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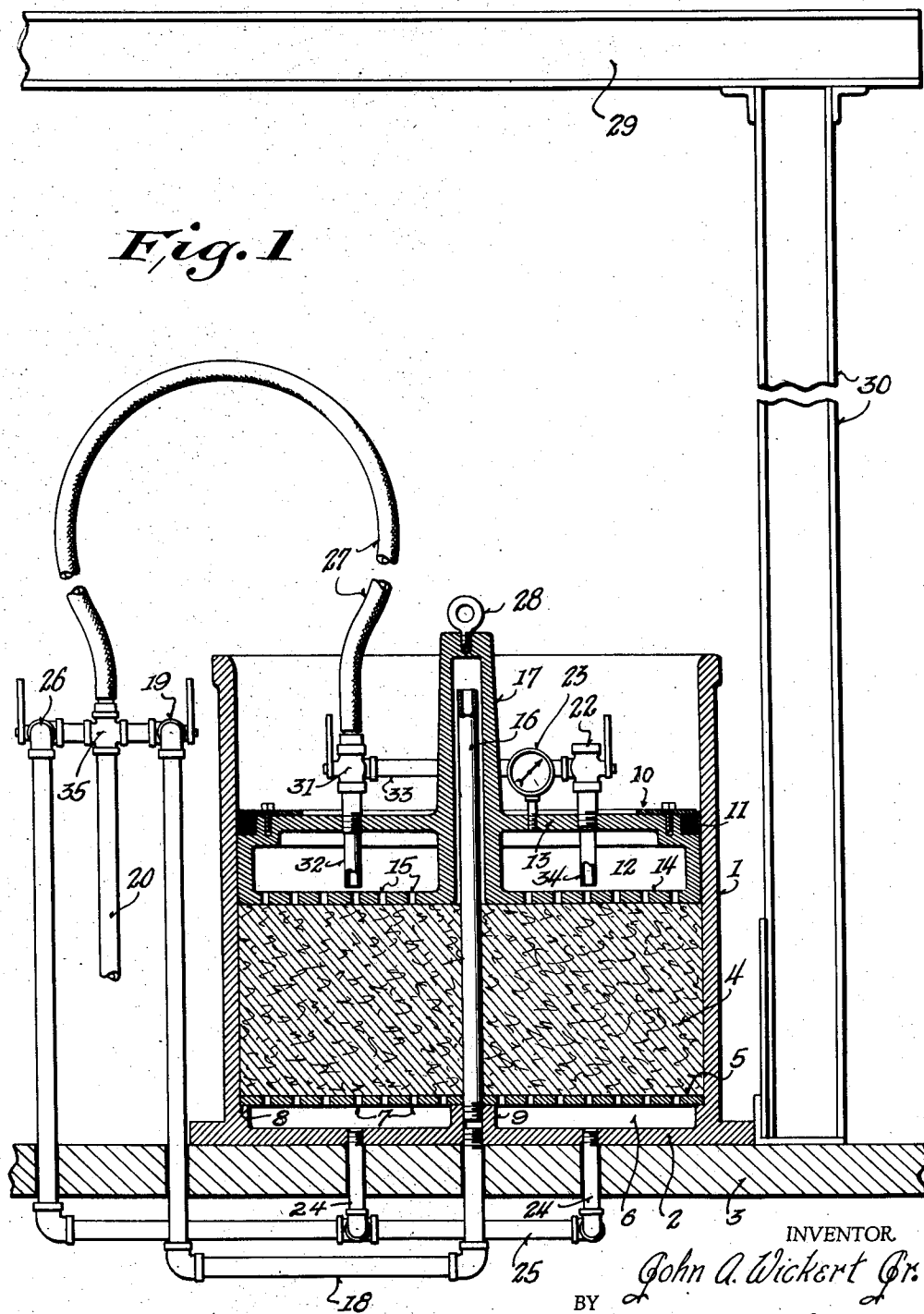
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2,109,559

LIQUID EXTRACTING MEANS AND METHOD

Filed Feb. 4, 1935

2 Sheets-Sheet 1



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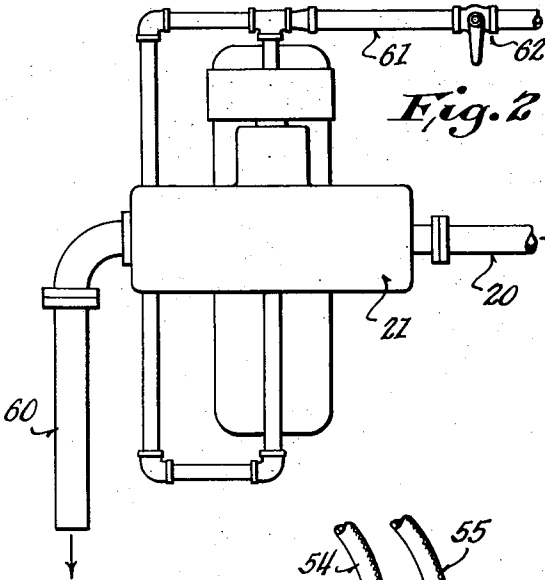


