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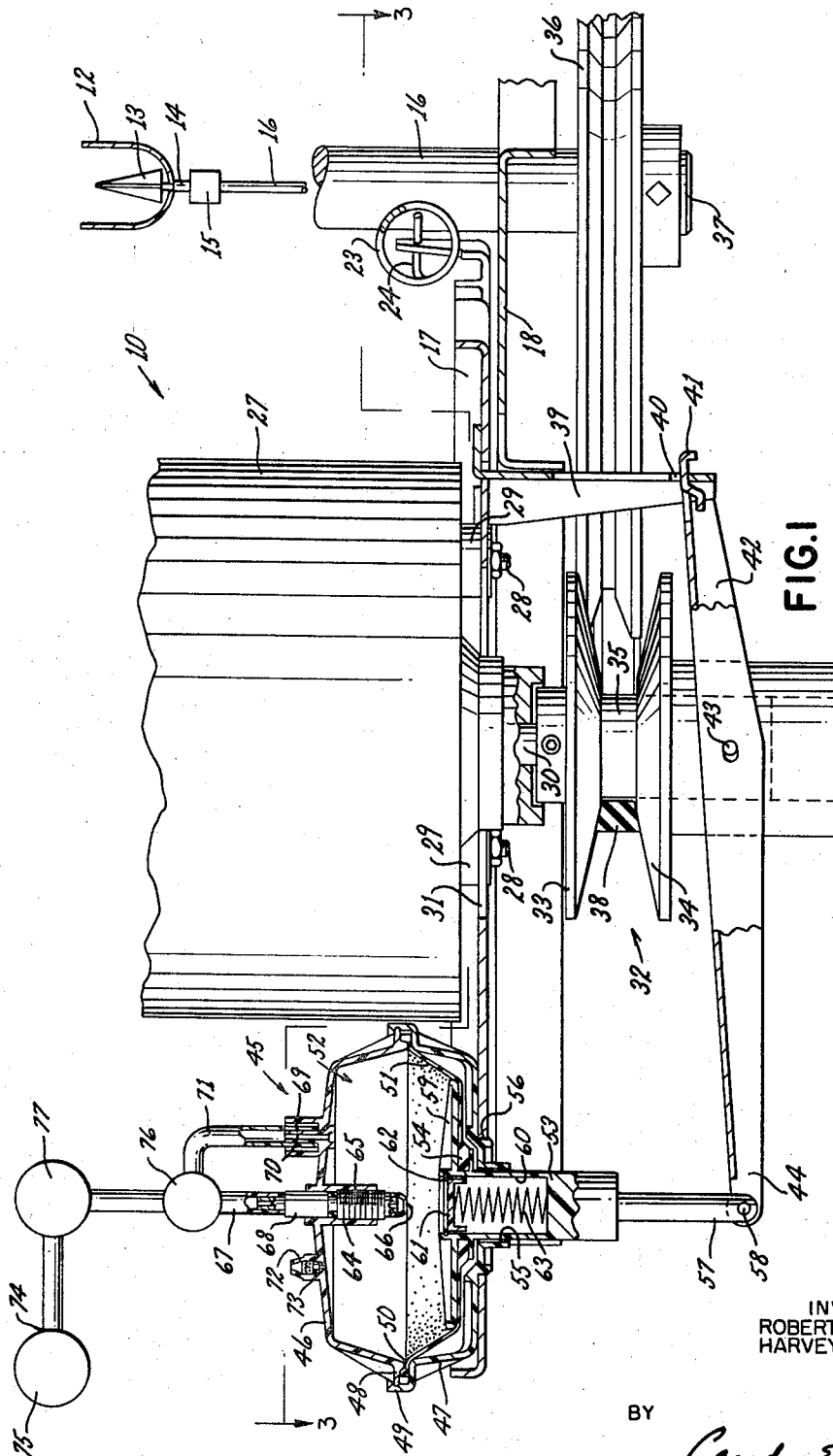
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3,425,288

