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FILTERING APPARATUS FOR EXHAUST PUMPS

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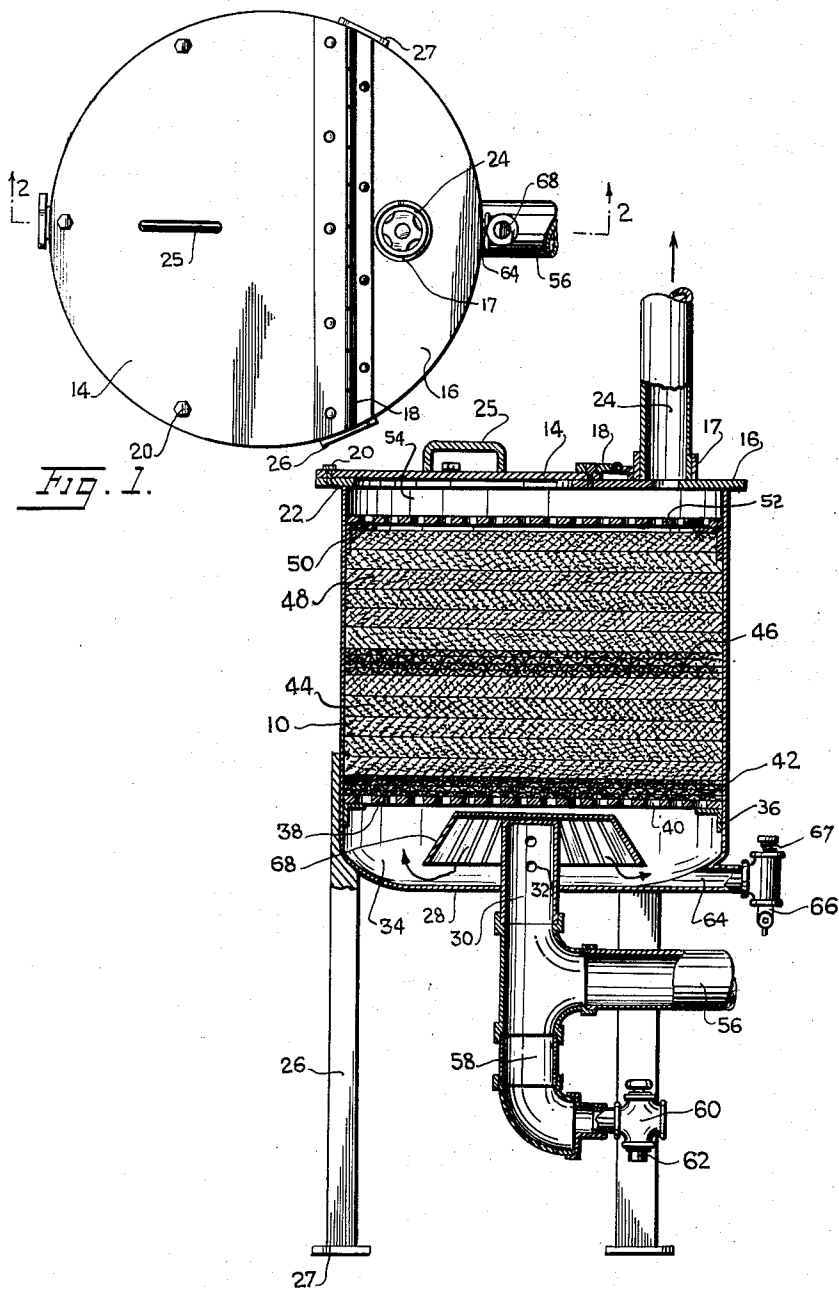


Fig. 2.

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FILTERING APPARATUS FOR EXHAUST PUMPS 5

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6 Claims. (Cl. 183—34)

This invention concerns an apparatus for filtering exhaust pump oil vapors in the form of oil smoke, mist or smog.

According to the invention there is provided a casing through which the vapors are passed. The casing includes a pair of screens between which is disposed a laminated structure consisting of woven or knitted metallic hair filter members and layers of rock wool. This material is made from slag which is a residue of various ore refining processes. Instead of rock wool it is possible to use Fiberglas. The consistency of the material must be precisely controlled for optimum filtering results.

It is a principal object of the invention to provide a filtering apparatus employing a first fluid dispersion member in the path of a vapor to be filtered, a metallic hair filter unit and a mass of fibrous material, in the path of the vapor to be filtered.