Fig. 2

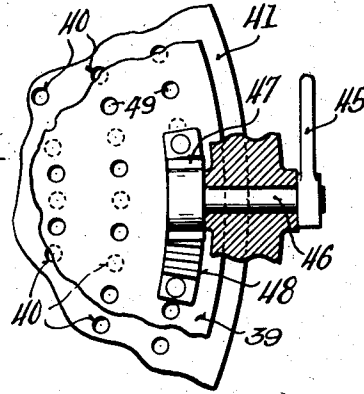
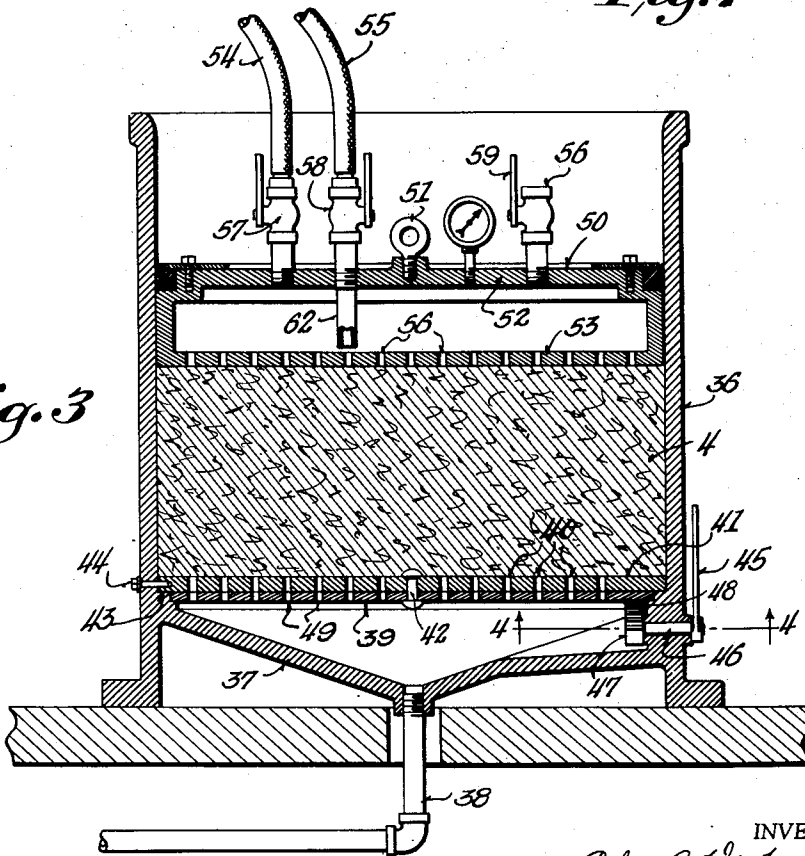


Fig. 4

Fig. 3



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LIQUID EXTRACTING MEANS AND METHOD

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4 Claims. (Cl. 28—60)

This invention relates to a novel method and apparatus for use following a soaking process in the treatment of raw thread material for removing the excess soaking liquid from the thread material in preparing it for the subsequent thread making operations.

Heretofore, a soaking tub and a centrifugal extractor have been required for the soaking and the extractor processes. The raw thread material is soaked in the tub, after which the wetted material is placed in the extractor to remove the excess moisture from the thread material to leave the oil contained in the soaking liquid on the thread material for lubricating purposes as the thread material passes through the throwing and the knitting machines. Aside from the amount of equipment required under the old method, the thin strands of the thread material are likely to be broken or damaged in the extractor. Even though the wetted skeins are carefully laid in the extractor at the time of packing it, yet the mass slides up the side walls of the perforated basket or container of the extractor under the centrifugal action and this displacement frequently injures the thread strands causing breakage which appears when unwinding the skeins on the bobbins in the thread throwing operations. Moreover, the amount of time required for the soaking process includes the time the thread material is being treated in the extractor.

The general purpose and object of my invention is to extract the excess liquid from the thread material without removing the thread material from the tub in which the soaking process is carried out.

