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CAGE TYPE WASHER

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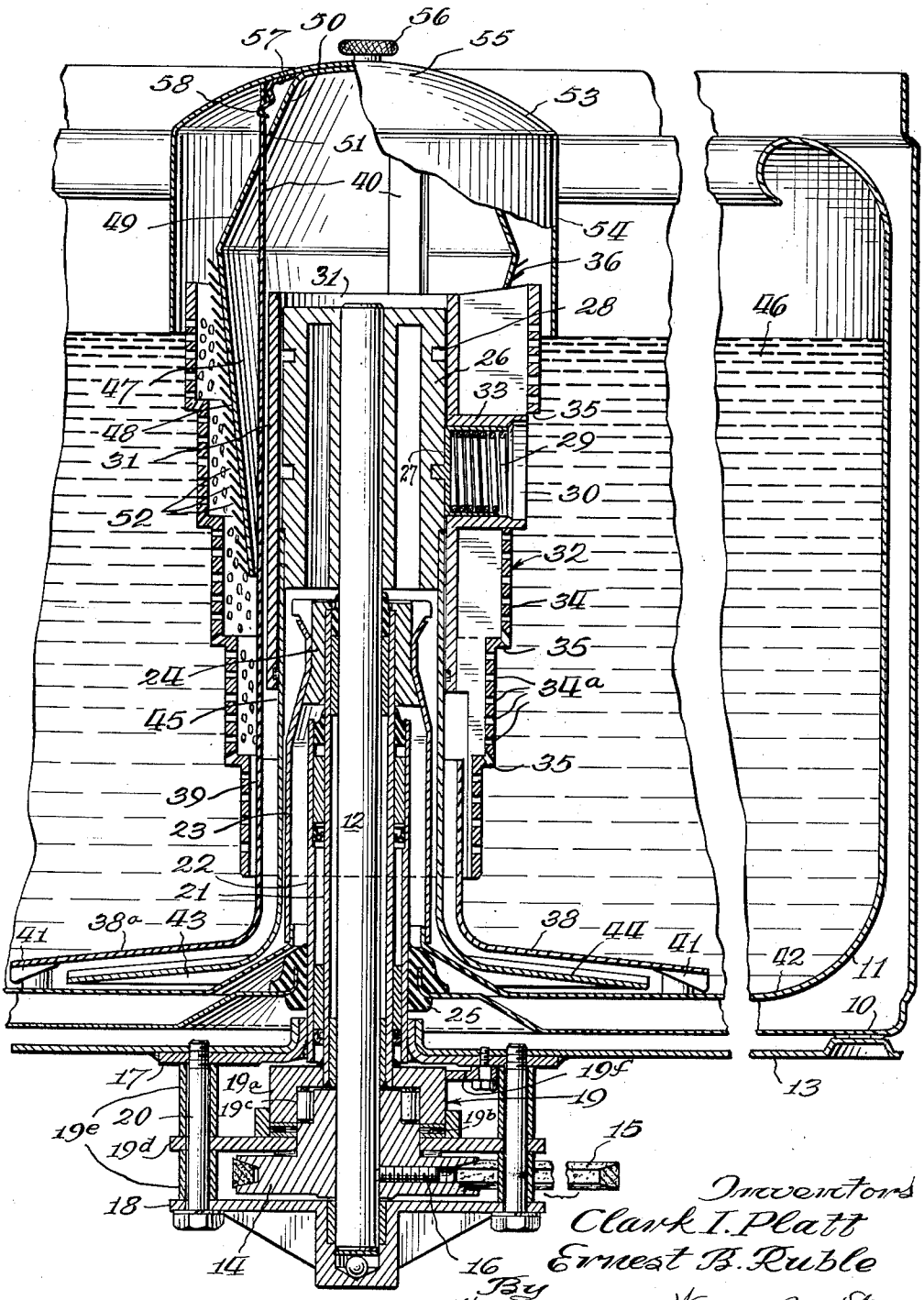

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CAGE TYPE WASHER

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This invention relates to a fabric cleaning device such as a clothes washing machine.

