Dec. 13, 1960 C. F. EDWARDS 2,963,892

FABRIC LAUNDERING MACHINE

Filed Jan. 21, 1958 4 Sheets-Sheet 1

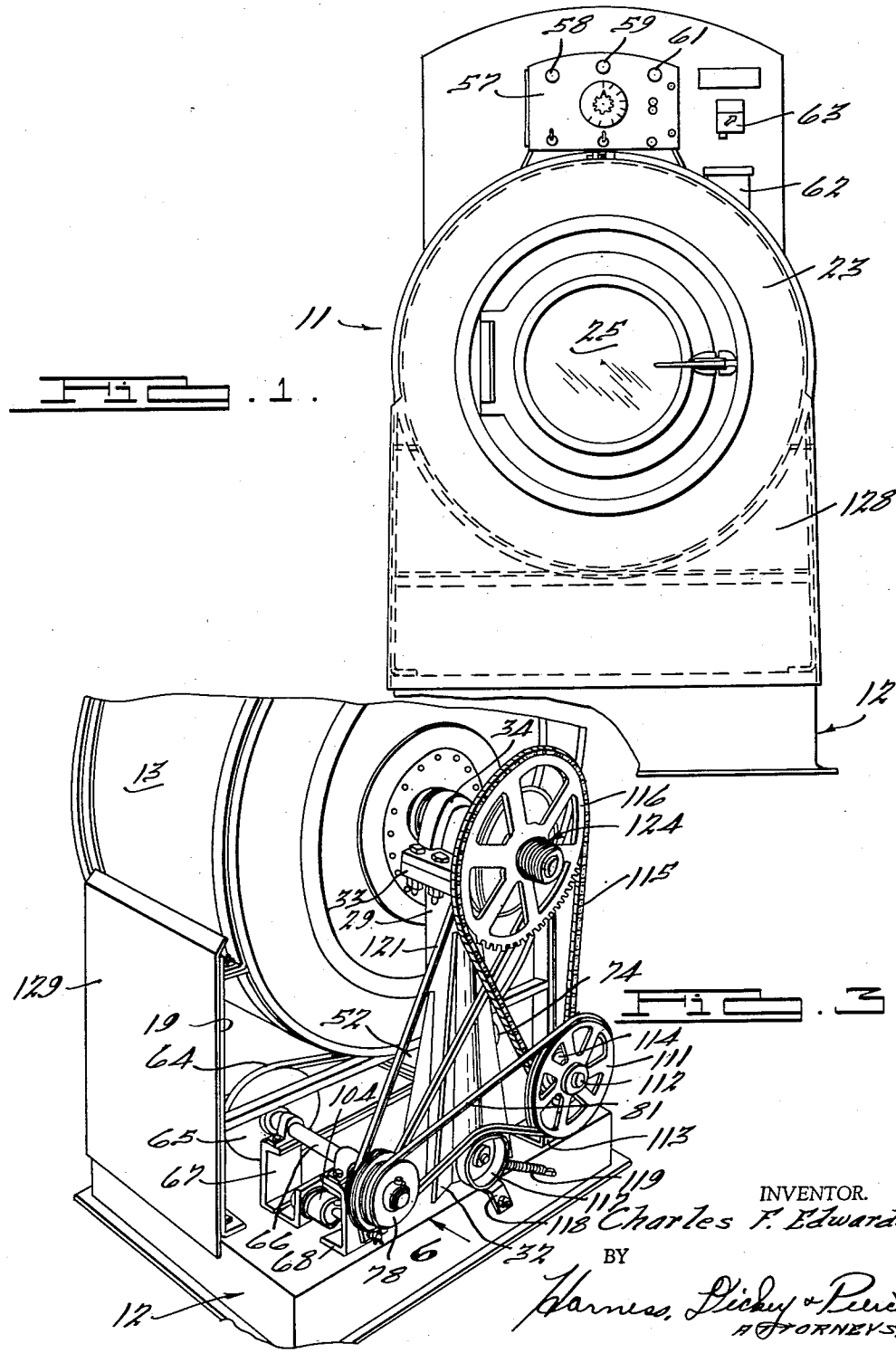

FIG. 1.

FIG. 3.

