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HYDRAULIC TRANSMISSION FOR TUMBLE-TYPE FABRIC-TREATING MACHINE

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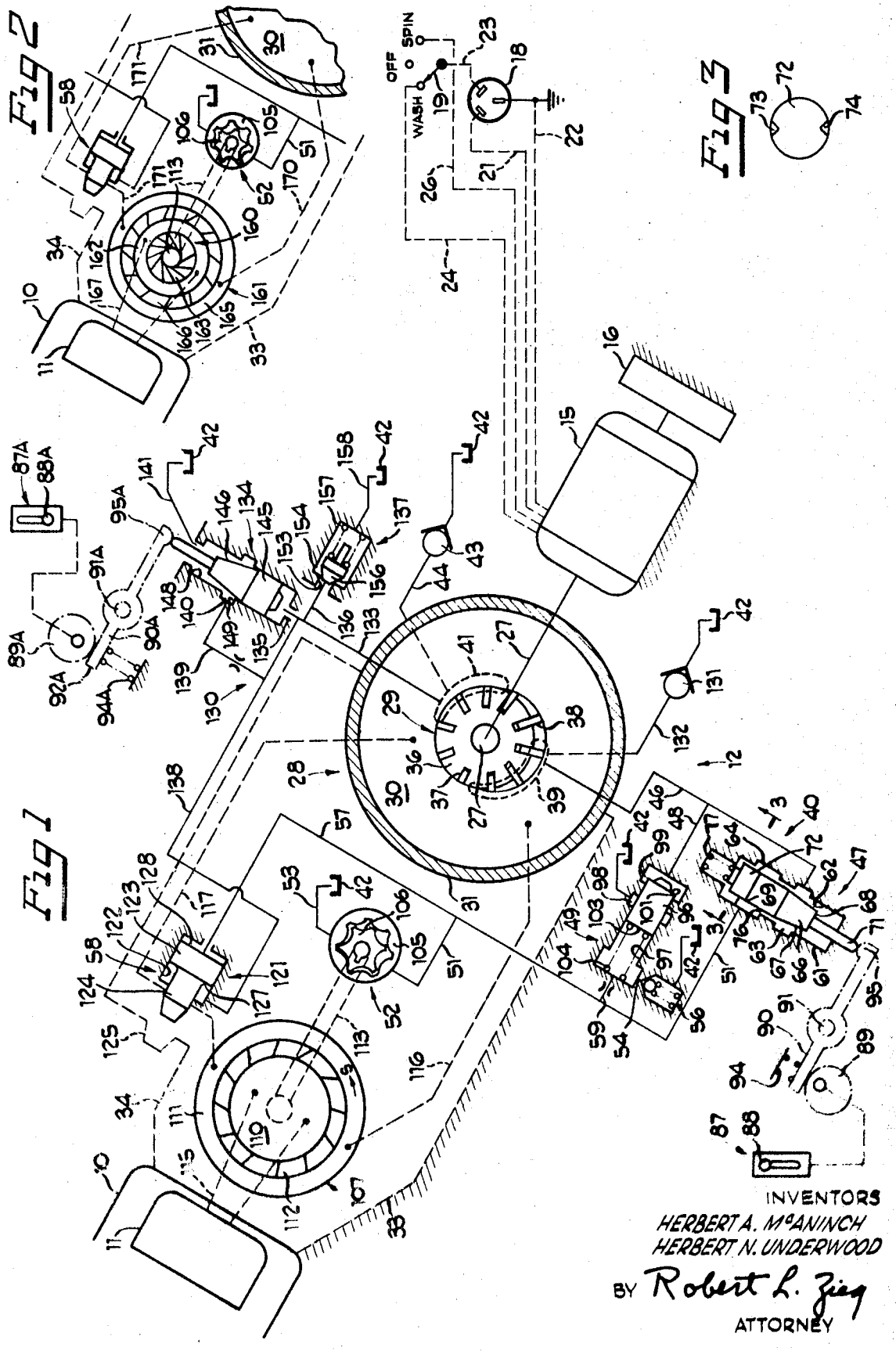


Fig 1

Fig 2

Fig 3

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HYDRAULIC TRANSMISSION FOR TUMBLE-TYPE FABRIC-TREATING MACHINE

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U.S. Cl. 68—24 8 Claims

ABSTRACT OF THE DISCLOSURE

A fabric-treating machine of the tumble-type including a fabric container disposed at an angle to the vertical and a hydraulic transmission for driving the fabric container. The hydraulic transmission includes a reversible positive displacement hydraulic pump operable in one direction of rotation to drive a hydraulic motor which in turn rotates the fabric container for a relatively low speed tumble or washing operation, the pump being operative in another direction of rotation to rotate the fabric container through the pump housing element for a relatively high speed centrifugal extraction operation.