In a common type of clothes washing machine such as illustrated for example in U.S. Patent No. 2,770,118 there is provided a vertically reciprocable agitator for supplying agitation to the fabric load and the liquid which performs the cleaning operation. In a laundry device this liquid is of course a water solution of a detergent. Because the vertically reciprocable agitator normally extends above the liquid surface during the cleaning operation and because the detergent reduces substantially the surface tension of the liquid there is a tendency to produce a large quantity of suds. Excessive suds of course reduces the efficiency of the cleaning operation.

One of the features of this invention therefore is to provide a fabric cleaning device having means for reducing substantially the amount of suds produced by a vertically reciprocable agitator.

Another feature of the invention is to provide an improved fabric cleaning device employing a vertically reciprocable agitator and including an improved lint filter adapted to remove suspended solid particles such as lint from the liquid.

Other features and advantages will be apparent from the following description of the invention considered in conjunction with the accompanying drawing which is a fragmentary vertical sectional view through a washing machine embodying the invention.

In the illustrated embodiment of the invention the laundry device includes a tub **10** having located therein a basket **11** containing perforations (not shown) and with both the tub and the basket having open tops for loading. Extending upwardly within the tub **10** and substantially centrally located with respect thereto is a drive shaft **12** that extends to beneath a platform **13** on which the tub **10** is mounted. The bottom of the shaft **12** beneath the platform **13** has attached thereto a drive pulley **14** adapted to be rotated by means of a belt **15** driven by a reversible electric motor (not shown). Rotation of the pulley **14** rotates the shaft **12** as the two are attached together as by means of a set screw **16**. The pulley **14** is located between two plates **17** and **18** with the upper plate **17** being spaced beneath the platform **13** to provide for a one-way clutch and bearing assembly **19**. The plates **17** and **18** and the associated parts are mounted beneath the platform **13** as by a plurality of bolts **20**.

Extending upwardly through the bottom of the tub **10** is a basket spin tube **21** that is fixedly attached to clutch hub **19***a* and closely surrounds the drive shaft **12**. Located outwardly of the basket spin tube **21** is a support tube **22**. This support tube **22** is attached to the base platform **13** as by welding. Located outwardly of the support tube **22** is a basket tube **23** whose upper end is held by a collar **24** that surrounds the basket spin tube **21** and is attached thereto. The bottom of the basket tube **23** is attached to the bottom **42** of the basket **11**. As can be seen, various gaskets are provided for sealing the space between the shaft **12** and the tube **21** and the space between the shaft **12** and the tube **21** and the space between the tubes **21** and **22**. In addition, the gasket **25** is provided sealing the bottom of the tub **10** to the support tube **22**.

Mounted on the upper end of the drive shaft **12** is a cylindrical cam **26** that is provided with a cam follower **27** that is spring pressed into engagement with the cam track **28** as by a spring **29** held against the follower **27** by a removable cover **30**. The cam **26** is located within the tubular interior **31** of a vertical agitator **32**. This vertically reciprocable agitator **32** is provided with a radially extending tubular projection **33** in which the cam follower **27**, spring **29** and cover **30** are located. Rotation of the shaft **12** in one direction with resultant rotation of the cam **26** causes vertical reciprocation of the cam follower **27** and thus of the agitator **32** in a customary and well-known manner as exemplified by the aforementioned U.S. Patent No. 2,770,118.

The agitator **32** which may be made of a molded plastic such as nylon includes a stepped generally cylindrical body **34** provided with numerous perforations **34***a* as shown. This body **34** has a series of steps **35** progressing inwardly from the top to the bottom of the agitator. The agitator **32** also includes three equally spaced radial webs **36** and is of integral construction. These steps **35** tend to push or poke fabrics downwardly during the reciprocation of agitator **32** and a fluid circulation through perforations **34***a* by the pumping mechanism hereinafter referred to.