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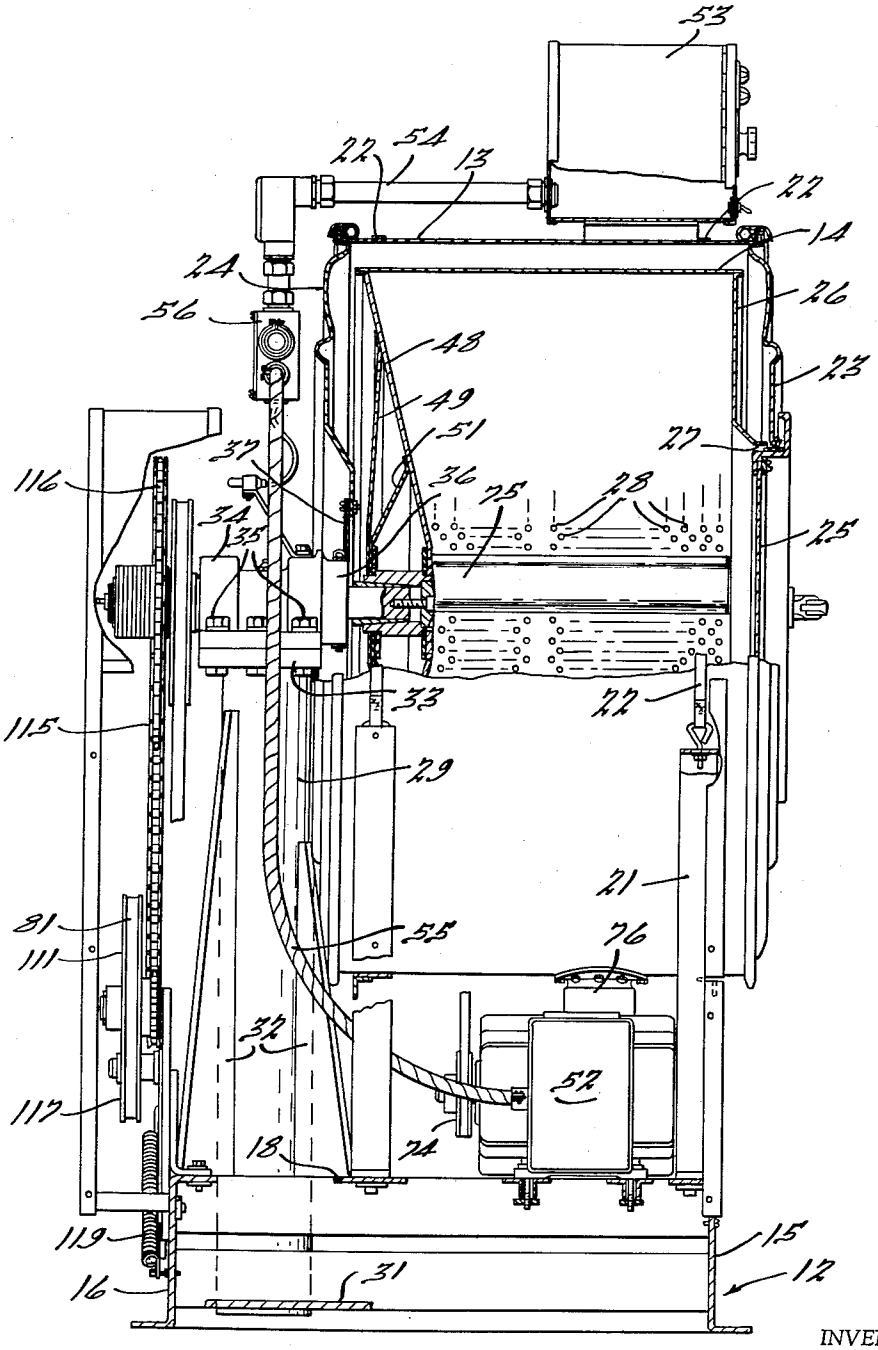