FLUIDIC OPERATED SPEED CONTROL MEANS

Filed Oct. 3, 1966

Sheet 1 of 4



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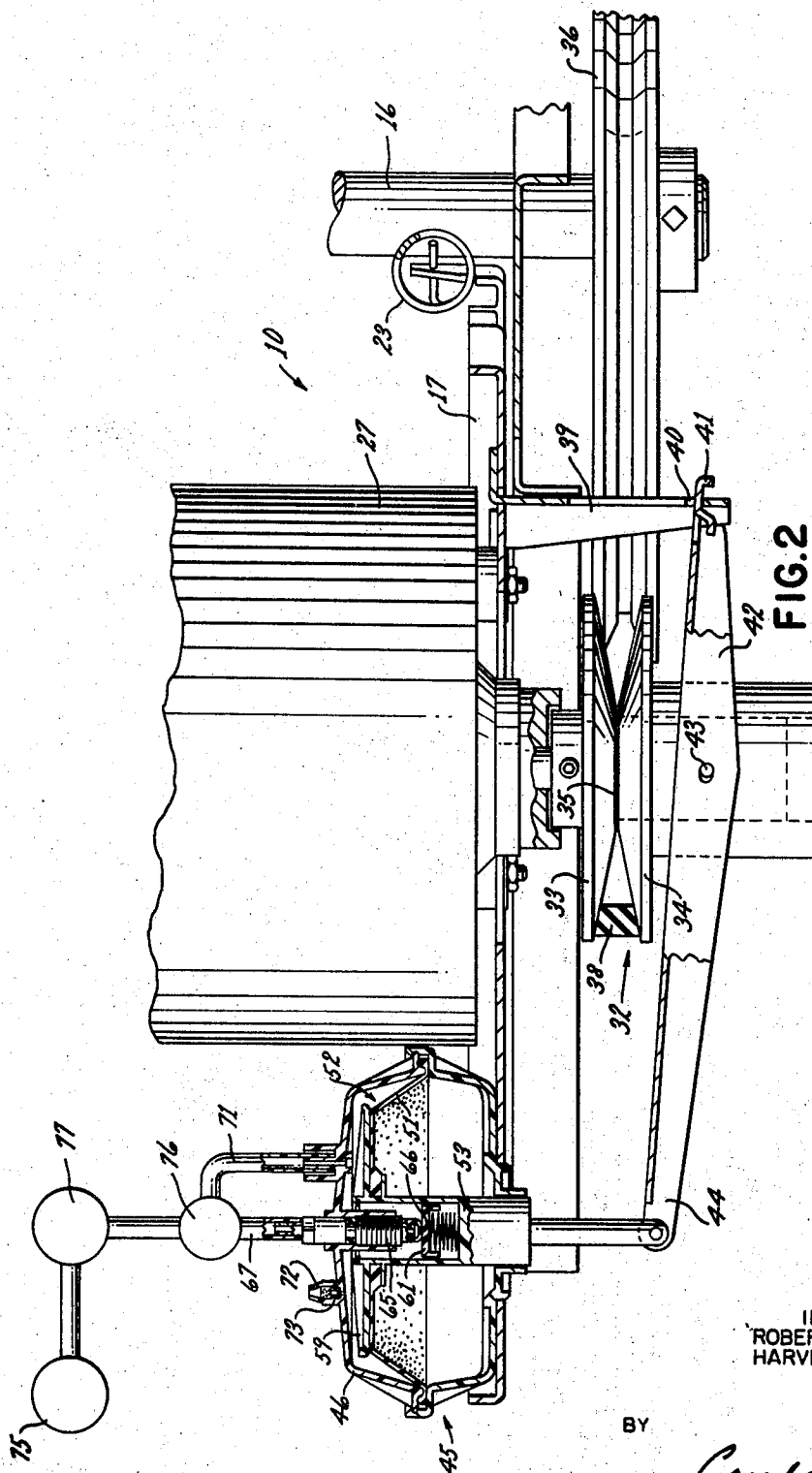


