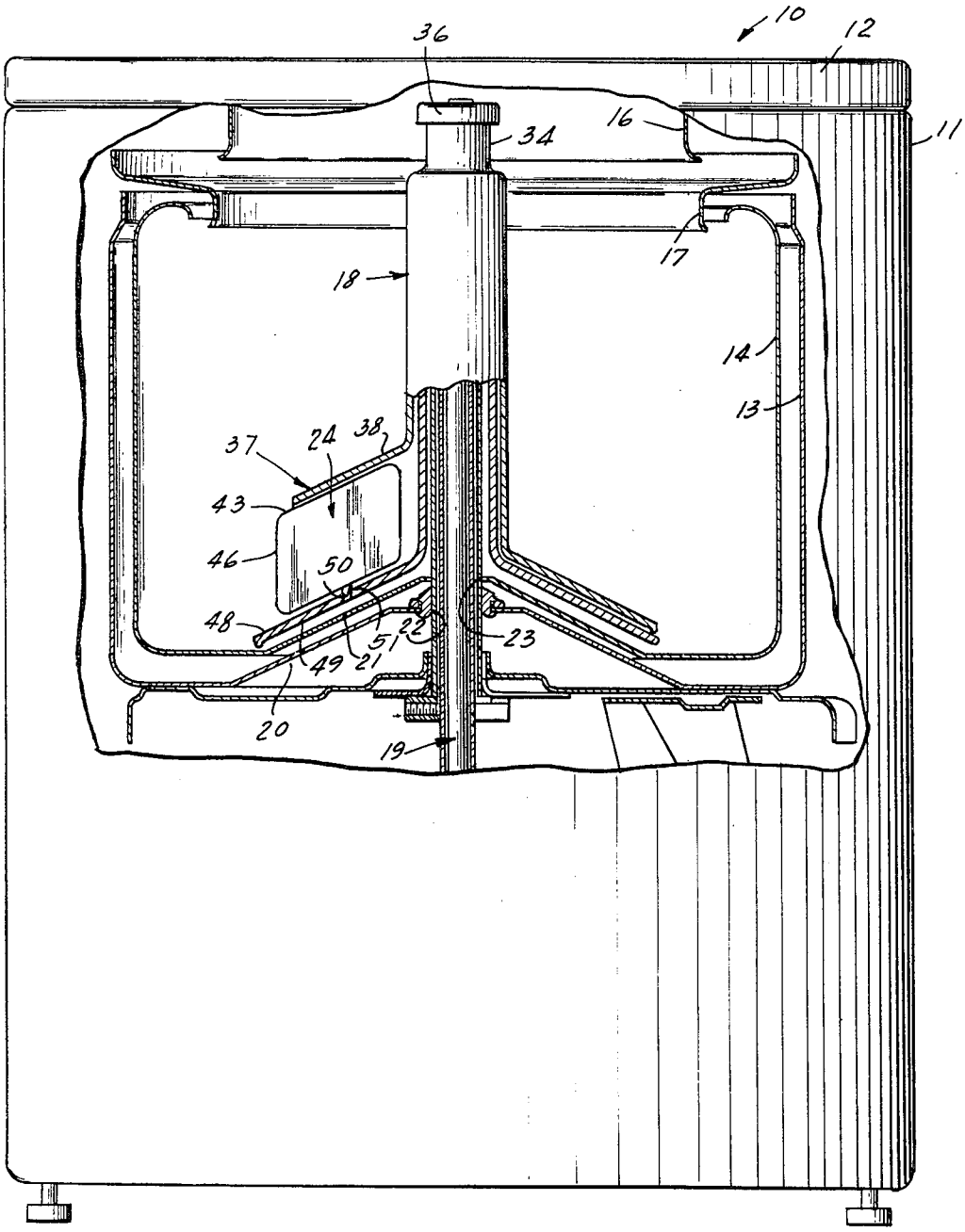
March 31, 1970 A. MASON ET AL 3,503,086

VARIABLE VANE AGITATOR WITH SELF-COMPENSATING MEANS

Filed June 5, 1968 3 Sheets-Sheet 1

Fig. 1



INVENTORS
ANTHONY MASON
KEITH D. SALISBURY
DAVID A. MATZEN
BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

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VARIABLE VANE AGITATOR WITH SELF-COMPENSATING MEANS

Filed June 5, 1968 3 Sheets-Sheet 2

Fig. 3

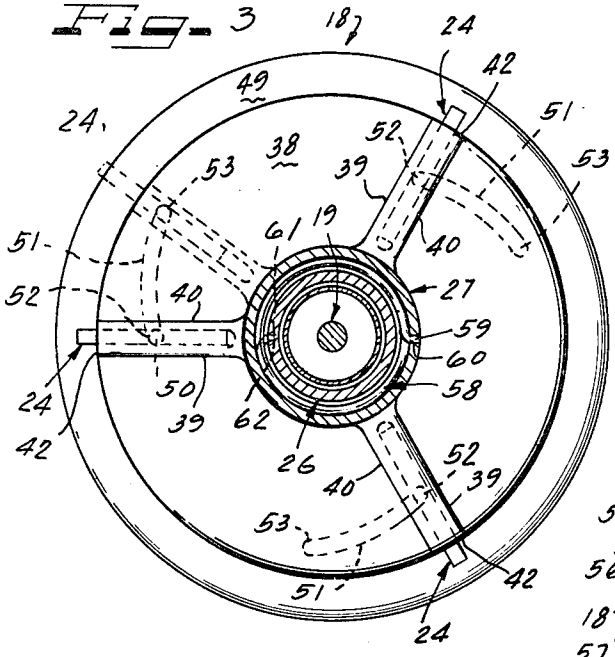
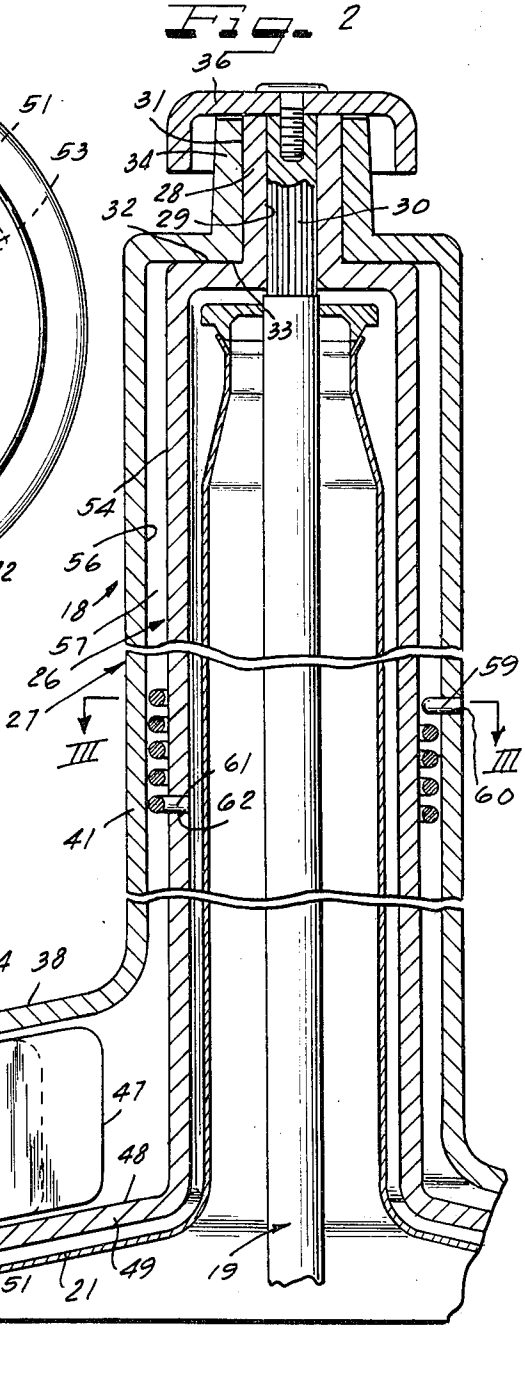


