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PORTABLE DEGREASER AND DISTILLATION APPARATUS

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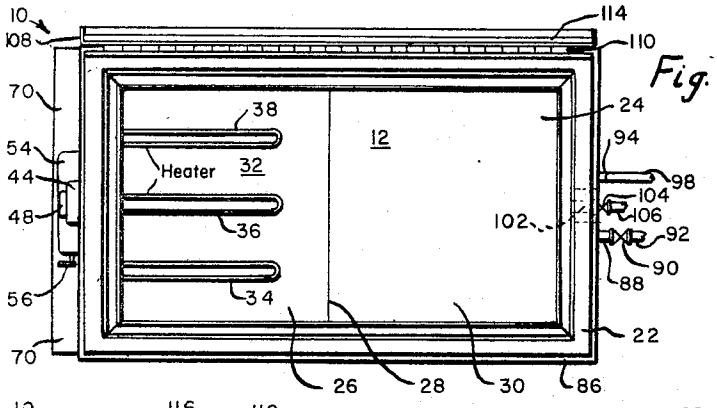


Fig. 1

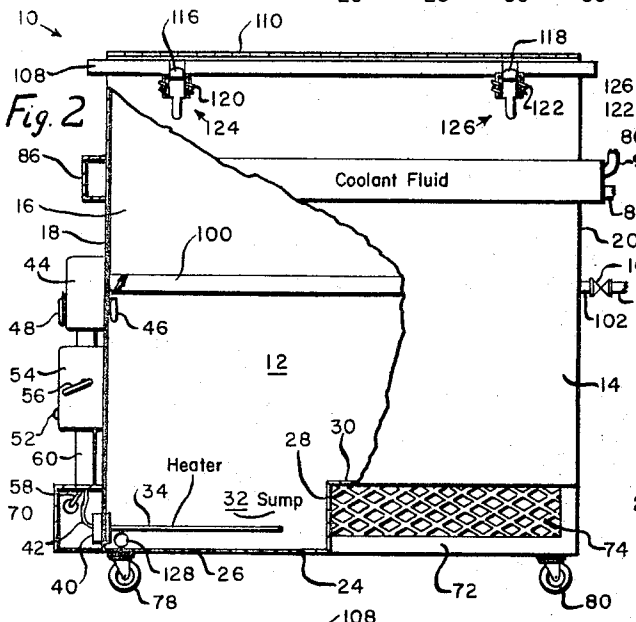


Fig. 2

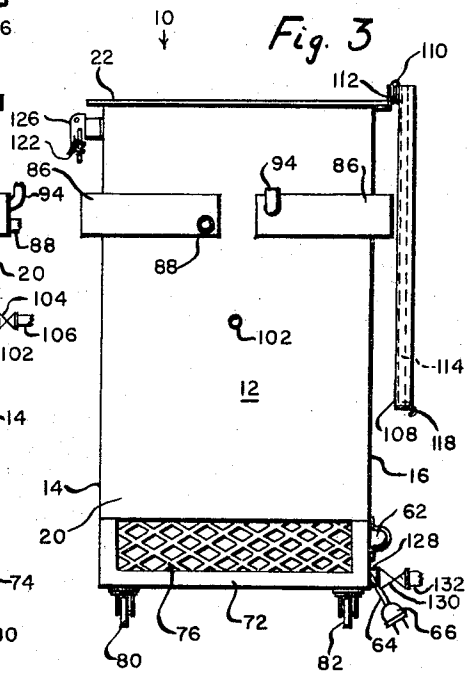


Fig. 3

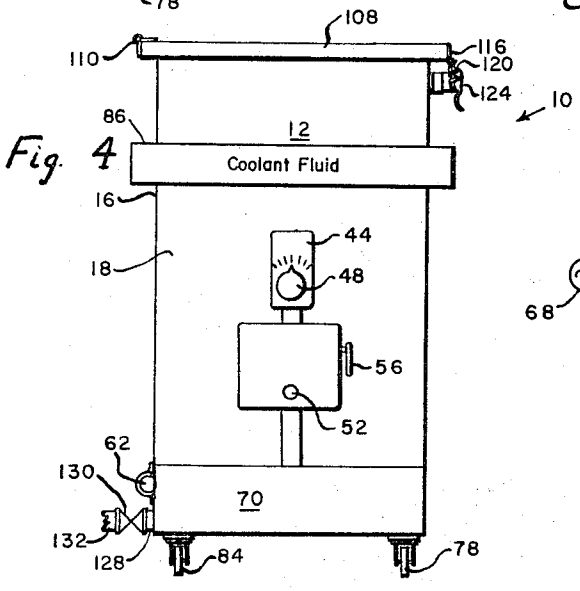


Fig. 4

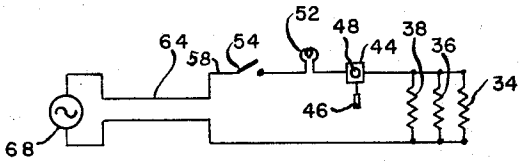


Fig. 5

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PORTABLE DEGREASER AND DISTILLATION APPARATUS

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This invention relates to an improved combined portable vapor degreaser and degreasing fluid distillation device for heavier than air degreasing vapors.

Conventional vapor degreasers using heavier than air degreasing vapors such as trichlorethylene have usually been in the form of fixed installations of large size requiring special permanent space accommodation with ventilating ductwork and separate distillation equipment for recovering contaminated degreasing fluids for re-use in the degreaser. Such large permanent installations generally result in substantial losses of degreasing fluids through evaporation and escape through the ventilating system during operation and even in periods of standby non-use. They also pose problems of inefficiency for lack of rapid adaptability to changing production line needs. This is caused in part by the inconvenience from necessity of transporting work to be degreased from a particular machine operation to the site of the degreaser and subsequent return of the degreased work to the site of the next operation. To improve versatility, some degreasers incorporate a degree of portability for moving to the site of the work to be degreased. However, such efforts at portability have generally lacked the simplicity and ruggedness of construction, safety, convenience, efficiency and versatility of operation desirable for such a device.

These problems have been overcome by the present invention of a combined portable vapor degreaser and distillation device which also incorporates other desirable features and advantages. Among these other features and advantages of the present invention is a capability for rapid and easy movement to substantially any location in a manufacturing plant and safe use at such selected location for effective and efficient degreasing or alternatively for distilling and recapturing degreasing fluids contaminated with grease and oil. Another desirable feature and advantage is that of the rapidity with which the device may be alternatively converted for use as an efficient vapor degreaser on the one hand and as a degreasing fluid distillation or storage device on the other. A further feature and advantage is that of a capability for prolonged non-use storage of volatile degreasing fluid without evaporating losses resulting therefrom. And a further feature is that the invention includes a simple and effective arrangement for preventing the buildup of excessive pressure within the device.

A primary object of the present invention is the provision of a portable combined vapor degreaser and degreasing fluid distillation device for heavier than air vapors which is safely operable without the need for special ventilating equipment.