SUMMARY OF THE INVENTION

This invention relates to fabric treating machines and more particularly, to fabric treating machines of the tumble-type incorporating a hydraulic transmission to drive a fabric container disposed at an angle to the vertical.

Tumble-type washing machines known in the art have generally been driven by electric motors from mechanical reduction gears. This construction involved belts, gears, shafts and the like which presented considerable difficulty in maintaining accurate alignment. Another inherent difficulty in such prior art devices was the problem of noisy operation.

One approach which has been developed for fabric treating machines of the horizontal axis type is to use a hydraulically powered reversing cylinder for wash action, and a hydraulic powered wringer for drying the clothing.

An improvement over this design was the approach taken by Wilcox and shown in U.S. Patent 2,582,810. The fabric treating machine there illustrated is of the horizontal axis type and uses a hydraulic transmission to rotate the fabric container for washing action in a cyclically reversing manner and to rotate the fabric container at high speed in a single direction for centrifugal extraction.

The present invention is directed to providing a fabric-treating machine combining the inherent advantages of a hydraulic transmission with the inherent advantages of a tumble-type machine. The present invention is particularly directed to providing a hydraulic transmission including a reversible hydraulic pump including a pumping element and a pump housing element which is operative in one direction of rotation to drive a hydraulic motor to rotate the fabric container and is operative in another direction of rotation to rotate the fabric container through the pump housing element with which it is associated. This transmission is further adapted to allow the operator to vary the rotational speed between predetermined limits in both a low speed wash operation and a high speed centrifugal extraction operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a hydraulic transmission for a tumble-type clothes washer embodying the principles of the invention.

FIG. 2 is a schematic view of a modified embodiment of the transmission.

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a fabric-treating machine in the form of a washing machine is illustrated comprising a tub **10** adapted to hold a laundering fluid and a clothes container **11**, both tilted at an angle to the vertical here illustrated as roughly 60°. The hydraulic transmission **12** is illustrated for driving the clothes container **11** in one direction of rotation to effect a low speed washing operation and another direction of rotation to effect a high speed centrifugal extraction operation.

An electric motor **15** is provided having a water pump **16** driven thereby for recirculating the water in the clothes container **11** of the automatic washer during the wash operation. During the spin operation, the water is dumped into a drain by means of a diverter valve (not shown). A source of power **18** is illustrated for operating the motor **15**. The cycle selector switch **19** is schematically illustrated in simplified form although in a washer installation, this function would be performed by a timer switch mechanism of known construction. Electric leads **21** and **22** interconnect the source of power **18** with the motor **15**, the lead **22** being a ground line. The lead **23** connects the source of power **18** to switch mechanism **19**. Switch mechanism **19** is connected to the motor **15** by a lead **24** or a lead **26**, depending upon the position of the switch. The direction of rotation of the electric motor **15** is determined by the use of line **24** or **26** from switch **19**.

The electric motor **15** includes a rotatable drive member **27** which connects the motor to a reversible positive displacement hydraulic pump **28**. The hydraulic pump **28** includes a pumping element **29** and a rotatable pump housing element **30** operative within a fixed case **31**. The tub **10** is attached to the fixed case **31** as indicated at **33** and **34**.

Any of a number of well-known types of hydraulic pumps would adequately perform the function of the hydraulic pump **28**, as for example, the crescent type or the gerotor type but for reasons that will be later described, it is found that the vane type pump will perform best in the present transmission. For this reason, the hydraulic pump **28** is illustrated as a vane pump.

The pumping element **29** consists of a rotor **36** connected to the rotatable drive member **27** of the electric motor **15**. The rotor **36** defines a series of radial slots **37**. A plurality of vanes **38** are provided each vane adapted to slide within a slot **37**.