In accomplishing this object, I subject the interior of the tub to a sufficiently low vacuum, following the soaking process, to remove the excess soaking liquid from the thread material in the tub. The thread material is subjected to this vacuum treatment for a length of time sufficient to remove all excess liquid and thus dry the thread material to the same extent as accomplished by the centrifugal extractor method heretofore employed.

In accordance with my invention, the vacuum connections are made with the bottom of the tub below the thread mass therein and also with the slidable head or cover above the mass so as to remove the excess liquid from below, as well as from above the thread mass in the tub. I provide the tub with a perforated false bottom wall above the actual bottom of the tub to provide a drain compartment below the thread mass

to insure a complete withdrawal of all excess liquid from the bottom of the tub. I may also give the tub a conical or hopper shaped bottom wall with a vacuum connection at its lowest central point to facilitate the removal of the excess liquid.

It is also within the objects of my invention to employ for the vacuum extracting process the same vacuum producing means used in the soaking operations. This, coupled with the fact that the soaking and extracting processes under my invention are carried out in the soaking tub, reduces the equipment required for these processes, and also reduces the amount of handling required of the thread material.

My improved process and apparatus are particularly adaptable for the treatment of raw silk and other thin thread material employed in the knitting of hosiery and other fabrics.

The invention consists further in the features hereinafter described and claimed.

In the accompanying drawings:—

Fig. 1 is a vertical sectional view, with parts in elevation of a customary soaking tub embodying the features of my invention;

Fig. 2 is a top plan view of the vacuum pump assembly to which the tub is connected;

Fig. 3 is a vertical sectional view of a tub provided with a conical shaped bottom wall and a rotatably mounted valve plate in accordance with my invention; and

Fig. 4 is a plan view taken on line 4—4 of Fig. 3, showing the means employed for adjusting the valve plate.

In the drawing, 1 indicates a soaking tub or container. This is of the usual type employed in the soaking operations as heretofore, and comprises an upright metal cylinder open at its upper end and closed at its lower end by a bottom wall 2. The tub is securely fastened to the floor 3 of the room in which the tub is located. Lag screws or bolts may be used for this purpose and the tub may be provided at its lower end with lugs or webs to receive the fastenings as usual. The tub is also of the size required to receive the desired amount of thread material in skein form for each soaking operation. This material is indicated generally at 4 in the drawings.

The tub, in accordance with my invention, is provided with a false bottom wall 5 suitably supported in the tub above its bottom wall 2 to provide a liquid draining compartment 6 as shown. The bottom wall 5 is perforated, as at 7, 7 which perforations provide for the flow of liquid from the thread mass 4 into the compart-

ment 6. These perforations are distributed over the entire area of the bottom wall 5. The latter may be supported in the tub in any preferred manner. I have shown the tub provided with an annular seat 8 for the peripheral portion of the wall 5 and an upstanding boss 9 for the central portion of said wall. The boss 9 is integral with the bottom wall 2 as shown. Additional supports may be provided for the wall 5 if required.

The raw thread material as purchased in skein form is placed in the tub on the perforated bottom wall 5 in layers as the tub is filled to the extent desired. The soaking liquid is sprayed into the tub onto the skeins as the packing progresses. This liquid, as usual in soaking operations, comprises a mixture of water and an oil. It may also contain a dye of the desired color, if the thread mass is to be colored for marking purposes.

When the tub is loaded, its upper end is closed by a cover in the form of a vacuum head 10. This head has a sliding fit within the tub and has a gasket 11 about its periphery to provide an air tight joint between the head and the tub as usual in these structures. The head 10 is made hollow providing a chamber 12 between the top and bottom walls 13 and 14 of the head. The bottom wall 14 is perforated, as at 15, which perforations afford means for removing excess soaking liquid from the top of the mass 4 as hereinafter described.

The tub 1 is provided with a stand pipe 16 which rises upwardly from the bottom wall 2 of the tub and extends into a dome 17 provided on the head 10. These parts are centrally arranged and the pipe 16 is connected through the boss 9 with a pipe line 18 which, through a hand operated valve 19, is connected with a pipe 20 leading to the suction side of a suitable vacuum producing means, such as a rotary vacuum pump, indicated generally by 21 in Fig. 2. The dome 17 rises above the top wall of the head 10 and is closed at its upper end as shown. The dome opens at its lower end into the interior of the tub and provides a passage whereby the interior of the tub may be placed under a partial vacuum from above the mass 4 through the stand pipe 16 when the valve 19 is opened. The pump 21 is of course operating at this time.