A further object is the provision of filtering apparatus for straining and filtering an oil vapor so that clean air is discharged from the apparatus and the liquids are retained and drained off.

Another object is the provision of a filtering apparatus in which a first metallic hair filter unit is disposed on a metal apertured vapor dispersion screen, a plurality of layers of rock wool are disposed on the hair unit, a second hair filter unit is superimposed on the top layer of rock wool, another plurality of layers of rock wool are disposed on the second hair unit, and a second apertured screen is located over the top layer of rock wool.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a top plan view of a filter apparatus embodying the invention.

Fig. 2 is a longitudinal sectional view taken on line 2—2 of Fig. 1.

Referring to the drawings there is shown a substantially closed, generally cylindrical casing 10 disposed with its axis in a vertical position. The casing has a top closed by a cover plate 14. The plate is pivotally secured to a sector plate 16 at the top of the casing by hinge 18. Bolts 20 are removably threaded in a radially extending annular flange 22 at the top of the casing for holding the cover securely closed. The plate 16 has a stub sleeve 17 which supports an exhaust pipe 24 from which clean air or other gas is exhausted from the casing. The cover has a handle 25.

The casing is supported upon three legs 26 spaced 120° apart around the casing and resting on bedplates 27. Fitted into the center of the dish bottom wall 28 of the casing is an inlet pipe 30. This pipe has a plurality of circumferentially spaced holes 32 in its wall. The holes permit communication between the pipe 30 and a

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lower chamber 34 in the casing. Flanges 36 at the top of chamber 34 support a first circular grid or screen 38 having one-eighth inch openings 40. The screen 38 serves as a first dispersing means for the vapors discharged into chamber 34 from pipe 30.

Disposed on screen 38 is a first circular pad or disk 42 made of knitted or woven metallic hair, such as steel or other metal wool. The consistency of this hair is such that it provides numerous interstices and tortuous paths for vapor which are smaller than the openings 40 in screen 38. Superimposed on disk 42 is a plurality of circular pads 44 formed of blankets of fibrous material such as rock wool. The disks are initially larger in diameter than the casing 10 so that when inserted in the casing the disks fit snugly at the inner wall of the casing. About midway between top and bottom of the casing and disposed on the uppermost disk 44 is a second knitted metallic hair pad or disk 46, similar to disk 42. Upon this disk 46 is another mass of fibrous material, preferably a plurality of pads 48 of rock wool.

A pair of flanges 50 support a second apertured screen 52 over the pads 48. Screen 52 is spaced a short distance from the top of the casing to define an upper collecting chamber 54 which opens into pipe 24.

The inlet pipe 30 receives oil vapors to be filtered from an exhaust pipe 56 of a vacuum pump or the like. A branch pipe 58 axially aligned with pipe 30 serves as a trap leg for liquid condensate. This leg has a drain housing 60 provided with a drain cock 62. A drain pipe 64 is secured to the casing and opens into the bottom of chamber 34. This pipe has a drain cock 66 and a pressure relief valve 67.

In assembling the apparatus it is important that the several filtering elements have interstices which are sufficiently large to prevent undue pressure in the filter assembly and back pressure at pipe 30. At the same time, the interstices must not be so large as to permit oil drops to pass with the exhaust air through the filter. To obtain optimum filtration results, the rock wool fibers must have an average density overall of five to ten grams per cubic inch of filter pad. The several pads may be stamped, punched or otherwise formed from rock wool blankets. The lower disk 42 may be of coarser metallic hair than the upper disk 46. The pads or disks 42 and 46 are preferably formed of knitted wire mesh which provides the necessary strength, flexibility, resiliency, light weight and extensive surface area.

The separation action of the apparatus is primarily one of impingement, with the individual wires and fibers serving as impingement targets.

A conical corrugated baffle 68 may be mounted on the upper end of pipe 30 in chamber 34.

In operation of the apparatus vapors to be filtered are fed into pipe 30 via the inlet 56. Excess liquid, heavy drops and condensate flows down into leg 50 and can be drained out via the drain housing 60. The vapor is driven under pressure through holes 32 into chamber 34 where further condensation liquid can be drained off via drain cock 66. If excessive pressure should build up in the apparatus, the spring biased valve 68 will open to relieve the pressure. The vapor is divided into streams in passing through holes 32 in pipe 30 and swirls around in chamber 34. The pressure of the vapor then drives it through the first screen 40 which further divides the vapor into a multitude of streams. The several streams impinge on the resilient wire mesh 42 and a condensation and separation of the larger oil drops occurs. This oil drains back through openings 40 in chamber 34 for drawing off via drain cock 66. The vapor now relieved of larger drops passes through the fibrous mass. This close packing effectively filters a major quantity of the oil entrained in the vapor.

