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WASHING DEVICE WITH ROTARY SCRUBBER

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Fig. 1.

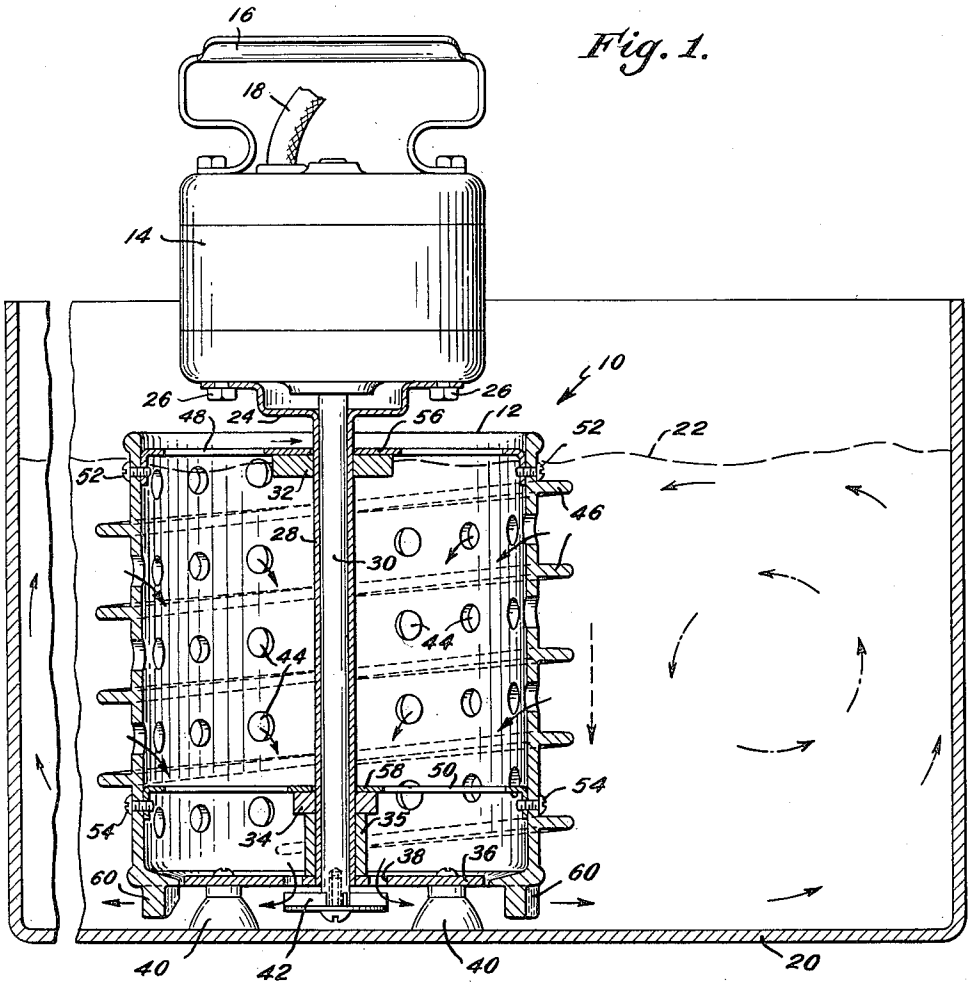
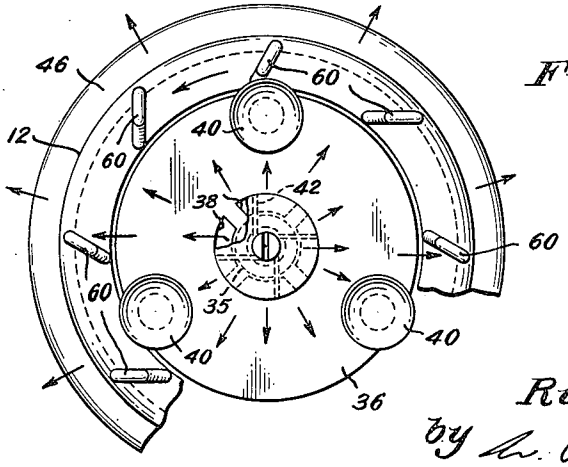


Fig. 2.



