

Jan. 6, 1959

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2,867,106

CLOTHES WASHING APPARATUS

Filed Sept. 17, 1957

2 Sheets-Sheet 1

Fig. 1.

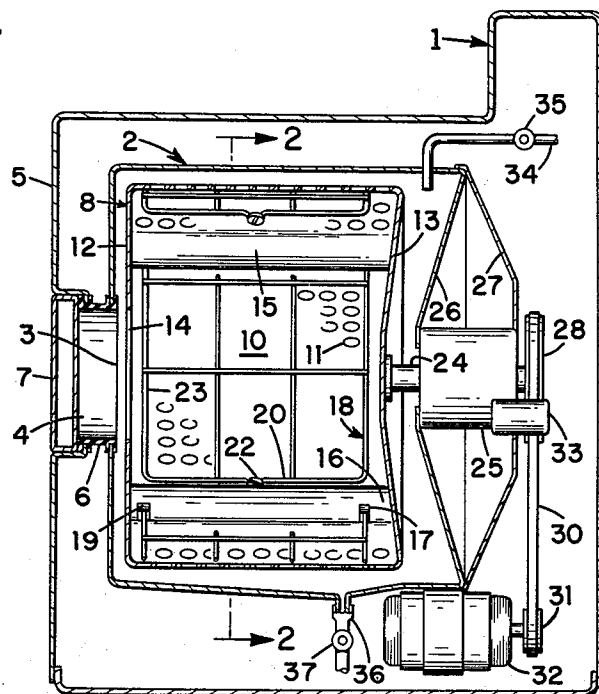


Fig. 2.

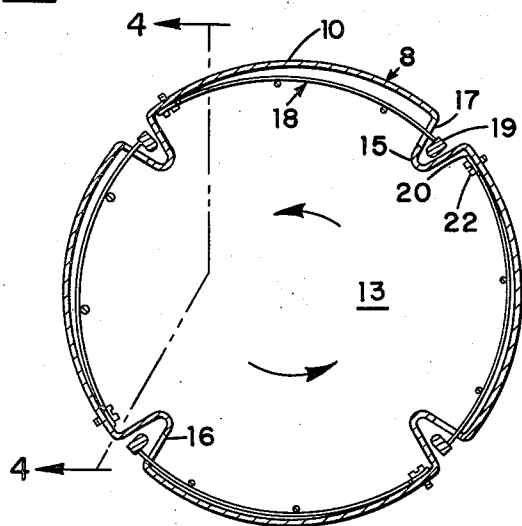
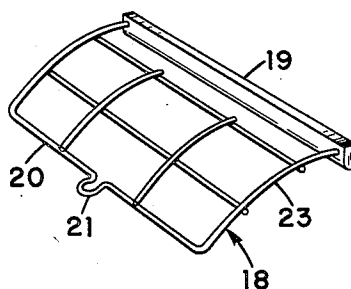


Fig. 3.



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2 Sheets-Sheet 2

Fig. 4.

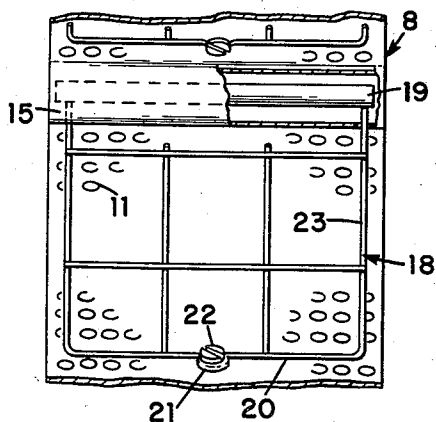


Fig. 5.

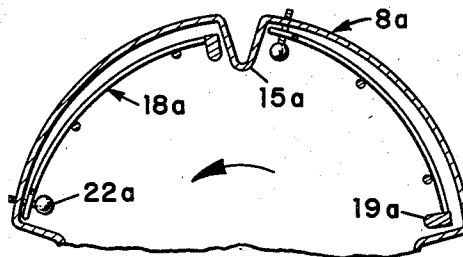


Fig. 7.

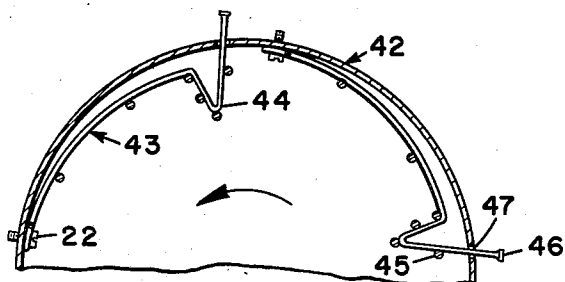


Fig. 8.

