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DRUM VENTING DEVICE

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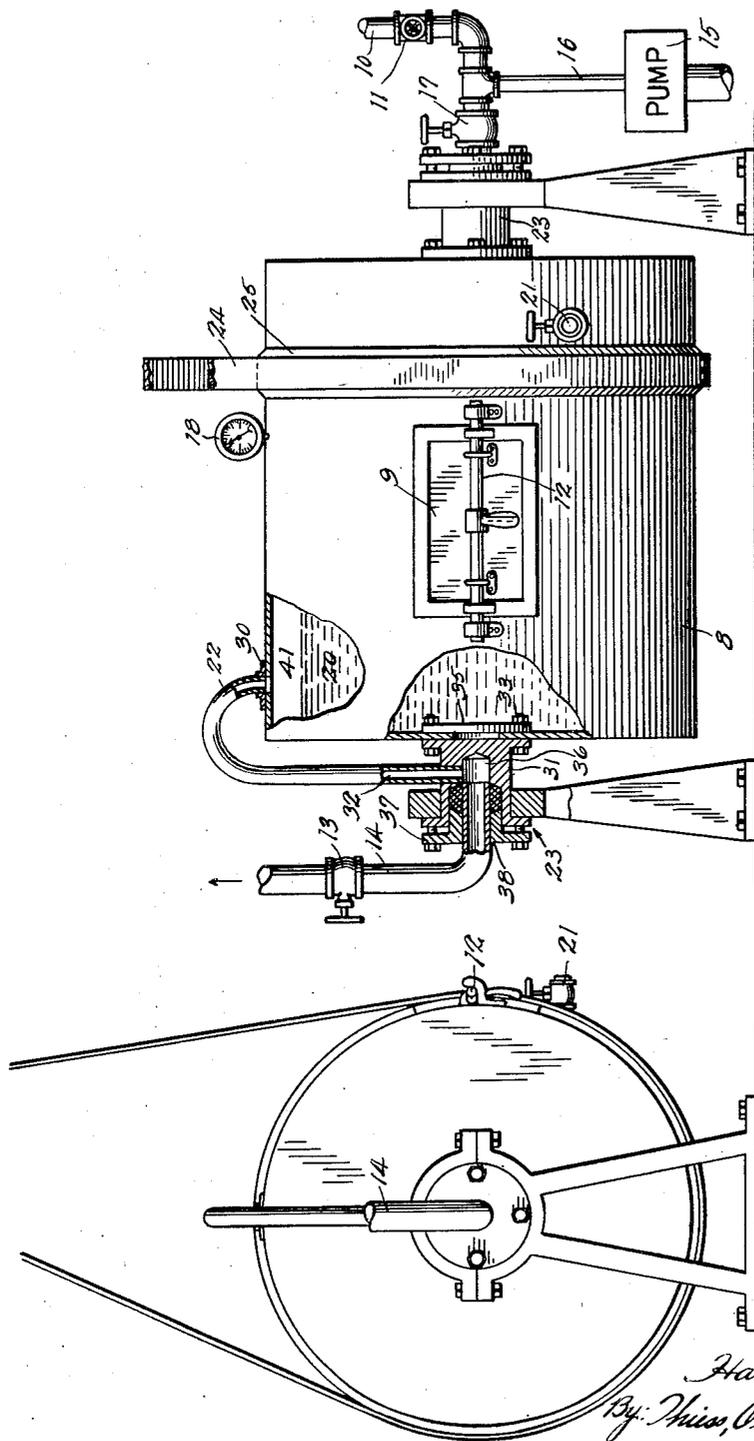


Fig. 2

Fig. 1

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# UNITED STATES PATENT OFFICE

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## DRUM VENTING DEVICE

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Application November 15, 1945, Serial No. 628,775

3 Claims. (Cl. 69—30)

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This invention relates to a venting device. More particularly my invention pertains to a vent forming a part of a rotating drum containing gas-evolving liquids.

Revolving receptacles such as drums are commonly used in the processing industries for the treatment of a large variety of materials. Frequently it is desirable to carry out the treatment within the revolving drum under hydraulic pressure conditions. This is particularly true whenever one desires to hasten the reaction taking place within the drum. When materials are treated with liquid reagents in such revolving drums under conditions wherein during the treatment there is evolved volatile or gaseous material, it becomes necessary to provide a means for venting or expelling such gases in order to avoid the creation of dangerous over-pressures. This is particularly true when the process involves the treatment of materials in a rotating drum with reagent liquors which are under hydraulic pressure. Under such processing conditions it is important to provide efficient means for eliminating any gases evolved during the action of the reagent liquor within the revolving drum. The conventional safety valve does not provide the proper solution to such a problem. This is because such safety valves would sometimes be in communication with the gas zone in the revolving drum and at other times with the reagent liquor zone, with the result that there would alternately be vented both gas and reagent liquor with consequent undesirable losses of reagent liquor.

Accordingly I provide a novel form of venting means which is particularly suitable for rotating drums containing gas-evolving reagent liquors. As one example of the use to which my venting device may be put, reference is made to my co-pending application Serial No. 584,857, filed March 26, 1945, now abandoned, of which the present application is a continuation-in-part.

