United States Patent

Platt

[15] 3,653,807

[45] Apr. 4, 1972

[54] **METHOD AND MEANS FOR SHREDDING AND FILTERING LINT IN A WASHING MACHINE**

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[22] Filed: **Aug. 24, 1970**

[21] Appl. No.: **66,252**

[52] **U.S. Cl.** .....**8/158**, 68/18 F, 134/115 G, 210/82, 210/167, 241/46.02, 241/101 R

[51] **Int. Cl.** **D06f 39/10**

[58] **Field of Search** .....68/18 R, 18 F; 241/46.02, 101 R, 241/46.11; 134/115 G; 210/82, 167; 8/158

[56] **References Cited**

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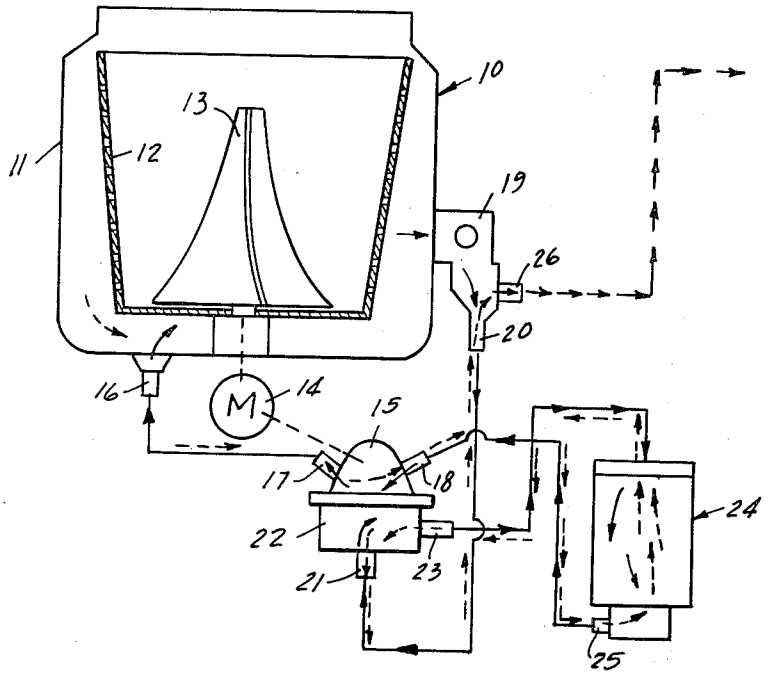
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[57] **ABSTRACT**

Method and apparatus for treating lint in an automatic washing machine assembly, the apparatus including a shredder which continuously chops up strands of lint before delivering the same to the washing machine filter, and then operates to chop up lint which is back-flushed from the filter before discharging the same.

