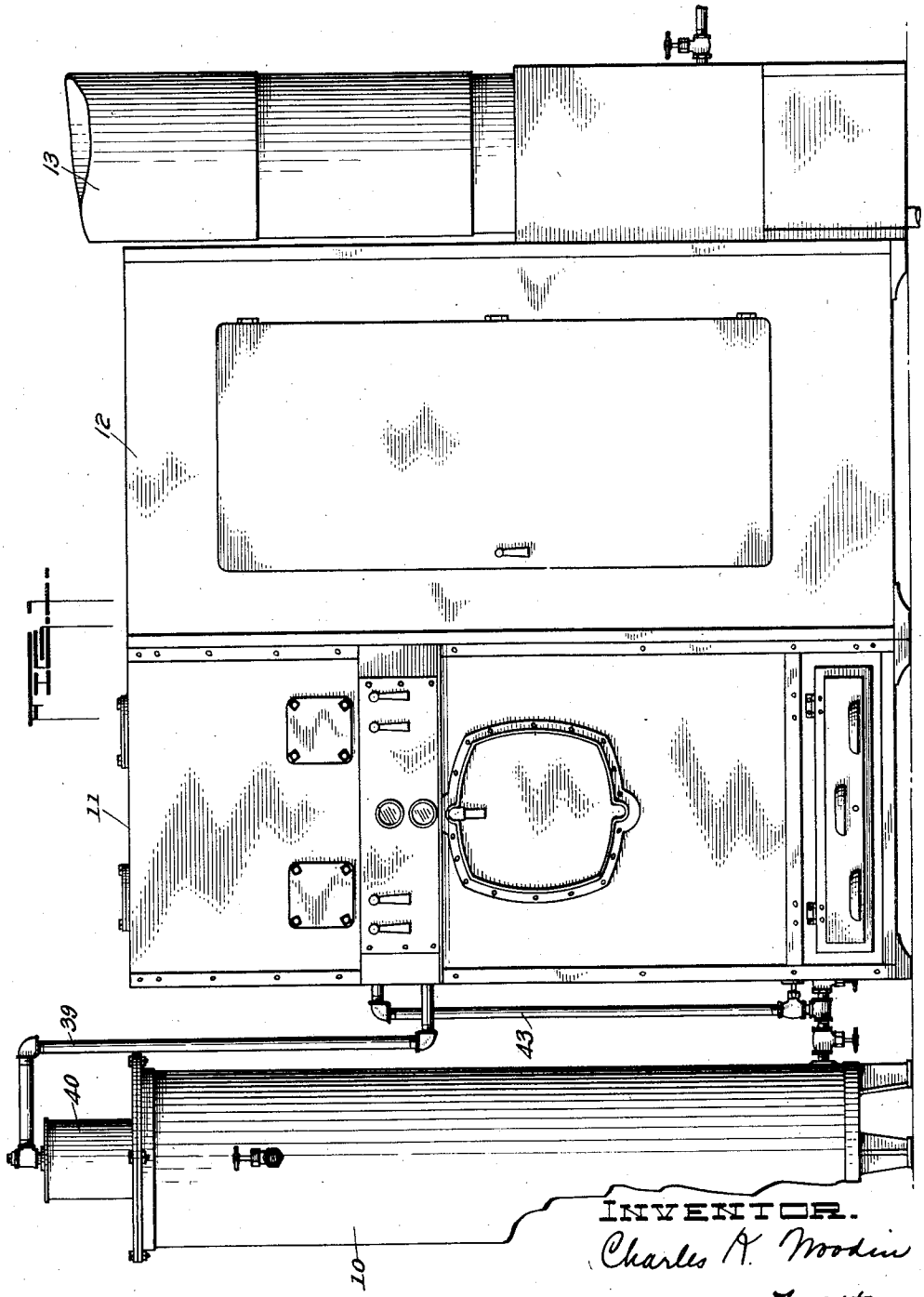
Feb. 1, 1938. C. K. WOODIN 2,107,227

DRY CLEANING MACHINE

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