Fig. 2



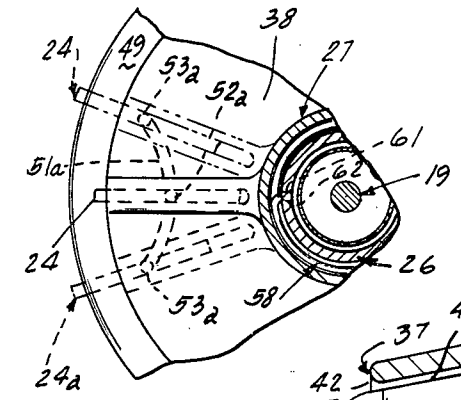


Fig. 4

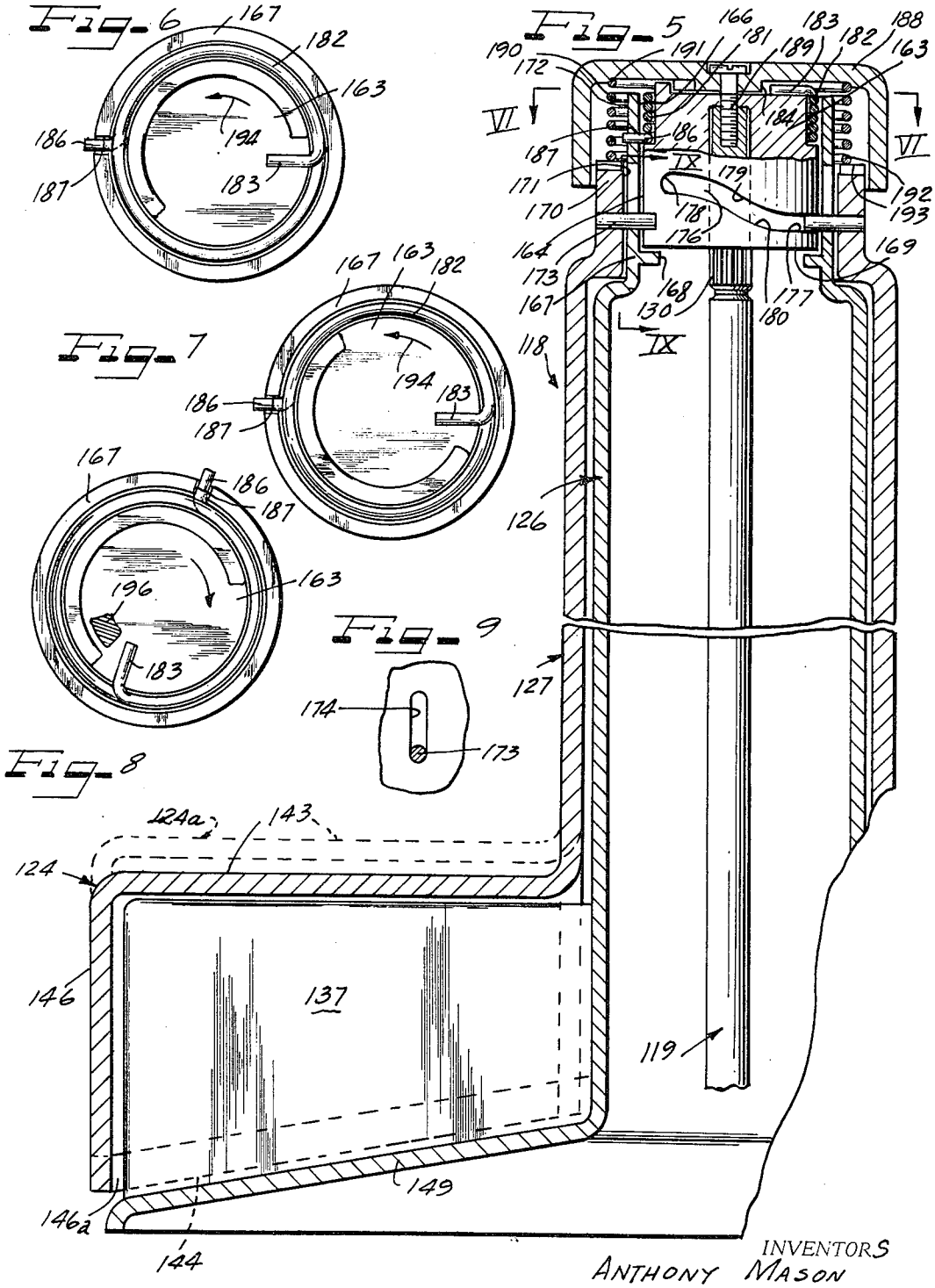
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KEITH D. SALISBURY
DAVID A. MATZEN

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

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INVENTORS
ANTHONY MASON
KEITH D. SALISBURY
DAVID A. MATZEN

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

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3,503,086

VARIABLE VANE AGITATOR WITH SELF-COMPENSATING MEANS

Anthony Mason, Benton Harbor, Mich., Keith D. Salisbury, Arlington, Mass., and David A. Matzen, St. Joseph, Mich., assignors to Whirlpool Corporation, Benton Harbor, Mich., a corporation of Delaware

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U.S. Cl. 8—159 18 Claims

ABSTRACT OF THE DISCLOSURE

A washing machine including an agitator assembly for agitating the material to be laundered. The agitator assembly includes a rotatable agitator shell and a plurality of agitation vanes rotatable with the shell and adjustable for varying the level of agitation in accordance with the quantity of material being laundered. The agitator shell is driven by an oscillating rotatable drive shaft to which it is connected by means of a coupling arrangement including a spring member so that the agitator shell lags behind or follows the drive shaft by an angle which is proportionate to the turn-resisting force imposed on the agitator shell and the agitation vanes by the laundry material. The agitation vanes are automatically moved to a position of adjustment as a function of the angle by which the agitator shell lags behind the drive shaft.

BACKGROUND OF THE INVENTION

This invention relates generally to the field of washing machines and more particularly to washing machines of the agitator type.

Agitator type washing machines generally employ an agitator shell which oscillates rotatably on a vertical axis. One or more agitation vanes extend radially from the agitator shell to increase the agitation of the laundry liquid and the laundered material.

It is usually desirable to vary the level of agitation as the quantity of laundered material varies. For example, a low level of agitation is generally preferred when the quantity of laundered material is low whereas a high agitation level is preferred as the quantity of laundered material increases.

Agitator type washing machines having adjustable agitation vanes to vary the level of agitation are known in the prior art. Such arrangements require manual adjustment of the vanes, however, which is not only time consuming and effort expending but often results in an improper adjustment of the vanes due to a miscalculation on the part of the operator with respect to the quantity of laundry material loaded in the machine.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages of the prior art by providing a method of and apparatus for automatically adjusting the agitation level of the washing machine to correspond with the quantity of laundry material in the machine. Manual adjustment is not required an deven if the quantity of laundry material is changed in the course of a wash cycle the level of agitation of the machine will be automatically readjusted to correspond to the adjusted load.

The method of the present invention may be briefly summarized as comprising the steps of transmitting a driving torque to the agitator shell of the agitator assembly, subjecting the agitator shell and an adjustable agitation vane connected thereto to a turn-resisting force which is imposed by the washing load in the machine,

increasing the driving torque to a level which exceeds the turn-resisting force in order to commence rotation of the agitator shell and adjusting the agitation vane in relation to the level of the driving torque required to exceed the load-imposed turn resisting force.

