Sept. 29, 1953 T. R. SMITH 2,653,483

WASHING MACHINE

Original Filed Dec. 20, 1948 2 Sheets-Sheet 1

Fig. 1.

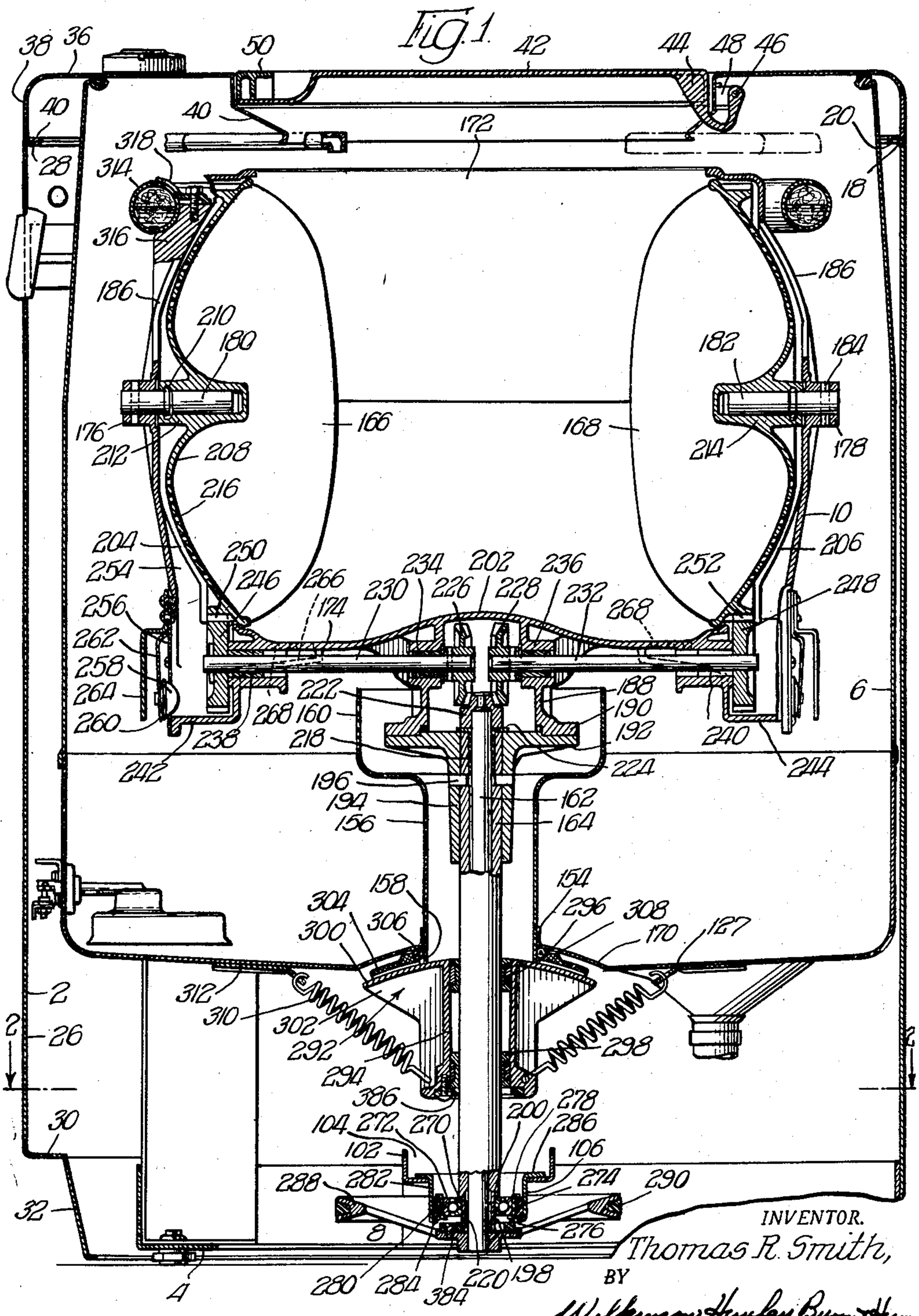

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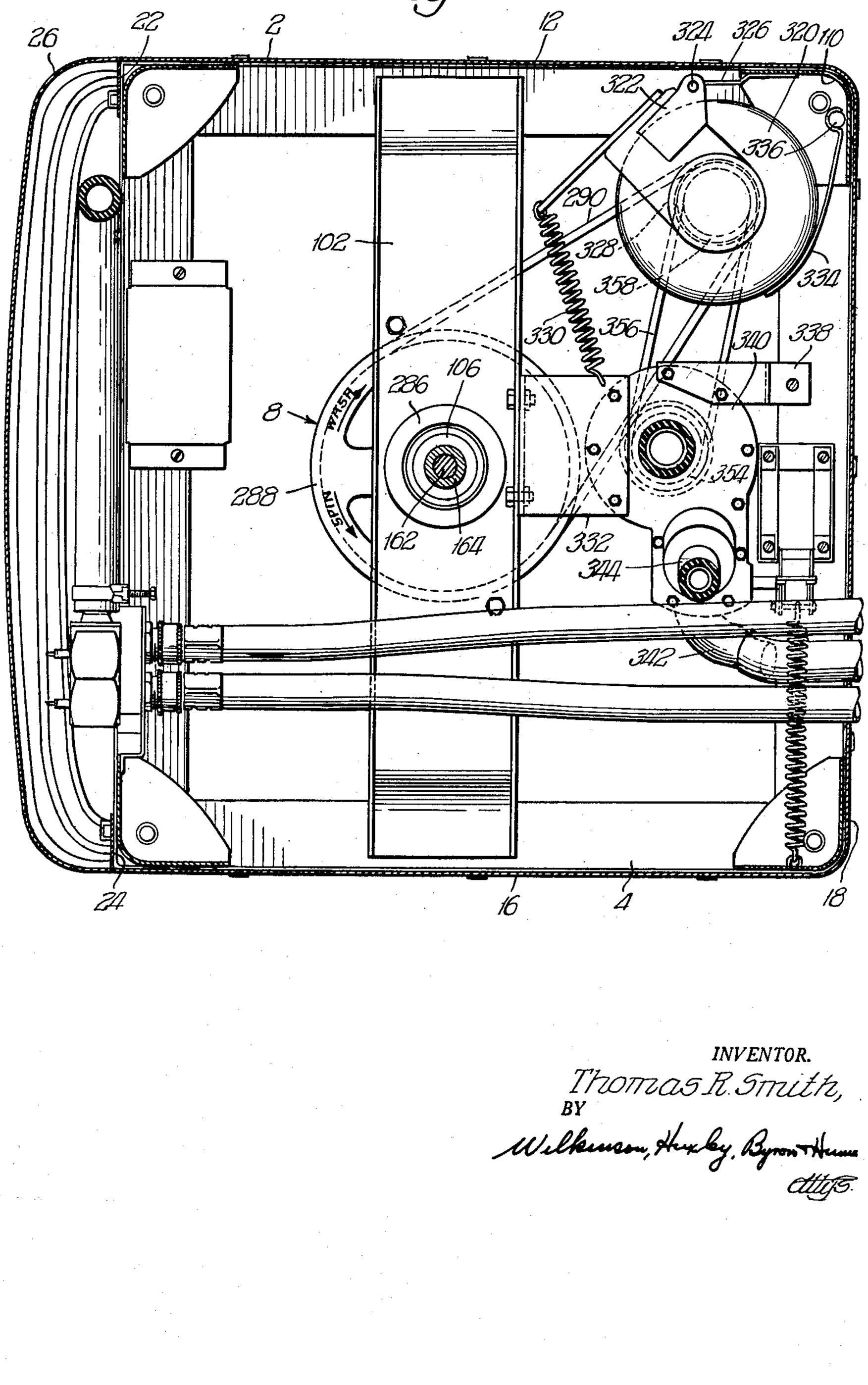
Fig. 2.



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2,653,483

WASHING MACHINE

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Original application December 20, 1948, Serial No. 66,229. Divided and this application October 17, 1950, Serial No. 190,518

5 Claims. (Cl. 74—242.15)

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The present invention relates to washing machines, and more particularly to washing machines of the type in which a washing operation is accomplished by agitating the liquid and material contained therein and in which the tub is thereafter rotated to extract the liquid from the material to effect a partial drying thereof.

This application is a division of the parent application Serial No. 66,229, filed December 20, 1948, for a Washing Machine.

One object within the purview of the present invention is to provide novel means for controlling the driving relation between the motor for the washing machine and the rotating tub assembly, whereby the motor is protected against overloading during the spinning or extracting operation.