The tub is subjected to this partial vacuum the desired number of times during the soaking process to draw the soaking liquid upwardly through the mass to effectively permeate it. This follows the usual soaking process as now practiced. The relief valve 22 on the head 10 is opened between each vacuum treatment to break the vacuum and allow the liquid to flow downwardly through the mass for further penetration and to release the pressure of the head on the mass so that it may expand to take up the liquid. A vacuum gage 23 is provided on the head 10 to indicate to the operator the pressure condition within the tub during the soaking process, as well as during the extracting process as hereinafter described. In actual practice a 12-inch vacuum is produced in the tub for the soaking process. This of course may be changed or varied as the conditions require.

In accordance with my invention, the bottom portion of the tub below the perforated wall 5, and the chamber 12 of the cover 10 are connected with the vacuum pump 21 or other vacuum producing means which may be employed. For the bottom portion of the tub, I provide one or more pipes 24 tapped into the tub through its bot-

tom wall 2, as shown in Fig. 1. These pipes connect with a conduit 25 which, through a hand operated valve 26, is connected with the pipe 20 heretofore referred to. The chamber 12 in the head 10 is connected with the pipe 20 by a conduit 27. This conduit is flexible, being in the form of a hose, whereby the head may be withdrawn from the tub and transferred to a companion one without straining the hose or removing it from the head. The head has an eye 28 at the upper end of its dome 17, whereby the head may be lifted by a hoist (not shown) movably mounted on the overhead rail 29 supported above the tub by an upright standard 30 at one side of the tub as shown in Fig. 1. This hoisting mechanism is of the character usually employed to raise and lower the head of a thread soaking tub.

The hose 27 is connected with the head 10 through a hand valve fitting 31, which has an extension 32 extending into the head chamber 12 and terminating just short of the perforated bottom wall 14. A pipe 33 connects the fitting 31 with the vent valve fitting 22, as shown in Fig. 1. The fitting 22 also has an extension 34 extending into the chamber 12 and ending fairly close to the perforated wall 14. The valve member in the vent fitting 22 is so constructed that the pipe 33 is connected with the interior of the tub when the vent is closed. This valve member may be in the form of a turning plug, and the other hand controlled valves herein referred to are of a similar character.

The hose 27 is connected with the pipe 20 by a fitting 35 of a character which also connects the pipes 18 and 25 to the pipe 20. This simplifies the arrangement and also locates the valves 19 and 26 within convenient reach of the operator and at one side of the tub.

To remove the surplus liquid from the thread mass 4 after the soaking operation, the valve 31 is first opened. This places the tub under suction and the surplus liquid which collects in the chamber 12 of the head 10 is withdrawn. The valve 26 is opened, immediately following the opening of the valve 31 and the surplus liquid is withdrawn from the bottom of the tub. The vacuum during this extracting process is run considerably lower than during the soaking process and is maintained for a longer period of time. I find that a 27 inch vacuum held for approximately five minutes is very effective. The head is drawn tightly against the thread mass under this low pressure and expresses a considerable amount of the excess liquid out of the mass. The suction on the mass also removes the excess liquid, which with vacuum connections above and below the mass, takes off the liquid at both points. In fact, as the head moves downwardly, the expressed liquid enters the two chambers 6 and 12 for removal through the piping system herein referred to.

On completing the extracting process, the valves 19 and 31 are closed, and the vacuum is broken by opening the vent valve 22. The head or cover 10 is then lifted out of the tub and the dried skeins are removed and ready for the drying room to evaporate all moisture therefrom, leaving the oil for lubricating purposes as heretofore mentioned.

In Fig. 1, the bottom wall 2 of the tub 1 is shown relatively flat, that is all portions of the bottom wall are in the same plane. This is not objectionable, although there is an opportunity afforded for some of the soaking liquid to re-

main on the bottom wall, which in actual practice might not have a surface enabling the liquid to drain freely to the suction pipes 24.

In Fig. 3, the tub 36 is provided with a conical bottom wall 37 whereby the drain is toward the center of the wall at which point the suction line 38 connects as shown.

Also in Fig. 3, I have shown another modification. This comprises a valve plate 39 for opening and closing the openings 40 in the perforated bottom 41 of the tub. The plate 39 is rotatably connected with the bottom wall 41 at its center by a pivot pin or rivet 42. The bottom wall 41 rests on an annular seat 43 in the tub and is held from turning by a pin or other holding means 44 engaging both the tub and said bottom wall, as shown. The valve plate 39 is turned by a handle 45 on the exterior of the tub. This handle connects with a shaft 46 journaled in the tub wall and provided at its inner end with a segmental gear pinion 47. The latter meshes with a rack 48 on the under side of the valve plate.