One of the objects of the present invention is to provide an efficient means for venting volatile or gaseous material from a rotating closed receptacle substantially filled with liquid reagents.

A further object of this invention is to provide a means for venting gases created during the liquid processing of materials in a rotating reaction chamber.

A still further object of the invention is to provide a means for continuously expelling evolved gases from a rotating treating drum substantially filled with reagent liquor.

Another object of my invention is to provide

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a means for continuously venting evolved gases from a rotating drum which is filled with reagent liquor wherein the latter is under hydraulic pressure.

Another object of my invention is to provide a means for continuously venting volatile matter from a rotating treating drum which is filled with low boiling volatile solvents and which is under hydrostatic pressure.

Other objects and advantages will appear, expressed or implied, from the following description of the present invention.

Referring to the drawings,

Fig. 1 is a diagrammatic front view of a rotatable drum to which my novel venting device is adapted; and

Fig. 2 is a side-elevational view of the same apparatus.

In one form of this invention the apparatus consists of a rotatable drum 3 of any conventional construction. The drum is horizontally supported for rotation on the journals 23, and is provided with any type of appropriate mechanical means for rotation during processing. The mechanical means best shown in Fig. 2 consists of the belt 24 driven by a suitable prime mover (not shown) and contacting the tire 25. The inlet pipe 10 enters the drum coaxially with one of the journals 23 and is equipped with the control valve 11 for feeding of reagent liquor into the revolving drum. The pump 15 connected to the water pipe 16 provides means for furnishing superatmospheric or hydrostatic pressure on the liquor in the drum. The valve 17 is utilized for controlling the hydraulic pressure within the drum. An outlet valve 21 is provided for emptying the drum when desired. The drum 3 has a door 9 equipped with locking means 12 for securing the door tightly to the drum during operation.

The venting means of my invention comprises an inverted substantially U-shaped conduit 22 rigidly attached to the outer periphery of the drum 3 through the medium of a flange 30. One leg of the U is, as shown, shorter than the other, the longer leg being attached to the hollow shaft 31 by insertion within an aperture 32 in the periphery of the shaft, being engaged therewith by a threaded or pressed fit for fluid tightness.

The shaft 31 is substantially cylindrical in form and is secured to the drum 3 by the plurality of bolts 33 passing through the flange 34, the end wall of the drum, and the reinforcing plate 35. A central aperture 36 is in fluid communication with the conduit 22 and the stack 14, there being

provided at the outboard end of the shaft 31 a gland 37 and packing 38 to form a stuffing box of conventional construction, thereby permitting rotation of the shaft, including the stuffing box, about the fixed stack 14. The stack 14 is equipped with the control valve 13 and extends vertically to a height sufficient to hold a head of fluid capable of counterbalancing the hydraulic pressure within the drum.

A pressure gauge 18 is mounted on the drum periphery indicates the hydraulic pressure within the drum.

In Fig. 2 the drum is indicated as substantially filled with liquor 20 and having the gas space 41. As the drum rotates, the gaseous material will enter the pipe 22, which in turn delivers the same to the stack.

The following will illustrate the operation of my apparatus. The rotatable drum 8 is so positioned that the door 9 thereon faces upwardly, and the drum is filled through inlet pipe 10 and valve 11 with the quantity of desired reagent liquor. The material to be treated by the reagent liquor is then introduced through the door 9. The door is then replaced and the locking means 12 securing it to the drum 8 are drawn up tightly. The exhaust valve 13 in the stack 14 is then opened and a hydraulic pressure applied on the reagent liquor within the drum by means of the pump 15. This hydraulic pressure may be brought about by either causing the pump 15 to force water through the water pipe 16 into the reagent liquor in the drum, or the pump may be used to force any other kind of liquid into the drum, depending upon the nature of the reagent liquor which is being handled. Thus if the drum is processing materials with immiscible solvent liquors such as carbon tetrachloride, etc., then the same type of liquor would be used in conjunction with the pump 15 for applying the necessary hydrostatic pressure in the drum 8.

The drum is then set in motion and is allowed to slowly rotate, usually at the rate of about 3 to 4 R. P. M. During the treatment of the materials within the drum with the desired reagent liquor, any evolved gases or vapors generated by the processing reaction will be continuously and efficiently vented by my venting device. These gases or vapors will be carried through the U-shaped conduit 22 by means of the fluid connection between the reagent liquor in the drum and the aperture 32 in the conduit. The liquor with the contained gases or vapors will then enter the stack 14. Upon entering this stack, the liquid will rise to a height corresponding to the head of fluid which is sufficient to counterbalance the hydraulic pressure within the drum. The length of the stack 14 extends beyond such height. Any gases or vapors within the liquid will pass through this fluid head and be vented into the air. This venting effect takes place intermittently during the operation of the drum. That is to say, as the drum rotates venting will occur as the opening of the conduit 22 is passing the gas zone. When the reaction is complete, valve 19 is closed and the reagent liquor within the drum discharged through valve 21. The treated material is then removed through door 9 and the drum is ready for another batch.