Another object is the provision of a portable combined vapor degreaser and degreasing fluid distillation device for heavier than air vapors which is readily and efficiently usable at the site of work to be degreased.

And a further object is the provision of a portable combined vapor degreaser and degreasing fluid distillation device for heavier than air vapors which is extremely rapidly convertible for use as a degreaser and alternatively as a degreasing fluid distillation device, and may be simultaneously operated as a vapor degreaser and degreasing fluid distillation device.

Other objects include the provision of a portable combined vapor degreaser and degreasing fluid distillation device for heavier than air vapors which is very compact, rugged and inexpensive in construction, and simple, efficient and reliable in operation.

These and other objects, features and advantages of the invention are achieved generally by the provision of a tank having upwardly extending sheet metal side and end walls whose upper and lower extremities define a top and bottom respectively of the tank, a step shaped sheet metal closure at the bottom with a lower step level extending from one of the end walls and changing at a position distal from the one end wall to an upper step level which extends to the other of the end walls, a support extension from the lower level sheet metal closure toward the other end wall bottom extremity to form with the upper step level sheet metal closure, a storage compartment for flexible electric supply cord and cooling fluid tubing for the degreaser, caster wheels fixed to the bottom for providing mobility to the degreaser, the lower step level closure combining with the side walls and the one end wall to form a degreasing liquid basin, an electrical resistor heating element extending into the degreasing liquid basin, an electric coupling arrangement including a flexible electric conductor coupled to the electric resistor heating element and adapted for coupling to an electric power source, a hollow cooling fluid conductor formation about the periphery of the tank at a position distal from the top for carrying cooling fluid in heat conducting engagement with the walls, a flexible inlet and outlet fluid conductors coupled to the hollow fluid conductor formation for circulating cooling fluid about the walls and adapted for coupling to a cooling fluid source and return respectively, a trough fixed to the walls inside the tank at a position below the hollow cooling fluid conducting formation and above the upper step level bottom closure for receiving degreasing vapor condensate flowing downwardly on the walls inside the tank, a fluid flow control structure coupled to the trough through a wall capacity for draining fluid from the trough, a removable cover closure on the top of the tank, a gasket of resilient material interposed between the cover and upper wall extremity for forming a vapor tight seal yieldably and pressurably therebetween, and a spring latch arrangement for yieldably and pressurably fastening the cover against the top of the tank to effect with the gasket a vapor tight seal which is releasable under a preselected vapor pressure in the tank.