Inventor,
Richard R. Walton,
by A. A. Hulbert
Atty.

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WASHING DEVICE WITH ROTARY SCRUBBER

Richard R. Walton, Boston, Mass., assignor to Walton Washing Machine Corporation, Boston, Mass., a corporation of Massachusetts

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9 Claims. (Cl. 68—28)

The present invention relates to scrubbing and washing devices and is more particularly concerned with a new and improved washer or scrubber for use in a container holding liquid and articles to be washed or scrubbed, the device having a gentle but positive washing or scrubbing action and especially adapted for construction as an independent portable unit apart from the container.

Most washing machines now on the market operate on one of two principles. There are those of the tumbling type, in which the clothes are tumbled in a revolving cylinder and there are those of the conventional agitator type, including a tub with a paddle type agitator therein, oscillaing about a vertical axis. Both types have advantages and disadvantages which are at this time rather well-known. In the tumbling type of washer, all of the clothes are acted upon, but the action is rough and the articles of clothing tend to become tangled. The washing action performed by the tumbling type of washer is by no means ideal. On the other hand, the agitator type of washers, while they tend to be more gentle, nevertheless in most of them the clothes are not circulated sufficiently so that all of them come in contact with the scrubbing member. From researches conducted in the washing of articles of clothing, sheets, towels, etc., it has been found that the most effective action is perhaps performed by the hands of the hand laundress, the suds being squeezed through the clothes and the clothes flexed and rubbed simultaneously. So far as I am aware, no washing machine now on the market even approaches duplicating these actions.

A principal object of the present invention is, therefore, to produce a washer in which the washing action will be as efficient as possible, simulating the operations performed by a hand laundress.

It is a further object of the present invention to provide a new and improved washing or scrubbing device adapted to produce such an improved but gentle washing or scrubbing action upon the articles being washed without causing tangling thereof.

Another object of the invention is to provide such a device which is especially adapted for manufacture as a portable unit for temporary use in any convenient tub or container.

A further object of the invention is to provide in a device of the class described a novel rotating scrubbing member which not only scrubs the articles to be washed, but in addition, tends to cause them to circulate in the washing solution so that all portions thereof will eventually be treated by the scrubbing surface.

The invention is featured by the provision of a generally cylindrical hollow scrubbing member with mountings therefor for holding the same upright for rotation about a substantially vertical axis in a convenient container. Within the mountings for the hollow member, preferably there is rotatably held a vertical shaft driven by a suitable motor. One end of this shaft extends substantially to the level of one end of the hollow member, preferably the lower end, and has attached thereto a centrifugal impeller for expelling liquid radially outwardly into the container over the edge of the scrubbing member which, in turn, is provided with a series of openings immersed so that liquid exhausted from within it is replenished by liquid pouring in through the openings. The hollow scrubbing member is provided with an external spirally arranged rib for rubbing, gripping and conveying the articles being washed toward the output stream. Means are provided for continuously rotating the scrubbing member and in the preferred embodiment shown such means comprises a series of angled projections extending from the lower rim of the scrubbing member into the output stream of the centrifugal impeller and angled so as to rotate such member continuously in one direction. The inward flow of liquid through the openings in the scrubbing member draws any articles floating therein against its surface. The spirally arranged rib then serves to grip these articles and, while scrubbing them, to convey them toward the output stream of the impeller. As soon as the articles reach such output stream, they are whirled away from the hollow scrubbing member and then are recirculated in the washing solution so that each article in the wash will eventually be scrubbed over its entire surface. Tangling of the articles is substantially avoided by the novel washing action just described.

Further objects, features and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof taken in connection with the accompanying drawings in which like numerals refer to like parts in the several views and in which:

Fig. 1 is a vertical view, for the most part in section, showing my novel device set in a tub; and

Fig. 2 is a bottom view of a portion of the washer alone showing especially the downwardly directed angled projections on the hollow scrubbing member for imparting rotational movement to the same.