11 Claims, 4 Drawing Figures



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2 Sheets-Sheet 1

Fig. 1

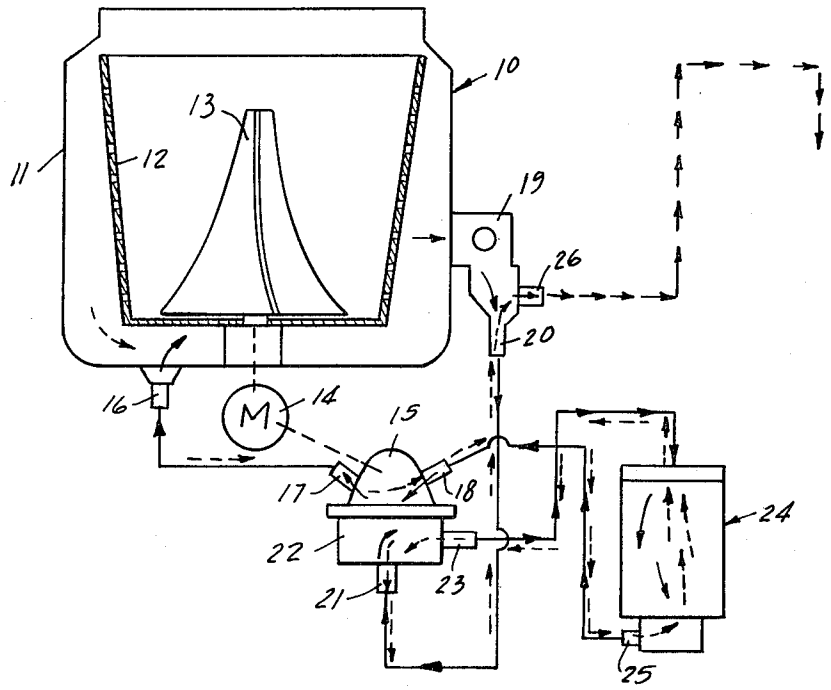


Fig. 3

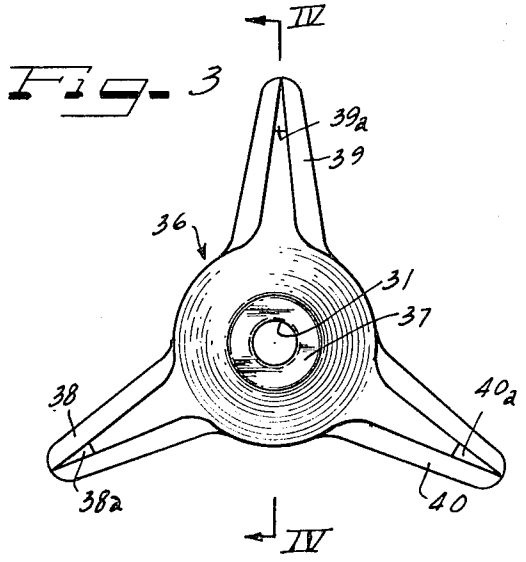
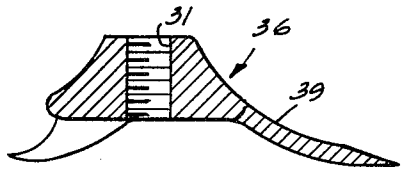