By making the resilient fastening structure in the form of a hinge fixed to one side wall of the tank and an associated portion of the cover, and a spring latch fixed to the other side wall of the tank engageable with the other side of the cover for pressurably and yieldably holding the cover in place against the top, an effective and simple arrangement for rapidly converting the tank from an operating degreaser to a vapor sealed degreasing fluid storage or distillation device is thereby achieved.

By making the hinge in the form of a piano type hinge running substantially the full length of one side wall, evenness of pressure for proper vapor seal along the gasket is thereby assured.

By making the spring latch in the form of a toggle and spring arrangement, suitable leverage is thereby achieved for effecting sufficient spring pressure on the cover to insure proper vapor seal at the gasket together with sufficient yield as a safety release in the event of excessive vapor pressure in the tank.

These and other features, objects and advantages of the invention will be better understood from the following description of the invention when taken in connection with the accompanying drawings of a preferred embodiment and wherein:

FIG. 1 is a plan view of the preferred embodiment

with the cover hanging at the side in the open position with the device in position for use as a degreaser;

FIG. 2 is a front elevation of the FIG. 1 embodiment with the cover shown in closed position on the top of the tank which is shown with a partially cut-away front wall for more clearly showing internal construction.

FIG. 3 is a side view of the FIG. 1 embodiment as viewed from the right hand side of the sheet;

FIG. 4 is a side view of FIG. 2 as viewed from the left hand side of the sheet;

FIG. 5 is a schematic view of a suitable electrical circuit for the present embodiment.

Referring to the drawings in more detail, the preferred embodiment of the portable combined vapor degreaser and degreasing fluid distillation device is designated generally by the numeral **10**. The preferred embodiment **10** has a rectangular tank **12** comprised of upwardly extending sheet metal side walls **14** and **16** (FIGS. 2, 3 and 4) and sheet metal end walls **18** and **20**, the upper part of which have a horizontal flange or lip formation **22** forming the top of tank **12**. The lower extremities of the walls **14**, **16**, **18** and **20** have a step-shaped sheet metal bottom closure **24** with a lower step level **26** extending from the end wall **18** to a distal position **28** where a higher step level **30** begins and extends to the other end wall **20**. The step shaped bottom closure **24** is preferably integral with or fastened to the side and end walls, as by welding to form a liquid and vapor tight seal therewith.

The lower step level **26** forms with the end wall **18** and portions of the side walls **14** and **16** a basin or sump **32** for carrying degreasing fluid, such as trichloroethylene (not shown). Extending horizontally into the basin **32** are electrical resistance heating elements **34**, **36** and **38**, each supported at the end wall **18** by a base such as the base **40** for the heating element **34** and suitably sealed at the end wall **18**. The heating elements **34**, **36** and **38** are connected by electric conductor cable **42** to a thermostat **44** having a sensor element **46** in the upper part of the chamber of the tank **12** and a temperature selector knob **48**. The thermostat **44** is coupled by an electric cable **50** to an indicator light bulb **52** and electrical switch **54** having an operating arm **56**. The switch **54** is connected by electric cable **58** running in protective conduits **60** and **62** to one end of a suitably long extension electric cable **64** having a conventional adapter **66** for plugging into an electric power source **68** such as a conventional 110 volt, 60 cycle alternating current power source.

A protective sheet metal housing **70** is provided at the lower end of the end wall **18** for shielding the electrical components such as the conductor cables **42** and **58**.

The lower step level sheet metal closure **26** is provided with support extension structure **72** of suitable material such as angle iron fastened at **28**, as by welding, and also at the lower extremity of the end wall **20** so as to form with the upper step level **30** and suitable wall material such as expanded metal components **74** and **76** a storge compartment for carrying needed accessories to the present embodiment **10** such as the extension chord or cable **64** and flexible cooling fluid conductor tubing as will be hereinafter further described.

Swivel casters **78**, **80**, **82** and **84** are fastened to the bottom of the degreaser **10** provide suitable and convenient mobility for movement to substantially any desired location in a manufacturing plant for use at the site of work to be performed.