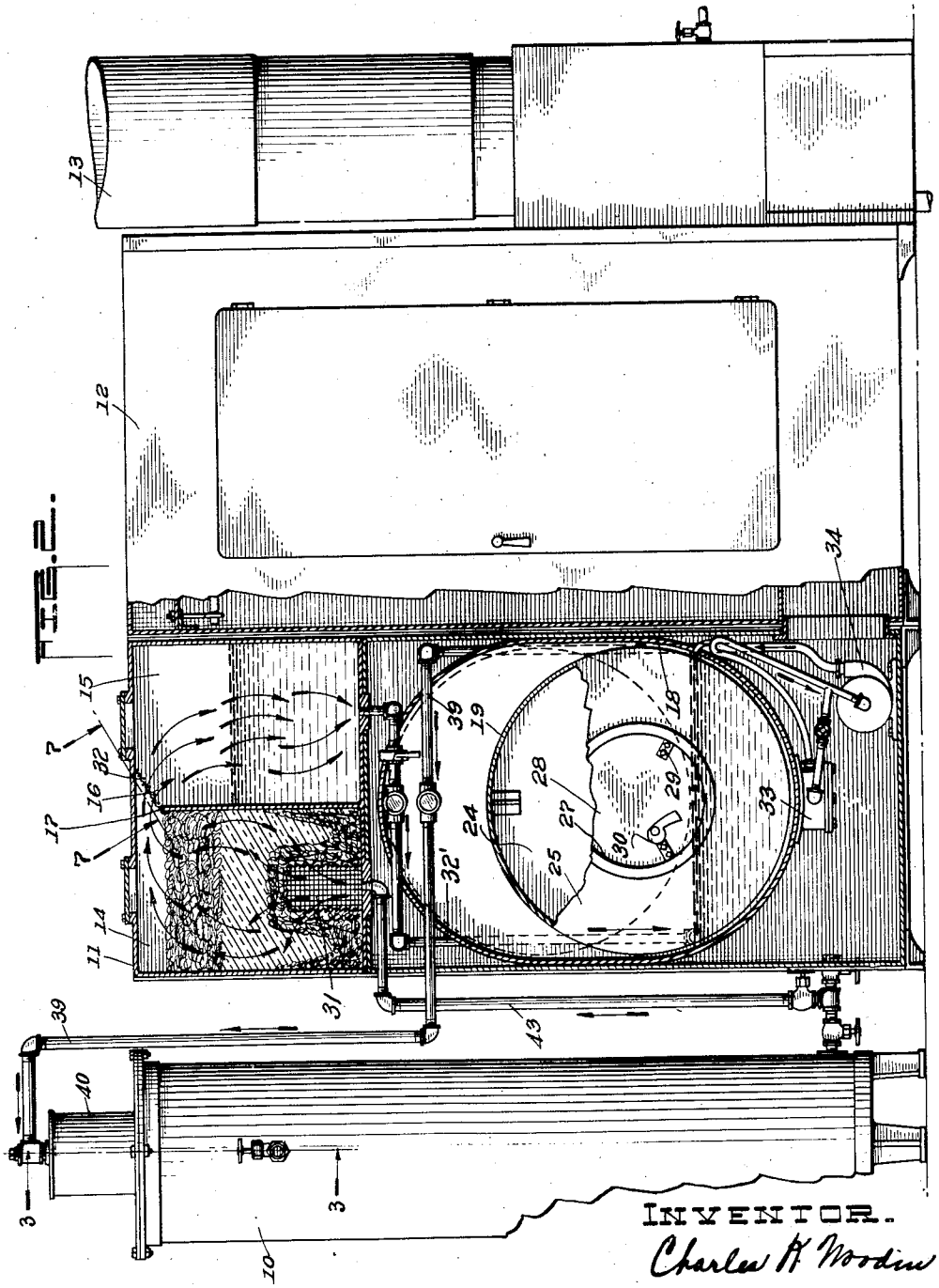
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FIG. 2.



