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3,101,625

AUTOMATIC WASHING MACHINE

Filed July 6, 1960

3 Sheets-Sheet 1

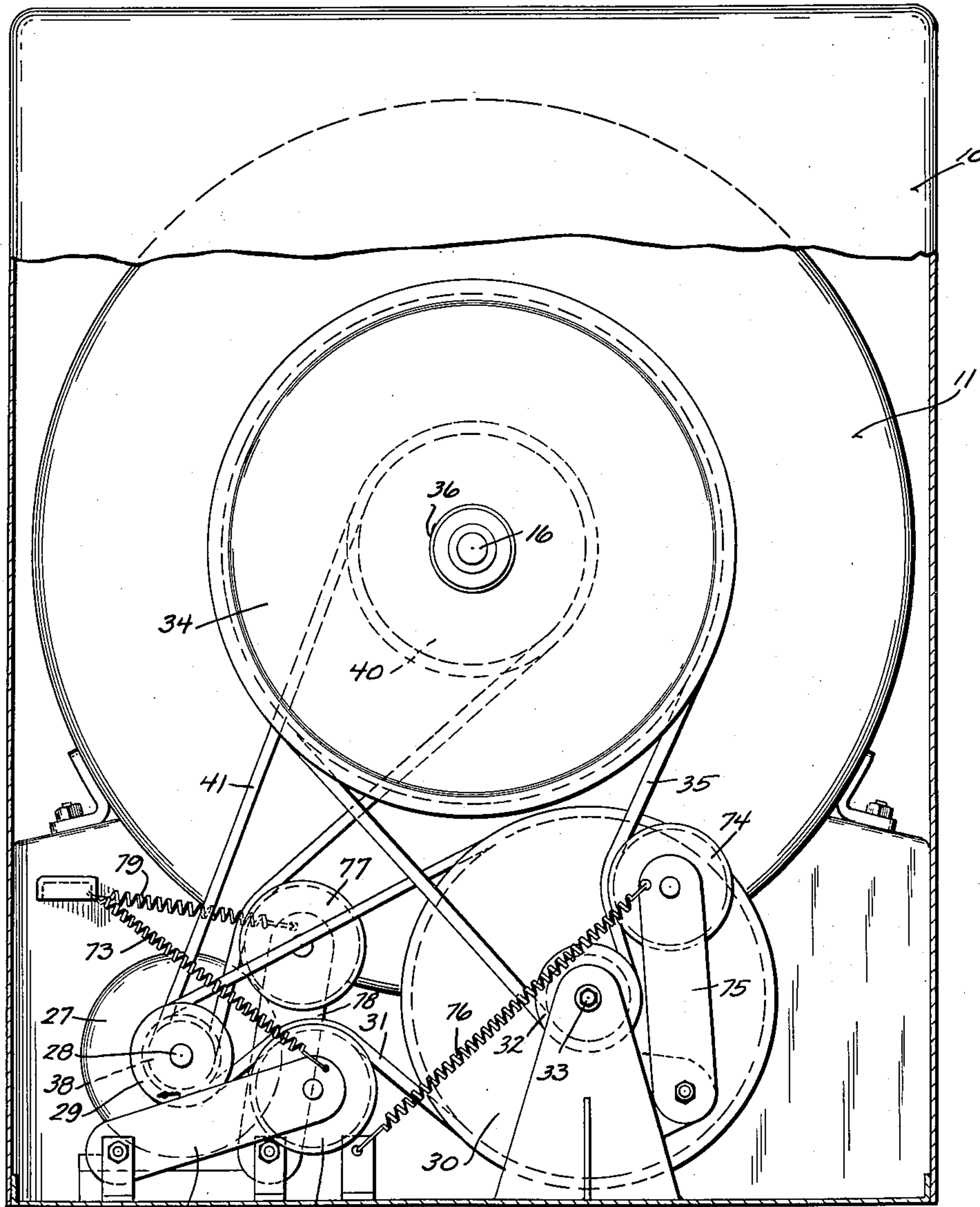