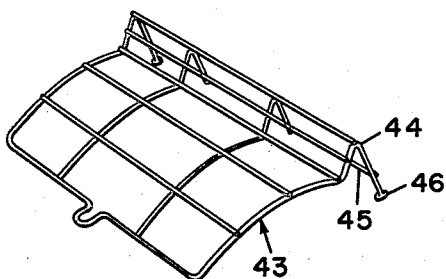
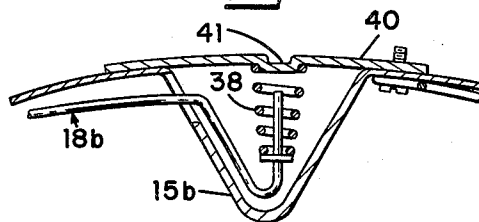


Fig. 6.



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1

2,867,106

CLOTHES WASHING APPARATUS

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Application September 17, 1957, Serial No. 684,540

14 Claims. (Cl. 68—24)

This invention relates to clothes washing apparatus and more particularly it relates to clothes washing machines adapted to remove cleaning liquids from clothes and other fabrics by a high speed centrifuging operation.

Many domestic clothes washing machines include a perforated drum or basket adapted for rotation about a horizontal axis, in which clothes or other fabrics are subjected to a series of washing, rinsing, and extraction operations. These operations are often facilitated by the provision of a series of lifts or vanes circumferentially spaced around the inside of the drum wall to lift and tumble the clothes during drum rotation.

During the washing operation the clothes are tumbled at a relatively low speed in the presence of water and usually a detergent. After conclusion of the washing operation, the clothes are subjected to a rinse or series of rinses in water, often in conjunction with a rinsing agent. When the rinsing operation is concluded, the rinse water is then removed or extracted from the fabric by a centrifuging or spin operation in which the drum is rotated at a relatively high speed, forcing the water to leave the fabrics and out of the drum through its perforations. In practice it has been found advantageous to interrupt this spin operation by one or more pause or rest periods during the spin cycle.

The so-called combination washer-dryer machine performs all of the above operations and in addition provides a heat drying operation after the spin cycle. In these machines, after the extraction operation, the machine completes drying by circulating heated air through the clothes while they are being continuously tumbled in the drum.

Horizontal axis washers and combination washer-dryers possess many advantages and have achieved wide acceptance. However, they also have a disadvantage in that the articles undergoing washing tend to adhere or "plaster" to the inside wall of the drum during the spin operation. During spin, the wet clothes are tightly pressed against the drum periphery and into its perforations while the water from the clothes is flowing out through the perforations. After completion of the spin cycle, it is usual that some of the clothes and other fabric articles remain tightly pressed against the inside wall of the drum. This tight adhesion of the clothes is such that a portion of the clothes will not fall free from the drum even though the spin operation is followed by a tumbling cycle. The tendency to stick to the drum wall is even more pronounced when the articles being washed are relatively small and light such as handkerchiefs and gloves.

The clothes and other fabric articles which have adhered to the drum wall can be removed by hand after spin without difficulty if the machine is an ordinary washer. However, if the machine happens to be a combination washer-dryer, a more serious problem is presented. Under ordinary conditions in the combination washer-dryer, the lifting and tumbling of the clothes and other fabrics during the heated drying operation prevents

2

heat damage to the fabrics because no particular area of the fabric is subjected to a prolonged heated period. However, if one of the fabric articles undergoing drying should remain adhered to the drum wall throughout the typical drying period, the fabric will probably sustain damage from overheating because under these conditions at least a portion of it may be exposed to the heat source throughout the entire drying cycle.

Our invention, adapted for use in horizontal axis clothes washers and combination washer-dryers, provides a construction which automatically dislodges clothes and other fabric articles from the drum wall after the spin cycle and thereby eliminates the adhesion of the clothes to the drum wall.

In view of the fact that the machines in question require tumbling vanes or lifts, it would be advantageous if a device to dislodge clothes after a spin cycle could be combined with a tumbling vane. One illustrated embodiment of our invention does in fact provide a construction which combines a tumbling vane with a device which automatically dislodges clothing from the drum wall after a spin cycle.

Accordingly, it is an object of our invention to provide a simple, inexpensive, and positive means to dislodge fabric articles which have adhered to the inside wall of a horizontal axis clothes washer drum during a centrifuging clothes washing operation.

It is another object of our invention to provide a washing machine tumbling drum having means which do not interfere with the washing or centrifuging of the clothes, but become automatically effective following a spin cycle to dislodge any clothes which may have adhered to the walls of the drum.

It is still another object of the invention to provide a spring or gravity biased means for dislodging fabric articles which have adhered to a drum wall during a spin operation, the means being automatically effective following a spin cycle.