The invention may also be summarized as comprising means for carrying out the aforementioned method and includes radially or axially adjustable agitation vanes which are moved between low and high agitation positions as a function of the magnitude of the turn-resisting forces imposed on the agitator assembly by the load of laundry material. Thus as the quantity of laundry material in the washing machine increases, the force acting on the agitator assembly to resist the driving force increases, and as the increase occurs the agitation vanes are automatically adjusted to a higher agitation level position commensurate with the increased load. The reverse situation occurs when the amount of laundry material in the machine is reduced.

The agitator assembly oscillates about an axis of rotation. The two positions during each cycle of oscillation at which the velocity of the agitator assembly is reduced to zero in changing direction of rotation may be considered the limiting end positions of the agitator assembly. At such positions the turn resisting force acting on the agitator assembly is sharply reduced.

In one embodiment of the invention the load-resisting force acting on the agitator assembly in both directions of rotation serves to move the agitation vanes to their adjusted positions. Thus at the limiting end positions of the agitator assembly the agitation vanes move to a low level agitation position but then immediately readjust to correspond with the load in the machine when the agitator assembly has moved from the limiting end position.

In another embodiment of the invention the turn-resisting force caused by the washing load serves to adjust the position of the agitation vanes only in one direction of rotation. As the agitator assembly rotates in an opposite direction of rotation the agitation vanes are maintained at the position to which they were moved in the first direction of rotation.

As a consequence of the invention the washing machine operator is not required to make a mental calculation of the load and furthermore is not required to manually adjust the agitation vanes once he has arrived at what he considers to be the proper adjustment. Accordingly, the present invention not only reduces the time and effort required in operating the washing machine but also provides optimum results by eliminating the "guess work" formerly required in estimating the quantity of the wash load.

It is, therefore, an object of the present invention to provide, in an agitator-type washing machine, a method of and means for automatically adjusting the agitation level of the machine to correspond to the quantity of laundry material being washed.

Another object of the invention is to reduce the time and effort required in adjusting the agitation vanes.

Another object is to improve washing results by eliminating the need for operator adjustment-selection with respect to the agitation vanes.

A further object of the invention is to provide automatic adjustability in a simplified fashion without materially increasing costs or potential maintenance problems.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheets of drawings, in which preferred structural embodiments incorporating the principles of the invention are shown by way of illustrative example only.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevational view of an agitator type washing machine constructed in accordance with the principles of the present invention with portions thereof broken away and other portions shown in section to reveal the relative positioning of parts.

FIGURE 2 is an enlarged fragmentary vertical elevational view of the agitator assembly shown in FIGURE 1.

FIGURE 3 is a horizontal sectional view taken along lines III—III of FIGURE 2.

FIGURE 4 is a fragmentary view similar to FIGURE 3 but illustrating a different vane adjustment arrangement.

FIGURE 5 is similar to FIGURE 2 but illustrates another embodiment of an agitator assembly constructed in accordance with the principles of the present invention.

FIGURE 6 is a horizontal sectional view taken along line VI—VI of FIGURE 5 with the cap of the agitator assembly and other parts removed.

FIGURES 7 and 8 are similar to FIGURE 6 but show the various parts of the agitator assembly in different relative positions.

FIGURE 9 is a fragmentary vertical view taken along lines IX—IX of FIGURE 5, illustrating a vertical slot formed in an inner agitator shell of the agitator assembly and a pin extending from an outer agitator shell through the slot.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGURE 1, an agitator type washing machine constructed in accordance with the principles of the present invention is indicated generally at reference numeral **10**. Various components of the washing machine **10** include an outer cabinet **11** at the top of which is mounted a hinged cover **12**, an imperforate tub **13** for receiving a supply of laundry liquid, a perforate drum **14** for receiving the material to be laundered, registered openings **16** and **17** through which laundry material is loaded into the drum **14**, an agitator assembly **18** which oscillates rotatably on a vertical axis for providing the agitation to the laundry liquid and the laundered material and a drive shaft **19** which drives the agitator assembly **18**. The drive shaft **19** is connected to a suitable driving mechanism such as an electric motor mounted in the lower portion of the cabinet **11** whereby the drive shaft oscillates back and forth during a wash cycle and spins at high speed in one direction in the usual manner during a spin cycle. Bottom walls **20** and **21** of the tub **13** and the drum **14** slope upwardly at the central portions thereof and are provided respectively with openings **22** and **23** through which the drive shaft **19** projects up into the agitator assembly **18**.

In the embodiment of the agitator assembly **18** illustrated in FIGURES 1–4, the level of agitation is regulated by the adjustment of a plurality of radially movable vertically upstanding thin, disc-shaped agitation vanes, only one of which is illustrated in the drawings at reference numeral **24**. As the vane **24** is moved radially outwardly from the axis of rotation or oscillation of the agitator assembly **18**, the level of agitation increases. Conversely, when the agitation vane **24** is moved radially inwardly the level of agitation decreases.