Fig. 1

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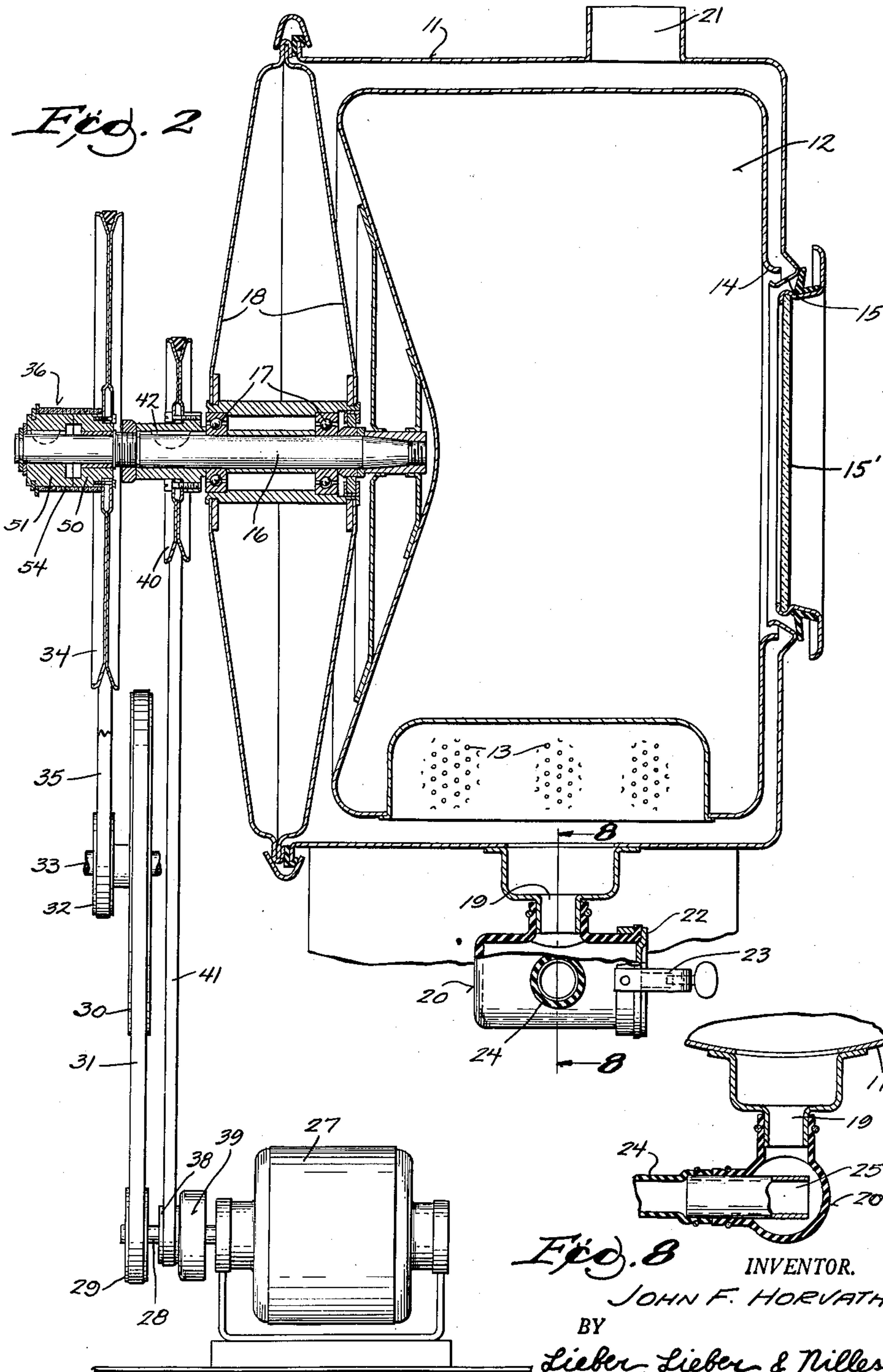
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