It is a further object of the invention to provide a device for use in the drums of horizontal axis clothes washers or combination washer-dryers which will lift and tumble the clothes during relatively slow speed rotation of the drum, and in addition, automatically dislodge fabrics which have adhered to the drum wall during a spin cycle.

Briefly stated, in accord with the illustrated embodiments of our invention, we provide a series of weighted or spring-biased grid structures about the inner periphery of a drum of a horizontal axis washing machine. The grids, which are curved to match the cylindrical drum, and are movable relative to the drum, lie against its periphery underneath clothes being washed. During the relatively high speed spin operation, the grids and the fabrics resting thereon will be in close proximity to the drum wall throughout the drum's rotational orbit due to the magnitude of the centrifugal force acting upon the grid and fabrics. However, at slower speeds with correspondingly lower centrifugal force, each of the grids will lie against the drum during the lower half of the drum's rotational orbit due to the weight of the grids and the clothes, but upon traversing the upper half of the orbit, will displace from the drum wall because of gravitational pull or the action of the spring biasing means. This movement of each of the grids in turn, will dislodge any fabric articles which may have adhered to the drum wall during the spin operation.

The subject matter which we regard as our invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. Our invention, however, both as to organization and method of operation, together with further objects and advantages thereof may best be understood by reference to the following

3

description taken in connection with the accompanying drawings in which:

Fig. 1 is a vertical sectional view of a washing machine constructed in accordance with the invention;

Fig. 2 is a transverse sectional view of the drum structure of the machine shown in Fig. 1;

Fig. 3 is an enlarged perspective view of one of the grids of Fig. 1 before installation in a drum;

Fig. 4 is an enlarged fragment of Fig. 2 taken along the line 4—4 in Fig. 2;

Fig. 5 is a section of a drum detail showing a modified form of grid structure which may be employed;

Fig. 6 is a section of a drum detail showing still another form of grid and drum structure which may be employed;

Fig. 7 is a transverse sectional view of a drum structure showing our combination grid and tumbling vane embodiment; and

Fig. 8 is an enlarged perspective view of one of the combination grid and tumbling vanes of Fig. 7 before installation in a drum.

Referring now to the drawings, in Fig. 1 we have shown the invention incorporated in a horizontal axis washing machine 1 of the domestic type which includes a suitably mounted tub assembly or liquid container 2 having an access opening 3 in the front thereof which is in registration with an outer access opening 4 in the housing or cabinet 5. The space between the outer access opening 4 and the tub access opening 3 is bridged by a suitable rubber sleeve 6. The outer access opening 4 is closed by a watertight door 7.

Within tub assembly 2 is a cylindrical perforated drum 8. The drum 8 is adapted for rotation in one direction and includes a side wall 10 having a plurality of perforations 11 therein, a front wall 12 and a back wall 13. The front wall 12 is formed with an access opening 14 in registration with the access opening 3 in the tub assembly 2.

Disposed within the drum are a plurality of circumferentially spaced, ridge shaped vanes 15 to lift and tumble clothes during the various washing operations. The forward or leading edges 16 of the vanes 15 in the direction of rotation of the drum are provided with adjoining parallel slots 17.

Also within the drum against the inside of wall 10 is a plurality of mutually spaced, resilient wire grids 18. In our preferred embodiment, one of these grids is disposed in close proximity to and parallel with the drum wall between each adjoining pair of tumbling vanes. The grids 18 include a leading edge 20 in the direction of rotation of the drum. This leading edge 20 is provided with a fastening loop 21 which is secured to the drum periphery by a screw 22. In our preferred embodiment the loop 21 is the only point on the grid which is fastened to the drum 8. The grid also has a pair of side members 23 which extend back from the leading edge 20. When the grids 18 are mounted within the drum, the side members 23 are in registration with and extend through the slots 17 in the leading edges 16 of the vanes 15. Inside the vanes the side members 23 are suitably joined to centrally disposed, weighted bars 19. As the grids 18 are of open construction and are curved to match the drum wall against which they are closely disposed, there is practically no departure from normal washing conditions within the drum. In our preferred embodiment, the resilient construction of the grids 18 and their arrangement within the drum 8 is such that the free trailing edge of the grid, when urged by the weighted bar 19, will bend radially inward away from the drum wall at upper positions in the drum. In this embodiment, we have obtained good results with grids made from $\frac{1}{8}$ inch diameter spring steel wire.

The drum 8 is mounted for rotation by means of a shaft 24 which is journaled in bearings (not shown) in a transmission housing 25. Within the housing 25 is a

4

suitable two speed transmission (not shown) which may be similar to that disclosed in U. S. Patent 2,426,078 issued August 19, 1947 to Rex Earl Bassett, Jr. As the transmission forms no part of this invention, its description has been omitted for the sake of brevity. The transmission housing 25 is carried by means of diverging stampings or similar spaced members 26 and 27 forming the rear wall of the tub assembly 2.