The novel washing device of the invention is indicated generally by the numeral **10** and comprises a hollow generally circular rotatable scrubbing member **12**. The machine is powered by an electric motor **14** on top of which is mounted a suitable handle **16** for carrying purposes. The motor **14** may be connected to a suitable source of electric current by an extension cord **18**.

The washer of the invention is adapted to be set in any tub or container **20** containing liquid at a predetermined level, indicated generally by the broken line **22**. As will hereinafter become apparent, the size and shape of the container **20** are unimportant since the successful scrubbing and circulating action of the washer is entirely independent of size or shape of the tub.

To the bottom of the motor **14** is fastened a water-tight housing **24** by means of bolts **26**. The housing **24** has a downwardly projecting cylindrical sleeve **28** within which rotates the drive shaft **30** driven by the motor **14**. Suitable stationary mutually spaced mounting shoulders **32** and **34** are affixed to the external surface of the sleeve **28**. Similarly attached to the sleeve **28** at the very bottom thereof is a circular mounting plate **36** having openings **38** therein close to the sleeve **28**. The plate **36** is separated from the annular shoulder **34** by a cylindrical spacer **35**. Near the periphery of the underside of the plate **36** is mounted a series of suction cups **40**, in this case three in number, which serve to support the device on the bottom of the container **20** in such a manner as to prevent upsetting.

To the bottom of the drive shaft **30** is keyed a centrifugal impeller **42**, the purpose and function of which will hereinafter be explained.

The hollow scrubber **12** is provided with a series of openings **44** in its cylindrical surface. Likewise, it carries on its outer surface a continuous downwardly spiral-

ing rib **46** for scrubbing, gripping and conveying the articles being washed toward the output stream of the impeller **42**. The hollow body **12** is rotatably mounted upon the shoulders **32** and **34** by means of an upper spider **48** and a lower spider **50** held to the cylindrical scrubbing member **12** by machine screws **52** and **54** respectively. The spiders **48** and **50** support annular bearing members **56** and **58** respectively which rest upon the ledges **32** and **34** in such manner as to permit free rotational movement of the member **12**.

The lower rim of the member **12** is provided with a series of downwardly directed angled projections **60**, which are perhaps best seen in the bottom view, Fig. 2. All the projections **60** are angled in the same direction so as to be driven by the radially outwardly directed liquid output stream of the centrifugal impeller **42** for imparting continuous rotational movement to the scrubbing member **12**.

The operation of the novel scrubbing device of the invention will now be readily apparent. The unit is set in the tub **20** which is filled to a predetermined level with liquid and articles to be scrubbed or washed. Since the unit rests on the suction cups **40**, it will be stably held and danger of upsetting will be minimized. A quantity of detergent is added to the water, if this be a clothes-washing operation, and the motor **14** started. The impeller **42** will immediately expel liquid from beneath the unit as indicated by the arrows at the bottom of Fig. 1, such liquid being drawn through the openings **38** in the bottom plate **36** and forced radially outwardly past the angled projections **60**. This high velocity radially outwardly directed stream impinging upon the angled projections **60** will immediately impart continuous rotational movement to the member **12** counterclockwise, as seen in Fig. 2. Withdrawal of liquid through the openings **38** lowers the liquid level within the hollow scrubbing member **12** and liquid to replace the same immediately commences to pour in through the openings **44** in the scrubber **12**. It will be apparent that flow of liquid into the interior of the hollow scrubber **12** through the openings **44** will produce a current of liquid converging on all sides on the scrubber **12** and any articles floating therein will be brought against the external surface of the scrubber **12**. These articles will thereupon be gripped by the rotating rib **46** which, due to its downward spiral, will convey the articles toward the bottom of the tub **20**, while, because of slippage, scrubbing them at the same time. This downward conveying of articles is indicated by the vertical broken arrow just to the right of the hollow member **12** as seen in Fig. 1. As soon as these articles reach the radially outwardly directed output stream of the impeller **42**, they will be whirled out and away from the washer and their mode of circulation is generally indicated by the circular arrows in Fig. 1.

Generally speaking, I have found that the best washing action, using the novel washer of the invention, may be obtained by filling the tub **20** to such a liquid level that a strong suction appears within the hollow scrubber **12**. This liquid level may vary, depending upon the wash load carried by the liquid. To find the optimum liquid level is a simple matter and with a little practice in using the novel washer unit, no trouble will be experienced.

