Sept. 2, 1958 O. BRUSDAL 2,849,894

COMBINATION CLOTHES WASHER AND EXTRACTOR

Filed Dec. 28, 1954 2 Sheets-Sheet 1

Fig. 1.

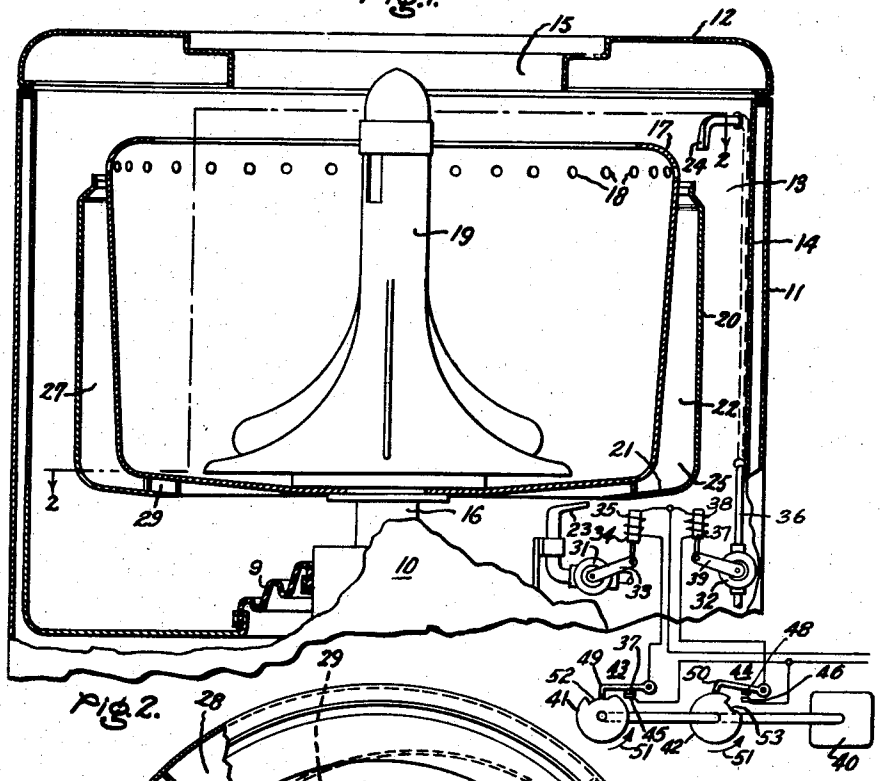

Fig. 2.

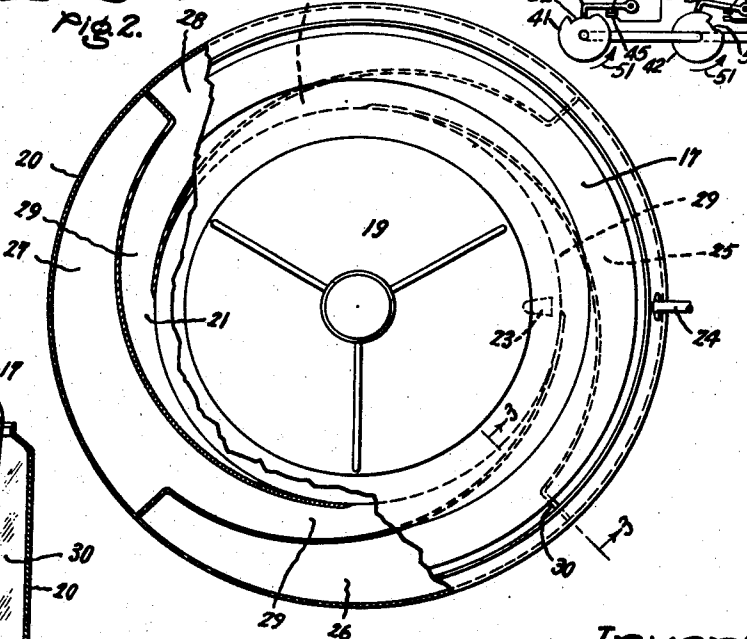

Fig. 3.

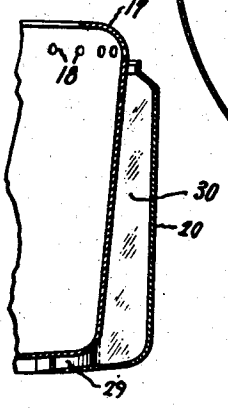

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Fig. 4.