FIG. 2

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FABRIC LAUNDERING MACHINE

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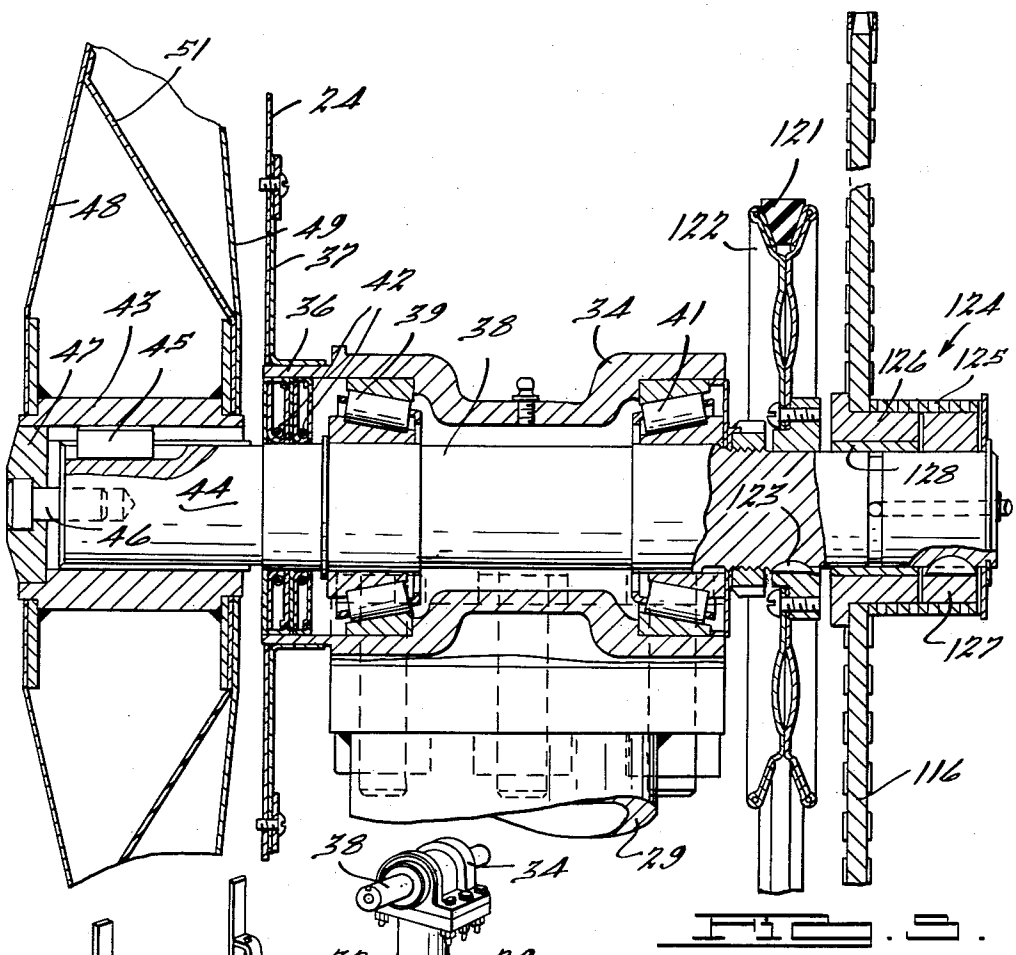

FIG. 3.

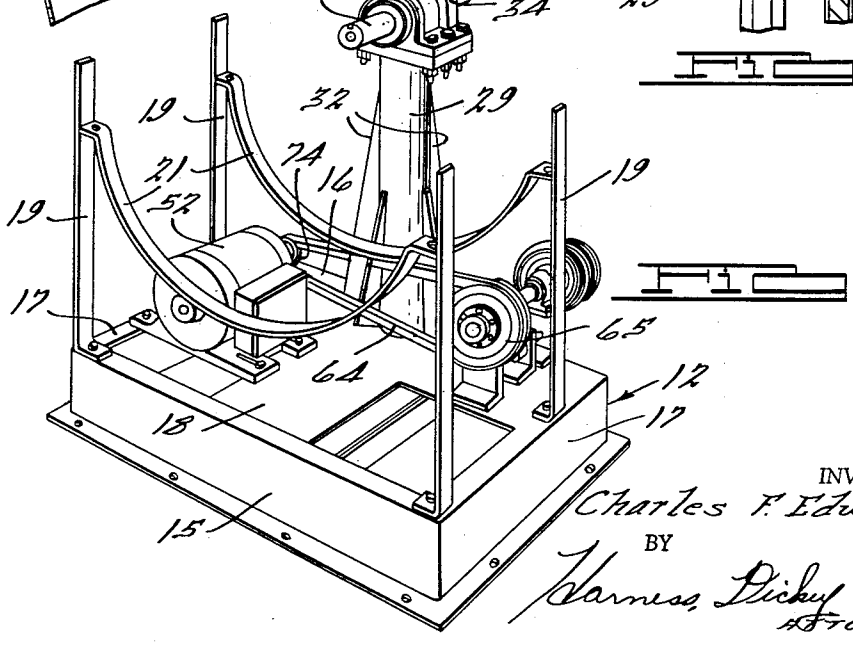

FIG. 4.