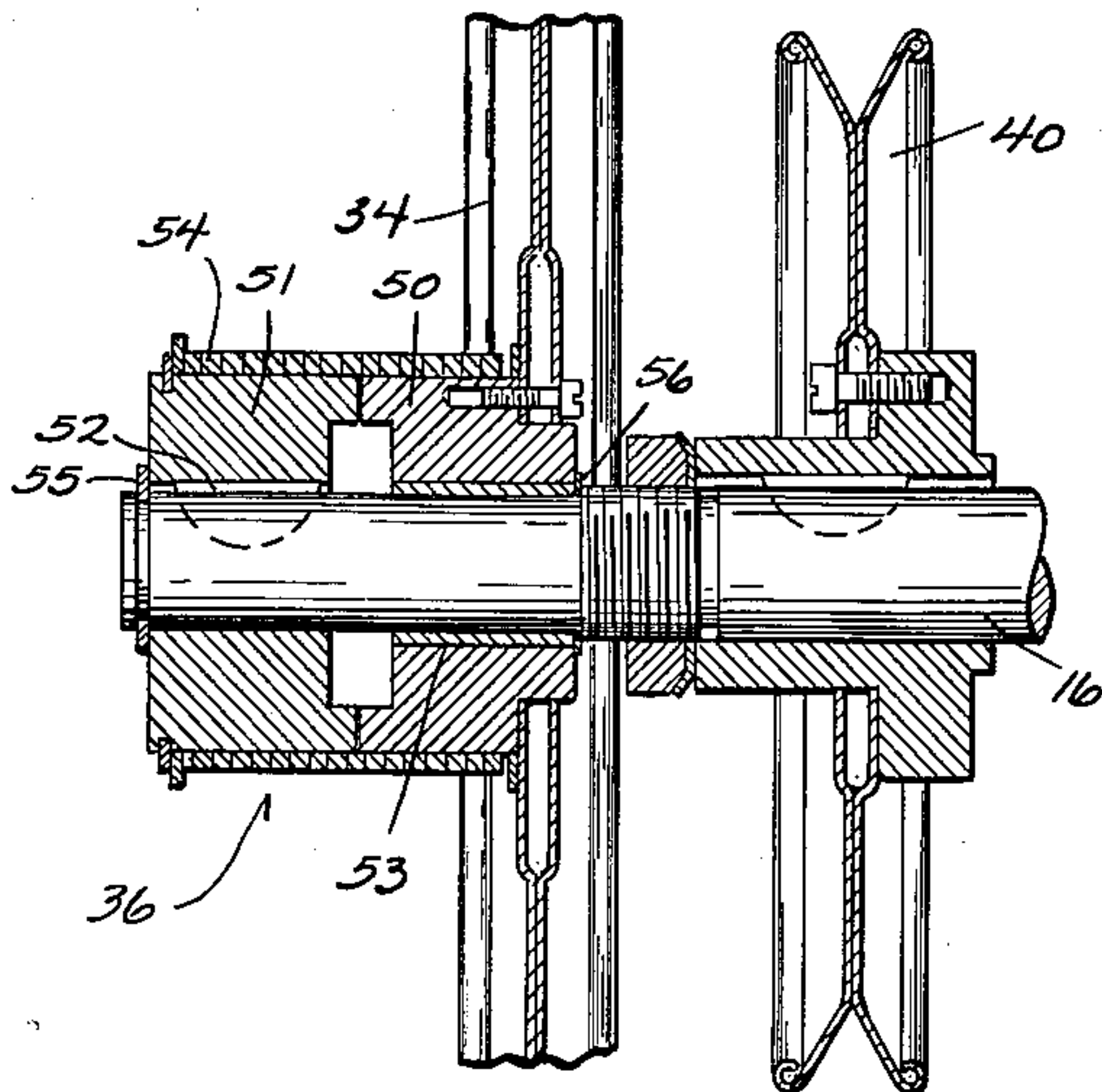


Fig. 3

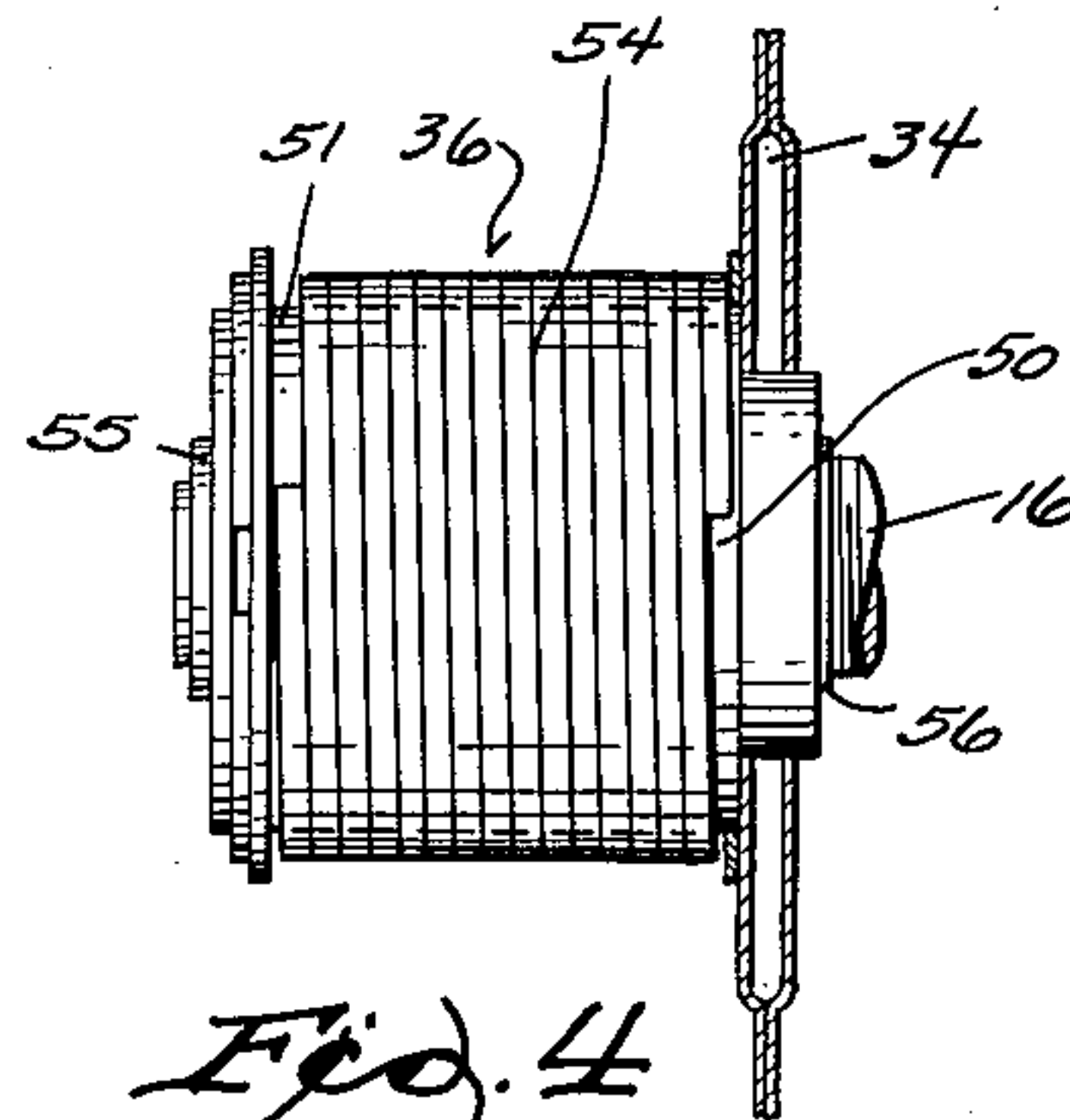


Fig. 4

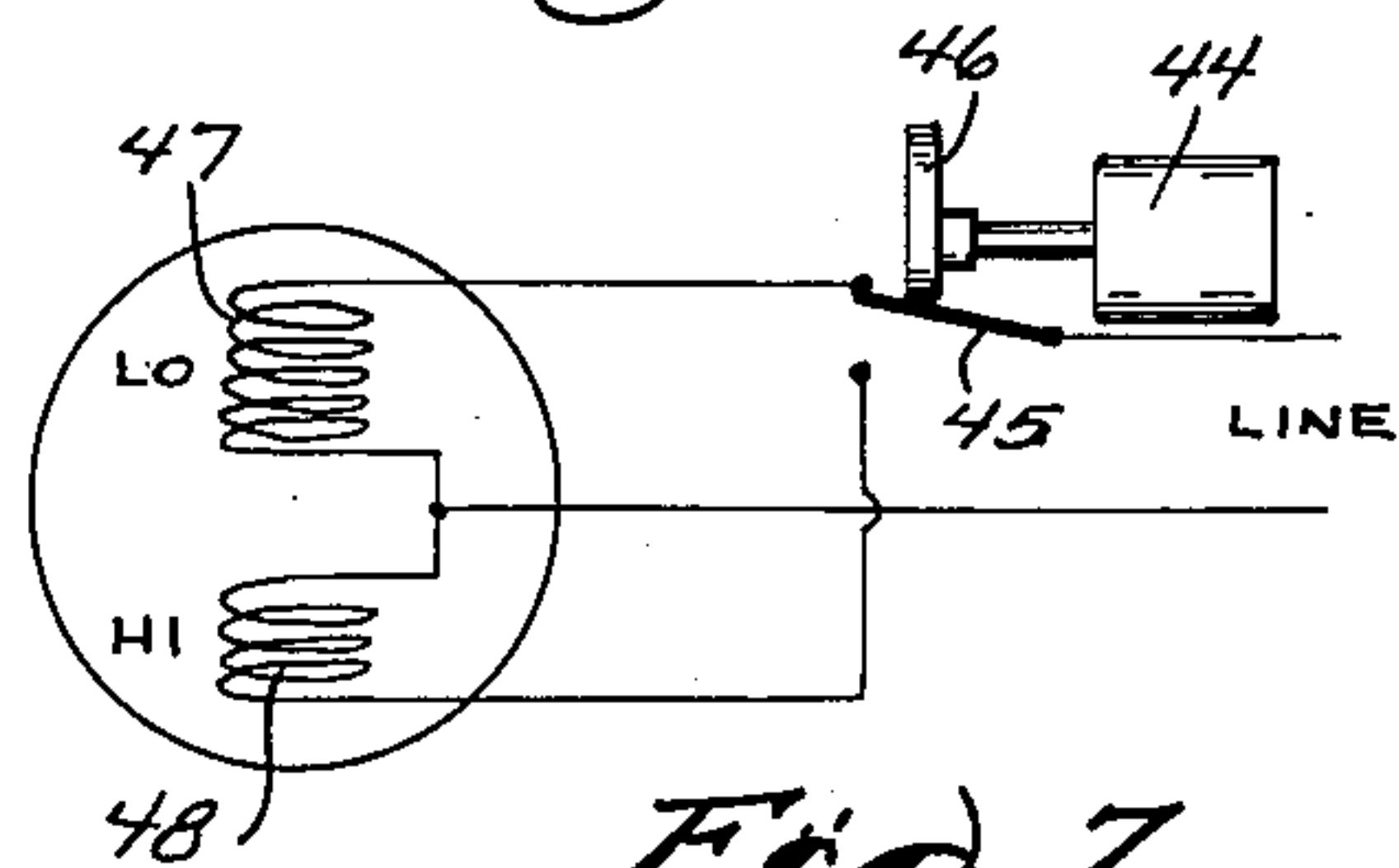


Fig. 7

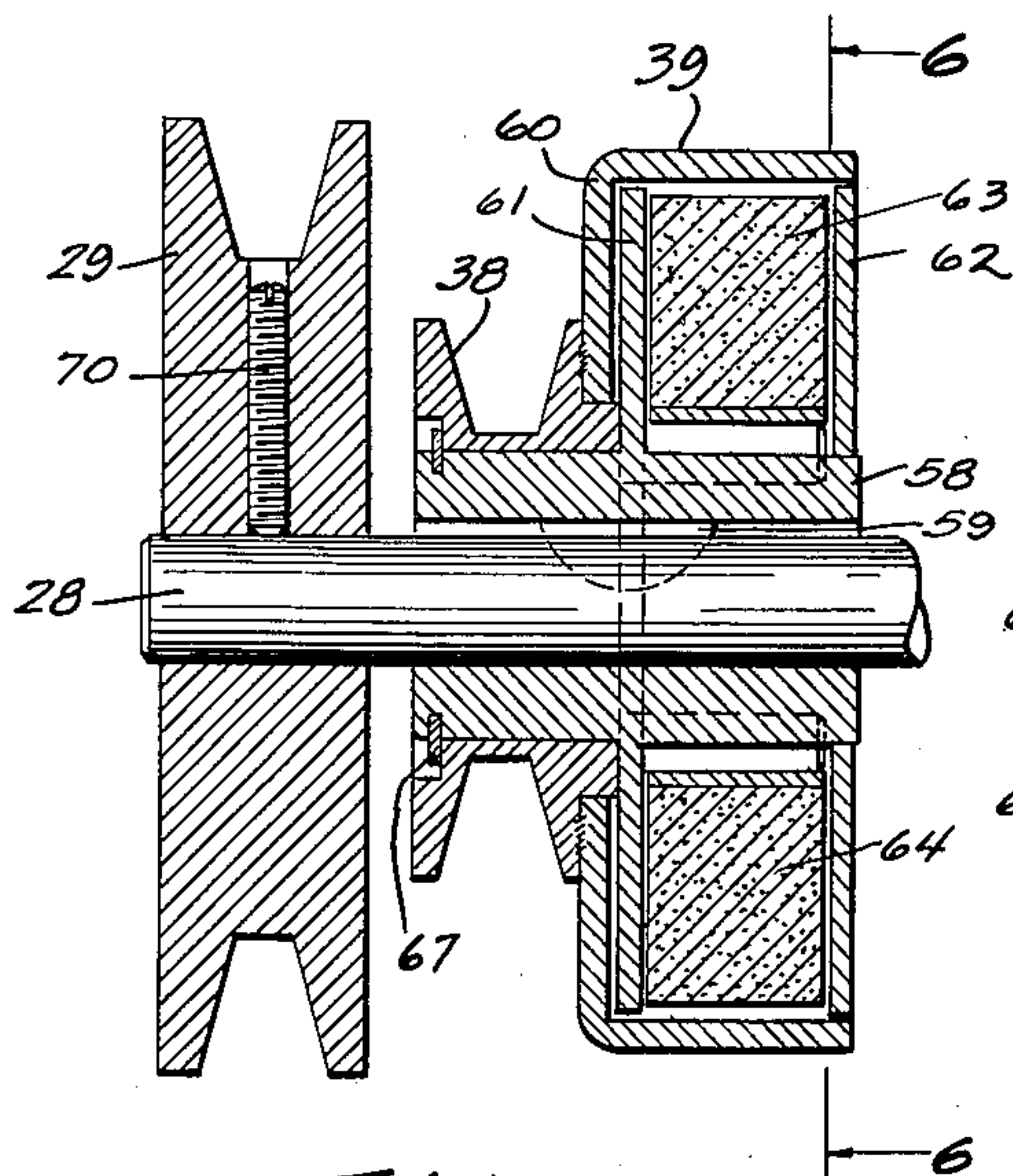


Fig. 5

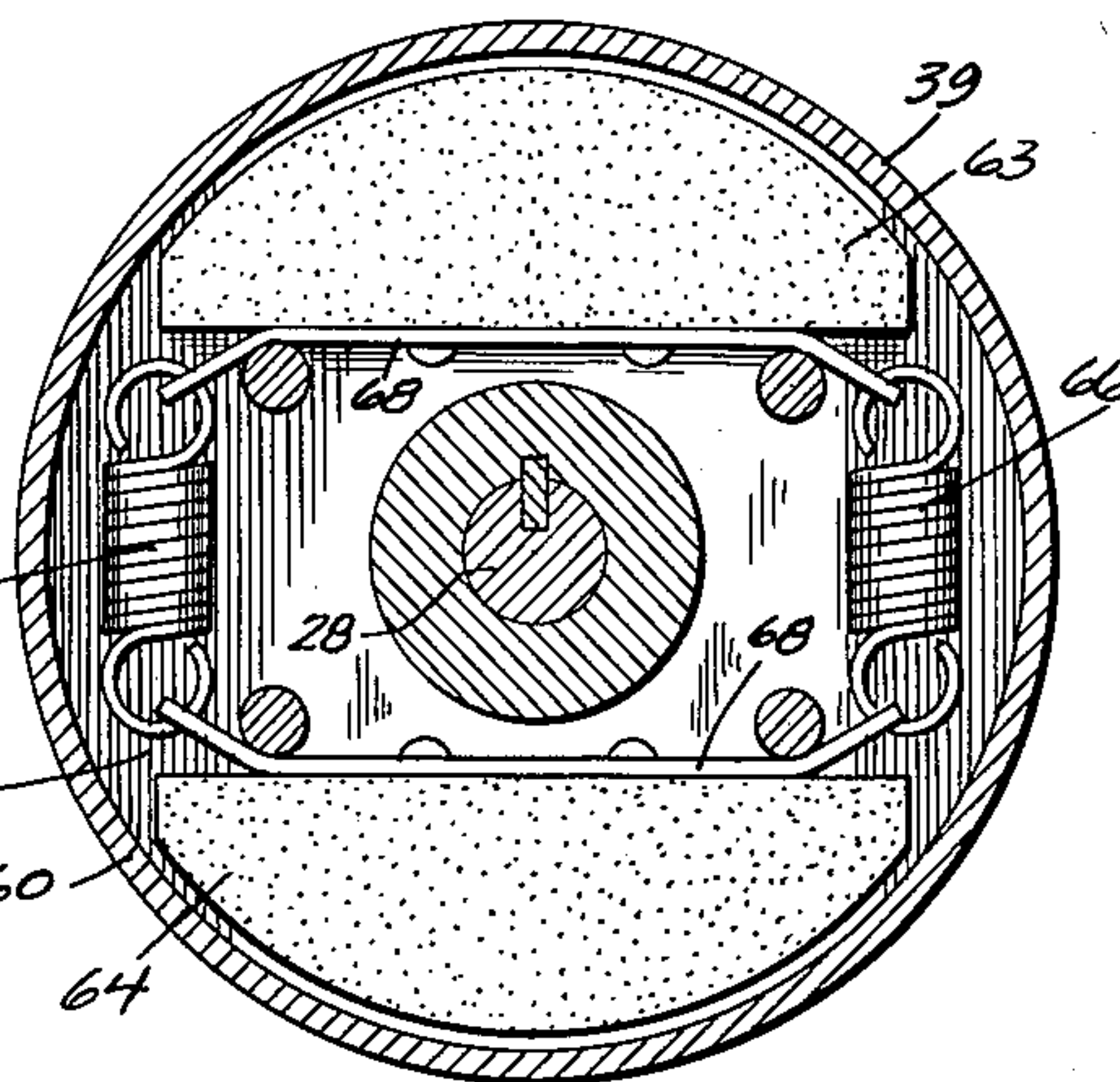


Fig. 6

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## AUTOMATIC WASHING MACHINE

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2 Claims. (Cl. 74-472)

The present invention relates generally to improvements in the art of washing clothes and the like, and relates more particularly to improvements in automatically operable washing machines of the two-speed type.

A primary object of the invention is to provide an improved two-speed drive arrangement for the clothes-receiving drum of a washing machine which is extremely simple in construction, highly efficient in operation, and in which the timing of the washing cycle and the spin or drying cycle is moreover exceedingly accurate.

Washing machines of the type in which the clothes receiving drum or basket is mounted for rotation about a horizontal axis at two different speeds through timed cycles are, of course, well known. In washing machines of this type, it is desirable to initially drive the drum at relatively low speed, on the order of 33 r.p.m., throughout a pre-determined period of time for the washing cycle and to thereafter drive the drum at a considerably higher speed, on the order of 410 r.p.m., for the spin or drying cycle.