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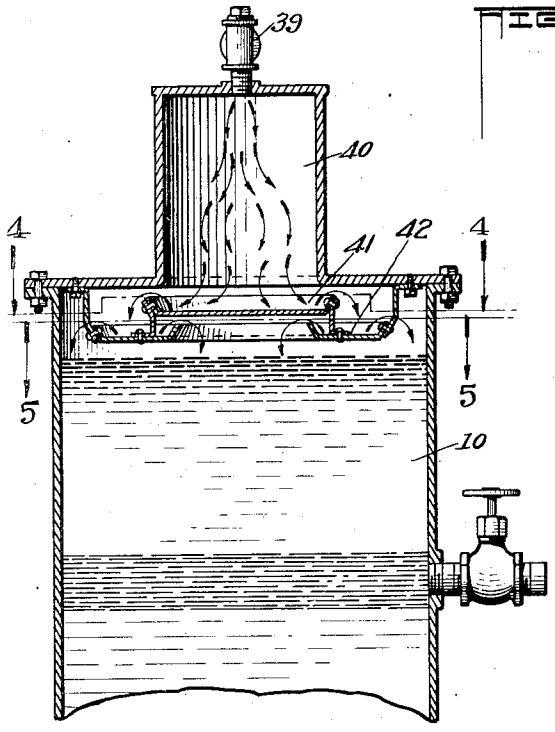


FIG. 3.

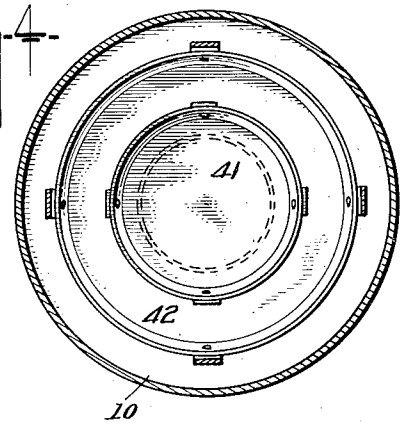


FIG. 4.

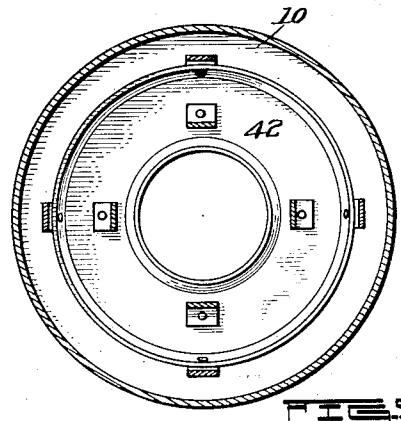


FIG. 5

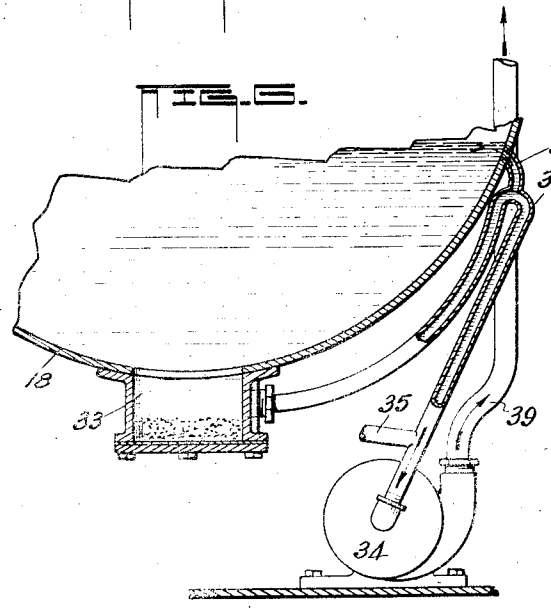


FIG. 6.

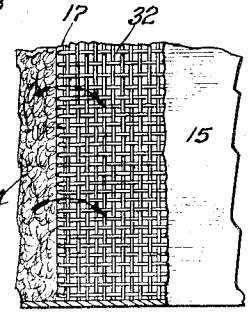


FIG. 7.

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DRY CLEANING MACHINE

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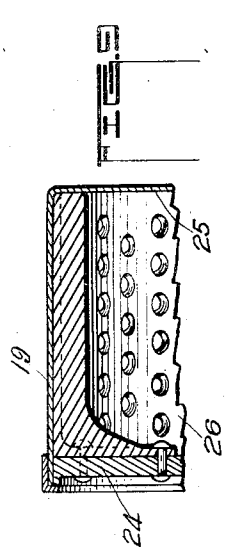


FIG. 9.