FIG. 2

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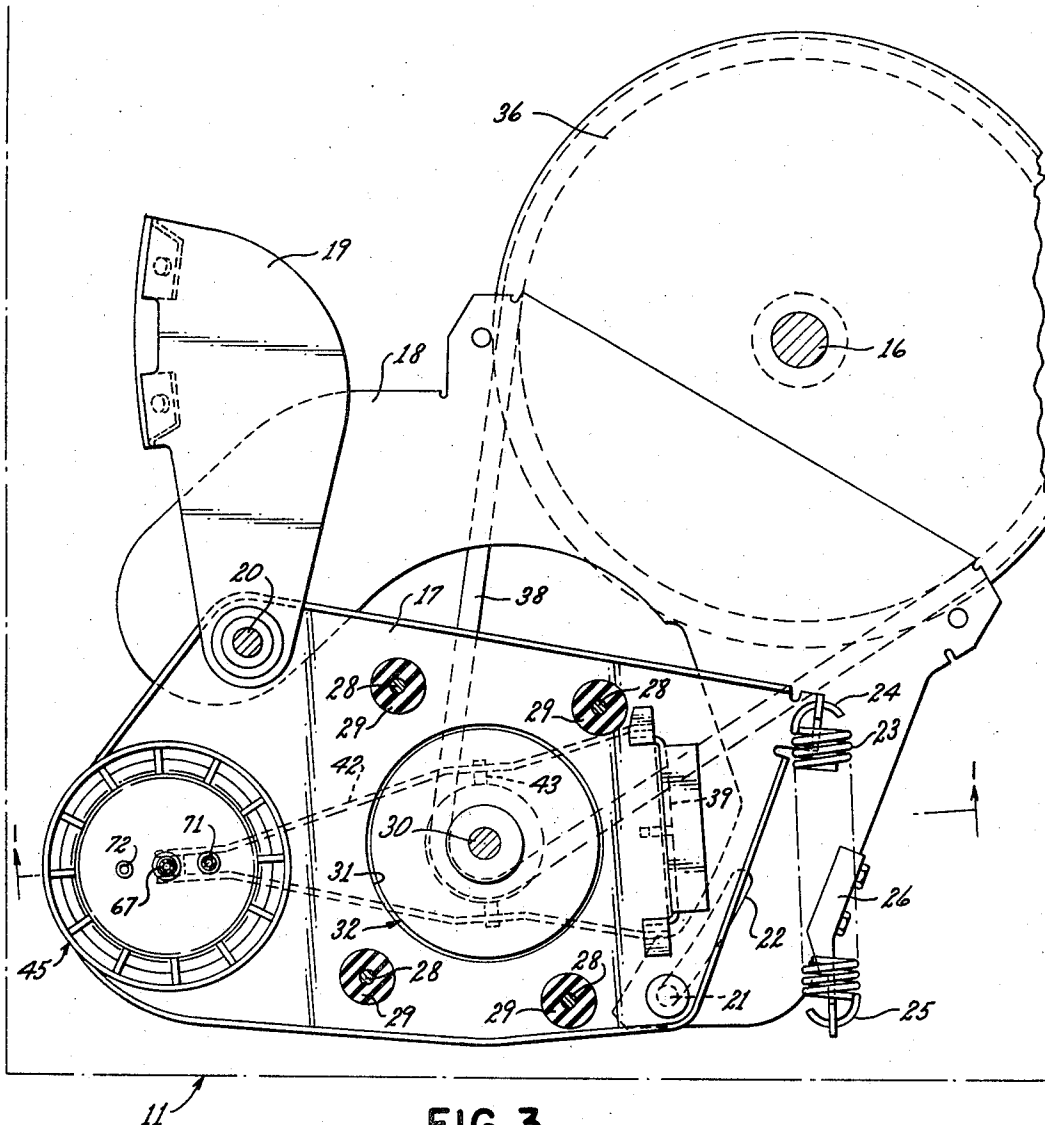


FIG. 3

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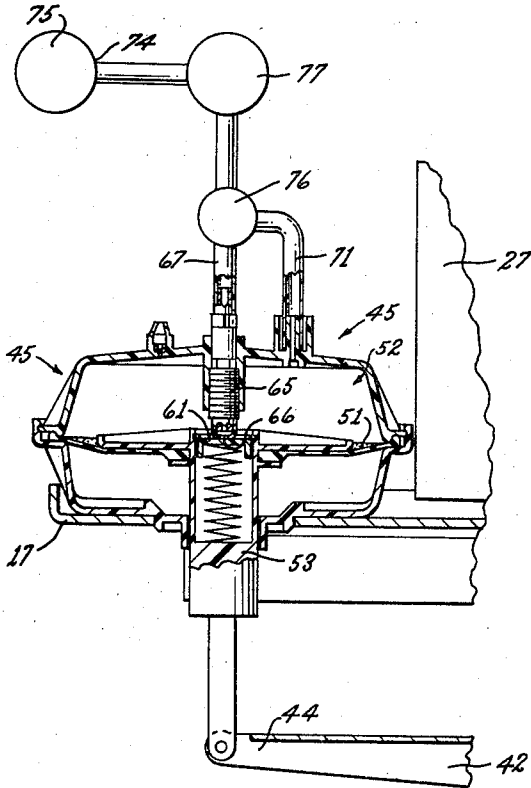