The washing action performed by the rubbing and downward conveyance of the articles by the rotating scrubber **12** is gentle yet thorough and avoids tangling. Even the finest fabrics will not be injured and yet the selective action of the machine in operating upon areas of the articles individually makes for thorough washing and no area of any article escapes without a gentle scrubbing.

The washing unit is particularly adapted for use in portable form as illustrated in the drawings. It is evident, however, that the invention is not limited to a portable washing unit and that it is entirely practical to build a so-called "integrated" washing machine, including a tub, automatic controls for filling and emptying the same, etc., with the novel washing unit comprising the washing mechanism. Furthermore, it is clear that the particular arrangement of motor, shaft and rotating scrubbing member is not critical and it may be found desirable to mount the motor at some other location and that the rotary scrubber may be mechanically driven by the motor rather than actuated by the output stream of the impeller.

While the invention has been illustrated and described as especially adapted for the washing of articles of clothing, it will be appreciated that the novel machine may be used for circulating and scrubbing all kinds of pliable materials which are being treated with a treating solution, as, for example, in the tanning of leather. Therefore, while I have herein referred to the apparatus of the invention as a washing or scrubbing device, I do not intend to limit myself to a domestic clothes washing mechanism, and the claims should be construed to embrace any use to which the device of the invention may be put.

I claim:

1. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow body having a plurality of openings, a mounting for said body permitting rotation thereof and supporting the same at a predetermined level within said container, a rotatable shaft mounted centrally of said mounting, and adapted to be driven from one end thereof, a portion of said shaft extending substantially to the level of the lower portion of said hollow body, impeller means connected to said portion of said shaft adapted to force liquid radially outwardly from beneath said hollow body while drawing liquid toward and through the openings in said body to replace the liquid so withdrawn and drawing any articles carried in said liquid against the outer surface of said body, means for imparting rotation to said hollow body during rotation of said shaft, said body being provided with at least one external generally spirally arranged rib adapted to convey any articles of clothing in contact therewith downwardly toward the output stream of said impeller during rotation of said body.

2. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow body having a plurality of openings, a mounting for said body permitting rotation thereof and supporting the same at a predetermined level within said container, a rotatable shaft mounted centrally of said mounting, the bottom end of said shaft extending substantially to the level of the lower portion of said hollow body, impeller means connected to the bottom end of said shaft adapted to force liquid radially outwardly from beneath said hollow body while drawing liquid toward and through the openings in said body to replace the liquid so withdrawn and drawing any articles carried in said liquid against the outer surface of said body, and a motor connected in driving relation to said shaft, means for imparting rotation to said hollow body during operation of said motor, said body being provided with at least one external generally spirally arranged rib adapted to convey any articles of clothing in contact therewith downwardly toward the output stream of said impeller during rotation of said body.

3. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a hollow body having a plurality of openings, a mounting for said body permitting rotation thereof and supporting the same at a predetermined level within said container, a rotatable shaft mounted centrally of said mounting, the bottom end of said shaft extending substantially to the level of the lower portion of said hollow body, a centrifugal impeller on the bottom end of said shaft adapted to force liquid radially outwardly from beneath said hollow body while drawing liquid toward and through the openings in said body to replace the liquid so withdrawn and drawing any articles carried in said liquid against the outer surface of said body, and a motor connected in driving relation to said shaft, the lower portion of said hollow body being

provided with projections arranged at an angle to the output stream of said impeller for imparting rotation to said hollow body, said body being provided with at least one external generally spirally arranged rib adapted to convey any articles of clothing in contact therewith downwardly toward the output stream of said impeller during rotation of said body.