Fig. 4

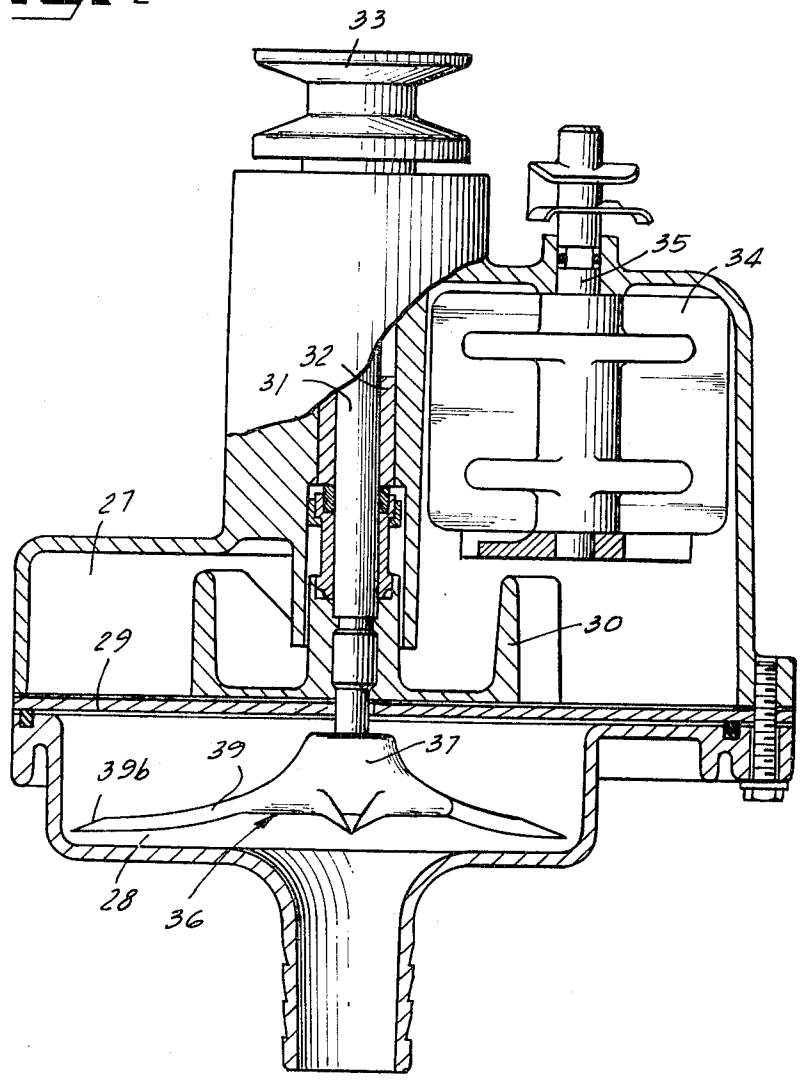


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Fig. 2



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METHOD AND MEANS FOR SHREDDING AND FILTERING LINT IN A WASHING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is in the field of automatic washing machines in which the wash liquid is continuously being withdrawn from the tub as washing proceeds, the wash liquid is passed to a filter and the filtrate is returned to the washing machine. The present invention provides a shredding means operating in conjunction with the pump of the washing machine assembly to comminute the lint strands in the circulating wash liquid system so that they may be more efficiently removed by the filter. The same shredding means take the lint recovered at the filter and back-flushed therefrom to comminute this material before discharging it into a drain.

2. Description of the Prior Art

The need for efficient lint removal is becoming accentuated because of increased use of fabrics which produce long fibrous lint when washed. Among such fabrics are chenille bedspreads, viscous rayon runners, wool throw rugs, long pile mats and the like. Lint from such materials tends to ball up as it collects on the lint filter, and presents a problem both from the standpoint of efficient operation of the filter and disposal into a plumbing system.

In the preferred form of the present invention, a shredding means is combined into a reversible pump structure both to shred the lint being circulated from the washing machine tub before it reaches the filter, and also to shred the lint deposited on the filter before it is discharged into the household plumbing line.

It is well known to combine macerating or grinding means into an automatic dishwasher as exemplified by U.S. Pat. Nos. 3,310,243 and 3,370,598. There are also examples of the prior art wherein pumps are shown having cutting means or the like driven on a common shaft with the pump impeller. U.S. Pat. Nos. 1,912,575; 2,042,641; and, 2,306,298 are examples of disclosures of this type. A somewhat related disclosure is found in U.S. Pat. No. 2,496,359 which deals with a disintegrator or cutting device for insertion in sewer lines. This unit must be driven by an external source and is not amenable, per se, to installation in an automatic washing machine circulating system.

SUMMARY OF THE INVENTION

The present invention provides a circulating system for lint disposal in an automatic washing machine. A reversible flow pump is provided to pump wash liquid into the washing machine tub during the clothes washing cycle, and to discharge wash liquid from the tub at the conclusion of the washing operation. During washing, the pump normally draws the wash liquid into a filter where lint is separated and the substantially lint-free wash liquid is then recirculated back into the tub. In the present invention, a shredding means is interposed between the recirculation outlet in the tub and the input to the filter so that the pieces of lint, particularly the long pieces are shredded or cut into quite small pieces which are much more easily handled by the filter. At the conclusion of the washing operation, the filter is back-flushed and the lint bearing stream is then again passed through the shredding device to further protect the plumbing lines of the household from becoming clogged by any chunks or excessively long pieces of lint collected at the filter.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure, and in which:

FIG. 1 is a schematic view of a washing machine assembly embodying the improvements of the present invention;

FIG. 2 is a view partly in elevation and partly in cross-section illustrating the combined pump-shredder of the type which can be used for the purposes of the present invention;

FIG. 3 is a plan view of the shredding device itself; and

FIG. 4 is a cross-sectional view taken substantially along the line IV—IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, reference numeral 10 indicates generally an automatic washing machine assembly including an outer tub 11 and an inner perforate tub 12. Mounted for rotation centrally of the perforate tub 12 is an agitator 13 driven by means of a motor 14.

In FIG. 1, the solid lines have been used to show the direction of flow of the wash liquid during the washing operation, and the dashed lines have been used to show the flow of wash liquid during pumping out of the wash liquid at the completion of the washing operation. It will be seen that during the normal washing operation, wash liquid is pumped into the tub 11 by means of a pump 15 driven by the motor 14, the wash liquid entering the tub through a sump 16. The pump 15 is of the reverse flow type and has fittings 17 and 18 which alternately act as inlet and discharge openings for the pump, depending upon the setting of an internally mounted diverter valve (not shown).