FIG. 4

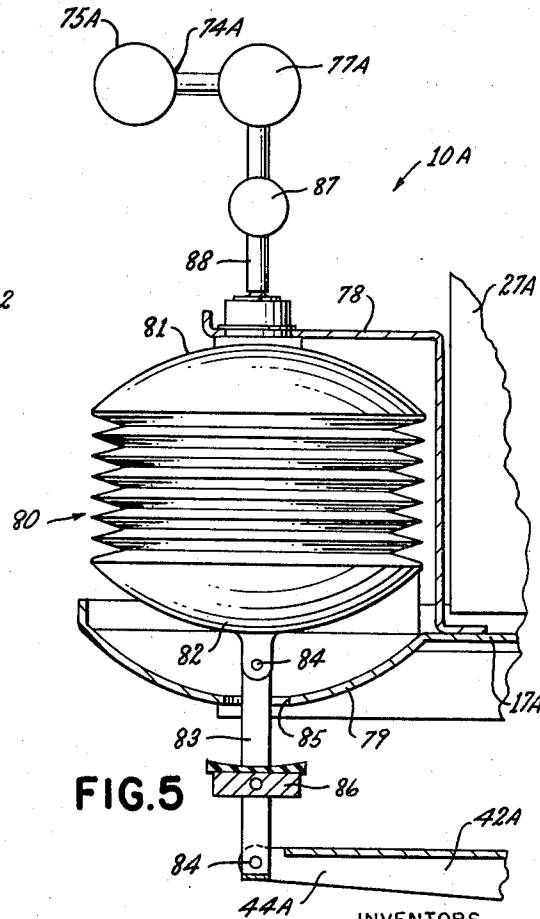


FIG. 5

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FLUIDIC OPERATED SPEED CONTROL MEANS
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Int. Cl. F16h 5/56

ABSTRACT OF THE DISCLOSURE

Speed control means for varying the speed of spin of a washing compartment of a washing machine wherein a variable sheave drive pulley is carried by an electric motor fixed to a support member that is pivotally mounted to a stationary frame means carrying the driven part of the washing machine, a pneumatic actuator being carried by the movable support and being interconnected to a lever that is pivotally mounted to the movable support and operatively interconnected to the movable sheave of the drive pulley whereby evacuation of the actuator will pivot the lever to a predetermined position to cause movement of the movable sheave of the variable speed pulley.

This invention relates to an improved fluidic operated speed control means for a washing machine or the like as well as to improved parts for such a speed control means.

It is well known that many washing machine manufacturers are now producing a washing machine wherein the housewife or the like can manually select a desired speed of spin of the washing compartment thereof and/or desired speed of movement of the agitator utilized in the washing compartment or the like.

Accordingly, this invention provides improved speed control means for such a washing machine or the like wherein the speed of the spin of the washing compartment and/or the speed of movement of the agitator can be selectively controlled by the housewife or the like by effectively directing a pneumatic signal to a pneumatic actuator or the like through a program means or the like.

Thus, it is an object of this invention to provide an improved fluidic operated speed control means or the like having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide improved parts for such a speed control means or the like.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIGURE 1 is an enlarged, schematic, partially cross-sectioned view of the improved speed control means of this invention and is taken substantially on line 1-1 of FIGURE 3.

FIGURE 2 is a view similar to FIGURE 1 and illustrates the speed control means in another operating position thereof.

FIGURE 3 is a cross-sectional view taken substantially on line 3-3 of FIGURE 1.

FIGURE 4 is a fragmentary view similar to FIGURE 1 and illustrating the speed control means in still another operating position thereof.

FIGURE 5 is a view similar to FIGURE 4 and illustrates another embodiment of this invention.

While the various features of this invention are herein after described and illustrated as being particularly adaptable to provide a speed control means for a domestic washing machine or the like, it is to be understood that the various features of this invention can be utilized

singly or in any combination thereof to provide speed control means for other devices as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIGURES 1 and 3, the improved fluidic operated speed control means of this invention is generally indicated by the reference numeral 10 and is being illustrated for use in combination with a washing machine generally indicated by the reference numeral 11 in FIGURE 3 and containing a washing compartment 12, FIGURE 1, and an agitator 13 disposed in the washing compartment 12 in a conventional manner.

In particular, the washing compartment 12 is adapted to be spun by an output shaft means 14 of a transmission means 15 when an input shaft 16 of the transmission means 15 is rotated in one direction while the agitator 13 is adapted to be imparted with an agitating motion by the output shaft means 14 of the transmission 15 when the shaft 16 is rotated in the opposite direction in a conventional manner.

However, the speed control means 10 of this invention is adapted to control the speed of rotation of the input shaft 16, in either direction, so as to vary the speed of spin of the compartment 12 or agitation movement of the agitator 13 upon a preselection by the housewife or the like before the complete cycle of operation of the washing machine 11 is initiated.