The rotatable pump housing element **30** consists of an annular disc mounted eccentric to the rotor **36**. A pair of arcuate ports **39** and **41** are formed in the pump housing element **30**. A fluid sump **42** is schematically illustrated for convenience at various places in the illustration of the invention, although in the actual construction, one fluid sump **42** is provided into which all of the exhaust connections for various elements of the transmission exhaust fluid.

The function of the ports **39** and **41** will alternate, depending upon the direction of rotation of the pumping element **29**. For one direction of rotation of the pumping element **29**, one port will be the inlet port and the other port will be the outlet port. For a reverse direction of rotation their functions will be reversed.

Through rotation of the pumping element **29** in a clockwise direction as viewed in FIG. 1, a first hydraulic circuit **40** is established which will hereinafter be referred to as the wash or tumble circuit. The wash circuit **40** includes a check valve **43** which allows fluid flow only in a direction from the sump **42** to the port **41**. A fluid conduit **44** is provided to communicate fluid from the

sump 42 to port 41 when the wash circuit 40 is activated. A fluid conduit 46 is provided to conduct fluid from the port 39 to a flow control valve 47. A conduit 48 is provided to communicate fluid from the conduit 46 to the upstream end of a bypass valve 49. A fluid conduit 51 is provided to communicate fluid from the flow control valve 47 to a rotary hydraulic motor 52. A fluid conduit 53 is provided to communicate fluid from the rotary hydraulic motor 52 to sump 42.

A fluid conduit 54 is provided to connect bypass valve 49 to a pilot relief 56. A fluid conduit 57 is provided to connect conduit 51 and a basket lock device 58. A fluid conduit 59 is provided to connect conduit 51 with the downstream side of the bypass valve 49. The flow control valve 47 comprises a housing 61 defining a bore 62. The housing 61 further defines a pair of annular peripheral reliefs 63 and 64. A valve member 66 is adapted to slide axially within the bore 62 and has a tapered section 67 including a small end 68 and a large end 69. A cylindrical rod 71 concentric with the valve member 66 extends from the small end 68 of the tapered section 67 outside of the housing 61. Immediately adjacent the large end 69 is a pilot section 72 of essentially the same diameter as large end 69.

As shown in FIG. 3, a pair of grooves 73 and 74 are provided in the pilot section 72. The tapered section 67 coacts with an edge 76 of the housing 61 to define a variable orifice through which fluid is communicated to the outlet of the flow control valve 47. A spring 77 acts against the end of the pilot section to bias the valve member 66 down and to the left as shown in FIG. 1.

A speed control mechanism 87 is provided to vary the position of the valve member 66 with respect to the housing 61 and thereby vary the area of the orifice controlling the volume of fluid flowing through the flow control valve 47. This orifice will hereafter be referred to as the control orifice. The speed control mechanism 87 includes a control lever 88 suitably attached to a cam 89 and adapted to rotate the cam according to a setting of the control lever 88. A lever arm 90 is provided pivoted about an axis 91 having an end 92 biased to contact cam 89 by a spring 94. An outer end 95 of lever arm 90 is adapted to contact the cylindrical rod 71 and thereby selectively vary the position of the valve member 66 with respect to the housing 61 in response to positioning of the control lever 88.

The bypass valve 49 includes a valve member 96 acting within a bore 97. A peripheral relief 98 in the bore 97 coacts with an edge 99 of the spool valve 96 to define a variable orifice in fluid communication with the sump 42. The valve member 96 has an end face 101 against which fluid pressure in the upstream end acts and an end face 103 against which fluid pressure in the downstream end acts. A spring 104 is provided in the downstream end of bore 97 to urge the valve member 96 toward the upstream end of bore 97.

The pilot relief 56 is provided in communication with bore 97 to serve as a safety valve by connecting the bore 97 to sump in case of extreme pressure buildup in the conduit 51. The lowering of the pressure in chamber 97 will cause the bypass valve to act as a relief valve with the main flow going to the sump 42.

The rotary hydraulic motor 52 is shown in FIG. 1 as being of the gerotor type although other fluid motors could also be used. The hydraulic motor 52 includes an outer rotor 105 and an inner rotor 106.

Fluid pressure is admitted to the hydraulic motor 52 during the wash cycle from conduit 51 and in a known manner will act in the fluid chamber between the teeth of the inner rotor 106 and the recesses of the outer rotor 105 to turn the inner rotor and the clothes container 11 attached thereto and tumble the clothes. Conduit 53 is the exhaust fluid connection for the rotary hydraulic motor 52.