The transmission contained in the housing 25 is provided with a pulley 28 driven by a belt 30 from a pulley 31 on the armature shaft of an electric drive motor 32 which is attached in depending fashion from tub assembly 2.

Secured in suitable fashion to the rear wall of transmission housing 25 is a solenoid 33 which is adapted to shift the drum from low or tumble speed to high or spin speed on energization. This is accomplished when the solenoid 33 actuates the engagement of gears (not shown) forming a high speed drive within the housing 25.

During washing, rinsing, and drying operations, the drum is rotated at a relatively low or tumble speed, for example, 54 R. P. M. On energization of the solenoid 33 the transmission within the housing 25 will be actuated so that the drum 8 will begin to rotate at a relatively high or spin speed for good centrifuging action, for example, 365 R. P. M. It will be obvious, of course, that centrifugal forces acting on objects within the drum will be much higher during the spin cycle than during slower speed operations of the drum.

It will be understood that the drum operated in conjunction with our invention will rotate in the same direction during all phases of the washing machine cycle.

Water is supplied to the tub assembly 2 through a water inlet hose 34 under control of a suitable electrically operated water inlet valve 35. The inlet hose 34 is connected to hot and cold water sources through valves (not shown) so that water of suitable temperature may be admitted to the tub.

The washing liquid is discharged from the tub through a water discharge hose 36 to a suitable drain (not shown) under control of an electrically operated washing liquid discharge valve 37.

It will be understood that in the sequence of operations, which will be described hereinafter, the various elements of the washing machine such as the motor 32, the solenoid 33, the water inlet valve 35 and the washing liquid discharge valve 37 may be automatically controlled from a central source as by means of an electric timer actuated switch mechanism (not shown). Such control systems are well known in the art and further description thereof is deemed unnecessary since they form no part of the instant invention.

The operation of a clothes washing machine embodying the invention begins when the clothes to be washed and a suitable detergent are inserted into the drum 8 through the access opening 4. Water of the proper temperature is then admitted to the tub from the inlet hose 34 controlled by the electrically operated valve 35. It will be understood that the solenoid 33 is not energized and therefore the transmission within housing 25 will be adjusted for tumbling speed. The motor 32 is then energized and rotation of the drum begins.

During tumbling rotation, the clothes are continuously carried from the lower part of the drum upwardly by the vanes 15 to a point where they fall to return to the lower part of the drum. On the drawings we have shown only four vanes and four grids for simplicity. However, it will be understood that a greater or lesser number as desired can be used within the machine.

After the washing machine operation is complete, the washing liquid is drained from the machine through the discharge hose 36 controlled by the electrically operated valve 37. Then, clean rinse water is admitted to the machine through water inlet hose 34 controlled by inlet valve

5

35 and the clothes and other fabrics undergoing washing are subjected to one or more rinses.

After the rinse part of the cycle is complete, the two speed transmission within housing 25 is actuated to the relatively high spin speed by the energization of solenoid 33. Due to the high centrifugal forces acting on objects in the drum during the spin operation, the clothes and the grids on which they are disposed lie very close to the periphery of the drum at this time. While the spin extraction proceeds, water from within the drum and the fabrics flows out of the drum through its perforations.

During this high speed rotation cycle, the drum speed is interrupted by one or more pause or rest periods in which the drum comes to a complete stop. As the drum slows to a stop, the centrifugal forces acting upon the fabrics within the drum and the grids 18 against which they are disposed are reduced to the point where gravitational forces acting upon grids in the upper portion of the drum's rotational orbit cause bars 19 to attempt to fall and thus to bend the grids radially inwardly away from the drum periphery. As the grids move away from the drum the clothes which were pressed tightly against the grid and drum will be dislodged from the drum periphery and fall to the lower part of the drum. Thereafter, if the machine cycle calls for further tumbling operations the fabrics will be freely lifted and tumbled by the vanes as the drum rotation proceeds.

We have found that little or no tangling of the clothes during washing operations results from the use of our invention due to the fact that no appreciable movement of the grids occurs until they are in the upper portion of the drum's rotational orbit.

Means can also be provided within the housing 5 to blow heated air through the clothes during a tumbling operation preceded by a pause period following the spin cycle. If such means are provided, of course, the machine would be classed as a combination washer-dryer. As described above, in this machine the invention will also operate during periods of slow rotation to dislodge any clothes or other fabrics which have adhered to the drum periphery during the spin cycle. Thus, there will be no possibility of heat damage to clothes caused by prolonged exposure to the heated air through adhesion of one fabric area to the drum periphery.