Heretofore, the two-speed drive has been accomplished as by means of a solenoid and a clutch arrangement through a jack shaft having a large number of complicated and carefully machined clutch elements, the motor in this type of machine being of single speed type. It has also been proposed in the past to drive the drum at the desired speeds as by means of a two-speed motor and power actuated clutches energized as by means of solenoids or the like which in turn are energized by a timer. Various other types of drive arrangements embodying clutches and solenoids have also been heretofore proposed, but in all instances, the drive mechanism is characterized by numerous parts requiring careful machining and assembly as well as accurate adjustment and constant maintenance.

It is therefore another object of my invention to provide an improved two-speed drive for washing machines of the horizontal axis type which requires a minimum of parts and which obviates the disadvantages heretofore attendant prior drive arrangements of this general type.

Another object of this invention is to provide an improved two-speed drive and cycle-timing arrangement for the clothes receiving drum of a washing machine of the type in which the drum is mounted for rotation about a substantially horizontal axis.

A further object of my present invention is to provide an improved washing machine in which the horizontally mounted clothes receiving drum or basket is driven in a simple manner through its low speed washing and high speed spin-drying cycles by a two-speed motor controlled directly by an ordinary timer in a completely automatic manner.

An additional object of the present invention is to provide an automatic washing machine in which the drum is driven by a time controlled two-speed motor through a simple and improved power transmission arrangement interposed between the motor and the rotatable drum and embodying an over-riding clutch between the low speed transmission pulley and the drum shaft adapted to disengage the same at high speeds and a centrifugal friction clutch carried by the motor shaft and cooperable with the high speed transmission pulley to drive the drum

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through the high speed pulley upon engagement of the centrifugal clutch during high speed operation of the motor.

Still another object of the present invention is to provide an automatic washing machine of the type having a drum or clothes-receiving basket rotatable about a horizontal axis with an improved and readily accessible lint trap.

These and other objects and advantages of the invention will become apparent from the following detailed description.

A clear conception of the several features constituting the present improvement and of the mode of operation of washing machines embodying the invention may be had by referring to the accompanying drawings wherein like reference characters designate the same or similar parts in the several views.

FIG. 1 is a rear elevational view of a typical two-speed horizontal axis type washing machine embodying the invention, the outer casing having been broken away to reveal the transmission belts and sheaves.

FIG. 2 is a view, partly in elevation and partly in vertical section, taken from one side of the machine with the outer casing removed and with the transmission belts and sheaves extended in a vertical plane for the sake of clarity;

FIG. 3 is an enlarged fragmentary section through the sheaves and over-riding clutch carried by the drum-driving shaft;

FIG. 4 is a similarly enlarged fragmentary exterior side view of the over-riding clutch;

FIG. 5 is a likewise enlarged section through the sheaves and centrifugal clutch carried by the motor drive shaft;

FIG. 6 is another enlarged section through the centrifugal clutch taken along the line 6-6 of FIG. 5;

FIG. 7 is a simple wiring diagram illustrating the timing of the motor operation; and

FIG. 8 is a fragmentary section through the lint trap of the machine taken along the line 8-8 of FIG. 2.