Associated with the fabric container 11 is a one-way torque transfer means 107. The one-way torque transfer means 107 includes an inner element 110, an outer element 111 and engaging means 112 disposed between the inner and outer element. The inner element 110 is connected to the inner rotor 106 of the rotary hydraulic motor 52 by a shaft 113. The inner element 110 is also connected to the fabric container 11 by means of a shaft 115. By means of such a connection, it can be seen that the fabric container 11 is driven directly from the hydraulic motor 52. The outer element 111 of the one-way torque transfer means is connected to the pump housing element 30 as at 116 and 117.

Basket lock device 58 is attached to the pump housing element 30 and consists of a piston member 121 adapted to slide within a bore 122 in response to fluid pressure. The piston member 121 includes a land section 123 and a pin section 124. The pin section 124 is adapted to contact an indent 125 defined in the fixed case 31 to prevent rotation of the pump housing element 30. Fluid will be communicated to act on either a top side 127 or a bottom side 128 of the land section 123 depending on the direction of rotation of electric motor 15.

Upon rotation of the pumping element 29 in a counterclockwise direction as viewed in FIG. 1, a second hydraulic circuit 130 is established which will be hereafter referred to as the spin or centrifugal extraction circuit. The spin circuit 130 includes a check valve 131 which allows fluid flow only in a direction from the sump 42 into the port 39. A fluid conduit 132 is provided to communicate fluid from sump 42 to port 39 when the spin circuit is activated. A fluid conduit 133 is provided to conduct fluid from port 41 to a first fluid inlet 135 of a restricting means 134. A fluid conduit 136 communicates fluid from conduit 133 to a spin relief valve 137. A fluid conduit 138 inter-connects the fluid conduit 133 and the basket lock device 58. A fluid conduit 139 communicates fluid from the conduit 138 to a second fluid inlet 140 of the restricting means 134. A fluid conduit 141 communicates fluid from the restricting means 134 to sump 42.

Restricting means 134 includes a valve member 145 having a uniformly tapered section 146 acting within a bore 148. The tapered section 146 coacts with peripheral relief 149 to define a variable orifice through which fluid is communicated from the pump 28 to sump 42.

A spin-speed control mechanism 87*a* is provided to selectively vary the position of the valve member 145 and thereby vary the area of the orifice which it cooperates to define. The spin-speed control mechanism 87*a* is similar in design and operation to the speed control mechanism 87, like numbers with the addition of suffix *a* being used to designate like components.

The spin relief valve 137 is essentially a pressure relief valve and consists of an orifice 153 defined by a housing which admits fluid to a chamber 154 also formed in the housing. A tapered valve member 156 acts within the chamber 154 and is biased to close the orifice 153 by a resilient member 157 here shown as a spring. A fluid conduit 158 serves to communicate the chamber 154 with sump 42.

The operation of the fabric treating machine as shown in FIG. 1 and previously described herein is as follows. The timer for the cycle selector switch of the automatic washer schematically represented by switch 19 will first select the wash cycle of operation. The electric motor 15 will be activated to rotate in a clockwise direction as viewed in FIG. 1. The pumping element 29 will also rotate, its speed of rotation corresponding to that of the drive member 27.

After the first revolution of the pumping element 29, the vanes 38 will be disposed within their corresponding slots 37 out of contact with the pump housing element 30, effecting a zero output of the pump 28 since no pumping action is taking place. At a predetermined rotational speed, the vanes will be urged to move radially outward

by centrifugal force to contact the pump housing element **30** thereby initiating a pumping action. The desired rotational speed at which pumping becomes effective can be achieved by properly designing the geometry of the rotor and vanes. The obvious result of using this particular type of hydraulic pump is that it enable the electric motor to build up sufficient speed before imposing a load on it.

Since the wash cycle is first selected, the pump **28** will draw fluid from the sump **42** through check valve **43** and conduit **44** communicating the fluid to the port **41** of the hydraulic pump **28**. As the fluid is pressurized, it will be delivered from the port **39** to conduit **46** and from there will be communicated to the flow control valve **47**. The position of cam **89** will determine the size of the control orifice defined between the tapered section **67** of the valve member **66** and the edge **76** of the peripheral relief **64**.

Fluid leaves the flow control valve **47** via conduit **51** at a pressure lower than the pressure of the fluid which enters the flow control valve in accordance with the principle well known in the art whereby a pressure drop will result when fluid flows through a control orifice.