In Fig. 5 we have illustrated a modification of the invention in which the weighted bar 19a, instead of being enclosed within a tumbling vane is disposed within the drum in front of a vane 15a. The grid 18a is secured to the drum 8a by means of the screw 22a which may be adjusted so as to permit the grid a limited degree of pivotal movement. As the weighted bar 19a is mounted parallel with and close to the vane 15a, the projecting structure of the vane virtually eliminates any tendency of the grid to skew within the drum. The modification of our invention shown in Fig. 5 is completely effective to dislodge fabric articles from a drum inner periphery. In addition, it is less costly to manufacture than the preferred embodiment because less material and fabrication is required.

Still another modification of the invention is shown in Fig. 6. As illustrated, the grids 18b are biased by coil springs 38 instead of the weighted bar 19 used in our preferred embodiment. Spring backing members 40 are secured to the drum periphery so as to bridge the tumbling vanes 15b. Each of the backing members 40 is provided with an embossed portion 41 to locate the coil spring. The coil spring 38 is in turn secured to the backing member 40 and to the grid 18b. When the drum is rotated at spin speeds, the centrifugal forces acting on the grid will compress the spring so that the grid and the fabrics thereon will lie against the drum periphery. However, at low speeds, the forces exerted by the expansion of coil spring 38 aided by the gravitational forces acting on the grid will be sufficient to urge the grid away from the drum periphery during the upper half of the

6

drum's rotational orbit so as to dislodge any article of clothing which may have adhered to the drum periphery during the spin operation.

In Figs. 7 and 8, we have shown a modification of our invention which consists of a combination tumbling vane and grid. This particular modification offers definite advantages in that a cylindrical drum 42 can be used for a horizontal axis washing machine without the provision of conventional vanes which are difficult to fabricate and expensive as to material. In this modification, the construction consists of a wire formed grid 43 with a portion near its trailing edge formed so as to constitute a ridge 44 extending radially into the drum interior. The trailing edge 45 of the wire formed vane and grid 43 is unattached to the drum and its side members 46 movably project through apertures 47 in the drum periphery. In this modification, we have found that the resilience of the wire formed vane and grid construction 43 is such that it will move away from the drum periphery during the upper half of the drum's rotational orbit at slower speeds without the provision of additional biasing means. It will be seen therefore that we have provided in the modification shown in Figs. 7 and 8 a construction which will automatically dislodge fabric articles from the drum periphery following a spin operation, and in addition, constitute a tumbling vane to lift and tumble the clothes during the various phases of the clothes washing operation.

While we have shown several embodiments of the invention, it will be understood that it is not so limited, but is subject to other modifications, and it is intended to cover in the appended claims all such modifications as fall within the scope of the invention.

We claim:

1. In apparatus for tumbling wet fabrics and for extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum adapted for rotation in one direction to contain the fabrics to be treated, said drum having a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of its end walls; a plurality of mutually spaced tumbling vanes parallel to and extending inwardly from said drum side wall; a movable grid providing a resting place for fabrics disposed against the inside wall of said drum adjacent to each one of said vanes, said grid having at least one point on its leading edge in the direction of rotation of said drum attached to said side wall near a vane, grid side members extending back from said leading edge toward the next vane to the rear of said leading edge, a weighted bar in close proximity to said next vane adjoining said side members, said bar having a mass large in relation to said grid and providing a trailing edge for said grid unattached to said drum whereby said grid can rotate inwardly about said attached leading edge; means for rotatably mounting said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the respective grids and fabrics disposed thereon will be in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force associated with said centrifuging speed and at slower speeds with correspondingly lower centrifugal forces in which the grids will lie close to the drum during the lower half of the drum's rotational orbit due to gravitational force but on traversing the upper half of the drum's rotational orbit will move away from said drum wall interior by gravitational force thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

2. In apparatus for tumbling wet fabrics and for extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum to contain the fabrics to be treated, said drum having a perforated, generally cylindrical side wall and an access opening to receive said fabrics; a plurality of mutually spaced hollow tumbling vanes extending axially inwardly from said

7

drum side wall, each of said vanes having at least two adjacent slots therein; a resilient grid providing a resting place for fabrics disposed against the inside wall of said drum adjacent to each one of said vanes, each said grid having at least one point on its leading edge in the direction of rotation of said drum attached to said side wall near a vane, grid side members extending back from said leading edge through said slots into the next vane to the rear of said leading edge, a weighted bar wholly within said next vane joining said side members, said bar having a mass large in relation to said grid and being unattached to said drum whereby said grid can pivot inwardly about said attached leading edge; means for mounting said drum for rotation about an axis inclined from the vertical; and a drive mechanism to rotate said drum at a centrifuging speed whereby the respective grids and fabrics disposed thereon will be in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force associated with said centrifuging speed and at slower speeds with correspondingly lower centrifugal forces in which the grids will lie close to the drum during the lower half of the drum's rotational orbit due to gravitational force but on reaching the upper half of the drum's rotational orbit will move away from said drum wall interior by gravitational force thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