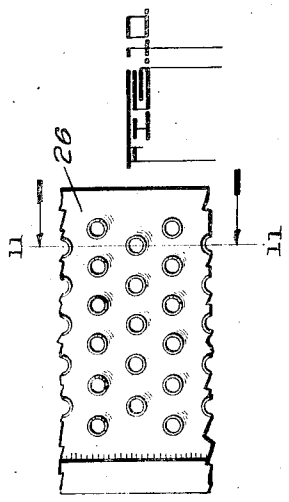


FIG. 10.

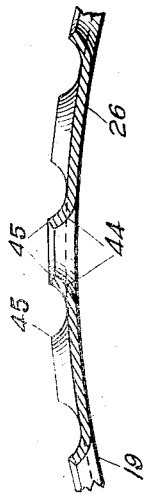


FIG. 11.

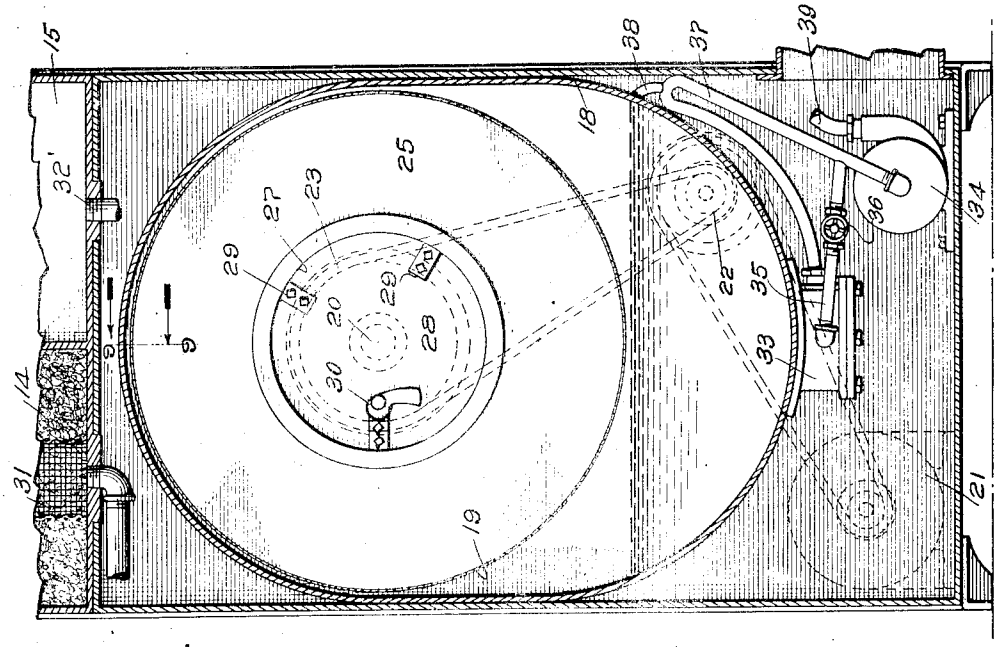


FIG. 8.

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Patented Feb. 1, 1938 2,107,227

UNITED STATES PATENT OFFICE

2,107,227

DRY CLEANING MACHINE

Charles K. Woodin, Bloomington, Ill., assignor to National Rubber Machinery Company, Akron, Ohio, a corporation of Ohio

Application November 29, 1933, Serial No. 700,212

2 Claims. (Cl. 210—76)

This invention relates to cleaning machines, more particularly to that portion of such machinery having to do with the extraction of cleaning fluids from garments processed in the machine and purification of the liquid subsequent to the extracting operation.

The invention has for one of its objects the provision of means whereby cleaning liquid may be quickly and completely removed from garments subsequent to cleaning thereof in the liquid.

Another object is to provide means for purifying liquid used in cleaning the garments to the end that the liquid may be satisfactorily used for a number of cleaning operations.

Still another object is to so combine the extracting and purifying means that the liquid purifying action operates continuously while extraction is in progress.

A further object lies in the provision of novel means associated with the extracting mechanism whereby extraction of cleaning fluid from the cleaned garments is most efficiently accomplished.