Referring to FIGURES 2–4, the agitator assembly **18** may be further characterized as comprising inner and outer agitator shells **26** and **27**, both of which are tubularly shaped and axially aligned with the axis of the drive shaft **19**. The upper end of the inner agitator shell **26** comprises a centrally bored tubular portion **28** which is internally splined at **29** to receive a complementarily splined upper end **30** of the drive shaft **19**. The inner agitator shell **26** is, therefore, connected to the drive shaft **19** for joint oscillation and rotation.

An outer surface **31** of the upper end portion **28** as well as a radial shoulder **32** of the inner agitator shell **26** are smooth, the radial shoulder **32** supporting a companion shoulder **33** formed on the outer agitator shell **27**, and the smooth outer surface **31** of the upper end section **28** providing a bearing surface for a reduced diameter end portion **34** of the outer agitator shells **27**. The inner and outer agitator shells **26** and **27** are, therefore, arranged and mounted for relative rotation with the radial shoulder **33** and the cylindrical surface **31** providing the bearing surfaces between the two shells. A cap **36** is mounted on the upper end of the drive shaft **19** and overlies the end portions of the inner and outer agitator shell **26** and **27**.

The agitation vane **24** is diposed within a vane guide **37** which comprises a top wall **38** and a pair of spaced parallel vertical side walls **39** and **40**. The vane guide **37** is formed on and projects radially outwardly of a body portion **41** of the outer agitator shell **27** and a distal end **42** thereof is open so that the vane **24** is movable within the confines of the side walls **39** and **40** from a radially inner or low level agitation position shown in the solid lines in FIGURE 2 to a radially outer or high level agitation position as shown in the dashed lines of FIGURE 2.

The illustrated embodiment of the agitation vane **24** comprises spaced parallel top and bottom walls **43** and **44** and spaced parallel end walls **46** and **47**. The bottom wall **44** is supported in sliding engagement on a top wall **48** of a skirt **49** extending radially outwardly and sloping axially downwardly from the bottom end of the inner agitator shell **26**. A pin or cam follower member **50** projects downwardly from the bottom wall **44** and is received in a curved slot **51** formed in the skirt **49**, the side walls of the slot **51** providing cam surfaces for the pin **50**.

In the embodiment shown in FIGURE 3, three agitation vanes **24** and vane guides **37** are spaced equally about the circumference of the outer agitator shell **27**. The slots **51** each extend from an inner end **52** to an outer end **53** disposed not only in circumferentially spaced but also in radially outwardly spaced relation to the inner end **52**. It will be apparent from FIGURE 3 that as the inner and outer agitator shells **26** and **27** are rotated with respect to one another the agitation vanes **24** rotate with the outer agitator shell **27** and also move radially outwardly to a high level agitation position as shown in the dashed lines at reference numeral **24**.

As shown in FIGURE 2 an outer cylindrical wall **54** of the inner agitator shell **26** is radially spaced from an inner cylindrical wall **56** of the outer agitator shell **27** and in the chamber **57** formed therebetween is disposed in a helical coil spring **58**, one end of which as shown at **59** protrudes through an aperture **60** formed in the outer agitator shell **27**, and an opposite end **61** of which protrudes through an aperture **62** formed in the inner agitator shell **26**.

In operation the inner agitator shell **26** is directly coupled to and is driven jointly with the drive shaft **19**. The inner agitator shell **26** in turn drives the outer agitator shell **27** through the helical spring **58**.

As the drive shaft **19** begins turning in one direction of rotation the inner agitator shell **26**, of course, turns with it. However the load of laundry material within the drum **14** imposes a counterforce or turn-resisting force on the outer agitator shell **27** proportionate to the quantity of laundry material in the drum **14**.

Since the outer agitator shell **27** is subjected to a torque acting against the torque being applied by the inner agitator shell **26** through the spring **58**, the outer agitator shell **27** does not immediately rotate jointly with the inner agitation shell **26** but instead lags behind the inner agitator shell **26**, thus producing a winding force on the spring **58**. This winding force increases until the torsional force applied by the spring **58** to the outer agitator shell **27** exceeds the turn-resisting force to which the outer agitator shell **27** is subjected by virtue of the washing load in the drum **14**.

As the inner and outer agitator shells **26** and **27** rotate relative to one another as the spring **58** is winding up, the agitation vanes **24** are moved radially outwardly a

distance which corresponds to the angle of relative rotation between the inner and outer agitator shells **26** and **27** which angle, in turn, depends upon the magnitude of the turn-resisting force being applied to the outer agitator shell **27** by the laundry material. Thus as the size of the load of laundry material within the drum **14** is increased the angle of displacement or relative rotation between the inner and outer agitator shells **26** and **27** increases proportionately. As a consequence the level of agitation, which varies as a function of the position of the agitation vanes **24**, corresponds proportionately to the size of the load of laundry material in the drum **14**.

As the drive shaft **19** oscillates through each oscillation cycle and approaches a limiting end position of oscillation or a position at which the direction of rotation is reversed, the turn-resisting force acting on the outer agitator shell **27** is substantially reduced and the tendency of the spring **58** is to cause the outer agitator shell **27** to rotate relative to the inner agitator shell **26** to bring the two shells back from a relatively rotationally displaced position to the relatively neutral position which they assumed initially while at rest. At that point in time the agitation vanes **24** are moved radially inwardly to the low level agitation position thereof.