3. In apparatus for tumbling wet fabrics and for extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a rotatable drum to contain the fabrics to be treated, said drum having a generally cylindrical side wall and an access opening to receive said fabrics; a plurality of mutually spaced tumbling vanes parallel to and extending inwardly from said drum side wall; a plurality of elongated, open-work structures disposed within said drum about the cylindrical side wall thereof, the respective structures each having its leading edge, considered with respect to the direction of rotation of said drum, fixed relative to said side wall for pivotal movement of said structure in a direction inwardly of said drum; a weighted bar fixed to said structure adjacent the trailing edge thereof, said bar having a mass large in relation to said grid and being unattached to said drum, whereby said grid can move inwardly about said attached leading edge; and means including a drive motor to rotate said drum at a centrifuging speed whereby the respective grids and fabrics disposed thereon will be in close proximity to the drum wall due to the large magnitude of the centrifugal force associated with said centrifuging speed, and at slower speeds with correspondingly lower centrifugal forces in which the grid will lie close to the drum during a lower portion of the drum's rotational orbit due to gravitational force but on traversing an upper portion of the drum's rotational orbit will move away from said drum wall interior by gravitational action, thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

4. In apparatus for tumbling wet fabrics and extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum to contain the fabrics to be treated, means for mounting said drum for rotation about a substantially horizontal axis, said drum having end walls, a generally cylindrical side wall, and an access opening; a plurality of mutually spaced hollow tumbling vanes extending axially inwardly from said drum side wall, each of said vanes having at least two adjacent slots therein; rigid backing members secured to said drum behind each of said slots; a movable, grid-like structure disposed contiguous with and generally parallel to said drum wall intermediate each pair of adjacent vanes, whereby the respective structures are interposed between the fabrics and the side wall of the drum; means for supporting each grid structure relative to said drum for rotation

8

inwardly of said drum, rigid means extending from each said grid structure through the slots in an adjacent vane; a coil spring disposed within each said vane between the said rigid means and the said backing members to urge said grid-like structure radially inwardly from said drum side wall; and means including a drive motor to rotate said drum at a centrifuging speed and at a much slower speed, the said coil springs being compressible by the centrifugal forces acting on said grid-like structures at centrifuging speed to permit said structures to assume a position in close proximity to said drum wall, but assuming an expanded condition at said lower speed to urge said structures inwardly of said drum to dislodge any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

5. In apparatus for tumbling wet fabrics and extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum, means for mounting said drum for rotation about a substantially horizontal axis, said drum having end walls and a perforated, generally cylindrical side wall and an access opening to receive said fabrics; means for rotating said drum and its content of wet fabrics at said high centrifuging speed and at a much lower tumbling speed; and means for separating from said drum side wall any fabrics which may have adhered thereto during said centrifuging operation, said separation means comprising a plurality of rod-like structures secured to said drum for movement in a direction toward the center thereof, each said structure having a relatively heavy portion extending axially of said drum, the said portions also projecting to be engageable with said fabrics to lift the same and thereby facilitate tumbling operations at said tumbling speed; said separation means being responsive to centrifugal forces engendered by said high speed to lie beneath said fabrics in close proximity to the drum wall, but at said lower tumbling speed to disengage from said drum wall by gravity as the respective separation means traverse the upper portion of the rotation of the drum to dislodge any fabrics which may have adhered to the drum wall interior during the spin operation.

6. In apparatus for tumbling fabrics and extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum adapted for rotation about a substantially horizontal axis to contain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of said walls; a plurality of mutually spaced tumbling vanes parallel to and extending inwardly from said drum side wall; a movable grid disposed contiguous with and generally parallel to said drum side wall intermediate each pair of adjacent vanes, whereby the respective grids are interposed between the fabrics and the side wall of the drum; means for supporting each grid relative to said drum for movement inwardly of said drum; at least one coil spring mounted to each grid between said grid and said drum, said coil spring being adapted to urge said grid radially inwardly from said drum side wall; mounting means for said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall, compressing said spring, due to the large centrifugal forces acting on said grid and at much slower speeds with lower centrifugal forces whereby the entire grid and any fabrics which may be disposed thereon will be displaced inwardly with respect to said drum wall when traversing upper portions of the drum's rotational orbit urged by the expansion of said coil spring thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