Fluid leaving the flow control valve **47** is communicated to the hydraulic motor **52** through conduit **51** to drive the clothes container **11** of the washing machine through inner element **110** of the one-way torque transfer means **107**. The clothes container **11** will be driven by the hydraulic motor **52** at a relatively low speed to effect a wash or tumble cycle of operation.

Fluid is also communicated to basket lock **58** through conduit **57** and acts against the bottom side **128** of piston member **123** urging the piston member into locking engagement with the indent **125** and fixed case **31** thereby preventing rotation of the rotatable housing **30** in the wash cycle.

In the absence of bypass valve **49**, it would be obvious that the variation in size of the control orifice would have little effect on the speed of the rotary hydraulic motor **52**. The speed of the hydraulic motor **52** is directly proportional to the volume of fluid applied to it per unit time. Using a constant displacement pump, the effect of reducing the size of the control orifice would be to increase the average velocity of fluid across the orifice, the volume flow per unit time remaining essentially unchanged.

Fluid pressure is admitted to the upstream end of bore **97** from conduit **48** to act against end face **101** of the valve member **96** to urge the valve member **96** upwardly, allowing some of the fluid in the upstream end of bore **97** to escape to sump. It is evident from FIG. 1 that the pressure of fluid supplied to the upstream end of bore **97** is substantially the same as the pressure of the fluid supplied to the flow control valve **47**.

Fluid at the lower pressure is admitted to the downstream end of bore **97** from conduit **59** to act against the end face **103** of the valve member **96** which has the same area as end face **101**. This force acts in cooperation with the force of the spring **104** to urge the valve member **96** to the bottom of the bore **97** thereby restricting the flow of fluid from the upstream end of the bore to sump **42**.

It can now be seen that the characteristics of the spring **104** and the cross sectional area of the valve member **96** determine the value of the pressure drop across the control orifice. The pressure drop for any given size orifice is dependent upon the volume of fluid passed through the orifice per unit time. As the volume flow through the orifice increases, the resulting pressure drop across the orifice will also increase. The converse is also true.

If, for a range of orifice sizes the desired pressure drop is, for example, 10 p.s.i., a spring will be chosen with characteristics such that it will exert a force equal to that exerted by a pressure of 10 p.s.i. against the area of end face **101** of valve member **96**. It is understood of course, that the variation of spring force due to compression of the spring is negligible due to the small displacement involved and a low spring constant. For the bypass valve to open, the pressure of the fluid entering the upstream end of bore **97** must exceed the pressure of the fluid entering the downstream end by at least 10 p.s.i. If the pressure differential hence the pressure drop across the control orifice is greater than 10 p.s.i., the bypass valve will open wider alowing a greater volume of fluid to be bypassed to sump. The volume of fluid through, hence the pressure drop across, the control orifice will therefore be reduced until the pressure differential equals 10 p.s.i., at which point the system will be at equilibrium.

If the pressure differential is less than 10 p.s.i., the spring force plus the pressure force on end face **103** of the valve member **96** will exceed the force on the end face **101** causing the valve member **96** to move toward the closed position until the pressure differential reaches equilibrium at 10 p.s.i. Thus it has been shown that with the selection of the proper spring the pressure drop across the control orifice can be held to the same predetermined value over a range of orifice sizes. Making use of this principle, it has further been shown that by varying the size of the control orifice which is accomplished by varying the orientation of the cam **89**, the volume of fluid per unit time passing through the control orifice and delivered to the hydraulic motor **52** may be varied, the speed of the clothes container increasing as the flow increases.

When the wash cycle has been completed, the timer for the cycle selector switch **19** advances the switch to the spin position. The electric motor **15** will reverse its direction of rotation, and the pumping element **29** will rotate in a counterclockwise direction as viewed in FIG. 1. The hydraulic pump **28** will draw fluid from the sump **42** through check valve **131** and conduit **132** to port **39**. As the fluid becomes pressurized, it will be delivered from port **41** to conduit **133**. Conduit **133** will communicate the fluid to inlet **135** to act against the valve member **145** urging it into contact with lever arm **90***a*. Fluid is communicated from conduit **138** to peripheral relief **149** of restricting means **134** by conduit **139** and flows from inlet **140** to sump **42** through the variable orifice.