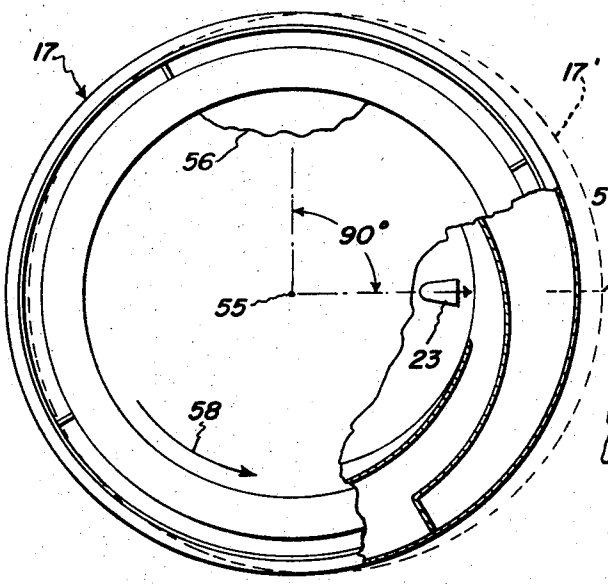


Fig. 5

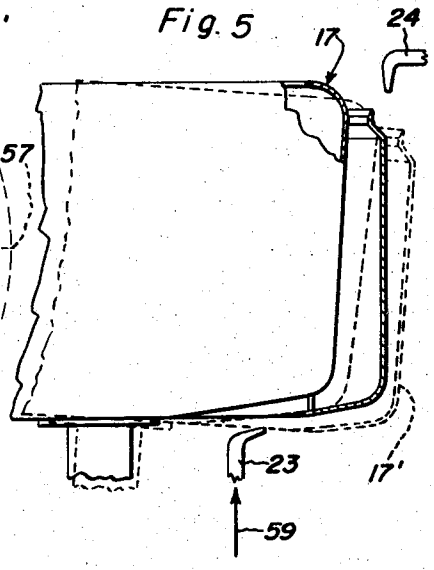


Fig. 6.

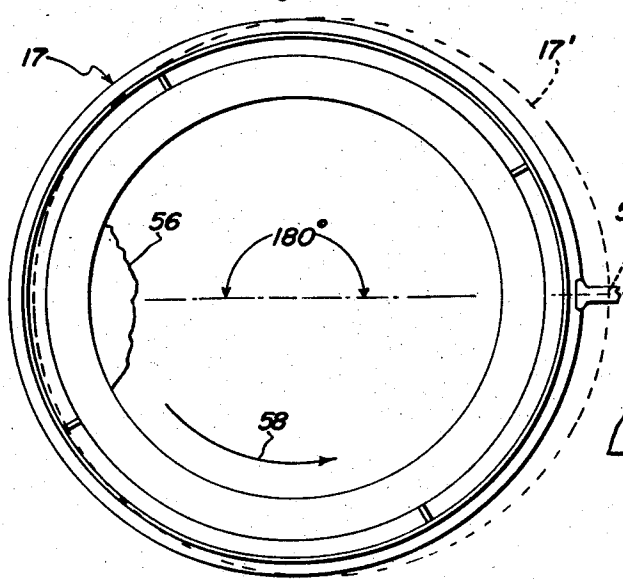
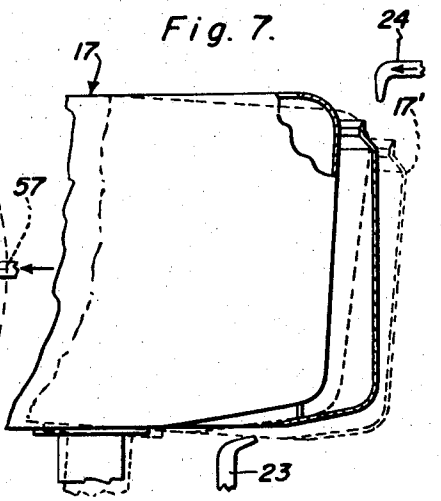


Fig. 7.



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COMBINATION CLOTHES WASHER AND EXTRACTOR

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3 Claims. (Cl. 74—573)

This invention relates to combination automatic washing machines and extractors and specifically to an apparatus for balancing the extractor basket of such machines.

A washing machine which is balanced during its entire spin-drying cycle is desirable in both domestic and commercial laundry use. Clothes load in a washing machine shifts during the washing cycle to cause subsequent rotor unbalance during the spin-drying cycle with attendant undesirable vibrations. Such a problem exists in a conventional machine in which unbalance has not been corrected over its entire speed range. The invention of the present application eliminates rotor unbalance during the spin-drying cycle both below and above the critical speed of the basket to provide a self-balanced and efficient machine which is inexpensive to manufacture.