In particular, the speed control means 10 of this invention includes a movable support plate or member 17 pivotally mounted between stationary frame members 18 and 19 of the washing machine 11 by means of a pivot pin 20 interconnected between the frame members 18 and 19 and passing through suitable bearing means carried by the support plate 17. Pivotal movement of the support plate 17 about the pivot pin 20 is controlled by a pin means 21 carried by the support plate 17 and being received in an arcuate slot 22 formed in the frame member 18 whereby the pivotal movement of the support plate 17 is limited between the opposed ends of the slot 22.

The support plate 17 is normally urged to the position illustrated in FIGURE 3 by a tension spring 23 having one end 24 interconnected to the plate 17 and the other end 25 interconnected to a bracket 26 fixed to the stationary frame member 18.

A suitable electric motor 27 or the like is mounted to the support plate 17 by fastening members 28 while resting on suitable shock absorbing bumpers 29 disposed between the support plate 17 and the motor housing 27. In this manner, the output shaft 30 of the motor 27 can project downwardly through an opening formed in the support plate 17 and be operatively interconnected to a variable speed pulley means 32 which is, in effect, carried by the support plate 17.

The variable speed pulley 32 comprises a fixed sheave 33 and an opposed movable sheave 34, the sheaves 33 and 34 being mounted on a shaft-like member 35 interconnected to the output shaft 30 of the electric motor 27.

The input shaft 16 of the transmission means 15 of the washing machine 11 carries a large pulley 36 on the lower end 37 thereof and is adapted to be driven by the variable speed pulley 32 by a belt means 38 passing around the pulleys 32 and 36 in the manner illustrated in FIGURES 1 and 3.

When the variable speed pulley 32 is disposed in the position illustrated in FIGURES 1 and 3, it can be seen that the effective diameter of the variable speed pulley 32 is relatively small whereby the input shaft 16 of the transmission 15 will be driven at its lowest speed by the speed control means 10 of this invention. However, when the support plate 17 is pivoted from the position illustrat-

ed in FIGURES 1 and 3 to the position illustrated in FIGURE 2 in a manner hereinafter described, the movable sheave 34 has moved toward the fixed sheave 33 to increase the effective diameter of the variable speed pulley 32 so that the input shaft 16 of the transmission 15 will be driven at its maximum speed by the speed control means 10 of this invention in a manner hereinafter set forth.

As illustrated in FIGURE 1 a bracket-like arm 39 suspends from the support plate 17 and has a slot means 40 at the lower end thereof for pivotally mounting the right hand end 41 of a lever 42 thereto, the lever 42 having an intermediate part thereof interconnected to the movable sheave 34 of the pulley 32 by a pin 43. In this manner, when the left hand end 44 of the lever 42 is moved upwardly from the position illustrated in FIGURE 1 toward the position illustrated in FIGURE 2 in the manner hereinafter set forth, the lever 42 moves the sheave 34 toward the sheave 33 to effectively increase the effective diameter of the variable speed pulley 32 to increase the speed of the input shaft 16. As the effective diameter of the pulley 32 increases, the support plate 17 is pivoted about its pivot pin 20 to cause the motor 27 and pulley 32 to move toward the pulley 36 on the input shaft 16 to compensate for the increased effective diameter of the pulley 32 in opposition to the force of the tension spring 23. Conversely, as the end 44 of the lever 42 is moved downwardly from the position illustrated in FIGURE 2 toward the position illustrated in FIGURE 1, the sheave 34 is moved away from the sheave 33 by the force of the tension spring 23 to thereby decrease the effective diameter of the pulley 32 so that the belt 38 will ride closer to the shaft 35 whereby the increased effective length of the belt means 38 will be compensated for by the support plate 17 carrying the motor 27 and pulley 32 away from the pulley 36.

As illustrated in FIGURES 1 and 3, a pneumatically operated actuator 45 of this invention is carried by the support plate 17 and includes a pair of cup-shaped housing members 46 and 47 respectively snap fitted together at the open ends 48 and 49 thereof to sealingly hold an outer periphery 50 of a flexible diaphragm 51 therebetween whereby the diaphragm 51 cooperates with the housing member 46 to define a chamber 52 therebetween.

A post member 53 is operatively secured to the inner periphery 54 of the diaphragm 51 and projects out through an opening 55 in the cup-shaped housing member 47, as well as through an aligned enlarged opening 56 in the support plate 17. The free end 57 of the actuating post 53 is pivotally connected to the end 44 of the lever 42 by a pivot pin 58.