Another object is to provide in a washing machine a reversible driving arrangement whereby the motor operates in one direction for driving the agitators for washing and in the opposite direction for spinning the tub for extracting liquid from the washed clothes, the motor being flexibly mounted to prevent excess loads thereon.

Another object is to provide a simple, novel and efficient driving and transmission arrangement for washing machines wherein a smooth operation is maintained to meet the requirements for successful use.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a vertical cross-sectional view of an automatic washing machine embodying the present invention;

Figure 2 is a horizontal cross-sectional view taken substantially in the plane represented by lines 2—2 of Figure 1 of the drawings.

Referring now more in detail to the drawings, an embodiment selected to illustrate the combined washing and drying machine for washing, rinsing and spin drying fabrics and the like, generally comprises an outer casing or cabinet 2 for completely enclosing the various parts of the washing machine, and which is supported upon a base structure 4 which also serves to support an outer stationary tub 6, an inner tub 10 rotatably mounted therein, and power operated means generally referred to as 8 for the washer.

The casing or cabinet 2 is formed of a plurality of parts made from sheet metal, one of said parts being fabricated from a single sheet of metal to provide oppositely disposed side wall

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panels 12 and 16 and a back wall panel 18, said panels being provided with an inturned horizontally flanged portion 20 along their upper edge, and the said panels 12 and 16 at the forward marginal edges remote from the back panel being provided with inturned oppositely disposed vertically extending flanges 22 and 24. These flanges 22 and 24 are adapted to mate with and be rigidly secured to similar vertical flanged portions provided on opposite sides of a curved front panel 26. This front panel is also provided with an upper horizontally disposed inturned flange 28 disposed in the plane of the horizontal flanges 20 on the side and the back wall panels. The lower portion of the front panel terminates with an inwardly extending flanged portion 30 above the lower edge of the side and back wall panels to provide a toe space for the operator. A separate cover or foot board 32 is secured to the base assembly. Disposed above the inturned horizontal flanged portions is a horizontal relatively flat cover or top 36, preferably formed from a single piece of metal and having vertically extending side portions 38 terminating in the inturned horizontal flanged portions 40 at the lower end thereof which mate with the flanged portions 18 and 28, the same being fastened thereto in any desired manner.

The top wall or cover 36 is formed with a centrally located access opening defined by a downwardly and inwardly extending flange 43 to permit access to the inner receptacle or tub 10. This opening is normally closed by the lid or door 42 hinged by the U-shaped member 44 at one end thereof by means of horizontally disposed hinge pins 46 mounted in spaced brackets 48 on the under side of the cover or top wall 36. This lid swings upwardly to a substantially vertical position and is provided with a handle or grip 50 at the end opposite the hinge 44 to provide means for raising or lowering the lid.

The bottom 127 of the stationary tub 6 is formed with a centrally disposed opening defined by the up-standing annular flange 154 to which is secured stand-pipe 156 in the form of an up-standing sleeve or tubular shaped member. The sleeve 156 projects downwardly below the bottom of the tub, as at 158, and extends upwardly above said bottom and terminates in an enlarged cylindrical portion 160. This up-standing sleeve provides means through which concentrically arranged shafts 162 and 164 extend, these shafts being driven to actuate the agitators 166 and 168 and for rotating the inner tub or receptacle 10. The up-standing sleeve 156 is spaced from the

concentrically arranged shafts to permit lateral and gyratory movement thereof. The central portion of the tank bottom 127 adjacent to and outwardly of the annular flange 154 is provided with a spherical surface 170 for a purpose to be hereinafter more fully disclosed.

The inner rotary tub or receptacle 10 is disposed within the upper portion of the stationary tub 6 and is spaced from the side walls thereof a sufficient distance to permit of a certain amount of lateral or gyratory movement thereof without contacting the same. The said inner tub is in the general form of a truncated spherical hollow body member terminating in a horizontal plane at its upper marginal edge to provide an access opening 172 which is in alignment with the opening in the cabinet formed by the flange 40 whereby the interior thereof is accessible to the operator. This hollow body member is provided with a substantially horizontally disposed bottom wall 174 opposite the opening 172.