7. In apparatus for tumbling wet fabrics and for extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum adapted for rotation about a substantially horizontal axis to con-

tain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of said walls; at least one hollow tumbling vane parallel to and extending inwardly from said drum side wall, at least one movable grid providing a resting place for fabrics disposed against the inside wall of said drum adjacent to said vane, said grid having at least one point on a leading edge in a direction of rotation of said drum attached to said side wall, grid side members extending back from said leading edge, a cross member providing a trailing edge for said grid joining said side members, said trailing edge having secured thereto a weight with a mass large in relation to said grid, said trailing edge further being unattached to said drum whereby said grid can pivot inwardly about said attached edge; mounting means for said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force associated with said centrifuging speed and at slower speeds with correspondingly lower centrifugal forces in which the grid will lie close to the drum on the lower half of the drum's rotational orbit due to gravitational force but on reaching the upper half of the drum's rotational orbit will move away from said drum wall interior urged by gravitational force acting on said weighted trailing edge thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

8. In apparatus for tumbling wet fabrics and extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum adapted for rotation about a substantially horizontal axis to contain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of said walls, said drum including a plurality of mutually spaced vanes extending axially inwardly therefrom; between each adjacent pair of said vanes a grid member comprehending substantially the entire area of that portion of the drum, said grid members being formed to engage the cylindrical inner wall portion of said drum; means including elements of said grid members extending through said drum for movably supporting said grid members for radial displacement relative to said drum wall; mounting means for said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the grid and fabrics disposed thereon will be held in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force imposed on said grid members at said centrifuging speed, and at slower speeds with correspondingly lower centrifugal forces in which the grid will lie close to the drum during the lower half of the drum's rotational orbit due to gravitational force but on reaching the upper half of the drum's rotational orbit will move away from said drum wall interior by gravitational force acting on said grid thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

9. In apparatus for tumbling fabrics and extracting liquids therefrom by a high speed centrifuging operation the combination comprising: a drum adapted for rotation about a substantially horizontal axis to contain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of said walls; clothes tumbling means within said drum; a plurality of circumferentially spaced movable grids mounted to the inside of the side wall of said drum, said grids providing a resting place for fabrics contiguous with and generally parallel to said drum side wall; at least one coil spring mounted to each grid between said grid and said drum side wall, said coil spring being adapted to urge said grid radially inwardly

away from said drum side wall; mounting means for said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall, compressing said spring; due to the large centrifugal forces acting on said grid and at much slower speeds with negligible centrifugal forces associated therewith whereby the entire grid and any fabrics which may be disposed thereon will be displaced radially with respect to said drum wall when traversing the upper half of the drum's rotational orbit urged by the expansion of said coil spring thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

10. In apparatus for carrying out clothes washing and drying operations the combination comprising: a perforated drum mounted for rotation about a substantially horizontal axis to contain fabrics undergoing washing operations, said drum having end walls, a generally tubular side wall, and an access opening to receive fabrics in one of said walls; mounting means for said drum; means to lift and tumble clothes within said drum; a plurality of circumferentially spaced movable grids mounted to the side wall of said drum on its interior, said grids providing a resting place for fabrics contiguous with and generally parallel to said drum side wall, said grids having at least one point on their periphery pivotally attached to said drum wall and a weight fastened to an opposite unattached edge whereby said grid can pivot inwardly about said attached point; and means including a drive motor to rotate said drum at a relatively high centrifuging speed to extract liquid from fabrics therein whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force associated with said centrifuging speed, and at slower speeds including a tumble speed to facilitate drying following the centrifuging operation, said slower speeds having correspondingly lower centrifugal forces associated therewith whereby the grid on traversing the upper half of the drum's rotational orbit will move away from said drum wall interior urged by gravitational force acting on said weighted grid thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

11. In apparatus for carrying out clothes washing and drying operations the combination comprising: a drum adapted for rotation about a substantially horizontal axis to contain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of said walls; mounting means for said drum; means to lift and tumble clothes within said drum; a plurality of circumferentially spaced movable grids mounted to the inside of the side wall of said drum, said grids providing a resting place for fabrics disposed contiguous with and generally parallel to said drum side wall; spring means mounted to each grid between said grid and said drum side wall, said spring means being adapted to urge said grid inwardly away from said drum side wall; and means to rotate said drum at a centrifuging speed to extract liquid from fabrics therein whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall, compressing said spring, due to the associated large centrifugal forces acting on said grid and its contents and at slower speeds including a tumble speed to facilitate drying following the centrifuging operation, said slower speeds having correspondingly lower centrifugal forces associated therewith whereby the grid and any fabrics which may be disposed thereon will be close to and supported by the drum when traversing lower portions of the drum's rotational orbit but when traversing upper portions will be displaced inwardly with respect to said drum wall urged by the expansion of said spring means thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