The actuating post 53 includes a back up plate 59 disposed in the chamber 52 of the actuator 45 with the back up plate 59 being disposed against the flexible diaphragm 51 in the manner illustrated in FIGURE 1. The back up plate and post 53 are interrupted by a cylindrical bore 60 having a valve-like member 61 disposed therein and normally urged outwardly against a stop ring 62 by a compression spring 63.

The cup-shaped housing 46 has a centrally disposed tubular portion 64 carrying an adjustable tubular member 65 having its opened end 66 projecting into the chamber 52 while being adapted to be fluidly interconnected to a flexible conduit 67 at the other end 68 thereof whereby fluid communication is provided by the tubular member 65 between the chamber 52 of the actuator 45 and the conduit 67.

The cup-shaped housing 46 is also provided with an offset tubular portion 69 having a passage means 70 passing therethrough whereby another flexible conduit 71 or the like can be telescoped over the tubular member 69 to be fluidly interconnected with the chamber 52 of the actuator 45 for a purpose hereinafter described.

In addition, another passage means 72 can be formed

through the cup-shaped housing 46 in offset relation to the member 65 and have an orifice means 73 disposed therein to limit the degree of atmospheric connection between the chamber 52 of the actuator 45 and exterior of the actuator 45 for a purpose hereinafter described.

A suitable pneumatic source, such as the inlet 74 of a vacuum pump 75, can be interconnected to the conduit 67 or the conduit 71 of the actuator 45 by means of a manually operated selector valve 76, the selector valve 76 being interconnected to the vacuum pump 75 when a program controlling member 77 determines that the speed control means 10 should be operated during a particular portion or portions of a selected cycle of operation of the washing machine 11.

The operation of the control system 10 of this invention will now be described in reference to FIGURES 1-4.

When the vacuum source 75 is not being interconnected to the chamber 52 of the actuator 45, the actuator 45 assumes the position illustrated in FIGURE 1 because eventually the controlled amount of air being directed to the chamber 52 through the controlled bleed means 72, 73 eventually maintains the chamber 52 at atmospheric conditions whereby the tension spring 23 holds the lever 42 and support means 17 in the position illustrated in FIGURES 1 and 3 so that should the motor 27 be operating, the input shaft 16 will be rotated at its minimum speed.

When the housewife or the like desires to utilize the machine 11, she can manually position the selector valve 76 so that during the spin cycle and/or agitation cycle the input shaft 16 of the transmission means 15 will only be driven at the speed produced by the pulley 32 when in the condition of FIGURES 1 and 3 whereby the selector valve 76 will not permit the program means 77 to interconnect the vacuum source 75 with the chamber 52 of the actuator 45 during the complete cycle of operation of the machine 11. However, should the housewife or the like set the selector valve 76 in a position so that when the program member 77 determines that the vacuum pump 75 should be interconnected to the actuator 45 through the conduit 67, the subsequent evacuation of the chamber 52 through the passage means of the tubular member 65 will cause the flexible diaphragm 51 to be drawn upwardly from the position illustrated in FIGURE 1 to the position illustrated in FIGURE 4 whereby the valve member 61 carried by the post means 53 effectively seals off the end 66 of the member 65 so that further evacuation of the chamber 52 cannot take place. As the diaphragm 51 is being drawn upwardly, it can be seen that the left hand end 44 of the lever 42 is also being drawn upwardly to move the sheave 34 toward the sheave 33 to increase the effective diameter of the pulley 32 whereby the support plate 17 will pivot toward the pulley 36 to compensate for this increased diameter of the pulley 32 while the pulley 32 effectively increases the speed of the input shaft 16 of the transmission 15 in the manner selected by the housewife through the selector valve 76.

However, should the housewife or the like set the selector valve 76 so that the vacuum source 75 will be interconnected to the conduit 71 instead of the conduit 67 at the proper portion of the cycle of the program means 77, the flexible diaphragm 51 will be drawn upwardly in the manner illustrated in FIGURE 2 whereby when the valve member 61 abuts the end 66 of the tubular member 65, the post 53 can move relative thereto in the manner illustrated in FIGURE 2 until the back up plate 59 bottoms against the cup-shaped housing member 46 in the manner illustrated in FIGURE 2. With the actuator 45 now in the position illustrated in FIGURE 2, it can be seen that the effective diameter of the pulley 32 has been increased to its maximum condition so that the motor 27 will drive the input shaft 16 of the transmission means 15 at its maximum speed, the support plate 17 be-

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ing pivoted toward the pulley 36 to compensate for the increased effective diameter of the pulley 32.