Accordingly, it is an object of my invention to provide a new and improved automatic washing machine which corrects for unbalance during its entire spin-drying cycle.

It is another object of the invention to provide an improved washing machine in which undesirable vibrations are eliminated.

It is a further object of the invention to provide a novel apparatus to eliminate unbalance in a washing machine.

In carrying out my invention in one form, a pair of liquid spray nozzles are positioned adjacent opposite rims of the extractor basket to produce counterbalancing forces to overcome unbalance in the washing machine.

These and various other objects, features and advantages of the invention will be better understood from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a vertical cross sectional view of a combination automatic washing machine and extractor which embodies my invention;

Fig. 2 is a top plan view taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a diagrammatical illustration of a top view of the basket of Fig. 1 in a condition of unbalance at speeds below the critical speed;

Fig. 5 is a diagrammatical illustration of the side view of Fig. 4 indicating the tilt of the basket at speeds less than critical, and operation of a water spray nozzle;

Fig. 6 is a diagrammatical illustration of the top view of the basket of Fig. 1 during the condition of unbalance at speeds above the critical speed; and

Fig. 7 is a further illustration and side view of Fig. 6 indicating the position of unbalance of the basket at speeds above critical, and the operation of a balancing water nozzle.

In Fig. 1 of the drawing, an automatic vertical type washing machine and extractor shown generally at 10, comprises an outer decorative and ornamental cabinet 11 with a top wall 12 secured thereto in any suitable manner to define a washing and drying chamber 13 which is

separated from the driving mechanism by an inner wall 14. An aperture 15 in top wall 12 which provides an opening through which clothes and other articles may be inserted into machine 10 is closed by a suitable cover or lid (not shown). A drive shaft 16 is resiliently mounted within the lower portion of cabinet 11 to support within chamber 13 an extractor or spin basket 17 with a plurality of extractor apertures 18 near its upper edge. Shaft 16 may be flexibly mounted in various forms, for example, as illustrated in this invention, basket 17 is flexibly supported through a flexible connection 9 between shaft 16 and the inner wall 14. This flexible mounting permits a tilting or wobbling action of the rotating wash basket 17 through a generally predetermined range. An agitator 19 is mounted on the head of shaft 16 within basket 17 while a conventional motor (not shown) drives shaft 16 through any suitable pulley or gear arrangement.

A balance ring 20 with a flange 21 at its lower edge is positioned around the periphery of and spaced from basket 17 to provide a balancing chamber 22. A water spray nozzle 23 is mounted adjacent the rim of flange 21 to provide a water spray for rotor balancing below the critical speed of basket 17 during the spin-drying cycle of machine 10. A similar water nozzle 24 is also positioned adjacent the upper rim of ring 20 to provide a liquid spray to correct unbalance above critical basket speed. Both nozzles are separately actuated by solenoid valves 31 and 32 during spin cycle operation of machine 10 which is described as the automatic cycle type. Valve 31 which is located adjacent nozzle 23 has a lever 33 connected pivotally to a valve closure within the valve and to an armature 34 within a solenoid 35. Valve 32 is provided in pipe line 36 which supplies liquid to nozzle 24. An armature 37 within a solenoid 38 is connected pivotally to a lever 39 which actuates a valve closure within the valve. Each solenoid is energized separately from a suitable source of current.

As is best shown in Figs. 2 and 3, chamber 22 which is located between basket 17 and ring 20 is partitioned into a plurality of circumferential positioned balancing compartments or pockets, four of which are shown at 25, 26, 27 and 28. A plurality of channels 29 are positioned between the bottom of basket 17 and flange 21 to provide access for fluid into compartments 25, 26, 27 and 28 from spray nozzle 23. In addition, these compartments have direct openings thereto at the top of the ring 20 between the ring 20 and basket 17. Each channel inlet is located circumferentially in the direction of rotation which is counterclockwise when viewing Fig. 2 and at a 90° angle or arc from its respective compartment in generally overlapping relationship for reasons to be more fully explained hereinbelow. In Fig. 3, end wall 30 of compartment 25 is shown with adjacent channel 29 to supply liquid to compartment 26. While an automatic vertical type washing machine is described, the present invention is also applicable to a washing machine with its axis of rotation in the horizontal plane or at any other angle thereto.