In the embodiment shown in FIGURE 3 the agitation vanes **24** are moved to the high level agitation position thereof only as the drive shaft **19** rotates in one direction of rotation, since the vanes assume a radially inward position as the drive shaft completes the oscillation cycle in an opposite direction of rotation. In the embodiment shown in FIGURE 4, however, each of the slots **51***a* formed in the skirt **49** extends from a radially inner point **52***a* in opposite directions to circumferentially and radially outwardly spaced points **53***a*. In this embodiment, therefore, the agitation vanes **24** are moved to a higher level agitation position as the drive shaft **19** rotates in both directions of rotation. The vanes **24** assume a low level agitation position only momentarily at the limiting end positions of rotation of the drive shaft **19**.

In the embodiment shown in FIGURES 2–4, the agitation vanes **24** constitute vanes extensions of the vane guides **37**, since the guides themselves perform an agitation function. In the embodiment shown in FIGURES 5–9 the agitation vanes are adjusted in a different manner but perform a similar agitation function.

Referring to FIGURES 5–9, wherein parts corresponding to similar parts shown in FIGURES 2–4 are indicated by like reference numerals increased by 100, a series of relatively thin vertically upstanding circumferentially spaced vane guides, one of which is indicated at reference numeral **137**, project upwardly from the skirt **149** of the inner agitator shell **126**. A corresponding number of adjustable agitation vanes **124** are formed on the outer agitator shell **127** and comprise a top wall **143**, an outer end wall **146** and a pair of spaced parallel vertically upstanding walls **146***a*. A bottom end **144** of the agitation vane **124** is open to receive the vane guide **137**.

In the embodiment shown in FIGURES 5–9, the outer agitator shell **127** is movable relative to the inner agitator shell **125** in an axial direction. The agitation vanes **124** serve as vane extensions of the vane guides **137** to increase the level of agitation as the outer agitator shell **127** moves axially upwardly relative to the inner agitator shell **126**. The high level agitation position assumed by the agitation vanes **124** is a raised position of the outer agitator shell **127** is indicated in the dashed lines at reference numeral **124***a*.

As shown in FIGURE 5, a cylindrically shaped cam block **163** is mounted on the splined end **130** of the drive shaft **119** for joint rotation therewith. A smooth cylindrical outer wall **164** of the cam block **163** is disposed in proximately spaced relation to a complementarily shaped smooth inner surface **166** of a reduced diameter upper end portion **167** of the inner agitator shell **126**. An annularly shaped radially inwardly extending shoulder **168** is formed on the inner surface **166** and extends under a bottom wall **169** of the cam block **163** to prevent axial movement of the inner agitator shell **126** while enabling the inner agitator shell to rotate relative to the cam block **163**.

The outer agitator shell **127** also comprises a reduced diameter upper end portion indicated at reference numeral **170**, which portion comprises a smooth cylindrical inner wall **171** disposed in proximately spaced relation to an outer wall **172** of the inner agitator shell **126**. A plurality of circumferentially spaced pins or cam follower members as indicated at reference numeral **173** are connected in fixed assembly to the outer agitator shell **127** and project radially inwardly through complementarily arranged elongated vertical slots **174** formed in the inner agitator shell **126**. The pins **173** each extend into a corresponding one of a plurality of cam slots **176** formed in the outer cylindrical surface **164** of the cam block **163**. Each of the cam slots **176** extends in a helical fashion circumferentially from a lower end **177** to an axially upwardly spaced end **178**, side walls **179** and **180** serving as cam surfaces for the cam follower members or pins **173**.

The cam block **163** further comprises a reduced diameter cylindrical wall **181** about which is wrapped a one-way spring clutch **182**. An upper end **183** of the spring clutch extends radially inwardly over a top wall **184** of the cam block **163** whereas a bottom end **186** projects through an aperture **187** formed in the reduced diameter portion **167** of the inner agitator shell **126**.

An agitator assembly cap **188** covers the upper end of the assembly **118** and is mounted on the drive shaft **119** by means of a suitable fastening device such as a threaded screw **189**. Housed within the cam **188** is a helical spring **190** which is disposed in surrounding relation adjacent the reduced diameter upper portion **167** of the inner agitator shell **126**. An upper end **191** of the spring **190** bottoms on the underside of the cap **188** and the lower end **192** thereof bottoms on a top wall **193** of the outer agitator shell **127**.

FIGURE 5 illustrates the relative disposition of parts when the drive shaft **119** is at rest. The spring **190** has biased the outer agitator shell **127** axially downwardly such that the agitation vanes **127** provide no substantial vane extension of the vane guides **137**.

During operation, when the drive shaft **119** and the cam block **163** begin to rotate in a counterclockwise direction as indicated by the arrow **194** in FIGURE 6, the outer shell **127** is subjected to a load-resisting force. Since the pins **173** extend through the vertical slots **174** formed in the inner agitator shell **126**, the load-resisting force is also transmitted to the inner agitator shell **126**.