When the vacuum source 75 is disconnected from the chamber 52 by the program means 77, the flexible diaphragm 51 of the actuator 45 is adapted to return to the position illustrated in FIGURE 1 as soon as the control bleed of air into the chamber 52 through the passage means 72, 73 returns the chamber 52 to normal atmospheric conditions as illustrated in FIGURE 1, the tension spring 23 effecting such return by tending to pivot the support member 17 back to the position illustrated in FIGURES 1 and 3 whereby the lever 42 is pivoted downwardly to the position of FIGURE 1.

Thus, it can be seen that the actuator means 45 of this invention is adapted to position the lever 42 in any one of the three positions illustrated respectively in FIGURES 1, 2 and 4 depending upon the setting of the selector valve 76 by the housewife or the like whereby the agitation and/or spin speed of the washing machine 11 can be manually selected by the housewife or the like.

However, it is to be understood that the pneumatically operated actuator means of this invention could be utilized to position the lever 42 in an infinite number of positions between the minimum speed position of FIGURE 1 and the maximum speed position of FIGURE 2, if desired.

For example, another fluidic operated speed control means of this invention is generally indicated by the reference numeral 10A in FIGURE 5 and parts thereof similar to the speed control means 10 are indicated by like reference numerals followed by the reference letter "A".

As illustrated in FIGURE 5, the support plate 17A carries the motor means 27A and has been modified to provide opposed bracket means 78 and 79 to carry a bellows type of pneumatic actuator 80 having opposed ends 81 and 82, the end 81 of the actuator 80 being fixed in any suitable manner to the support bracket 78 while the other end 82 is movable and is operatively interconnected to a link 83 by a pivot pin 84. The other end of the link 83 is pivotally interconnected to the left hand end 44A of the lever 42A by a pivot pin 84.

The link 83 passes through an opening 85 in the bracket portion 79 of the support plate 17A and carries a stop member 86 for abutting against the support plate means 79 when the movable wall 82 of the actuator 80 has been pulled upwardly to its maximum position for determining the maximum speed of the pulley means connected to the output shaft of the motor 27A in the manner previously described for the pulley means 32.

The interior of the pneumatic actuator 80 is adapted to be interconnected to a vacuum regulator 87 by a flexible conduit means 88, the vacuum regulator 87 being manually adjustable to preselect the degree of evacuation of the chamber of the actuator 80 in a manner well known in the art. The vacuum regulator 87 is adapted to be interconnected to the inlet 74A of the vacuum source 75A by means of the program means 77A in the manner previously described during the appropriate portion or portions of the cycle of the program means 77A.

Thus, the housewife can select the desired speed for speed and/or agitation of the system 10A by manually setting the vacuum regulator 87 at a desired position thereof so that when the program means 77A interconnects the vacuum source 75A to the actuator 80 through the vacuum regulator 87, the movable wall 82 of the actuator 80 will be drawn upwardly to a particular position thereof corresponding to the setting of the regulator 87 whereby the left hand end 44A of the lever 42A will be drawn upwardly to that position to vary the effective diameter of the pulley means interconnected to the motor 27A in the manner similar to the pulley means 32 previously described.

Thus, it can be seen that the actuator 80 can be infinitely controlled between the low speed position of the system 10A when the movable wall 82 is disposed

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against the bracket portion 79 of the support plate 17A and when the stop means 86 is disposed against the bracket means 79 of the support plate 17A for its maximum speed setting through the infinitely variable vacuum regulator 87.

Accordingly, it can be seen that this invention not only provides an improved fluidic operated speed control means for a washing machine or the like, but also this invention provides improved parts for such a control means or the like.

While the form of the invention now preferred has been disclosed as required by statute, other forms may be used, all coming within the scope of the claimed subject matter which follows.

What is claimed is:

1. In a washing machine having frame means, a motor means and a part to be driven by said motor means, the improvement comprising a variable speed pulley driven by said motor means, belt means operatively interconnecting said pulley to said part, a support member movably mounted to said frame means and carrying said motor means and said pulley, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor means and pulley to move toward said part as the effective diameter of said pulley increases and to move away from said part as said effective diameter decreases, and a fluidic operated actuator carried solely by said support member for moving said lever relative to said support member whereby said actuator moves in unison with said support member relative to said frame means.

2. In a washing machine as set forth in claim 1, the further improvement wherein said lever is pivotally mounted to said support member.

3. In a washing machine as set forth in claim 1, the further improvement wherein said support member is pivotally mounted to said frame means.