Other objects will appear in the following specification taken in connection with the annexed drawings, in which—

Fig. 1 is front elevational view of a complete cleaning and purifying unit with which my invention may be embodied;

Fig. 2 is a view similar to Fig. 1, with certain portions broken away to permit clearer view of underlying parts;

Fig. 3 is a sectional elevational view showing a portion of the liquid processing devices to be described, the same being taken from line 3—3 in Fig. 2;

Figs. 4 and 5 are sectional plan views taken from lines 4—4 and 5—5 respectively in Fig. 3;

Fig. 6 is an enlarged fragmented sectional elevational view showing parts to be described;

Fig. 7 is a fragmental detail view taken from line 7—7 in Fig. 2;

Fig. 8 is a sectional elevational view showing parts of the extracting apparatus to be described;

Fig. 9 is a fragmental detail view taken from line 9—9 in Fig. 8;

Fig. 10 is a fragmental view showing details of construction to be described, and

Fig. 11 is an enlarged sectional view taken from line 11—11 in Fig. 10.

Before proceeding with the description it may be noted that the present invention is herein shown as embodied in a cleaning machine similar to one which has already been described in considerable detail in Chamberlin Patent No. 1,893,398. In view of this, certain portions shown in the accompanying drawings will not be described in detail and the present description will be directed principally to those portions connected with the present invention.

It is to be noted, however, that the present invention is not to be considered as exclusively applicable to the particular form of cleaning apparatus here shown. The following description will make apparent that the invention is applicable to cleaning apparatus of many forms and I therefore do not wish to be limited in the matter of application or form except within the scope of the appended claims.

Referring to the drawings, Fig. 1 discloses a front elevational view of a complete cleaning apparatus comprising four general elements, a tank or drum member 10, cabinet sections 11 and 12 and a stack 13.

Fig. 2 discloses that cabinet 11 contains, in its upper portion, dual compartments 14 and 15 having communication through an opening 16 formed in the upper portion of a partition 17. In the lower portion of cabinet 11 is disposed a casing 18 of vertically elongated form, so fashioned as to house a revolvable drum or basket 19. In Fig. 2 the drum is shown in solid lines, as disposed in the lower portion of the casing. A dotted outline indicates a possible elevated position in which the drum may be placed and will also indicate that the casing with its elongated form is adapted to house the drum in such a manner that the drum may be lowered or elevated therein.

It may be assumed that drum 19 is rotatably supported in the casing 18 by means of a horizontal shaft, not shown, having its axis at 20, Fig. 8, whereby, by means of mechanism fully disclosed in formerly mentioned Patent No. 1,893,398, the drum may be lowered or elevated as indicated and at the same time rotated upon its axis.

In order to illustrate features of my invention, I have shown, in Fig. 8, the outline of a driving motor 21 having belted connection with a countershaft assembly 22 with the latter having driving connection with a pulley 23 secured to the supporting shaft of the drum. Countershaft 22 is made movable to an extent suitable to maintain the driving belts in proper tension and to compensate vertical movement of the drum, whereby the drum may be continuously rotated by the motor while occupying either an elevated or lowered position.

Drum 19 generally comprises a rear face plate 24, shown only in Fig. 9, by means of which the drum structure is secured to its supporting shaft and a front face plate 25.

Plates 24 and 25 are joined by a perforated peripheral strip 26 of substantial width, thus forming a hollow cylindrical member.

Plate 25 is provided with an opening 27, normally closed by a cover member 28 removably secured over the opening by means of clips 29 and a latch mechanism such as 30. Thus the interior of the drum is made accessible for placing or removal of garments to be cleaned. Other details of the drum structure will be explained later.

Referring again to Fig. 2, it will be noted that compartment 14 contains a screen 31 through which liquid may pass, as will be later described, to be circulated through cleaning or filtering materials, disposed substantially as indicated in the drawings. Since details of the latter materials or the arrangement thereof is not material to the present invention, they will not be described further than to say that liquid passing through the system passes through this filtering or cleaning station to overflow the partition 17 through opening 16, in which a screen 32 is disposed, into compartment 15, and through a pipe line 32' to the lower portion of casing 18.