Consequently the cam block **163** will begin to turn relative to the inner and outer agitator shells **126** and **127**, causing the pins or cam follower members **173** to move within the cam slots **176**, the effect of which is to move the outer agitator shell **127** axially upwardly. As this upward movement of the outer agitator shell **127** occurs, the helical spring **190** is compressed, thereby increasing the biasing effect thereof on the outer agitator shell **127** in a downward direction. The pins **173** will continue to turn and rise in the cam slots **176** until the biasing force of the spring **190** increases to a level of balance with the load-resisting force acting on the outer agitator shell **127**. As the outer agitator shell **127** moves increasingly upwardly the agitation vanes **124** provide increased extensions of the vane guides **137**, thus increasing the effect action surfaces of the agitation vanes and increasing the level of agitation proportionately.

After the outer agitator shell **127** has moved upwardly sufficiently to increase the biasing force of the spring **190** to balance the load-resisting force acting on the agitator shell **127**, the outer agitator shell and hence the inner agitator shell **126**, which is co-rotatably coupled to the outer agitator shell **127**, will rotate jointly with the cam

block **163** and the drive shaft **119** until the drive shaft **119** reaches its limiting end position in a counter-clockwise direction of rotation.

As the drive shaft **119** rotates in a counter-clockwise direction the one-way spring clutch **182** does not apply a gripping force to the cam block **163** and instead merely rotates with the inner agitator shell **126** by virtue of the lower end **186** thereof which extends through the aperture **187**. As the drive shaft **119** reaches the limiting end position and begins to rotate in a clockwise direction, the load-resisting force to which the outer agitator shell **127** is subjected is substantially reduced, the consequence of which is to tend to cause the inner and outer agitator shell **126** and **127** to rotate relative to the cam block **163**, thereby moving the outer agitator shell **127** axially downwardly to a low level agitation position thereof. Immediately upon clockwise rotation of the drive shaft **119**, however, the spring clutch **182** immediately frictionally grips the cam block **163** and rotates therewith, thereby causing the inner agitator shell **126**, and hence the outer agitator shell **127**, to rotate in a clockwise direction jointly with the drive shaft **119**, thus precluding relative rotation between the cam block **163** and the outer shell **127** and further precluding an axially downward movement of the outer agitator shell **127**.

FIGURE 6 illustrates the relative positions of the spring clutch **182**, the cam block **163** and the inner agitator shell **126** when the drive shaft **119** is at rest. FIGURE 7 illustrates the relative positions of these parts after the drive shaft **119** and the cam block **163** have been rotated in a counter-clockwise direction but before the biasing force of the spring **190** has overcome the load-resisting force being applied to the outer agitator shell **127** by the wash load.

FIGURE 8 illustrates the relative positions of the parts after the direction of rotation of the drive shaft **119** in the cam block **163** has been reversed and the spring clutch **182** has frictionally gripped the cylindrical wall **181** of the cam block **163** to rotate jointly therewith in a clockwise direction. Rotation of the spring clutch **182** has caused joint rotation of the inner agitator shell **126** and thus when the drive shaft **119** is rotated in a clockwise direction of rotation the cam block **163** as well as the inner and outer agitator shells **126** and **127** rotate jointly with the drive shaft **119**.

At the end of the wash cycle it is possible that the drive shaft **119** may come to rest while it is rotating in a clockwise direction. If this occurs the spring clutch **182** may maintain a tight grip on the cam block **163**, thus precluding the outer agitator shell **127** from moving axially downwardly to the low level agitation position thereof. For this reason the underside of cap **188** is provided with a tab **196** as shown in FIGURE 8 which, upon rotation of the cap **188** in a counterclockwise direction, engages the upper end **183** of the spring clutch **182** to release the tension in the clutch, thus enabling the spring clutch **182** as well as the inner and outer agitator shells **126** and **127** to rotate relative to the cam block **163**. The helical spring **190** thereupon urges the outer agitator shell **127** axially downwardly so that the agitation vanes **124** again assume a low level agitation position as shown in the solid lines in FIGURE 5. This is desirable so that the inner and outer agitator shells **126** and **127** will be returned to their relatively neutral position at the end of each wash cycle, so that at the commencement of the subsequent wash cycle the angle of displacement to which the inner and outer agitator shells **126** and **127** are moved will correspond to the size of the subsequent load of laundry material, and not to the size of the preceding load.

Although minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably come within the scope of our contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. The method of automatically adjusting the agitation level of a washing machine having an agitator shell and an adjustable agitation vane mounted thereon comprising the steps of

transmitting a driving torque to the agitator shell, subjecting the agitator shell and agitation vane to a turn-resisting force imposed by the washing load in the machine,

increasing the driving torque to a level exceeding the turn-resisting force to rotate the agitator shell, and

adjusting the agitation vane in relation to the level of the driving torque required to exceed the load-imposed turn-resisting force.