Referring to the drawings and particularly FIGS. 1 and 2 thereof, the clothes washing machine shown therein as embodying the features of the present invention comprises generally a housing 10 enclosing a substantially cylindrical tub 11 which, in turn, houses a likewise cylindrical clothes receiving drum 12 mounted for rotation about a horizontal axis. The drum 12 is of usual construction having side wall perforations 13 and the customary clothes tumbling baffles, the front wall of the front wall of the drum 12 having a central opening 14 therein cooperating and aligned with a front opening 15 in the front wall of the tub 11 normally closed by a door 15' and adapted to receive articles to be laundered.

The drum 12 is mounted for rotation within the tub 11 in a customary manner by suitable bearings, and the rear of the drum 12 is coupled to the front end of a rearwardly extending shaft 16 adapted to be driven in a manner hereinafter described, the shaft 16 being mounted in suitable bearings 17 carried by a supporting structure 18 on the rear of the tub 11. Secured to the lower medial portion of the tub 11 is a sump and drain opening 19 communicating with a lint trap 20 also to be hereinafter more fully described.

Wash water is introduced into the tub 11 through the customary inlet line, not shown, and soap may be introduced through a conveniently located upper opening 21 which may be normally closed by a suitable door. Dirty water is drained from the tub 11 through the opening 19 and lint trap or receptacle 20 which is shown as being accessible by way of a front door 22 normally maintained in closed position by a suitable latch 23. The trap or



receptacle 20 communicates with a wash water discharge or drain conduit 24 which has a portion 25 extending into the receptacle 20 above the bottom thereof so as to permit lint and debris to settle in the trap while the wash water is conducted away through the drain pipe 24.

An electric drive motor 27 is suitably mounted within the casing 10 and has a drive shaft 28 extending rearwardly therefrom. The motor drive shaft 28 is connected to the driven drum shaft 16 by a low-speed drive transmission which comprises generally a sheave 29 coupled directly to the shaft 28 and driving a large sheave 30 through a belt 31, the large sheave 30 being coupled to a small sheave 32 through a shaft 33 with the sheave 32 in turn driving a large sheave 34 transmitting power to the driven drum shaft 16 through an overrunning clutch 36. The motor drive shaft 28 is also connected to the driven drum shaft 16 by a high-speed driving transmission comprising generally a sheave 38 driven by the shaft 28 through a centrifugal clutch 39 and the sheave 38 drives a sheave 40 through a transmission belt 41, the sheave 40 being directly coupled to the driven drum shaft 16 as by means of a key 42.

The electric motor 27 is a four pole, six pole two-speed unit adapted to run at 1140 r.p.m. when the six pole side is energized and at 1725 r.p.m. when the four pole side is energized. The motor speed is controlled by direct action of a timer 44 adapted to actuate a switch 45 through a suitable cam 46 to thereby energize the low and high speed windings 47, 48 respectively.

The overrunning clutch 36 includes two adjoining drums 50, 51, the drum 51 being keyed to the driven shaft 16 as at 52, and the drum 50 being freely rotatable on a bearing sleeve 53 carried by the shaft 16. The sheave 34 is secured to the drum 50 of the overrunning clutch, and the drums 50, 51 are surrounded by a helical spring 54 which is loose on the drums in its relaxed condition. The drums 50, 51 are held captive on the shaft 16 by means of split rings 55, 56 or the like, and as the sheave 34 is rotated through the low-speed transmission from the motor drive shaft 28, the spring 54 is wound up tightly and by the combined action of the spring and the friction between the adjoining faces of the drums 50, 51, the shaft 16 is driven at low speed, the high speed transmission being inactive due to the fact that the centrifugal clutch 39 carrying the sheave 38 is disengaged from the motor drive shaft.

The centrifugal clutch 39 comprises a sleeve 58 keyed to the motor drive shaft 28 as at 59, and this sleeve or bushing 58 carries the sheave 38 and the drum 60 which is suitably secured to the sheave for rotation therewith. Housed within the drum 60 is the drive assembly consisting of spaced disks 61, 62 carried by the sleeve 58 and confining a pair of friction shoes 63, 64 therebetween. The friction shoes are normally maintained out of contact with the inner annular surface of the drum 60 by means of a pair of tension springs 65, 66 loaded so as to maintain the shoes 63, 64 disengaged from the drum 60 at low-speed operation while permitting the shoes to be thrown by centrifugal force outwardly into engagement with the inner annular surface of the drum 60 at high-speed operation. The pulley may, of course, be held captive on the sleeve 58 as by means of a split ring 67 and the shoes 63, 64 may be provided with a brake facing and may be secured to the respective ends of the springs 65, 66 as by means of plates or tie rods 68. In operation, the motor 27 is started in the usual manner and the timer 44 is set so as to energize the low-speed circuit 47 for a predetermined time interval, the timer 44 driving cam 46 to actuate the switch 45 to energize the high-speed winding thereafter. At low speed, the clothes receiving drum 12 is driven through the sheave 29 coupled to the motor shaft 28 as by means of a set screw 70, the sheave 29 driving the sheave 30 through the belt 31 with sheave 32 being driven by shaft 33 and in turn driving sheave

