March 31, 1970 E. SULZMANN 3,503,230

DOUBLE-DRUM FLOW-THROUGH WASHING MACHINE

Filed Dec. 14, 1967

Fig. 1

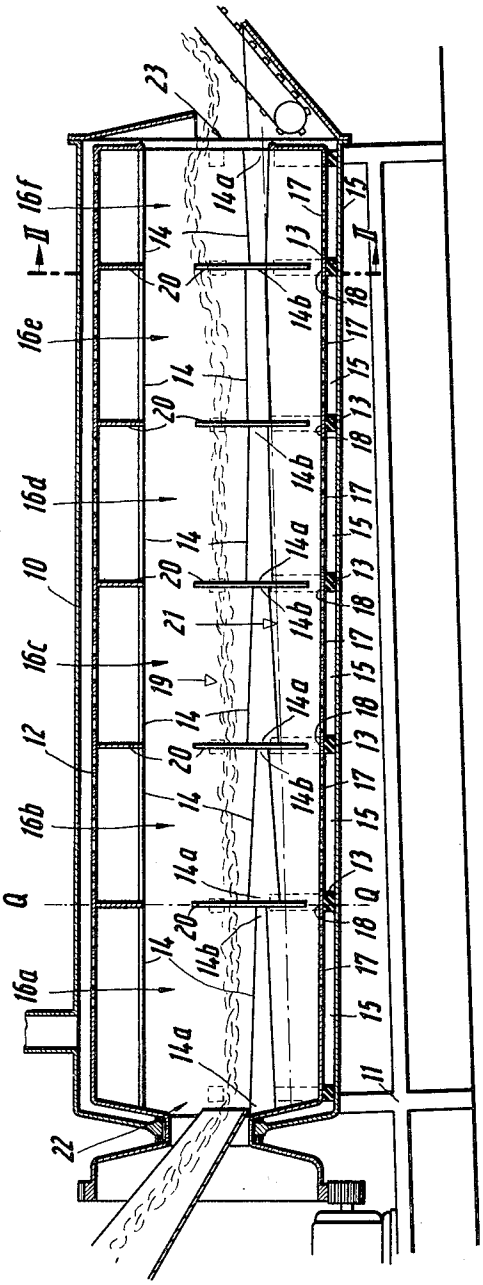
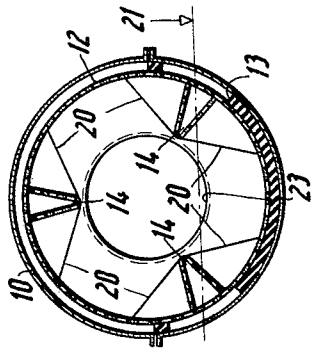


Fig. 2



Inventor:
ERICH SULZMANN
By
Lowry & Rinehart
ATTYS.

United States Patent Office 3,503,230 Patented Mar. 31, 1970

3,503,230

DOUBLE-DRUM FLOW-THROUGH WASHING MACHINE

Erich Sulzmann, Provincia di Como, Campione d'Italia, Italy

Filed Dec. 14, 1967, Ser. No. 690,547
Claims priority, application Germany, Jan. 27, 1967, S 108,037
Int. Cl. D06f 37/06, 37/08
U.S. Cl. 68—58 11 Claims

ABSTRACT OF THE DISCLOSURE

This invention provides a double-drum flow-through washing machine which comprises longitudinal guide ribs and radial washing-liquid separators inside the washing drum so that the wash can pass through the washing drum without being hindered by annular ribs. These longitudinal guide ribs may be conically tapered to determine the speed of the wash as it passes through each washing zone of the washing drum. The washing-liquid separators which may be made of sheet metal serve to separate the washing zones from one another so that different washing processes can be carried out adjacent to one another while the washing liquids mix with each other as little as possible and the wash can pass easily through the washing drum.