Where my apparatus is used for the liming of hides, the reagent liquor would be a mixture of water, lime, and sodium polysulphide, and the raw material would be wet, hairy hides. The evolved gas in this instance is hydrogen sulphide.

This gas would be continuously vented by my apparatus during the liming of the hides. Sometimes the sodium polysulphide in the hide liming treatment is replaced by dimethylamine. In this case ammonia gas and dimethylamine vapors would be evolved during the liming treatment. These gaseous materials are readily vented and removed by my drum venting device.

My venting device for rotating processing drums is not limited to the use of the particular chemicals mentioned in the above example nor to the particular industry, namely, the hide-treating industry, mentioned in this example. The venting device is applicable to any treatment of materials in a rotating drum under conditions wherein the rotating drum contains reagent liquor which evolves gaseous or volatile material. An example of the use of my venting device for the treatment of material with volatile liquid reagents is the dry-cleaning of textile material. In an ordinary dry-cleaning process, textile material, such as suits, dresses, etc., is placed in a revolving drum and the drum is then filled with dry-cleaning liquor, which usually consists of highly volatile liquid solvents such as carbon tetrachloride, propylene dichloride solvent naphtha, etc. These dry-cleaning solvents readily form large amounts of vapors which tend to build up pressure within the revolving drum. By means of my venting device, any vapors of the dry-cleaning solvents which are formed during the agitation of the textile material with the dry-cleaning solvents in the revolving drum can be readily vented through the vent pipe 14, and by means of suitable connections these solvent vapors can be led to a condensing means and thereby recovered for re-use.

There are numerous other processes wherein gases or vapors are formed during the treatment of raw materials with reagent liquors in revolving drums which may or may not be under hydrostatic pressure. Examples are the bleaching of textile materials with sulphur dioxide-evolving reagent liquors such as sodium bisulphite liquors, the sulphur dioxide bleaching of foods such as cherries, etc., and the bleaching of paper pulp by means of chlorine or sulphur dioxide. Other examples are the chlorination of starch liquors and metallurgical operations involving the use of chlorine or other gaseous chemical reagents for the extraction of metals, such as copper, lead, zinc, etc. Another example is the de-tinning of iron plate coated with tin by means of chlorine. A further example is the neutralization of acidic material with soda ash or sodium bicarbonate with accompanying production of carbon dioxide gas. In all of the above instances there is a need for an efficient gas-venting means wherever the process is carried out in a rotating drum, particularly when the process conditions are such that the reagent liquor in the rotating drum is under hydrostatic pressure. For all of these conditions my drum venting device offers an efficient means for disposing of any evolved gaseous material.

My invention may be modified in many other ways, and I do not wish to be limited to the details shown and described.

I claim:

1. An apparatus of the type suitable for treating hides which comprises a closed drum mounted for rotation upon a horizontal axis, and venting means for the discharge of gases from said drum during its rotation without substantial loss of liquid therefrom despite its being almost com-

pletely filled with liquid which comprises a gas-conducting pipe communicating with the interior of the drum through the lateral wall thereof, a hollow trunnion not in communication with the interior of the drum but adapted to rotate coaxially therewith, said gas-conducting pipe being in open communication with said hollow trunnion, and a vertical gas-discharge standpipe freely vented to the atmosphere and in direct communication with the interior of said hollow trunnion and of a height sufficient to maintain a liquid column asserting a static liquid pressure at least equal to the pressure existing within the drum, whereby gas escaping from the interior of the drum through said gas-conducting pipe and hollow trunnion may bubble upwardly through said standpipe and escape to the atmosphere.

2. An apparatus for the liquid processing of materials in which gases are evolved which comprises a drum mounted for rotation about a substantially horizontal axis, a hub-member supporting said drum and having a passageway extending thereon, a vent pipe carried by said drum communicating with said passageway and opening into said drum at a point removed from the axis of rotation thereof, and an upwardly extending standpipe freely vented to the atmosphere also in communication with said passageway whereby gases evolved within said drum are

vented from the drum through said vent pipe, said passageway and said standpipe.

3. An apparatus for the liquid processing of materials in which gases are evolved which comprises a cylindrical drum mounted for rotation about a substantially horizontal axis, a hub member supporting said drum and having a passageway and stuffing box therein, a vent pipe carried by said drum communicating with said passageway and said stuffing box and opening into said drum at a point adjacent the periphery thereof, and an upwardly extending standpipe freely vented to the atmosphere also in communication with said passageway whereby gases evolved within said drum are vented from the drum through said vent pipe, said passageway and stuffing box and said standpipe.

HARRY BIRKENSTEIN, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

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1,338,307	Krouse	Apr. 27, 1920
2,374,247	Thaxton	Apr. 24, 1945
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**Certificate of Correction**

Patent No. 2,528,207

October 31, 1950

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 19, for the word "material" read *materials*; column 5, line 24, for "thereon" read *therein*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of January, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,  
*Assistant Commissioner of Patents.*