A hollow cooling fluid conducting formation **86** is fixed as by welding about the outside periphery of the walls **14**, **16**, **18** and **20** with one end carrying an inlet coupling **88** leading through a cooling fluid inlet valve **90** to a flexible cooling fluid conductor tube **92**, only a small portion of which is shown in FIG. 1, and the other end of which is adapted to fasten to any suitable coolant source such as a conventional water tap (not shown). The other end of the coolant fluid conducting formation **86** has an outlet coupling **94** preferably in the form of an elbow rising above the formation **86** as shown in FIG. 2 to insure complete displacement of air by coolant fluid in the coolant fluid conductor formation **86**. The elbow **94** is coupled to one end of a coolant fluid outlet flexible tubing **98**, only a small portion of which is shown in FIG. 1, and the other end of which may be coupled to any suitable drain for purposes as will be hereinafter further described. To avoid possible injurious buildup of fluid pressure in the coolant conductor formation **86**, no valve appears in the discharge line **98**.

A trough **100** is provided about the walls **14**, **16**, **18** and **20** inside of the tank **12** at a position below the coolant fluid conductor formation **86** and above the upper step level **30**. The trough **100** is fixed firmly against the walls in manner to receive condensed fluids forming on the walls **14**, **16**, **18** and **20** and flowing downwardly toward the trough **100**. At the end wall **20**, the trough **100** has a coupling **102** carrying a condensate outlet valve **104** with a condensate outlet flexible tubing **106**, only a small portion of which appears in FIGS. 1 and 2.

The combined degreaser and distillation device **10** has at the top thereof a cover **108** which may be of sheet metal. The cover **108** is fastened at one side to a piano type hinge **110** extending substantially the full length of the side wall **16** and fixed to an angle iron **112** carried by the flange **22**. The cover **108** also has glued or otherwise fixed thereto a gasket **114** of resilient material such as rubber which engages the upper surface of the flange **22** when the cover **108** is swung to the closed position as shown in FIGS. 2 and 4. The cover **108** also has hook members **116** and **118** which may be engaged by spring elements **120** and **122** respectively of toggle type latches **124** and **126** fixed to the upper extremity of the side wall **114**. Thus, when the cover **108** is closed as shown in FIGS. 2 and 4, the spring elements **120** and **122** yieldably and pressurably hold the cover **108** against the flange **22** to compress the resilient gasket **114** so as to form a vapor seal therewith. The spring elements **120** and **122** are chosen of a size such that they will yield at a selected excessive pressure in the tank **12** sufficiently to permit escape of gasses past the gasket **114** and thereby prevent further increase of internal pressure.

A drainage coupling **128** is provided at the lower part of the basin **32** in side wall **16** and leads to a drainage valve **130** carrying a drainage tube **132**, only a portion of which is shown in FIGS. 3 and 4. Thus, fluid may be drained from the basin **32** through the coupling **128**, valve **130** and drainage tube **132** as needed, for example when cleaning the degreaser. Alternatively the condensate tube **106** may be coupled to the drainage tube **132** to permit condensate flow from the trough **100** to continuously flow back to the basin **32** for re-use.

In operation, the present embodiment **10** may be easily moved on its casters **78**, **80**, **82** and **84** to the site of work to be degreased, as for example adjacent a production machine creating components requiring degreasing. At such desired operating site, coolant fluid inlet and outlet tubes **92** and **98** are coupled to a suitable coolant fluid source such as a water tap and a drain respectively. By means of valve **90**, the rate of coolant flow through the coolant fluid conductor formation **86** is regulated to provide sufficient cooling affect on the adjacent portions of walls **14**, **16**, **18** and **20** to prevent degreasing vapor from rising above the formation **86** and thus providing a freeboard space between formation **86** and flange **22** at the top of tank **12** as a vapor free area in which work which has been degreased may remain for a brief perior to become completely free of degreasing fluid and vapor. The basin **32** is filled with trichlorethylene and the switch **54** closed with the thermostat **44** control knob **48** set to a selected degreasing vapor temperature which if exceeded would cause the sensor **46** to open the circuit to the resistance heater elements **34**, **36** and **38**. The condensate valve **104** may be closed, in which event conden-

sate from the falls will overflow the trough **100** and find its way back to the basin **32** for reheating. With the cover **108** in the open position as shown in FIGS. 1 and 3, the embodiment **10** is ready as a degreaser for receiving work preferably in suitable wire baskets or trays (not shown) through the open top to a position above the fluid level in the tank **12** and always kept well below the level of the trough **100**. Degreasing vapor condenses on the work so inserted and flows back to the basin **32** carrying with it the grease on the work which is thereby cleaned. Depending upon the type and speed of operation desired, the cooling fluid valves **90** and **96** are adjusted to prevent the vapor from rising above the coolant fluid conductor formation **86**.