The valve plate 39 has apertures or ports 49. These are distributed over the plate in the same manner as the ports in the bottom wall 41. The plate 39 is moved in opposite directions to open and close the two sets of the ports. The ports are closed during a soaking process and opened during an extracting process. The ports are closed while soaking the thread mass to prevent waste of the soaking liquid by collecting in the drain chamber below the bottom wall 41. This chamber is relatively large due to its tapered bottom wall 37 whereas the similar chamber in Fig. 1 is considerably smaller and does not require the closing of the ports or apertures in the bottom wall 5.

In the construction shown in Fig. 3, the head or closure 50 for the tub fits within the tub the same as before, but is devoid of a dome. The lifting eye 51 is secured directly to the top wall 52 of the head. This head is made hollow as before and has a perforated bottom wall 53 as shown.

The head 50 is also provided with vacuum connections 54, 55 and a relief valve 56. These parts have hand operated control valves 57, 58 and 59, respectively. The connection 54 is employed for the soaking operations, while the connection 55 and the connection 38 are used during the extracting operation. The connections 54 and 55 include flexible hose sections, and these together with the piping 38 are connected with the vacuum pump 21 in the same manner as shown in Figs. 1 and 2.

The excess soaking liquid extracted from the tub is discharged from the pump 21 with its cooling water through the discharge pipe 60. The cooling water, in the pump shown in Fig. 2, is supplied to the pump jacket by a supply pipe 61 containing a shut-off valve 62. Discharging the extracted soaking liquid with the cooling water enables the operator to determine when the extracting process is completed by the lack of soaking liquid in the cooling water discharge. This also may be determined by the period of time allowed for the extracting operation. A cloth is placed on the perforated bottom wall member of the tub so as to cover the perforations and thus prevent the suction on the tub during the extracting operation from drawing the thread material into the perforations to injure or damage the thread strands.

The advantages of my invention are as follows. The soaking tub is used for both the soaking process and the extracting process. This reduces the amount of equipment required as both processes can be carried out in one and the same fixture. Handling of the thread material is also reduced and damage to the thread strands by handling is minimized. Also, the thread mass may be dried to the same extent as with a centrifugal extractor without danger of breaking or injuring the thread strands by shifting of the mass in the extractor as heretofore. Other advantages will be apparent to those skilled in the art to which my invention relates.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the appended claims.

I claim as my invention:

1. In an apparatus of the character described, comprising in combination with a soaking container having a slidably fitted head closing the upper end of the container and a bottom wall closing the lower end of the container, said head having a vacuum chamber and perforations connecting said chamber with the interior of the container, and vacuum producing means connected with the interior of the container through the head and the bottom wall of the container, respectively, for removing excess soaking liquid from a mass in the container between its bottom wall and said head, the vacuum connection with the head extending relatively close to the perforations in the head to remove excess liquid from the vacuum chamber thereof.

2. The herein described process for use with a soaking container having a freely slidable closure head for closing the upper end of the container and a bottom wall for closing the lower end of the container, consisting in placing a dry material to be treated in the container, introducing a soaking liquid into the container to wet the dry material therein, placing the closure head in the container on the wetted material to close the container, subjecting the interior of the container to a partial vacuum through the head to draw the liquid upwardly through the material to thoroughly wet the same, and then following the soaking of the material in the container subjecting the interior of the container to a partial vacuum through the bottom wall of the container to remove the excess soaking liquid from the wetted material in the container.

3. The herein described process for use with a soaking container having a perforated bottom wall and a slidably fitting closure head for the upper portion of the container above said bottom wall, consisting in placing a dry material to be treated in the container on said bottom wall and introducing a soaking liquid in the container to wet the dry material therein, placing the closure head in the container on the wetted material to close the upper end of the container, closing the perforations in the bottom wall, then subjecting the interior of the closed container to a partial vacuum through the head to draw the soaking liquid upwardly through the material in the container to thoroughly wet the same, and then following the soaking of the material in the container opening the perforations in the bottom wall and subjecting the interior of the container to a partial vacuum through said openings to remove the excess soaking liquid from the wetted material in the container.

4. The herein described process for use with a soaking container having a freely slidable closure head for closing the upper end of the container and a bottom wall for closing the lower end of the container consisting in placing the material to be soaked in the container below the head in contact with a soaking liquid, subjecting the interior of the closed container to a partial vacuum through the head to draw the liquid upwardly through the material and then venting the interior of the container through the head to allow the liquid to flow downwardly through the mass for further penetration and to release the pressure of the head on the mass so that it may expand to take up the liquid.

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