34 through belt 35 to wind up the spring 54 on the overrunning clutch 36 and thereby drive the driven drum shaft 16. The motor is thus operated at low speed at approximately 1140 r.p.m., sufficient to hold the materials being washed in an annulus against the outer periphery of the drum 12 which is, of course, immersed in washing water. When the wash cycle has been completed as determined by the timer 44, the switch 45 is actuated by means of the cam 46 to energize the high speed winding, means also being provided for draining the tub 11 of wash water. As the motor 27 is operated at high speed, the centrifugal clutch, which remains disengaged at low speed with the shoes 63, 64 out of contact with the drum 60, becomes activated and the centrifugal force on the shoes 63, 64 overcomes the resistance of the springs 65, 66 to permit the shoes to engage the inner periphery of the drum 60. The drum 60 and sheave 38 are then rotated at high speeds, on the order of 1750 r.p.m., with the shaft 28 to drive the sheave 40 through the belt 41. The driven drum shaft 16 is then rotated along with the drum 12 at high speeds and the spring 54 of the overrunning clutch is unwound permitting the sheave 34 to ride freely on its bearing sleeve 53. This high speed operation of the drum 12 in the now empty tub 11 extracts wash water from the articles in the drum and this cycle is therefore called the spin drying or extraction cycle. The springs 65, 66 of the centrifugal clutch are loaded so as to stay disengaged until the motor accelerates to a speed in excess of the 1140 r.p.m. low speed operation of the motor, and since the low and high speed connections are entirely dependent upon the speed of the motor shaft 28, it is unnecessary to provide any separate means for actuating these connections, the entire operation being under the control of the timer which controls the motor speed.

The overrunning clutch 36 and the centrifugal clutch 39 may be of ordinary construction such as are commercially available in the trade, and the timer 44 and two-speed motor 27 are also commercially available items. The belts 31, 35 and 41 may be maintained at the proper tension by means of belt tensioning devices, in a well known manner. As shown the belt 31 has an idler sheave 71 coacting therewith, the sheave 71 being carried by a lever 72 urged toward the belt by means of a spring 73. Likewise, the belt 35 has an idler sheave 74 coacting therewith and maintained under proper tension by a spring 76 constantly urging the lever 75 toward the belt, while the belt 41 is maintained under proper tension by the idler sheave 77 carried by the lever 78 and maintained under proper tension by the spring 79.

While the invention has been shown and described as being embodied in a horizontal axis type wash machine, embodying various structural details, it is not intended or desired to restrict or limit the invention thereto, since various modifications may occur to persons skilled in the art to which this invention pertains.

I claim:

1. A two-speed transmission for a rotatable clothes receiving drum having a drive shaft therefor, in turn driven by a two-speed drive motor having a drive shaft extending therefrom, said transmission including:

- (a) a speed responsive clutch mounted coaxially about the drive shaft of said motor;
- (b) a high-speed drive sheave rotatably mounted about the said motor drive shaft adjacent said speed responsive clutch, said clutch having a driven section secured to said high-speed drive sheave and a drive section secured to said motor drive shaft whereby said high-speed drive sheave may be engaged by said drive section and rotated when said drive section attains a predetermined speed;
- (c) a low-speed drive sheave fixedly secured to the said motor drive shaft;
- (d) a high-speed driven sheave fixedly secured to said drum drive shaft;



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- (e) a low-speed driven sheave mounted coaxially about said drum drive shaft;
- (f) power transmission means connecting said two high-speed sheaves and said two low-speed sheaves;
- (g) and means associated with said low-speed driven sheave permitting the said sheave to engage and turn the said drum drive shaft when the said sheave is rotated by the said low-speed drive sheave and to become disengaged from the said drum shaft when the high-speed driven sheave on the said drum drive shaft is rotated by the high-speed drive sheave on the said motor shaft.
2. A two-speed transmission for a rotatable clothes receiving drum having a drive shaft therefor, in turn driven by a two-speed drive motor having a drive shaft extending therefrom, said transmission including:
- (a) a speed responsive clutch mounted coaxially about the drive shaft of said motor;
- (b) a high-speed drive sheave rotatably mounted about the said motor drive shaft adjacent said speed responsive clutch, said clutch having a driven section secured to said high-speed drive sheave and a drive section secured to said motor drive shaft whereby said high-speed drive sheave may be engaged by said drive section and rotated when said drive section attains a predetermined speed;
- (c) a low-speed drive sheave fixedly secured to the said motor drive shaft;

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- (d) a high-speed driven sheave fixedly secured to said drum drive shaft;
- (e) a low-speed driven sheave mounted coaxially about said drum drive shaft;
- (f) power transmission means connecting said two high-speed sheaves and said two low-speed sheaves;
- (g) means associated with said low-speed driven sheave permitting the said sheave to engage and turn the said drum drive shaft when the said sheave is rotated by the said low-speed drive sheave and to become disengaged from the said drum drive shaft when the high-speed driven sheave on the said drum drive shaft is rotated by the high-speed drive sheave on the said motor shaft;
- (h) and timing means for operating said motor at low and high speeds respectively for predetermined time intervals.

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