12. In apparatus for carrying out clothes washing and drying operations the combination comprising: a drum adapted for rotation about a substantially horizontal axis to contain the fabrics to be treated, said drum having end walls, a perforated, generally cylindrical side wall, and an access opening to receive fabrics in one of said walls; mounting means for said drum; within said drum at least one movable grid member providing a resting place for fabrics, said grid member being disposed contiguous with and generally parallel to said drum side wall, said grid member further having an edge normal to the direction of rotation of said drum pivotally attached to said drum side wall and an opposite unattached edge with a projecting portion adjacent and parallel to said unattached edge, said projecting portion extending radially inwardly from said drum side wall so as to form a ridge paralleling said drum axis thereby facilitating tumbling operations within said drum, said unattached edge of said grid adapting said grid for displacement with respect to said drum side wall; and means including a drive motor to rotate said drum at a relatively high centrifuging speed to extract liquids from fabrics therein whereby the grid and fabrics disposed thereon will be in close proximity to the drum wall due to the associated large centrifugal forces and at slower speeds including a tumble speed following the centrifuging operation to facilitate drying, said slower speeds having correspondingly lower centrifugal forces associated therewith whereby the entire grid will be close to and supported by the drum when traversing lower portions of the drum's rotational orbit but when traversing upper portions of the orbit the unattached edge of said grid will not be supported by said drum wall but will fall away from said drum wall urged by gravitational forces acting on said grid thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

13. In a combination washer-dryer for fabric treating operations the combination comprising: a perforated, rotatable drum to contain the fabrics to be treated, said drum having end walls, a generally tubular side wall, and an access opening; means for mounting said drum for rotation about a substantially horizontal axis; a plurality of mutually spaced, ridge shaped, hollow tumbling vanes extending inwardly from said drum side wall parallel to the axis of said drum, to lift and tumble fabrics during certain treating operations, each of said vanes having at least two parallel, radially extending slots in its leading surface with respect to the direction of rotation of said drum; rigid backing members secured to said drum side wall behind each of said slots, each of said backing members having a locating emboss thereon; a resilient bendable grid disposed contiguous with and generally parallel to said drum side wall intermediate each pair of adjacent vanes so as to be interposed between said drum side wall and fabrics being treated within said drum, said grid having at least one intermediate point on its leading edge with respect

to the direction of rotation of said drum attached to said drum side wall, said grid further having side members extending toward the adjacent vane rearwardly of said grid, one of said side members projecting through each of said slots into said adjacent vane; a coil spring attached to each of said side members within said adjacent vane, each said spring being disposed between each said side member and one of said backing members facilitated by said locating emboss whereby said grid is urged inwardly away from said drum side wall guided by said slots; and means including a drive motor to rotate said drum for a time interval at a relatively high centrifuging speed wherein the grids and fabrics disposed thereon will compress said springs and lie close to the drum periphery because of the relatively large centrifugal forces acting on said grids, said time interval being interrupted by at least one pause period wherein drum rotation substantially ceases whereby the centrifugal force is negligible and the grids will be bent inwardly away from said drum wall by the expansion of said coil springs thereby dislodging any fabrics which may have adhered to the drum wall during the centrifuging operation.

14. In a combination washer-dryer for fabric treating operations the combination comprising: a drum adapted for rotation in one direction to contain the fabrics to be treated, said drum having a perforated, generally cylindrical side wall and an access opening to receive fabrics in one of its end walls; a plurality of mutually spaced tumbling vanes parallel to and extending inwardly from said drum side wall; a resilient bendable grid providing a resting place for fabrics disposed against the inside wall of said drum adjacent to each one of said vanes, said grid having at least one point on its leading edge in the direction of rotation of said drum attached to said side wall near a vane, grid side members extending back from said leading edge toward the next vane to the rear of said leading edge, a weighted bar in close proximity to said next vane joining said side members, said bar having a mass large in relation to said grid and providing a trailing edge for said grid unattached to said drum whereby said grid can bend inwardly about said attached leading edge; means for rotatably mounting said drum; and means including a drive motor to rotate said drum at a centrifuging speed whereby the respective grids and fabrics disposed thereon will be in close proximity to the drum wall throughout the drum's entire rotational orbit due to the large magnitude of the centrifugal force associated with said centrifuging speed and at slower speeds with correspondingly lower centrifugal forces in which the grids will lie close to the drum during the lower half of the drum's rotational orbit due to gravitational force but on traversing the upper half of the drum's rotational orbit will bend and fall away from said drum wall interior by gravitational force thereby dislodging any fabrics which may have adhered to the drum wall interior during the centrifuging operation.

No references cited.