The upper and lower portions of the receptacle 10 are formed with mating hub portions which extend outwardly and in opposed relation to one another to provide the horizontally aligned hubs 176 and 178 which are adapted to receive the stub shafts 180 and 182 secured therein by means of pins or the like 184, upon which the agitators 166 and 168, respectively, are mounted for rotation about a horizontal axis. The tub 10 is further provided with the oppositely disposed offset portions 204 and 206 to accommodate the agitators 166 and 168, respectively, and the driving mechanism therefor, and in the side wall of which is formed a plurality of relatively large openings 186, each of which has its lower marginal edge disposed slightly above the horizontal axes of the stub shafts 180 and 182 which define a maximum liquid level for liquid within the tub 10 and serve to permit the washing liquid to flow therethrough when the level thereof tends to rise above the plane of the lower marginal edges of these openings and also when the tub is rotated about its vertical axis.

The bottom wall 174 of the tub 10 is provided with an integrally formed housing structure 188 concentrically arranged with respect to the vertical axis of the receptacle 10 and having an annular and outwardly extending flange 190 seating upon, and being secured as by bolts or the like, to the outwardly disposed flange 192 of the hub member 194 which is secured to the outer hollow shaft 164 through the medium of pins 196, or any other suitable connecting means. The hollow rotatable shaft 164 extends downwardly through the opening provided in the sleeve member 156 of the outer tub 6 and is formed at its lower end with a reduced portion 198, having a shoulder 200 engaging a combined radial and thrust bearing assembly 106, whereby the inner tub is supported axially solely by this bearing, the said combined radial and thrust bearing assembly serving as a pivot point about which the said tub 10 is rotated, as will be explained more fully hereinafter. The bottom of the tub 10 adjacent the central axis of the same, and immediately above housing 188, is provided with a raised or crowned surface 202 for accommodating certain driving mechanism disposed within the said housing 188.

The agitators 166 and 168 are of similar construction and each comprises a substantially spherical shaped base or disk portion 208 fitting within the offset portions 204 and 206, respectively, to provide a substantially uninterrupted

inner surface for tub 10. The agitators are removably secured to shafts 180 and 182 by means of the spring retaining rings 210 fitting within complementary annular grooves formed in the shafts 180 and 182 and the hubs 212 and 214 of the agitators 166 and 168, respectively. The disk portions 208 of the agitators are provided with a plurality of openings 216 which extend therethrough so that water or washing liquid may flow through such openings to the openings 186 and into the outer tub 6. Each of the agitators is preferably provided with a single vane, as illustrated, which extends vertically outwardly from the base and extends substantially across the entire width of said base. These vanes, when the agitators are mounted within the receptacle 10, project toward the center of the inner tub 10 and the same are capable of agitating the liquid disposed within the tub or container when the same are rotated.

The inner shaft 162 is journalled in the outer sleeve 164 with its upper and lower portions in the bearings 218 and 220, respectively, and extends upwardly beyond the flange 192 and into the housing 188, the upper end thereof having the bevel pinion 222 secured thereto. The bevel gear 222 is mounted on the upper surface of the outer shaft 164 through the thrust bearing 224, which prevents the inner shaft 162 from moving in a downward vertical direction, and to position the same with respect to the hollow shaft 164. The bevel pinion 222 meshes with the bevel gears 226 and 228 mounted adjacent the inner ends of drive shafts 230 and 232, respectively, which extend outwardly and horizontally in opposed relation and are journalled adjacent their inner ends in the inner bearings 234 and 236 formed in the housing 188 and adjacent their outer ends in the bearings 238 and 240. The bearings 238 and 240 are provided in the recess housings 242 and 244 disposed adjacent to and immediately below the agitators 166 and 168, respectively. Mounted on the drive shafts 230 and 232 adjacent their outer ends are spur pinions 246 and 248 disposed within housings 242 and 244, respectively, which mesh with spur gears 250 and 252 of relatively large diameter, which may be integrally formed with the agitators 166 and 168, respectively, or formed separately and connected thereto. It will be seen from the drawings, that as the drive shaft 162 is rotated in any given direction that the bevel gear 222 connected thereto will rotate the bevel gears 226 and 228 in opposite directions for driving the shafts 230 and 232 and the agitators 166 and 168 operatively connected in driving relation thereto, in opposite directions. Due to the opposite rotation of the agitators, the liquid or cleaning fluid within the receptacle 10 is forced from one side or face of one of the agitators to the oppositely facing side of the other agitator and is forced downwardly and over to the other side of the face thereon and is discharged therefrom and is then caused to flow back to the adjacent face of the first agitator by the second agitator. The opposite rotation of the agitators causes the liquid to flow in a continuous direction in a horizontally circular manner between the agitators and in a vertical semi-circular manner at and adjacent the agitators. The flow, however, will be very turbulent as the body of liquid is moved in the general direction indicated.

