to a source of solvent, a spray nozzle of smaller section than one of said bung openings to extend therethrough while leaving viewing space therepast, means connecting the outlet of said pressure pump to said nozzle to deliver solvent thereto for discharge within the drum, a suction probe receivable through the other of said bung openings and of greater length than the distance from said other opening to the opposite side of the bottom of the drum, a suction pump, means connecting said suction probe to the inlet of said suction pump to withdraw solvent and dissolved material from within said drum, an illumination unit including a socket for an electric light bulb and a protective cage for such bulb detachably secured to said socket, said cage being dimensioned for insertion parallel with said probe through said other opening, and means securing said unit to said probe in predetermined spaced relation with the intake end of said probe providing for insertion of said cage into the drum with a bulb in said socket for illuminating the interior of the drum while maintaining said socket outside the drum away from contact with solvent within the drum.

3. Apparatus of the character described for use with an inflammable solvent to clean a drum of predetermined diameter and length having two spaced bung openings adjacent the periphery of the top thereof, comprising a pressure pump having an inlet, a plurality of supply sources each adapted to contain a selected different solvent, manifold means including a corresponding plurality of selectively operable valves connected to said pressure pump inlet, means for connecting each said valve to a different said solvent supply source, a spray nozzle proportioned to extend through one of said bung openings, means connecting the outlet of said pressure pump to said nozzle to deliver solvent thereto from a selected said valve and supply source for discharge within the drum, a suction probe receivable through the other of said bung openings and of greater length than the distance from said other opening to the opposite side of the bottom of the drum, a suction pump, means connecting said suction probe to the inlet of said suction pump to withdraw solvent and dissolved material from within said drum, and means carried by said suction probe for illuminating the

interior of said drum for visual inspection thereof through said one opening.

4. A device of the character described for use with an inflammable solvent for cleaning a drum of predetermined diameter and length having two spaced bung openings of predetermined sizes adjacent the periphery of the top thereof, comprising a suction probe of greater length than the distance from one of said openings to the opposite side of the bottom of the drum and including an intake end, means for connecting the opposite end of said probe to a source of suction, a protective cage for an electric light bulb secured to said probe in parallel relation therewith and dimensioned for insertion with said probe through said one opening to support the bulb in illuminating relation with the interior of the drum, a socket for the bulb detachably secured to the end of said cage, furthest from said intake end of said probe and said cage being located in predetermined spaced relation with said intake end of said probe preventing insertion of said socket within the drum to maintain said socket out of contact with solvent vapor within the drum.

5. Apparatus of the character described for use with an inflammable solvent to clean a drum of predetermined diameter and length having two spaced bung openings of predetermined size adjacent the periphery of the top thereof, comprising a suction probe including an intake end portion receivable through one of said bung openings

and of greater length than the distance from said opening to the opposite side of the bottom of the drum to withdraw solvent and dissolved material from within said drum, means for connecting the opposite end of said probe to a source of suction, an illumination unit including a socket for an electric light bulb and a protective cage for such bulb detachably secured to said socket, said cage being dimensioned for insertion parallel with said probe through said other opening, means securing said unit to said probe in predetermined spaced relation with the intake end of said probe providing for insertion of said cage into the drum with a bulb in said socket for illuminating the interior of the drum while maintaining said socket outside the drum away from contact with solvent within the drum, and a skirt mounted on said suction probe adjacent said socket and proportioned to overlie said one opening to shield against splashing of solvent outwardly through said opening.

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