The vapor now passes through wire mesh pad 46 for further division into separate streams and through a final mass of fibrous material provided by pads 48. Screen 52 acts as a hold-down member to prevent deformation of the rock wool pads 48 and as a final condensation producing member. The cleaned and strained air free of oil is then discharged through pipe 24. Due to the vertical disposition of the casing and upward travel of the vapor the filtration process is assisted by gravity.

The several screens and pads can be removed by opening cover 14 when it is desired to clean the casing and to replace the screens and/or pads. Cover 14 is a sector plate having a straight side shorter than the diameter of the casing and a curved side extending more than 180° of arc so that the plate is larger than one-half the circular extent of flange 22.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve.

2. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve, the first and second masses of fibrous material being formed of circular pads of rock wool having a

density of five to ten grams per cubic inch, said pads fitting snugly within the cylindrical casing.

3. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve, the first and second masses of fibrous material being formed of circular pads of rock wool having a density of five to ten grams per cubic inch, said pads fitting snugly within the cylindrical casing, said inlet pipe having a terminal portion in the lower compartment formed with circumferentially spaced holes for initially dividing into a plurality of streams the vapor entering said lower compartment, and an inverted conical baffle on the upper end of the inlet pipe.

4. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve, the first and second masses of fibrous material being formed of circular pads of rock wool having a density of five to ten grams per cubic inch, said pads fitting snugly within the cylindrical casing, said inlet pipe having a terminal portion in the lower compartment formed with circumferentially spaced holes for initially dividing into a plurality of streams the vapor entering said lower compartment, and an inverted conical baffle on the upper end of the inlet pipe, the bottom of the casing having a dished form, said casing being supported upon angularly spaced legs.

5. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to

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define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve, the first and second masses of fibrous material being formed of circular pads of rock wool having a density of five to ten grams per cubic inch, said pads fitting snugly within the cylindrical casing, said inlet pipe having a terminal portion in the lower compartment formed with circumferentially spaced holes for initially dividing into a plurality of streams the vapor entering said lower compartment, and an inverted conical baffle on the upper end of the inlet pipe, the bottom of the casing having a dish form, said casing being supported upon angularly spaced legs, the top of the casing including a first sector plate supporting said exhaust pipe, and a cover in the form of another sector plate larger than a semicircle hinged to the first sector plate.

6. A filtering apparatus for oil vapor, comprising a generally cylindrical casing having a closed bottom and top, an inlet pipe opening vertically into the bottom of the casing, said casing being disposed with its axis vertical, said pipe being disposed in axial alignment with the casing, a first apertured screen mounted transversely across the casing and spaced from the bottom thereof to define a lower compartment, a first knitted wire mesh disk disposed on the screen, a first mass of fibrous material disposed on the wire mesh disk, a second wire mesh

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disk disposed on said mass, a second mass of fibrous material disposed on the second disk, and a second apertured screen supported over the second mass, said second screen being spaced from the top of the casing to define an upper compartment for collecting filtered air, and an exhaust pipe secured to the top of the casing and opening into the upper compartment, a first drain connected to the lower compartment for draining liquid therefrom, and a second drain connected to said inlet pipe for draining liquid condensate therefrom, there being a vapor exhaust pipe connected to said inlet pipe at a point above said second drain, said first drain terminating in a drain cock and pressure relief valve, the first and second masses of fibrous material being formed of circular pads of rock wool having a density of five to ten grams per cubic inch, said pads fitting snugly within the cylindrical casing, said inlet pipe having a terminal portion in the lower compartment formed with circumferentially spaced holes for initially dividing into a plurality of streams the vapor entering said lower compartment, and an inverted conical baffle on the upper end of the inlet pipe, the bottom of the casing having a dish form, said casing being supported upon angularly spaced legs, the top of the casing including a first sector plate supporting said exhaust pipe, and a cover in the form of another sector plate larger than a semicircle hinged to the first sector plate, said casing being formed with an annular flange at its top end, said cover having a free arcuate rim secured to said flange by removable bolts for removing and replacing the screens, disks and pads.

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