The housings 242 and 244 are each in communication with the interior of the tub by way of channels, such as 254, and the openings 216

in the agitators. Laterally and on both sides of shafts 230 and 232, the housings 242 and 244, respectively, are formed with radially extending portions 266 connected to the bottom wall 174 of the inner tub to provide passageways communicating at one end with the recesses formed by the housings 242 and 244 and at the other end with the interior of the inner tub 10 through openings 268 provided in the bottom wall 174.

Each of the housings 242 and 244 is provided with an opening exteriorly of the tub 10 which is closed by a wall element 256 connected to the tub 10 in any desired manner. The wall is apertured, as at 258, to permit water or cleaning fluid to be discharged from the tub 10 when the same is rapidly rotated in the washing cycle. The opening 258 is normally closed by a valve member 260, spring pressed into such position by means of the spring member 262 which permits the valve member 260 to be opened against the action of the spring during relatively high speed of the tub 10. The outward movement of the valve members 260 is limited by stop elements 264 connected to the tub 10 in any desired manner.

The primary object of the valves 260 is to provide means for flushing dirt and other foreign matter away from the pinions and gears, which may have collected during the washing cycle in the recesses formed by the housings 242 and 244. Water or cleaning fluid for this flushing operation passes from the interior of the tub 10 outwardly through openings 216 in the agitators and channels 254 and through the openings 268 into the recesses formed by the housings 242 and 244.

As previously pointed out, the hollow shaft 164 is formed with a reduced portion 198 providing the shoulder 200 which is in operative association with the radial and thrust bearing assembly generally referred to by the reference numeral 106. More particularly, the said shoulder 200 engages the inner race-ring 270 of the bearing 106 to support the shaft 164 in vertical position. The outer race ring 272 is mounted in and connected to an annular member 274, S-shaped in vertical cross-section, the same being provided with a lower inturned flange 276 for supporting the outer race ring 272 and with an upper outwardly disposed flange 278 which overlaps and engages an annular shaped rubber bushing 280. This bushing, which may be of any desired resilient material, is positioned by an annular dish shaped retaining member 282 which has an inwardly disposed flange 284 on which the annular resilient bushing 280 is mounted and an upper and outwardly extending flange 286 which is disposed within the opening 104 of the channel member 102 and overlaps the same and is rigidly connected thereto in any desired manner.

The inner drive shaft 162 extends downwardly through the hollow shaft 164 and is journalled in the bearings 218 and 220 as previously indicated to prevent relative radial movement between these drive elements. The extreme lower end of the shaft 162 projects downwardly beyond the restricted portion 198 of the hollow shaft 164 and has a driving pulley or wheel 288 keyed or otherwise secured thereto in any suitable manner, whereby the same is adapted to drive the shaft 162. It is to be noted that the reduced end portion 198 is disposed to have its end in abutting relation to the hub of the pulley 288 so as to prevent relative axial movement of the two shafts 162 and 164.

From the foregoing it will be seen that the combined radial and thrust bearing 106 not only

supports the receptacle 10 but, through the thrust bearing 224 disposed between the bevel pinion 222 and the supporting hub member 194, maintains the pulley 288 in its proper operative position. As the receptacle 10 is caused to move laterally within the stationary tub 6 during the spinning operation, or if the same is moved in any manner away from its vertical position, the receptacle 10 will tilt about the bearing assembly 106, it being noted that the bearings constitute the sole support for the receptacle 10 and the agitators, and their operating mechanism. The pulley 288 is dish-shaped in such a manner that the horizontal plane defining the center of the groove for the driving belt 290 fitting therein, extends through the pivot point of the bearing assembly 106 in order to minimize deflection of the driving belt.