Fluid is also communicated through conduit **138** to the basket lock device **58** and acts against the top side of land **127** releasing the pump housing element **30** from its engagement with the fixed case **31**.

By restricting the flow of fluid from peripheral relief **149** to sump **42**, we effectively restrict the output of the hydraulic pump **28** which creates a reaction torque on the pump housing element **30**. This induces a rotation of the pump housing element **30**. The one-way torque transfer means **107** is oriented such that upon rotation of the outer element **111** in a counterclockwise direction as would be induced by rotation of the pump housing element **30**, the inner element **110** would also be rotated in a counterclockwise direction as would the fabric container **11** connected to the inner element **110**. Rotation of the inner element **110** would correspondingly effect a rotation of the inner rotor **106** of the hydraulic motor **52** to the shaft **113**.

It can now be seen that by varying the position of valve member **145** we vary the area of the orifice defined between the valve member and the peripheral relief **149** thereby varying the restriction to the flow of fluid from the hydraulic pump through the orifice to sump. The smaller the orifice, the less fluid is allowed to pass to sump and the more nearly the rotational speed of the pump housing element **30** approaches the speed of the pump element **29**. The difference in rotational speed between the pump housing element **30** and the pumping element **29** is mainly due to the fluid allowed to leak to sump. If the valve member **145** were to completely close off communication between the outlet of the pump **28** and the sump, assuming zero leakage in the spin circuit, the rotational speed of both elements would be substantially the same, the hydraulic fluid becoming trapped in the circuit. The net flow output of the pump would be zero since there would be

no relative rotation between the pumping elements resulting in a hydraulic couple between the pumping element 29 and the pump housing element 30.

If valve member 145 was now moved to allow a slight fluid flow from pump 28 to sump 42, this would allow a slight relative rotation between the pump elements. Since the rotational speed of pumping element 29 is substantially constant and determined by the speed of electric motor 15 to which it is attached, the result will be a decrease in the rotational speed of the pump housing element 30 and correspondingly, a decrease in rotational speed of the clothes container 11. As the area of the orifice increases, the flow from pump 28 to sump increases allowing a greater relative rotation between the pumping elements and a slower speed for the clothes container 11. When the valve member 145 is positioned such that it offers virtually no resistance to the fluid flow between pump and sump, we reach the point of minimum rotational speed of the clothes container 11. The reaction on the pump housing element 30 at this time is solely due to the viscous drag between the pump elements.

Thus it has been shown that the speed of the clothes container 11 can be infinitely varied between a predetermined minimum and maximum speed by varying the restriction to the output of the hydraulic pump. A spin speed range of from 70 to 400 r.p.m. has been found to be adequate for most applications.

When the spin cycle is initiated, the torque required to accelerate the clothes container 11 and the wet clothes contained therein from a position initially at rest up to a desired rotational speed is initially quite high. This high starting torque results in a relatively high pressure in the spin circuit 130. The spin-up relief 137 is set to open at a predetermenid pressure bypassing some of the output of hydraulic pump 21 to sump until the clothes container 11 has attained a sufficient velocity and the inertia of the standing basket and clothes has been overcome. The torque now required to rotate the clothes container 11 is considerably less and the pressure in the spin circuit correspondingly decreases, allowing the spin relief 137 to close and further allowing restricting means 134 to maintain control over the rotational speed of the clothes container 11.

FIG. 2 illustrates a modification of the transmission shown in FIG. 1 and includes a pair of one-way torque transfer devices 160 and 161. The first one-way torque transfer device 160 includes an inner element comprising the shaft 113 which is connected to the inner rotor 106 of the hydraulic motor 52. Torque transfer means 160 further includes an outer element 162 and an engaging element 163 disposed between the inner element 113 and the outer element 162. The second one-way torque transfer means 161 includes an iner element 162 which also functions as the outer element of the first one-way torque transfer means 160. Torque transfer means 161 further includes an outer element 165 and an engaging element 166 positioned between the element 162 and the element 165. The element 162 is connected to the fabric container 11 by a shaft 167. The element 165 is connected to the pump housing element 30 as at 170 and 171.