During normal washing, wash liquid is discharged from the tub 11 into a side check valve 19, an arm 20 of which directs the lint laden wash liquid into a fitting 21 formed in the housing which contains the pump 15. As will be explained in more detail in a succeeding portion of the specification, the pump 15 is actually a combined pump and shredder, with a pump impeller being mounted on the same shaft as a shredding knife contained in a shredding compartment 22. The shredding compartment 22 is physically adjacent but sealed from the pumping compartment in which the impeller of the pump is located. Rotation of the motor 14 thereby serves to drive the pump impeller and the shredding knife simultaneously.

The suspension of lint strands in the wash liquid after shredding is passed by means of a conduit 23 into a filter assembly generally indicated at reference numeral 24 in the drawings. This filter assembly 24 is preferably of the self-cleaning type, and a typical example of a filter of this type will be found in U.S. Pat. No. 3,500,011 owned by the assignee of the present application. This filter may, for example, contain saw toothed vanes which trap material and thereby filter the water during the washing operation. Then, during the drain cycle operation, the vanes are repositioned with respect to the casing and a tangential and helical flow of wash water serves to wash off the lint which has collected on the vanes.

As shown by the solid lines in the diagram of FIG. 1, the discharge from the shredding chamber 22 is passed into the filter 24 as downward flow therethrough during the washing cycle. After filtration, the filtrate is drawn through a conduit 25 back into the fitting 18 which now serves as the inlet to the pump 15 for further recirculation of washing liquid through the washing machine.

During the pump-out or discharge operation, the direction of flow through the pump 15 is reversed so that the fitting 16 becomes a discharge conduit through which the wash water is withdrawn from the tub 11. This water is then passed into the fitting 17 which now functions as an inlet conduit to the pump 15, and is discharged through the fitting 18. The washing liquid is then directed into the fitting 25 whereupon it proceeds upwardly through the filter 24 in a back-washing operation, picking up lint which has been deposited by previous operation of the filter. Then, as indicated in the dashed lines of the flow diagram, the lint laden washing liquid is again passed through the shredding chamber 22 so that any excessively long pieces of lint which have been accumulated on the filter element are shredded into smaller, more easily handled pieces. The wash liquid containing lint is then safe to discharge through the side check valve 19 which, in the drain-

ing operation, is so oriented that it permits flow from the fitting **20** into a discharge port **26** which discharges the same through a rubber hose or the like into a laundry tub or other drain.

The pump portion of the combined pump-shredder shown in FIG. **2** of the drawing has many features in common with the type of pump shown in U.S. Pat. No. 2,924,959 also owned by the assignee of the present application. The assembly is divided into two parts in a common housing, the upper portion being designated as a pumping chamber and illustrated at reference numeral **27** of the drawings, and the lower portion being a shredding chamber and designated by reference numeral **28**. The two chambers are separated in fluid tight relationship by means of a partition **29**. Within the pumping chamber **27** there is located a centrifugal impeller **30** which is mounted for rotation on a shaft **31** which is journaled for rotation within a bearing sleeve **32**. The shaft **31** is driven by means of a pulley **33** about which a drive belt is trained.

Bidirectional operation of the pump is accomplished by the provision of a butterfly valve **34** carried on a shaft **35** journaled for rotation in the housing of the pump. While not shown in the drawings of this application (but shown in U.S. Pat. No. 2,924,959) the butterfly valve **34** cooperates with a chamber of a generally figure eight-shaped configuration consisting of two overlapping generally cylindrical recesses. One lobe of this chamber constitutes an inlet recess and the other constitutes an outlet recess. Selective communication is afforded between an inlet and outlet for the pump and these recesses by the butterfly valve **34**. The angular position of the valve **34** thus determines the direction of flow through the pump **15**.

In the shredding chamber **28** there is disposed a cutting knife generally illustrated at reference numeral **36**. The knife **36** includes a centrally disposed collar portion **37** which is fixedly secured to an extension of the shaft **31** passing into the chamber **28**. As best seen in FIGS. **2** through **4**, the shredding knife **36** may include three cutting blades **38**, **39** and **40** each having a tapered rib portion **38***a*, **39***a* and **40***a*, respectively, extending to the periphery of the fingers, which periphery is formed into a knife edge such as the knife edge illustrated at **39***b* in FIG. **2**.