In order to maintain the receptacle 10 in substantially its vertical position, there is provided a combined stabilizing and damper mechanism, generally referred to as 292, which is disposed immediately below the bottom 127 of the stationary tub 6. This mechanism includes a hollow sleeve-like member 294 surrounding the hollow shaft 164 which is provided with two radial bearings 296 and 298 journalled upon the hollow shaft 164 adjacent the upper and lower end portions of the tubular member 294. The upper end of the central tubular member 294 is formed with a spherical shaped wall 300 reinforced by a plurality of downwardly extending webs or brackets 302 which provides a spherical shaped friction surface. The spherical shaped wall 300 is adapted to contact a spherical shaped member 304 formed of friction material which is mounted upon the lower wall 127 adjacent the spherical shaped portion 170 through an annular tubular member 306 which surrounds the downwardly extending end portion 158 of the sleeve 156. The hollow tubular member is preferably formed of some resilient material, the same being adapted to engage an annular shoulder 308 provided adjacent the inner marginal edge of the member 304. Adjacent the lower end of each of the webs or brackets 302, four being provided in the illustrative embodiment of the invention herein described, there is provided an opening engaged by one end of a coil spring 310, which has its other end connected to the stationary tub 6 by means of a bracket 312 connected to the bottom wall 127 thereof. These springs are uniformly spaced around the member 294 so that springs of each pair are disposed in opposite relation to one another and due to the angular position of these springs with respect to the tub and the connection at the lower end of the webs 302, a component of the spring force is applied in a vertical direction to the friction member 304. Since each spring is equally loaded and opposed by an oppositely disposed spring, the tub 10 will be maintained in its vertical position under normal conditions. Should the receptacle 10 tend to move away from the vertical, the spring forces acting through the member 294 will tend to return it to its neutral or vertical position where the spring forces are all equal and opposite. As will be apparent, the surface of the spherical wall 300 is forced by the springs 310 toward the friction member 304 and, as the tub tends to move in a horizontal plane, a certain portion of the energy tending to move the tub is absorbed by the friction member. This friction member, therefore, tends to reduce the amplitude or extent of horizontal movement of the tub and absorbs some of the energy applied thereto.

Disposed about the outer periphery at the upper portion of the tub 10 is an annular or circular hollow tubular balancing member or ring 314 mounted in spaced relation to the receptacle upon a plurality of lugs 316 which are formed integrally with the tub and held in position by clamps 318 which grip the ring and are bolted to the lugs. The inner hollow portion of the balancing ring is packed with steel wool or other material to provide a large amount of exposed area for restricting and retarding to a certain degree the movement of a balancing fluid therein which partially fills the ring.

The driving means for the pulley 288 comprises a reversible motor 320 vertically mounted in, and supported by a frame 322 pivoted to the stationary bracket 326 connected to the vertical supporting element 110 of the base structure 4 for movement about a vertical shaft or axis 324 in remote relation to the axis of the motor. A drive pulley 328 having a V-shaped peripheral groove is connected to the rotor shaft of the motor and is adapted to drive the pulley 288 through the belt 290. The belt 290 is maintained under its proper belt tension by means of a horizontally disposed pre-loaded spring 330 connected at one end to the housing 322 and at its other end to the bracket 332 secured to the base assembly 4, said spring acting to move the motor and its supporting frame 322 about its vertical supporting axis 324 in a direction away from the driven pulley 288.

In bringing the tub 10 and its contents up to spinning speeds, a motor of the size which it is desirable to use in a washing machine of the type herein disclosed, will not attain its operating speed fast enough to prevent the starting winding thereof from burning out. In order to eliminate this difficulty, the motor 320 is pivotally mounted as described and operates in a counter-clockwise direction, as disclosed in Figure 2 of the drawings, to spin the tub 10 and in a clockwise direction to rotate the agitators 166 and 168. The pivot 324 is arranged with respect to the motor so that the reactive torque of the motor operates against the spring 330 which holds the belt 290 tight so that the belt is loosened during the rotation of the motor in a counter-clockwise direction sufficiently to allow the motor pulley 328 to slip on the belt 290. The spring 330 is adjusted so that the motor pulley will slip on the drive belt at a value considered to be the maximum safe output torque of the motor. In the operation of the washing machine, as soon as the motor is rotated in a counterclockwise direction, as viewed in Figure 2 of the drawings, the same immediately comes up to speed and slips on the belt 290 and provides a maximum safe torque which gradually accelerates the pulley 288 and the structure which is to be rapidly rotated thereby, including the tub 10 and the contents thereof. When the motor is rotated in the reverse direction for operating the agitators, it is evident that the torque required to cause slipping is much greater as the pulley tends to move up on the side of the belt which is closer to the pivot point 324 and, accordingly, there is less leverage tending to move the frame structure 322 against the action of spring 330. With this arrangement, slipping of the motor can be provided for spinning the tub 10 in one direction and ample torque is provided for operating the agitators without danger of belt slippage in the reverse direction. When the motor 320 is operated to spin the tub 10 there will be a tendency under some conditions for the motor to hunt or oscillate about the pivot point 324. In order to prevent this oscillation or hunting of the motor a friction damper is provided. This friction damper comprises a leaf spring 334 connected to the motor housing at one end thereof and being provided at its other end with a transverse groove adapted to hold the friction member 336 therein and against the inside face of the angle iron 110 upon which the motor is pivotally supported.