Casing 18 is adapted to retain a quantity of liquid, the depth of which is maintained at such a point that a portion of drum 19 is immersed when the drum occupies the lowered position shown. A sump 33 disposed in the bottom of the casing has communication with a pump 34 through a direct pipe line 35 having a valve 36, or through a looped pipe line 37, as shown.

At the upper extremity of the looped line is a vent duct 38 leading from the pipe to the interior of casing 18 at a point adjacent the surface of liquid in the casing, see Fig. 6.

A pipe line 39 leads from the pump to an upper dome portion 40 of tank 10. Fig. 3 will disclose that dome 40 communicates with the interior of the tank and that the upper portion of the tank is provided with liquid distributing means comprising a substantially shallow pan 41, of sufficient dimensions to include the open area of the dome below which is a flanged ring 42 so dimensioned and disposed that liquid overflowing pan 41 falls into the dished portion of the ring from which it overflows upon the surface of liquid contained in the tank in a widely distributed manner as clearly indicated by the arrows.

Since we are not here interested in the composition of liquids in the tank, they will not be described further than to say that practical operation of the cleaning machine the stratified liquids shown in the tank comprise a means for removing impurities from the liquids used in the cleaning process.

In the purifying process, it is necessary that the cleaning liquid pass through the purifying liquids in order that impurities may be removed.

Due to a difference in specific gravity of the several liquids, the cleaning liquid, when placed upon the purifying liquid tends to find its way downwardly through the successive strata of purifying liquids. In order to provide maximum contact between the liquids during the above described action it is obviously desirable to introduce the cleaning liquid upon the surface of the purifying liquid in a widely distributed manner and this is the function of the distributor pans 41 and 42.

The lower portion of tank 10 is normally occupied by purified cleaning fluid which is conducted by a pipe line 43, Fig. 2, to the compartment 14 which has already been noted.

The foregoing will make clear that with pump 34 in operation the cleaning liquid is successively drawn from casing 18, through pump 34 to dome 40 over distributors 41 and 42, through the purifying agents in tank 10, thence through the cleaning means of compartment 14, through screen 32 to compartment 15 to be discharged therefrom into casing 18.

In order to maintain the liquid level in casing 18, I provide the looped pipe 37 and vent 38 arrangement. It will be apparent that with pump 34 operating, when the liquid level is above the upper loop of pipe 37, it will flow through pipe 37 to the pump, whereas when the level is below the loop, the loop will be vented by duct 38 so that the pump can draw no more liquid except through the direct drain line 35. Valve 36 is normally closed and for this reason all liquid reaching the pump must flow through line 37. The looped pipe and duct 38 arrangement obviously prevents syphonic drainage action through pipe 37 and the pump when the latter is not operating except when the liquid is above the level of the loop.

Referring to the dome 40, it is to be noted that the same provides an air space above the liquids in tank 10 where air entrained with the cleaning liquid may separate therefrom, the air forming a cushioning means whereby surging movement of liquid, as normally produced by the pump, is compensated. The particular arrangement also provides an open space between liquids in the tank and line 39, whereby back flow from tank 10 is prevented without use of check valves.

Referring again to drum 19, it has already been noted that it may be rotated, with its horizontally disposed shaft, in an elevated or lowered position. It will be apparent that garments may be placed in the drum through the opening 27, lowered to immerse a portion of the drum in cleaning liquid and rotated therein, whereby the garments are thoroughly tumbled about and washed in the liquid.

After sufficient washing the drum is elevated out of the liquid and rotated at substantially high speed, whereby the liquid is extracted from the garments by well known centrifugal action.

In the interest of general efficiency it is quite desirable that the work of extracting the cleaning liquid be accomplished as rapidly and completely as possible with a minimum amount of power.

In conventional design, apertures of a member of this kind must be of such dimensions as to provide maximum open area. However, the size and adjacency of these must be so proportioned as to leave adequate structural strength in the member as a whole. In view of this it is clear that the openings may not be too large or too close together and for this reason the total open area in any given area of the perforated member is limited.

This being the case, it follows that in a structure such as that here considered, there is a considerable area of substantially flat surface to which the garments lie closely adjacent under a degree of pressure proportional to the peripheral speed of the drum.

Obviously with the drum rotating at a given rate, the speed and completeness of extraction will depend largely upon the facility with which

the liquid may find its way to and through the perforations.