2. In a washing machine having an agitator assembly including a rotatable agitator shell and an adjustable agitation vane coupled to the agitator shell for rotation therewith to vary the agitation level of the washing machine, the improvement comprising,

means for providing an agitator assembly driving torque in excess of the load-imposed turn-resisting force to which the agitator assembly is subjected by virtue of the washing load in the machine to rotatably oscillate the agitator shell, and

means operatively interconnecting said agitator assembly and said torque-providing means and responsive to the magnitude of the driving torque being applied to the agitator shell for adjusting the agitation vane as a function thereof.

3. The washing machine as defined in claim **2** wherein said agitation vane is adjustable between first and second positions to increase the level of agitation produced thereby and wherein said torque-responsive means causes said agitation vane to move from said first toward said second position as the driving torque increases in order to increase the agitation level of the machine as the washing load increases.

4. The washing machine as defined in claim **2** wherein said interconnecting means comprises a lost-motion coupling between said torque providing means and said agitator shell.

5. The washing machine as defined in claim **3** wherein said torque-providing means comprises a drive shaft and including,

means mounting said agitator shell for movement between first and second positions relative to said drive shaft, and

means interconnecting said agitator shell and said agitation vane for simultaneous movement thereof between their respective first and second positions,

said torque responsive means providing for movement of said agitator shell from said first to said second position thereof upon an increase in the torque being applied to said agitator shell.

6. A washing machine comprising,

a rotatable drive assembly,

a rotatable agitator assembly, and

drive coupling means interconnecting said drive assembly and said agitator assembly and allowing relative displacement therebetween which varies in magnitude as a function of the magnitude of the turn-resisting forces to which the agitator assembly is subjecting by virtue of the washing load in the machine,

said agitator assembly including means for varying the agitation level thereof as a function of the magnitude of the displacement between the agitator assembly and the driving assembly.

7. The washing machine as defined in claim **6** wherein said drive coupling means comprises a resilient member for providing a lost-motion connection between said drive assembly and said agitator assembly.

8. The washing machine as defined in claim 6 wherein said agitation level varying means comprises an agitation vane moveable between first and second positions relative to said drive assembly to vary the agitation level of the washing machine.

9. A washing machine comprising,

a rotatable drive shaft,

a rotatable agitator assembly for agitating and laundering a washing load in the machine,

means mounting said agitator assembly for rotation relative to said drive shaft,

said agitator assembly including means for increasing the agitation level of the washing machine as a function of the relative rotational displacement between said drive shaft and said agitator assembly, and

drive coupling means including a resilient member interconnecting said drive shaft and said agitator assembly for rotating said agitator assembly and for allowing rotational displacement between said drive shaft and said agitator assembly which varies as a function of the rotational resistance imposed on the agitator assembly by the washing load.

10. The washing machine as defined in claim 9 wherein said driving coupling means comprises a helical spring.

11. The washing machine as defined in claim 9 wherein said agitation level increasing means comprises an agitation vane movable radially with respect to said drive shaft and means for moving said agitation vane in response to relative rotational displacement between said drive shaft and said agitator assembly.

12. The washing machine as defined in claim 9 wherein said mounting means comprises means for mounting said agitator assembly for axial movement relative to said drive shaft and wherein said drive coupling means comprises cooperating helical groove and pin means mounted on said agitator assembly and on said drive shaft for providing relative axial displacement therebetween in response to said rotational displacement.

13. The washing machine as defined in claim 12 wherein said agitation level increasing means comprises an agitation vane assembly extendible in an axial direction in response to axial movement of said agitator assembly.

14. The washing machine as defined in claim 12 including means for rotatably oscillating said drive shaft and wherein said drive coupling means further comprises one-way clutch means between said drive shaft and said agitator assembly whereby said resilient member drives said agitator assembly in one direction of rotation and said one-way clutch means drives said agitator assembly in an opposite direction of rotation.

15. A washing machine comprising,

drive means including a rotatable oscillating drive shaft, an inner agitator shell mounted on said drive shaft for relative rotation therewith,

an outer agitator shell surrounding said inner agitator shell,

said drive shaft and said inner and outer agitator shells being axially aligned with one another,

cam means including a helical cam surface formed on said drive means,

means forming a vertical slot in said inner agitor shell,

means including a pin mounted fast to said outer agitator shell and extending through said vertical slot and into cam follower relation with said cam surface for providing joint rotation of said inner and outer agitor shells and relative axial movement there-between and for providing axial movement of said outer agitator shell between first and second positions in response to relative rotation between said outer agitator shell and said drive shaft,

means biasing said outer agitator shell axially toward said first position, and

agitation vane means on said outer agitator shell movable axially to increase the effective action surface thereof upon movement of said outer agitator shell to said second position in response to relative rotation between said outer agitator shell and said drive shaft caused by a washing load drag on said outer agitator shell.

16. The washing machine as defined in claim 15 where in said biasing means comprises a helical spring bottoming at one end of said agitator shell.

17. The washing machine as defined in claim 15 and including a one-way spring clutch interconnecting said drive means and said inner agitator shell for positively driving said inner and outer shells in one direction of rotation.

18. The washing machine as defined in claim 17 and including a cap member mounted on said drive means for relative rotation and including tab means engageable with one end of said spring clutch for releasing said spring clutch in response to rotation of said cap member.

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WILLIAM I. PRICE, Primary Examiner

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