From what has been said previously, the operation of the washing machine assembly should be evident. The lint laden wash liquid discharged from the tub **11** during the washing operation is first passed into the shredding chamber **28** where the larger pieces of lint are cut up before being passed to the filter **24**. The filtrate from the filter **24** is then drawn into the pump **15** and pumped back into the tub **11** for further circulation therethrough.

At the discharge or pump-out cycle (determined by a timer motor mechanism as is well understood by those skilled in the art) the direction of flow through the pump **15** is reversed so that wash liquid is now pumped upwardly through the filter **24**, thereby washing the filter element free from adhering lint strands or particles. This lint laden wash liquid is then passed to the shredding chamber **28** where the lint is cut up further into suitably small pieces or particles before being passed to the household plumbing system.

The use of the shredding device in accordance with the present invention has been found to substantially improve the effectiveness of filters in automatic washing machines. The shredding cycle employed during pump-out insures that only small particles enter the household drain system, thereby reducing problems caused by the accumulation of larger particles and resultant impairment of flow in such systems.

It will be appreciated that the invention comprehends arrangements of the components other than that of FIG. **1**, in which fluid flows first through the shredder, then through the filter, and lastly through the pump. For example, the pump may be placed ahead of the filter so that during recirculation fluid flows through the shredder, the pump, and the filter, in that order. Other variations within the scope of the invention are, of course, possible.

It will also be appreciated that it is not necessary to practice the invention on a washing machine having a filter of the type described. The invention can be employed advantageously on washing machines which have no filter means, because large particles of lint which can create problems with pumps and household drain systems would be eliminated. Further, it will be appreciated that the pump and shredder need not be contained within a single housing and driven jointly in order to practice the invention.

In view of the foregoing, the embodiments of the invention to which an exclusive property or privilege is claimed are defined as follows:

1. In an automatic washing assembly including a tub for containing washing fluid, a pump for withdrawing said fluid from said tub, and conduit means connecting said tub and said pump, the improvement comprising shredding means arranged so as to shred lint and particulate matter withdrawn with said fluid.

2. The assembly of claim **1** including means for filtering the washing fluid withdrawn from said tub.

3. The assembly of claim **1** wherein said pump and said shredding means are operated from a common drive means.

4. In an automatic washer assembly including a tub for containing washing fluid, a pump for withdrawing fluid from said tub, means for driving said pump, a lint filter, and means defining a fluid flow path connecting said tub, said pump, and said filter, the improvement comprising shredding means driven by said pump drive means and interposed in said flow path so as to shred lint passing therethrough.

5. The assembly of claim **4** including means for receiving washing fluid after it has passed through shredding means and discharging said fluid from said washing assembly.

6. The assembly of claim **4** wherein said shredding means and said pump are disposed in separate compartments within a common housing.

7. An automatic washing assembly comprising: a tub; a pump which may be energized in a first mode to withdraw washing fluid from and subsequently return said fluid to said tub, and in a second mode to withdraw said fluid from said tub and discharge said fluid to drain; shredding means operated jointly with said pump to shred lint in the washing fluid withdrawn from said tub; filter means for receiving the washing fluid bearing the shredded lint and removing said lint from said fluid; and fluid conduit means connecting said tub, said shredding means, said filter, and said pump.

8. The assembly of claim **7** wherein said pump is a reversible flow pump.

9. The assembly of claim **7** in which the impeller of said pump and said shredding means are positioned on a common shaft, said impeller and said shredding means being located in separate compartments within a common housing.

10. An automatic washing apparatus having a fluid circulation system comprising: a tub having at least two fluid outlets; a check valve located at a first of said outlets, said valve having three ports, a first of which is connected to said first tub outlet; fluid conduit means connected to a second port of said valve and arranged to discharge washing fluid from said washing apparatus; shredding means connected by fluid conduit means to the third port of said valve; filter means connected by fluid conduit means to said shredding means; and a pump having a first port communicating with said filter and a second port communicating with the second outlet of said tub, said pump and said shredding means being driven jointly and being located within separate compartments of a common housing.

11. The method of handling lint in an automatic washing machine having a tub in which the articles are washed, which comprises: withdrawing lint bearing wash liquid from said tub, shredding the lint in said wash liquid, filtering lint from the shredded lint bearing wash liquid, pumping the resulting filtrate back into said tub, back-flushing the filter at predetermined intervals, shredding the lint in the liquid resulting from said back-flushing, and discharging the shredded lint from said machine.