BACKGROUND OF THE INVENTION

The invention relates to a double-drum flow-through washing machine operating on the countercurrent principle, with an end-loaded perforated washing drum rotatable in an outer drum and having longtudinal guide ribs, for washing textiles, in which the space between the washing and outer drums is divided into liquid chambers and the washing drum for receiving the wash is divided into separate washing zones corresponding to the liquid chambers, the drum being perforated only in the vicinity of these separate washing zones and being mounted on bearing rails which are more particularly of plastics material, also act as partitions to form the liquid chambers, and are situated in the same transverse plane as the unperforated portions of the washing drum.

The point of departure of this invention is a known washing machine, shown for example in German patent specification No. 1,183,879. This machine has baffles in the form of radial annular ribs inside the washing drum, which baffles divide the drum into separate washing zones.

SUMMARY OF THE INVENTION

It is the object of this invention further to develop and improve the known washing machines, more particularly by facilitating the passage of the wash through the washing drum by comparison with the known machine and to enable the washing machine to empty automatically if not re-loaded with soiled wash, the clean wash being conveyed out of the washing drum at the discharge end. Another object of the invention is to transport the wash through the washing drum at the same speed, regardless of whether the machine is being loaded or not. All items in the wash are to spend the same time in the washing machine.

A further object of the invention is to wash all items in the wash as much as possible equally well. To this end, the washing machine should be such that the cross section of the material being washed inside it is as uniform as possible in all washing zones, so that all items in the wash come into contact with the washing liquid to the same extent.

A still further object of the invention is to transport items in nets through the washing drum as well and as uniformly as separate items.

To attain these objects, the present invention provides a double-drum flow-through washing machine which comprises a washing drum presenting in the axial direction a smooth passage uninterrupted by annular ribs for the wash and having in the vicinity of its unperforated portions radial washing-liquid separators, e.g. of sheet metal, which adjoin the longitudinal guide ribs on both sides and fill in the corners formed between the guide ribs and the internal surface of the washing drum.

The combination of features just given provides a flow-through double-drum washing machine which can wash continuously in a series of different washing zones without requiring troublesome radial baffles to separate these zones. Experience has shown that the radial baffles in the known washing machine which the present invention is to develop further and to improve impede uniform passage of the wash. They tend to tangle the wash so that it is not always washed uniformly, since not all of it is traversed equally by washing liquid and since the individual items in the wash do not all spend the same time in the washing drum. Also, the radial baffles in the known washing machine prevent the washing drum from emptying automatically if not re-loaded. These disadvantages are overcome in the washing machine embodying the invention by omiting the radial baffles. In spite of this omission, the washing drum is divided into separate washing zones during washing. The radial washing-liquid separators, which fill in the corners formed by the guide ribs and the surface of the washing drum, prevent the washing fluid from flowing freely along these corners from one washing zone into the next. During washing the washing zones themselves form because the washing drum is perforated only in the areas of these zones and it is only in these areas that washing liquid can be exchanged between the washing zones and the liquid chambers between the washing and outer drums, whereas the washing drum has unperforated portions where no exchange between the washing-drum interior and the liquid chambers can take place between the washing zones. The material present in the washing drum during washing prevents the washing liquid from moving freely inside the washing drum from one washing zone to the next. Since the corners formed by the guide ribs and the washing-drum surfaces are filled in by separators, the long tubular washing drum is therefore divided into separate washing zones succeeding one another in the axial direction, without any radial baffles being used.

The advantages of the washing machine embodying the invention are many: all items in the wash spend approximately the same time in the washing drum, so that the washing effect is uniform; the wash contained in the washing drum has the same cross section in all washing zones with no tangles so that the washing effect is uniformly good; items packed in nets pass through the washing drum with loose items without any trouble; and the washing drum empties automatically if not re-loaded, for example when work ceases.

To facilitate and accelerate the passage of the wash the longitudinal guide ribs preferably taper conically from one unperforated washing-drum portion to the next in the direction in which the wash advances. This conical tapering has the advantage of providing increased thrust for the articles washed, so that the latter are more readily and better conveyed through the washing drum.