In the operation of washing machine 10 during its spin-drying cycle, the motor (not shown) drives shaft 16 to rotate basket 17 with wet clothes therein about the shaft axis. Nozzle 23 which is actuated by its solenoid valve 31 at the start of the spin-drying cycle continues to spray a water stream laterally outwardly until critical basket speed is reached. During acceleration of basket 17 to its critical speed, a non-uniform or shifting laundry load causes an unbalance at one point in the basket and a tilting or wobbling point which is at an angle of lag of 0° to 90° behind actual unbalance. This tilting displacement of basket 17 aligns a channel 29 with spray

nozzle 23 to direct the water stream into the respective balance compartment which is positioned at an angle of 90° from the channel inlet and 180° from the loaded or unbalanced side of basket 17 to provide a counterbalancing force. When such channel 29 and nozzle 23 are not aligned during rotation of basket 17, water flows into the bottom of chamber 13 to be discharged through a drain (not shown).

As speed of rotation of basket 17 increases, water which is continually extracted from the clothes therein may produce a change in balance. Angle of lag approaches 180° and when critical speed is reached radial displacement of the tilting or wobbling point occurs at 180° behind the unbalance point. Spray nozzle 23 is automatically inactivated by valve 31 while spray nozzle 24 is actuated by its solenoid valve 32 to introduce water directly into the compartment of chamber 22 at a point 180° from basket unbalance to provide a counterbalancing force. In other words, the water introduced by nozzle 24 is positioned directly in the compartment in communication therewith, while nozzle 23 introduces water in the 90° channel inlets, which water is transferred by centrifugal force to a further position approximately 90° from the inlet and in the compartment. At speeds under critical where the tilting point of the basket lags the unbalance condition by displacement approaching 90°, the injection of water from nozzle 23 at 90° from the unbalance to be further transferred an additional 90° effectively positions the water at 180° from the unbalance condition of the basket. Where, at speeds above critical, the tilting point of the basket lags the unbalance condition by 180°, the nozzle 24 introduces water directly into the upper openings of those compartments in communication therewith for positioning the water directly at 180° from the unbalance condition. Nozzles 23 and 24 are spaced vertically from each other but are horizontally separated by a compartment wall defining an opening above a compartment and the inlet of a subsequent compartment. When balance is restored, basket 17 will run true without any water entering the balance compartment. Nozzle 24 is then rendered inactive through a time delay mechanism 40 (not shown) whose setting is determined by the size of such nozzle. During the course of this description, the operation of the nozzles 23 and 24 and solenoid valves 31 and 32 together with their particular sequence of operation has been set forth in conjunction with the ordinary spin cycle of washing apparatus and suitable switching mechanisms therein. It is generally the accepted practice to control all cycles of a washing apparatus through a central timing motor actuating sequential switches. Referring now to Fig. 1, for example, such a timing motor or sequential control device is illustrated broadly as 40, the particular elements employed to actuate the valve solenoids 35 and 38 being indicated by cams 41 and 42 which actuate switches 43 and 44. Switches 43 and 44 are interconnected with solenoids 35 and 38 and a suitable source of power, not shown, and are operable to establish or open a circuit between stationary contacts 45 and 46 and contacts 47 and 48 carried by and movable with fingers 49 and 50. During the spin cycle, the cams 41 and 42 commence rotating in the direction illustrated by arrow 51. It may be seen that fingers 49 and 50 of switches 43 and 44 ride upon the periphery of cams 41 and 42 and move into suitable depressions 52 and 53 therein to establish a given circuit.

In the operation of this control during the spin cycle, cams 41 and 42 are rotated in the direction shown by arrows 51 and at the start of the operation finger 49 moves into the depression 52 of cam 41 thus engaging contacts 45 and 47 to establish a circuit from the source of power, not shown, to solenoid 35 to actuate valve 31. The length of the depression 52 determines the time of operation of valve 31 and as heretofore mentioned, approximately a 30-second interval has been sufficient to correct unbalance conditions. Continued rotation of cam 41 raises finger 49 to interrupt the circuit and immediately or soon thereafter finger 50 moves into depression 53 of cam 42 to engage contacts 46 and 48 and energize solenoid 38 together with valve 32 for an additional approximately 30-second interval. The latter operation provides balance for speeds above critical. It is understood that the spacing and/or length of the depressions in the cams 41 and 42 may be suitably extended or shortened in order to match the speed characteristics of the washing apparatus in question with the proper time of water spray. It has been found that a half inch diameter spray nozzle provides within thirty seconds a basket balancing which continues until the spin-drying cycle has been completed.

Water which is removed from clothes within basket 17 during the spin-drying cycle through extractor apertures 18 drains into a sump (not shown) at the base of chamber 13. This sump receives also excess water from nozzles 23 and 24 which does not enter chamber 22.

Figs. 4–7 illustrate a summary of the operating principles of the balancing apparatus as set forth in this specification.