Located adjacent the bottom of the basket **11** there is provided a pump housing **38** having an upwardly projecting annular neck **39** surrounding the drive shaft **12** and itself provided with three equally spaced upwardly projecting straps **40**. These straps are adjacent but spaced outwardly from the tubular interior **31** of the agitator **32** and extend beyond the top of the agitator. The main portion **38***a* of the pump housing **38** slopes outwardly and downwardly and is attached to the bottom of the basket **11** at the outer edge of the housing by means of mounting feet **41** spaced approximately 90° apart. The space between the pump housing **38** and the bottom of the basket **11** provides the pumping space **43** and located therein is a pump impeller **44** that is attached by means of an upwardly extending impeller tube **45** to the cam **26**. Rotation of the shaft **12** and cam **26** causes rotation of the impeller **44** to propel liquid outwardly along the bottom **42** of the basket **11** and upwardly therein to provide a rolling or turning action to the fabric or clothes suspended in the liquid **46** during reciprocation of the agitator **32**.

Located interiorly of the agitator **32** there is provided a lint filter **47** made of polyethylene or the like having a lower portion **48** substantially concentric to the shaft **12** and to the agitator **32** and shaped like an inverted frustum of a cone. The upper portion **49** of the lint filter is also shaped like a frustum of a cone but here with the small end **50** at the top. The three straps **40** extend through openings **51** in this portion **49** of the lint filter.

In order to intercept substantially all threads and other suspended foreign material in the liquid **46**, the outer surface of the lower portion **48** of the lint filter is provided with a plurality of outwardly and upwardly sloped spaced spines **52**.

The upper end of the agitator **32** is enclosed within a cover member **53** having a cylindrical portion **54**. The top **55** of the cover member is connected by means of a bolt **56** to the upper end **40** of the lint filter **47**. A spring plate **57** is spot-welded to the top **55**. This spring plate is provided with three downwardly extending spring fingers **58** which are releasably retained within openings adjacent the tops of the straps **40**. Thus, the cover member **53** and the upper end of the lint filter **47** are

connected together as a unit by means of the bolt 56 and this unit is releasably held in position on the upper ends of the straps 40 by the spring fingers 58. When desired, the assembled unit of the cover member and lint filter may be removed from the straps 40 for cleaning merely by grasping the unit and moving it upwardly. The bottom of the lint filter 47 is open in the vicinity beneath the tubular projection 33 of the agitator 32 so that the lint filter may pass upwardly around this projection.

Without this invention vertical reciprocation of the agitator 32 would tend to whip the liquid 46 or washing solution into excessive suds or foam. However, with the provision of the cover member 53 having its lower end extending downwardly into the liquid 46 during the agitation of the washing operation the production of suds is considerably retarded so as not to interfere with the cleaning or centrifuging operations. Furthermore, circulation of the liquid caused partially by operation of the pump agitator 44 and partially by the vertical reciprocation of agitator 32 causes the liquid to flow through the openings 34*a* into the interior of the pump housing 36. In this flow the water contacts the outer surface of the lower portion 48 of the lint filter 47. During this flow lint, threads and other foreign particles are entrapped by the spines 52 and removed from the liquid. Then, at the end of the washing operation it is only necessary to remove the lint filter in the manner previously described and rinse the lint and foreign material from the filter.

The combined one-way clutch and bearing assembly 19 includes a radial thrust bearing 19*b* and a conventional type one-way roller clutch 19*c*. Thrust bearing 19*b* supports basket 11 for rotation through the one-way clutch 19*c* when shaft 12 is rotated in a reverse direction from that by which agitator 32 is caused to reciprocate. Rotation of shaft 12 in this reverse direction does not produce a reciprocation of agitator 32 since there is no relative motion between cam 26 and cam follower 27. The thrust bearing 19*b* is supported by thrust plate 19*d* which in turn is supported by the spacer members 19*e* carried by bolts 20. This assembly produces a simple compact and effective drive mechanism for agitator 32 and basket 11.

It will be apparent from this description that rotation of shaft 12 by pulley 14 in one direction causes reciprocation of agitator 32 and fluid circulation into perforations 34*a* and out of pump housing portion to effect a rolling action of clothes within basket 32 and a scrubbing of these clothes by stepped portions 35 during the torodial movement of the clothes within basket 11. Basket 11 is restrained against rotational movement during the agitation by the spring biased braking pawl or one-way brake 19*f*. It is during this fluid circulation through agitator 32 that lint, thread and various foreign particles are trapped by lint filter 47.