4. In a washing machine as set forth in claim 3, the further improvement wherein said support member carries a guide pin and wherein said frame means has a guide slot receiving said pin to guide pivotal movement of said support plate relative to said frame means.

5. In a washing machine as set forth in claim 3, the further improvement wherein said spring means is operatively interconnected between said support member and said frame means to tend to maintain said support member in one pivoted position relative to said frame means.

6. In a washing machine as set forth in claim 5, the further improvement wherein said spring means is a tension spring.

7. In a washing machine as set forth in claim 1, the further improvement wherein said fluidic operated actuator moves said lever to various stepped positions thereof relative to said support member within certain limits.

8. In a washing machine as set forth in claim 1, the further improvement wherein said fluidic operated actuator moves said lever to infinite positions thereof relative to said support member within certain limits.

9. In a washing machine as set forth in claim 1, the further improvement wherein said fluidic operated actuator has a movable part pivotally interconnected to said lever to move said lever relative to said support member.

10. In a washing machine having frame means, a motor means and a part to be driven by said motor means, the improvement comprising a variable speed pulley driven by said motor means, belt means operatively interconnecting said pulley to said part, a support member movably mounted to said frame means and carrying said motor means and said pulley, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor means and pulley to move toward said part as the effective

diameter of said pulley increases and to move away from said part as said effective diameter decreases, and a fluidic operated actuator carried by said support member for moving said lever relative to said support member, said fluidic operated actuator having a movable part pivotally interconnected to said lever to move said lever relative to said support member, said lever being pivotally mounted to said support member and said variable speed pulley having a movable sheave interconnected to said lever intermediate the pivot connections of said lever with said actuator and said support member.

11. In combination, frame means carrying a part to be driven, a support member movably mounted to said frame means and carrying a motor having a variable speed pulley, belt means operatively interconnecting said pulley to said driven part, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor means and pulley to move toward said part as the effective diameter of said pulley increases and to move away from said part as said effective diameter decreases, and a fluidic operated actuator carried solely by said support member for moving said lever relative to said support member whereby said actuator means moves in unison with said support member relative to said frame means.

12. A combination as set forth in claim 11 wherein said lever is pivotally mounted to said support member.

13. A combination as set forth in claim 11 wherein said support member is pivotally mounted to said frame means.

14. In combination, frame means carrying a part to be driven, a support member movably mounted to said frame means and carrying a motor having a variable speed pulley, belt means operatively interconnecting said pulley to said driven part, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor means and pulley to move toward said part as the effective diameter of said pulley increases and to move away from said part as said effective diameter decreases, and a fluidic operated actuator carried by said support member for moving said lever relative to said support member, said support member being pivotally mounted to said frame means, said support member carrying a guide pin and said frame means having a guide slot receiving said pin to guide pivotal movement of said support plate relative to said frame means.

15. In combination, frame means carrying a part to be driven, a support member movably mounted to said frame means and carrying a motor having a variable speed pulley, belt means operatively interconnecting said pulley to said driven part, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor

means and pulley to move toward said part as the effective diameter of said pulley increases and to move away from said part as said effective diameter decreases, a fluidic operated actuator carried by said support member for moving said lever relative to said support member, said support member being pivotally mounted to said frame means, and spring means operatively interconnected between said support member and said frame means to tend to maintain said support member in one pivoted position relative to said frame means.

16. A combination as set forth in claim 15 wherein said spring means is a tension spring.

17. A combination as set forth in claim 11 wherein said fluidic operated actuator moves said lever to various stepped positions thereof relative to said support member within certain limits.

18. A combination as set forth in claim 11 wherein said fluidic operated actuator moves said lever to indefinite positions thereof relative to said support member within certain limits.

19. A combination as set forth in claim 11 wherein said fluidic operated actuator has a movable part pivotally interconnected to said lever to move said lever relative to said support member.

20. In combination, frame means carrying a part to be driven, a support member movably mounted to said frame means and carrying a motor having a variable speed pulley, belt means operatively interconnecting said pulley to said driven part, a lever movably mounted to said support member and controlling the effective diameter of said pulley in relation to the position of said lever relative to said support member, said support member moving relative to said frame means to cause said motor means and pulley to move toward said part as the effective diameter of said pulley increases and to move away from said part as said effective diameter decreases, and a fluidic operated actuator carried by said support member for moving said lever relative to said support member, said fluidic operated actuator having a movable part pivotally interconnected to said lever to move said lever relative to said support member, said lever being pivotally mounted to said control member and said variable speed pulley having a movable sheave interconnected to said lever intermediate the pivot connections of said lever with said actuator and said support member.

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U.S. Cl. X.R.

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