Rigidly secured to brackets 332 and 338 of the base assembly, and disposed between the drive and driven pulleys 328 and 288, is a reversible pump 340 capable of operating in either direction of rotation of the motor 320 for pumping liquid from the tub 6 either through a conduit 342 to drain, or through a conduit 344 back to the receptacle 10 for recirculation.

The piping, directions of flow of water and the pump structure form no part of the present invention and accordingly will not be further described.

The pulley 354 is formed with a V-shaped annular peripheral groove adapted to receive a belt 356 which is driven by pulley 358 fixed to the drive shaft of the motor 320. The control of the flow of liquid either for recirculation through the conduit 344 or to drain through the conduit 342 is effected by any suitable valve mechanism.

Mounted on the inner side of the hub of the driving pulley 288 is a one-way clutch 384 comprising a body portion having tapered slots therein which have their openings disposed adjacent the reduced end portion 198 of the hollow shaft 164. A plurality of rollers are disposed in these slots so that when the driving pulley 288 is rotated in a clockwise direction, as viewed in Figure 2 of the drawings, as, for example, when the agitators 166 and 168 are being operated, the rollers will be disposed in the larger part of the slots and, accordingly, no turning movement is applied to the hollow shaft 164 upon rotation of the pulley 288. At this time the pulley 288 which is connected to the shaft 162 causes rotation thereof for operating the said agitators. When the direction of rotation of the pulley 288 is reversed, however, the rollers move along the tapered slots and grip the hollow shaft 164 to effect a driving connection between the pulley 288 and said hollow shaft 164. It will be apparent that during this operation the inner and outer shafts 162 and 164 are rotated together in the same direction, and at the same speed, and inasmuch as there is no relative movement therebetween, the agitators 166 and 168 are maintained stationary with respect to their axes of rotation but the same will be revolved about the vertical axis of the tub 10.

During the rotation of the inner shaft 162, when the agitators 166 and 168 are rotated for a washing operation, there is a natural tendency for the receptacle 10 to rotate with the inner shaft 162 which, if permitted, would reduce the effectiveness of the washing action of the agitators. In order to maintain the tub 10 stationary during the washing operation there is provided a one-way clutch 386 mounted in the lower end of member 294 of the stabilizing and damper mechanism 292 which is adapted to hold the tub 10 and to prevent its rotation. This one-way clutch is similar to the one-way clutch 384, except that the tapered slots formed in the body portion are disposed oppositely to the tapered slots in the one-way clutch 384. When the shaft 162 is rotated to rotate the agitators, the rollers

of this one-way clutch 386 are positioned to grip the hollow shaft 164 and, inasmuch as the stabilizing and damper mechanism 292 is connected to the stationary tub 6 through the springs 310, rotation of the hollow shaft 164 cannot occur. When the rotation of the driving pulley is in the reverse direction and the one-way clutch 384 grips the outer hollow shaft 164 to cause the tub 10 to rotate about its vertical axis, the one-way clutch 386 is released.

In a washing and drying machine of the type herein disclosed it is desirable to provide means for automatically operating the same. Such is fully described in the above identified parent application and is not being claimed in this divisional application. It might be stated however that the washing and drying machine above described is automatically operated through a complete cycle without its being necessary for the operator to do anything other than to adjust the control knobs prior to the time that the machine is set in operation.

In accordance with the contemplated operation of the washing and drying machine, the operator opens the lid 42 and places the clothes or fabrics to be washed in the receptacle 10. A proper quantity of a detergent is then poured into the receptacle, after which the lid is closed and then dependent upon the setting the machine is operated in a predetermined sequence.