To permit different wash retention times in the different washing zones, for example so that the wash stays longer in the rinsing zone than in the washing zone, the longitudinal portions of the guide ribs preferably taper

conically to differing extents between the various unperforated washing-drum portions. By this means the wash can spend a long time in certain zones, for example the rinsing zones, in which the conical tapering of the longitudinal guide ribs is less marked than in other zones, for example washing zones, where a faster passage of the wash is desirable. Alternatively, tapering longitudinal guide ribs may be provided in some zones and non-tapering longitudinal guide ribs in others. As a rule, the longitudinal guide ribs taper in the direction in which the wash advances. Alternatively, however, they might taper in the opposite direction, in which case they retard the passage of the wash in the zones concerned, instead of accelerating it. Tapering in this last-mentioned manner may be considered for certain zones especially if the washing drum is oblique, i.e. is inclined relative to the horizontal in the direction of wash advance.

BRIEF DESCRIPTION OF THE DRAWING

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawing, in which:

FIG. 1 is a longitudinal section through a washing machine according to the invention; and

FIG. 2 is a cross section on the line II—II of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The double-drum flow-through washing machine has a stationary outer drum **10** supported on a base **11**. An end-loaded perforated washing drum **12** inside the outer drum **10** is supported on its exterior merely by bearing rails **13** which are situated between the outer and washing drums and pass around part of the washing drum. These bearing rails **13** are for example of plastics material, rust-resistant metal or the like.

Liquid chambers **15** are formed between the washing drum **12** and outer drum **10** and are defined in the axial direction by the bearing rails **13** acting as dividing walls. Water, detergent and bleach are supplied to the liquid chambers **15** along pipes (not shown) from the outside.

The interior of the washing drum **12** is provided with longitudinal guide ribs **14**. Advantageously, the washing drum **12** may incline downwards relative to the horizontal in the direction of passage of the wash. Alternatively, however, it may be horizontal. The interior of the washing drum is divided into separate washing zones **16***a*, **16***b*, **16***c*, **16***d*, **16***e*, **16***f*, in only which areas perforations **17** in the drum are located. The bearing rails **13** are in the same transverse plane Q as the unperforated portions **18** of the washing drum **12**. The liquid chambers **15** correspond to the separate washing zones **16***a–f*.

In the axial direction as seen in FIG. 2 the washing drum **12** presents a smooth passage for the wash **19**, uninterrupted by annular ribs. In its unperforated portions **18** it also has washing-liquid separators **20**, for example of sheet metal, which adjoin the longitudinal guide ribs **14** on both sides and fill in the corners formed by the ribs **14** and its internal surface.

The wash **19** projecting beyond the washing-liquid level **21** in the unperforated portions **18** of the washing drum **20** substantially prevents washing liquid from passing freely out of one of the washing zones **16***a–f* into the next. The corners formed by the ribs **14** and the surface of the washing drum **12** and not filled by the wash **19** are filled by the radial washing-liquid separators **20**, so that there also the washing liquid is prevented from flowing from one of the washing zones **16***a–f* into another. The various washing zones **16***a–f* can therefore be separated effectively and different washing conditions can be created in them without, as in the known washing machine, having radial baffles in the form of annular ribs which have disadvantages in other respects. The inside surfaces of the washing drum **12** are therefore axially smooth, i.e. uninterrupted, except for the filled-in corners into which the material washed does not reach.

The washing liquid is passed through the washing machine in the opposite direction of the wash **19**. The liquid flows in the space between the washing drum **12** and outer drum **10** above the bearing rails **13**, which end below the washing-liquid level **21**. The wash passes through the washing machine from the loading end **22** to the discharge end **23**, i.e. from left to right in FIG. 1. The washing liquid flows in the opposite direction.