In the subsequent centrifuging operation, pulley 14 is reversed in rotation to cause the one-way clutch 19*c* to pick up clutch hub 19*a* and rotate basket 11 through the open tube 21 to effect the desired centrifuging action. The spring biased pawl 19*f* slides freely on the periphery of clutch hub 19*a* during the extraction operation.

Having described our invention as related to the embodiments shown in the accompanying drawings, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

We claim:

1. A fabric cleaning device, comprising: a container for the fabric load and a liquid; a substantially vertical drive shaft extending upwardly in said container; a substantially vertically reciprocable agitator surrounding said shaft and driven thereby, the agitator surrounding said shaft and driven thereby, the agitator having liquid permeable sides and a hollow interior; and a lint filter surrounding said shaft substantially fixed in position within said interior having lint catching means thereon.

2. A fabric cleaning device, comprising: a container for the fabric load and a liquid; a substantially vertical drive shaft extending upwardly in said container; a pump adjacent the bottom of said container surrounding said shaft and driven thereby for propelling liquid outwardly relative to said shaft, the pump having a housing extending upwardly around said shaft; a substantially vertically reciprocable agitator surrounding said shaft above said pump and driven by said shaft, the agitator having open sides and a hollow interior; a lint filter surrounding said shaft substantially fixed in position within said interior having lint catching means thereon; and means suspending said filter from said housing.

3. A fabric cleaning device, comprising: a container for the fabric load and a liquid; a substantially vertical drive shaft extending upwardly in said container; a pump adjacent the bottom of said container surrounding said shaft and driven thereby for propelling liquid outwardly relative to said shaft, the pump having a housing extending upwardly around said shaft; a substantially vertically reciprocable agitator surrounding said shaft above said pump and driven by said shaft, the agitator having open sides, an upper end normally extending above said liquid during the normal cleaning operation and a hollow interior; a removable lint filter substantially fixed in position within said interior having lint catching means thereon; a removable cover member substantially fixed in position enclosing said upper end and having a lower end extending beneath the surface of said liquid, said lint filter and cover member being fastened together as a unit; and means removably mounting said unit on said pump housing.

4. A fabric cleaning device, comprising: a container for the fabric load and a liquid; a substantially vertical drive shaft extending upwardly in said container; a pump adjacent the bottom of said container surrounding said shaft and driven thereby for propelling liquid outwardly relative to said shaft, the pump having a housing extending upwardly around said shaft and a plurality of projections extending upwardly from said housing; a substantially vertically reciprocable agitator surrounding said shaft above said pump and driven by said shaft, the agitator having open sides, an upper end normally extending above said liquid during the normal cleaning operation and a hollow interior; a removable lint filter substantially fixed in position within said interior having lint catching means thereon; a removable cover member substantially fixed in position enclosing said upper end and having a lower end extending beneath the surface of said liquid, said lint filter and cover member being fastened together as a unit; and means removably mounting said unit on said projections with the projections having their upper ends extending through said lint filter and located within said cover member.

5. The invention set forth in claim 4 further includes a support plate, a radial thrust bearing supported in said support plate, a clutch hub mounted on said thrust bearing and connected to said container, a one-way brake engageable with the periphery of said clutch hub and restraining said container against rotation during reciprocation, of said agitator when said drive shaft is rotated in one direction, and a one-way clutch mounted within said clutch hub for rotating said container when said drive shaft is rotated in a reverse direction.

6. A fabric cleaning device, comprising: a container for a fabric load and a liquid; a substantially vertically reciprocable agitator having a liquid-passing upper end normally extending to above said liquid during the cleaning operation; a removable lint filter defining a lower,

downwardly narrowing, frusto-conical portion within said upper end of the agitator, an upper portion substantially fixedly retained above the agitator, and a plurality of upwardly sloped spines projecting outwardly from said lower portion for intercepting foreign material in liquid passing into the agitator; and a removable cover member substantially fixed in position and having an upper, imperforate annular portion encircling said upper end of the agitator and a lower, imperforate annular portion

continuing downwardly from said upper portion and normally extending into said liquid.

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