In Fig. 4, basket 17 is indicated by arrow 58 as rotating counterclockwise about the center of rotation 55 with an unbalance load shown as 56. The dashed lines 17′ indicate the basket 17 during unbalance condition at speeds less than critical and further indicate the tilting side or point of run-out 57 as lagging the unbalance load by 90° opposite the direction of rotation. It is, of course, understood that the 90° value varies from a lower value at low speeds to approximately 90° near critical speeds. The 90° inlets however include balancing for all conditions and where water creates a partial unbalance, further balancing continues.

Fig. 5 is a side view of Fig. 4 indicating the tilt of the basket 17′ and nozzle 23 in operation as illustrated by flow arrow 59. It may be seen that a correlation of these two Figures 4 and 5 shows that nozzle 23 places the water at a point 90° from the unbalance load and thus balances the basket for speeds under critical.

Fig. 6 illustrates the basket 17 at speeds above critical where the unbalance load 56 is 180° radially displaced from or lags the tilt or run-out side 57 of the basket 17, opposite the direction of rotation.

Fig. 7 is a side view of Fig. 6 showing the run-out of the basket 17 as 17′ under speeds above critical and operation of nozzle 24. A correlation of Fig. 6 and Fig. 7 shows that during these conditions injection of water by means of nozzle 24 places the water directly 180° from the unbalance load condition.

As will be apparent to those skilled in the art, the objects of my invention are attained by the use of a pair of liquid spray nozzles which are positioned adjacent opposite rims of the extractor basket to produce counterbalancing forces to overcome unbalance in a washing machine during its spin-drying cycle.

While other modifications of this invention and variations of apparatus which may be employed within the scope of the invention have not been described, the invention is intended to include all such as may be embraced within the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A combination washer and extractor comprising a casing, a rotatable basket resiliently supported within said casing for tilting through a predetermined range, a balance ring positioned around said basket for rotation therewith, said balance ring comprising a plurality of balancing compartments, an inlet channel for each of said balancing compartments extending circumferentially on said ring and spaced from its associated compartment in the direction of rotation of the basket, each of said compartments having a direct opening thereto, first liquid spray means for said inlet channels, said spray

means communicating with the said inlet channels in the tilting range, and second liquid spray means in communication with said compartment direct openings during the tilting range, and means to sequentially supply a flow of liquid to said nozzles.

2. A combination washer and extractor comprising a casing, a rotatable basket supported resiliently within said casing for tilting through a predetermined range, a balance ring positioned around and spaced from said basket, an inwardly extending flange at one end of said balance ring adjacent the closed end of said basket, said balance ring comprising a plurality of balancing compartments, an inlet channel for each of said compartments between the closed end of said basket and said flange, each of said inlet channels spaced circumferentially in the direction of rotation at substantially a 90° arc from its associated compartment, each of said compartments having a direct opening thereto liquid spray means mounted within said casing and spaced from said flange, said spray means communicating with said inlet channels during unbalance conditions, second liquid spray means mounted within said casing and spaced from the edge of said balance ring at the open end of the basket, said second spray means communicating with the compartments during unbalance conditions and means actuating separately each of said spray means, the first said liquid spray means at speeds of the basket below the critical speed thereof and the second liquid spray means at speeds of the basket above the critical speed thereof.

3. An extractor comprising a casing, a basket supported resiliently within said casing for tilting through a predetermined range, a balance ring positioned around said basket, an inwardly extending flange at one end of

said balance ring adjacent the closed end of said basket, said balance ring comprising a plurality of balancing compartments, an inlet channel for each of said compartments between the closed end of said basket and said flange, each of said inlet channels spaced circumferentially in the direction of rotation at substantially a 90° arc from its associated compartment, said inlet channels and balancing compartments being in overlapping relationship circumferentially of said ring, said compartments having direct openings thereto between the ring and the basket at the top thereof, liquid spray means mounted within said casing and spaced from said flange, said spray means communicating with said inlet channels and balancing compartments during unbalance conditions, and second liquid spray means mounted within said casing and spaced from the edge of said ring at the open end of the basket, said second spray means communicating with said compartment direct housings and timing means to separately actuate the first of said liquid spray means and then the second liquid spray means.

References Cited in the file of this patent

UNITED STATES PATENTS

305,026	Stillman	Sept. 9, 1884
2,375,635	Dyer	May 8, 1945
2,463,801	Page	Mar. 8, 1949
2,498,420	Hemmeter	Feb. 21, 1950
2,534,267	Kahn	Dec. 19, 1950
2,534,269	Kahn et al.	Dec. 19, 1950
2,538,246	Holm-Hansen	Jan. 16, 1951
2,603,982	Davis et al.	July 22, 1952
2,687,215	Armstrong	Aug. 24, 1954