Preferably, the longitudinal guide ribs **14** taper conically from one unperforated portion **18** to the next in the direction of passage of the wash **19** as shown in FIG. 1, in which conical rib portions are shown with portions **14***a* of greater cross-section and portions **14***b* of smaller cross-section. FIG. 1 also illustrates the varying extent of the conical tapering of the longitudinal guide ribs **14** between the unperforated drum portions **18**. By way of example, it shows the guide rib portions in the first three washing zones **16***a–c* in the direction of wash advance as tapering equally. In the fourth washing zone **16***d* the tapering is less marked. In the fifth washing zone **16***e*, which is a rinsing zone, the guide rib portions are not conically arranged; and in the sixth washing zone **16***f*, which is also a rinsing zone, they taper conically in the opposite direction, i.e. opposite the direction of wash advance. This illustration is solely an example and explanation, and the conical tapering or non-tapering of the longitudinal guide rib portions could perfectly well be otherwise in the various zones.

In the particular embodiment, the relatively strongly marked conical tapering in the first three washing zones **16***a–c* accelerates the passage of the wash **19** to a relatively large extent. In the washing zone **16***d* the passage of the wash **19** is less accelerated because the conical tapering of the longitudinal guide ribs **14** is less. In the washing zone **16***e* serving as rinsing zone, they do not taper conically at all and therefore do not accelerate the wash. In the washing zone **16***f* serving as second washing zone the speed of the wash is in fact reduced, because the longitudinal guide ribs **14** taper conically in the opposite direction.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed is:

1. A tubular double drum type counterflow washing machine comprising:

(a) a stationary outer drum,

(b) means rotatably mounting an inner washing drum within the outer drum,

(c) a plurality of axially spaced bearing rails which provide support to said inner drum and form liquid chambers between the outer drum and the inner washing drum,

(d) the inner washing drum includes a plurality of longitudinal guide ribs circumferentially displaced with respect to each other on the internal surface of the inner drum, said ribs forming corners with the internal surface,

(e) said inner drum includes radial-liquid separators extending from at least one side of the circumferentially displaced longitudinal ribs to fill the corner between the ribs and the internal surface thereof,

(f) the inner drum further includes perforated washing zones longitudinally displaced along the internal surface thereof and

(g) a plurality of the radial washing-liquid separators extending from the guide ribs are located between adjacent washing zones to form both a separation therebetween and a free space along the internal surface of the inner washing drum and provide a

smooth, uninterrupted passage for wash material being washed therein.

2. A washing machine as defined in claim 1 wherein said radial-liquid separators extend from each side of the circumferentially displaced guide ribs.

3. A washing machine as defined in claim 2 wherein said inner drum includes unperforated areas along the internal surface thereof between said unperforated washing zones,

said plurality of radial washing-liquid separators being located at unperforated areas.

4. A washing machine as defined in claim 3 wherein said plurality of radial separators are located in a common radial plane.

5. A washing machine as defined in claim 4 wherein said bearing rails are located at unperforated areas and are composed of a plastic material.

6. A washing machine as defined in claim 4 wherein said radal separators are composed of sheet metal material.

7. A washing machine as defined in claim 4 wherein said longitudinal guide ribs have a radial height which continuously tapers from one end of each washing zone to the other end thereof.

8. A washing machine as defined in claim 7 wherein said radial height tapers continuously in the direction in which the wash material advances.

9. A washing machine as defined in claim 7 wherein said radial height tapers to differing extents between the various unperforated areas.

10. A washing machine as defined in claim 4 wherein said longitudinal guide ribs continuously become smaller in circumferential width from one unperforated area to the next and said ribs have a radial height which is uniform throughout each said washing zone.

11. A washing machine as defined in claim 10 wherein said circumferential width becomes smaller to differing extents between the various unperforated areas.

References Cited

UNITED STATES PATENTS

3,293,891 12/1966 Sulzmann ---------- 68—58

WILLIAM I. PRICE, Primary Examiner

U.S. Cl. X.R.

68—210