4. A portable clothes washer adapted to be temporarily placed in a tub, said washer comprising a motor, a housing attached thereto and having a vertically downwardly extending sleeve, a shaft rotatably mounted within said sleeve and in driven connection with said motor, mountings at spaced locations on the exterior of said sleeve, a generally cylindrical hollow perforated scrubbing member rotatably held on said mountings, a plate having a central aperture attached to the lower end of said sleeve and surrounding said shaft with a portion of the latter extending therebeneath, the periphery of said plate being closely adjacent the lower edge of said hollow member, and said plate having at least one opening adjacent said aperture, mounting means fastened to said plate for holding said washer upright in said tub and a centrifugal impeller mounted on said protruding end of said shaft and adapted to force liquid radially outwardly from beneath said plate and hollow scrubbing member while drawing liquid through said opening in said plate and the openings in said scrubbing member to replace liquid so withdrawn while drawing any articles carried in said liquid against the outer surface of said member, means for causing rotation of said member during the operation of said motor, said member having at least one external generally spirally arranged rib adapted to convey any articles of clothing in contact therewith downwardly toward the output stream of said impeller during rotation of said hollow member.

5. A device in accordance with claim 4 in which said means for causing rotation of said scrubbing member comprise at least one projection on the lower portion of said scrubbing member extending into the output stream of said impeller and arranged at an angle to such stream.

6. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow body having a plurality of openings, a mounting for said body permitting rotation thereof and supporting the same within said container, a shaft mounted within said body and adapted to be driven from one end thereof, at least a portion of said shaft extending substantially to the level of one end of said hollow body, liquid impelling mechanism in driven connection with said extending portion of said shaft and adapted to force liquid radially outwardly beyond said end of said hollow body while drawing liquid from within said body and permitting liquid to pour through said openings in said body to replace the liquid so withdrawn while drawing any articles carried in said liquid against the outer surface of said body, and means for imparting rotation to said hollow body, said body being provided with at least one external generally spirally arranged rib adapted to convey any articles in contact therewith in the direction of the output stream of said liquid impelling means during rotation of said body.

7. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow body having a plurality of openings, a mounting for said body permitting rotation thereof and supporting the same within said container, a rotatable shaft mounted within said body and adapted to be driven from one end thereof, at least a portion of said shaft extending substantially to the level of one end of said hollow body, a centrifugal impeller mounted upon said extending portion of said shaft and adapted to force liquid radially outwardly beyond said end of said hollow body while drawing liquid from within said body and permitting liquid to pour through said openings in said body to replace the liquid so withdrawn while drawing any articles carried in said liquid against the outer surface of said body, means for imparting rotation to said hollow body during rotation of said shaft, said body being provided with at least one external generally spirally arranged rib adapted to convey any articles in contact therewith in the direction of the output stream of said impeller during rotation of said body.

8. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow scrubbing member which, when the device is in the tub, assumes an upright position with its lower end adjacent the bottom of the tub, said hollow scrubbing member being provided over substantially the whole of its immersed surface with a series of openings, pump means mounted in operative relation to the interior of said hollow scrubbing member for withdrawing liquid from within said hollow member and to expel the same outwardly into the tub over the periphery of one end of said member, thereby causing liquid from the tub to pour through said openings replacing the expelled liquid and at the same time carrying said articles towards said member and pressing portions of the same against its outer surface, and means for imparting rotation to said hollow scrubbing member about a generally vertical axis during operation of said pump means, said scrubbing member being provided with at least one external generally spirally arranged gripping surface adapted to convey any of said articles in contact therewith toward the output stream of said pump means during rotation of said scrubbing member.

9. A scrubbing device for use in a container holding liquid and articles to be scrubbed comprising a generally cylindrical hollow scrubbing member which, when the device is in the tub, assumes an upright position with its lower end in spaced relation to the bottom of the tub, said hollow scrubbing member being provided over substantially the whole of its immersed surface with a series of openings, pump means mounted in operative relation to the interior of said hollow scrubbing member for withdrawing liquid from within said hollow member and to expel the same outwardly into the tub beneath the periphery of the lower end of said member, thereby causing liquid from the tub to pour through said openings replacing the expelled liquid and at the same time carrying said articles towards said member and pressing portions of the same against its outer surface, and means for imparting rotation to said hollow scrubbing member about a generally vertical axis during operation of said pump means, said scrubbing member being provided with at least one external generally spirally downwardly arranged gripping surface adapted to convey any of said articles in contact therewith toward the output stream of said pump means during rotation of said scrubbing member.

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