In connection with the operation of the agitators 166 and 168 for washing and the spinning of the tub 10 for extracting liquid from the clothes or fabrics the reversible motor 320 is provided. The motor is pivotally supported on a vertical axis 324 in a manner whereby the motor pulley 328 is adapted to move toward the operatively associated pulley 288 to permit said motor pulley to slip with respect to the belt when the load upon the motor exceeds a predetermined value. The spring 330 is provided to urge the motor pulley into driving relation with the belt 290 and as stated, it is yieldable when the load exceeds said predetermined value. Also there is provided the friction member 336 engageable with a support to prevent oscillation of the motor 320 about its pivotal support 324 when the motor pulley slips with respect to belt 290.

While I have herein described and by the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit of the invention.

What is claimed is:

1. In combination, a support, a reversible motor having a drive pulley, means driven by said motor including a driven pulley, a belt drive between said pulleys, means for pivotally supporting said motor upon said support for movement about a vertical axis to provide a positive driving relation between said drive pulley and belt in one direction of rotation of said motor and to provide for movement of said motor pulley toward said driven pulley to permit said motor pulley to slip with respect to said belt drive upon rotation of said motor in the other direction when the load upon said motor exceeds a predetermined value, means for urging said motor pulley into driving relation with said belt drive, said means being yieldable when said load exceeds said predetermined value, and spring means connected to said motor and having a friction member engageable with said support to prevent oscillation of said motor about the pivotal support when the motor pulley slips with respect to said belt drive.

2. In combination, a support, a reversible motor having a drive pulley, means driven by said motor including a driven pulley, a belt drive between said pulleys, means for pivotally supporting said motor upon said support for movement about a vertical axis to provide a positive driving relation between said drive pulley and belt in one direction of rotation of said motor and to provide for movement of said motor pulley toward said driven pulley to permit said motor pulley to slip with respect to said belt drive upon rotation of said motor in the other direction when the load upon said motor exceeds a predetermined value, a spring connected to said motor and support for urging said motor pulley into driving relation with said belt drive, said spring being tensioned to yield when said load exceeds said predetermined value, and spring means connected to said motor and having a friction member engageable with said support to prevent oscillation of said motor about the pivotal support when the motor pulley slips with respect to said belt drive.

3. In combination, a reversible motor having a drive pulley, means driven by said motor including a driven pulley, a belt drive between said pulleys, means for pivotally supporting said motor whereby the axis of the rotor for said motor is disposed laterally of a line extending between said pivot means and the axis of rotation of said driven pulley to provide a positive driving relation between said drive pulley and belt in one direction of rotation of said rotor and to permit said motor pulley to slip with respect to said belt upon rotation of said rotor in the opposite direction when the load upon said motor exceeds a predetermined value, and means for urging said motor pulley into driving relation with said belt, said means being yieldable when said load exceeds said predetermined value.

4. In combination, a reversible motor having a drive pulley, means driven by said motor including a driven pulley, a belt drive between said pulleys, means offset laterally from a line extending between the motor axis and the axis of rotation of said driven pulley for pivotally supporting said motor, and preloaded yieldable means for urging said drive pulley into driving relation with said belt, the preloading of said yieldable means being such that the drive pulley is moved toward the driven pulley to permit belt slippage when said motor is rotated in one direction and the load thereon exceeds the amount of said preloading, said preloading of said yieldable means also being such that when said motor is rotated in a reverse direction under load in the amount of said preloading a positive non-slipping driving relation is effected between the drive pulley and belt but to permit belt slippage when the load on said motor considerably exceeds the amount of said preloading.

5. In combination, a reversible motor mounted for rotation about a vertical axis and having a drive pulley, means driven by said motor including a driven pulley, a belt drive between said pulleys, a support for said motor mounted to pivot about a vertical axis whereby the vertical axis of said motor is disposed laterally of a line extending between said vertical pivot axis and the axis of rotation of said driven pulley, and preloaded resilient means for urging said motor pulley into driving relation with said belt, said pivotal mounting and loading means acting to provide a positive driving relation between said

drive pulley and belt in one direction of rotation of said motor and to permit said drive pulley to slip with respect to said belt upon rotation of the motor in the opposite direction when the load upon said motor exceeds a predetermined value, said preloaded means being yieldable when the load exceeds said predetermined value to permit said motor to move in the direction of said driven pulley.

THOMAS R. SMITH.

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