Bearing in mind the tenacity with which natural cohesive force (operating under the conditions described, namely substantially loosely packed garments lying adjacent flat surfaces) tends to hold the liquids in association with the garments, it will be apparent that actual dissociation of liquid from the garments and discharge thereof through the openings is not to be accomplished without expenditure of considerable power to build up the necessary centrifugal force.

The practice of constructing extracting mechanism of this character is conventional.

However, I have provided novel and useful means for assisting the extracting process consisting of fashioning the rims of the apertures in a special manner as will now be described.

Fig. 11 illustrates in detail that the edges of the apertures are so fashioned as to provide a tapered or funnel-like interior conformity as at **44**, which in Fig. 11 is the lower surface, while upon the outer surface is formed a series of crater-like protrusions as at **45**.

It will be apparent that upon the inner surface, with which the garments are in contact when the extracting process is taking place, the area of the openings is relatively large while the unopen or solid area is correspondingly small. The conformity noted is obviously provided without enlargement of the openings themselves and therefore we have the effect of enlarging the open area exposed to the garments while at the same time retaining ample metal between the openings to afford proper structural strength.

In addition to the feature above noted, the peculiar fashioning of the openings provides a slanting surface leading in the direction of the centrifugal force, whereby liquid is more easily induced to dissociate from the garments and this, in connection with the substantially small flat area already noted, greatly facilitates removal of liquid from the garments.

A further feature to be noted consists in providing upon the outer surface a multiplicity of relatively sharp edged protrusions adapted to reject droplets of liquid in a much more efficient manner than would be the case with the conventional flat exterior surface.

Another effect to be noted is that brought about by "wiping" action of air surrounding the drum when the same is revolving. The rapid movement of the protrusions **45** in the presence of more or less stationary air brings about the same action as that produced by blowing air across the surface and this action, together with that noted in the above paragraph, contributes to the over all efficiency of the device.

The foregoing will make clear that by utilizing the novel construction herein shown and described, I have produced an efficient extracting device having the following advantages:

The extracting process is accomplished without excessive rotational speed. Due to the favorable flow conditions brought about by the means described, rapid and complete extraction is accomplished with relatively low centrifugal pressure.

Low rotational speed, as permitted by the novel structure, is a highly desirable feature in a machine of this character. Due to the absence of excessive vibration brought about by high rotational speed, my device operates more quietly and with less power than is the case where the conventional drum is used. Further, the life of bearings and other moving parts is greatly prolonged.

What I claim is:

1. In a relatively high speed centrifugal extractor for washing machines, a drum mounted for rotation at high speeds on a horizontal axis, said drum having a one-piece continuous cylindrical wall extending entirely around the circumference of the drum and disposed concentric with said horizontal axis of rotation and being regularly perforated circumferentially and longitudinally, each of said perforations being defined by frustro-conical projections extending outwardly of said cylindrical wall, the internal surfaces of the projections being smooth and merging smoothly with the internal surfaces of the cylinder wall, the internal surface of the cylinder wall being smooth and devoid of projections, each of said frustro-conical projections terminating at its outer end at the margin of the defined aperture in a relatively sharp edge disposed on a circular line and formed by the junction of the outer surface of the projection and a surface disposed angularly with respect thereto, the last mentioned surface being inclined inwardly toward the center of the aperture.

2. In a relatively high speed centrifugal extractor for washing machines, a drum mounted for rotation at high speeds on a horizontal axis, said drum having a cylindrical wall extending continuously around the circumference of the drum concentric with said horizontal axis of rotation and being regularly perforated circumferentially and longitudinally, each of said perforations being defined by frustro-conical projections extending outwardly of said cylindrical wall, the internal surfaces of the projections being smooth and merging smoothly with the internal surfaces of the cylinder wall, the internal surface of the cylinder wall being smooth and devoid of projections, each of said frustro-conical projections terminating at its outer end in a surface bevelled inwardly toward the center of the aperture and extending circumferentially of the projection, said bevelled surface intersecting the outer surface of the projection at a sharp angle to assist in the discharge of droplets, the said perforations being spaced on centers substantially equal to twice the diameters of the perforations.

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