Embodiment **10** may be rapidly converted to a distillation device for distilling contaminated degreasing fluid by simply swinging the cover **114** closed onto flange **22** and pressurably and yieldably holding it in place by springs **120** and **122** of the toggle clamps **124** and **126** respectively. In this closed position, as a distillation device, the resistance heating elements **34**, **36** and **38** heat the fluid in the basin **32** which is thereby vaporized and subsequently condensed on the walls **14**, **16**, **18** and **20** adjacent the coolant fluid conductor formation **86** and flows into the trough **100** from which it is drained through condensate valve **104** and condensate tube **106** to a suitable receptacle (not shown) as a clear degreasing fluid ready for re-use as described above.

As a volatile fluid storage device, the cover **108** is closed and forms a vapor seal as described above. The switch **54** is opened to prevent heating fluid in the basin **32** and valves **106** and **130** are closed, thus creating a completely sealed tank **12** which prevents evaporational losses of the stored volatile fluid.

This invention is not limited to the specific details of construction and operation described, as equivalents will suggest themselves to those skilled in the art.

What is claimed is:

1. A portable combined vapor degreaser and distillation device comprising a sheet metal tank having a pair of end walls and side walls extending upwardly with the upper and lower extremities of said walls forming the top and bottom respectively of said tank, a step shaped metal closure at said bottom with a lower step level extending from one of said end walls and changing at a position distal from said one end wall to an upper step level extending to the other of said end walls, a support extension from said lower step level sheet metal closure portion toward said other end wall to form with said upper step level sheet metal closure a storage compartment for flexible electric supply cord and cooling fluid flow tubing of said degreaser, said compartment being enclosed by expanded metal components wheel means at said bottom for providing mobility to said device, said lower step level combining with said side walls and said one end wall to form a degreasing fluid basin, electrical resistor heating means extending into said degreasing fluid basin, electric coupling means including an elongated flexible electric conductor coupled to said electric resistor heating means and adapted for coupling said electric heater means to an electric power source, a hollow cooling fluid conductor formation integral with said walls about the periphery of said tank at a position distal from said top for carrying cooling fluid in heat conducting engagement with said walls, a flexible inlet and outlet fluid conductor means coupled to said hollow fluid conductor formation for circulating cooling fluid through said fluid conductor formation and adapted for coupling to a cooling fluid source and return respectively, a trough fixed to said walls inside said tank at a position below said hollow cooling fluid conductor means and above said upper step level storage compartment closure for receiving degreasing vapor condensate flowing downwardly on said walls inside said tank, degreasing fluid flow control means coupled to said trough through one of said walls with capacity for draining fluid from said trough, a removeable cover closure on the top of said tank, a gasket of resilient material interposed between said cover and upper wall extremity for forming a vapor seal therebetween, and means fixed to said cover and walls for resiliently and pressurably fastening said cover against the top of said tank whereby to effect with said gasket and upper wall extremities a vapor seal releasable under a preselected pressure of vapor in said tank.

2. The combination as in claim **1** wherein said fastening means includes hinge means fixed to one side wall of said tank and an associated portion of said cover, and spring latching means fixed to the other side wall of said tank pressurably and yieldably holding said cover in place against the top of said tank.

3. The combination as in claim **1** wherein said fastening means includes a piano type hinge running substantially the full length of one side wall and fixed to said one side wall and associated portion of said top, and a toggle and spring type latching means fixed to the other side wall of said tank with a catch means at the associated portion of said cover positioned for engagement with said spring for pressurably and yieldably holding said cover in place against the top of said tank.

References Cited

UNITED STATES PATENTS

2,037,071	4/1936	Gerlach	202—170
2,289,023	7/1942	Koch	202—170
2,305,166	12/1942	Koch	202—170
2,329,674	9/1943	Phillips et al.	202—170
2,700,645	1/1955	Kearney	202—170
2,703,093	3/1955	Boyen	134—172
2,811,974	11/1957	Garapolo et al.	134—105 X
2,816,065	12/1957	Legler	202—170
2,860,088	11/1958	Plassmeyer	202—170
3,238,065	3/1966	Fullhart	134—105 X

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