The one-way torque transfer devices 160 and 161 are oriented such that in the wash cycle of operation, the inner rotor 106 of hydraulic motor 52 will spin in a counterclockwise direction as viewed in FIG. 2. The shaft 113 will correspondingly rotate in a counterclockwise direction. Since the shaft 113 forms the inner element of first one-way torque transfer means 160, counterclockwise rotation of the shaft 113 will result in a similar counterclockwise rotation of the outer element 162 through the engaging element 163. Since the outer element 162 is connected to the fabric container 11, this will also rotate in a counterclockwise direction over a low speed range to effect the tumble or wash operation.

In the spin cycle of operation, the pump housing element 30 will be rotated in a counterclockwise direction thereby effecting a counterclockwise rotation of the outer element 165 of second one-way torque transfer means 161. Counterclockwise rotation of element 165 will cause a corresponding counterclockwise rotation of element 162 through the engaging element 166. As the element 162 rotates counterclockwise, so will the fabric container 11 connected to the element 162. The engaging element 163 is positioned such that for counterclockwise rotation of the element 162, no corresponding rotation of the element 113 will take place. In other words, the element 162 will free-wheel with respect to the element 113. The net effect of this orientation of the one-way torque transfer means 160 and 161 is to eliminate the necessity of the hydraulic motor being dragged around during the spin cycle of operation.

The operation of the fabric treating machine illustrated in FIG. 2 in all other respect is identical to the operation previously described for the fabric treating machine shown in FIG. 1.

Various features of the invention have been particularly shown and described, however, it should be obvious to one skilled in the art that various modifications may be made therein without departing from the scope of the invention.

What is claimed is:

1. A fabric treating machine adapted to perform a washing operation and a centrifugal extraction operation including a fabric container having a central axis disposed at an angle to the vertical; a reversible positive displacement hydraulic pump comprising a pump housing element associated with said container and a pumping element; drive means connected to said pumping element; a rotary hydraulic motor in fluid communication with said hydraulic pump when said pumping element is rotated in a first direction, said motor being further associated with said fabric container whereby said motor is operative to rotate said fabric container; means for selectively restricting the flow of fluid from said pump when said pumping element is rotated in a second direction to induce rotation of said pump housing element and said fabric container associated therewith.

2. A fabric treating machine as in claim 1 including speed control means associated with said restricting means operative to selectively vary the restriction to said flow thereby varying the speed of rotation of said container.

3. A fabric treating machine as in claim 1 including flow control means disposed between said hydraulic pump and said rotary hydraulic motor, operative to selectively vary the flow of fluid from said pump to said motor thereby varying the speed of rotation of said container.

4. A hydraulic transmission for a fabric treating machine having a fabric container tilted at an angle to the vertical and adapted to perform a washing operation and a centrifugal extraction operation, said hydraulic transmission including a positive displacement hydraulic pump including a pump housing element associated with said fabric container and a pumping element; drive means connected to said pumping element; a first hydraulic circuit associated with said hydraulic pump when said pumping element is rotated in a first direction; a second hydraulic circuit associated with said hydraulic pump when said pumping element is rotated in a second direction; a hydraulic motor in said second hydraulic circuit driven by said hydraulic pump, said hydraulic motor associated with said fabric container and operative to rotate said fabric container over a relatively low speed range for said washing operation; means in said first hydraulic circuit for selectively restricting the flow of fluid from said pump to induce rotation of said pump housing element and said fabric container associated therewith to rotate said fabric container over a relatively high speed range for said centrifugal extraction operation.

5. A hydraulic transmission as in claim 4 including speed control means in said first hydraulic circuit associated with said restricting means operative to selectively

vary the restriction to said flow thereby varying the speed of rotation of said container.

6. A hydraulic transmission as in claim 4 including flow control means in said second hydraulic circuit disposed between said hydraulic pump and said hydraulic motor operative to selectively vary the flow of fluid from said pump to said motor thereby varying the speed of rotation of said container.

7. A hydraulic transmission as in claim 4 including one-way torque transfer means connecting said fabric container and said pump housing element, said one-way torque transfer means operative to allow relative rotation between said pump housing element and said fabric container in one direction only.

8. A hydraulic transmission as in claim 4 including first one-way torque transfer means connecting said hydraulic motor and said fabric container whereby said hydraulic motor drives said fabric container through said first one-way torque transfer means during said relatively low speed range for said washing operation and second one-

way torque transfer means associated with said first one-way torque transfer means connecting said pump housing element and said fabric container whereby said pump housing element drives said fabric container through said second one-way torque transfer means during said relatively high speed range centrifugal extraction operation.

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