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FABRIC LAUNDERING MACHINE

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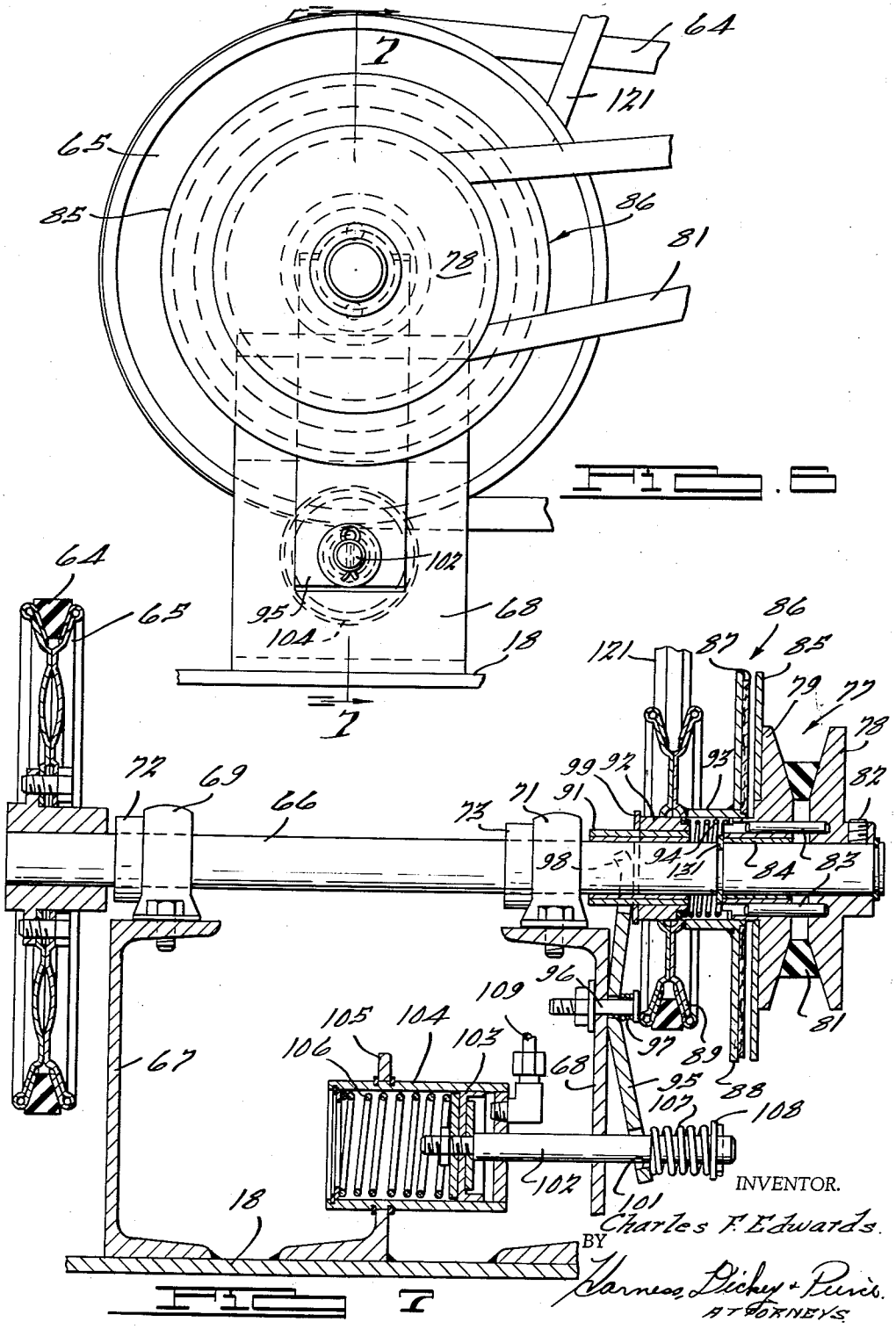

FIG. 7

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FABRIC LAUNDERING MACHINE

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5 Claims. (Cl. 68—140)

This invention relates to fabric laundering machines, and more particularly to washing machines of the type usually installed in laundries and similar commercial establishments.

One of the problems heretofore associated with the construction of large-sized washing machines for commercial use has been the provision of rotary drive means which can withstand the excessive stresses created by acceleration and deceleration of the rotating drum during transition between the washing or rinsing and centrifugal extracting portions of the cycle. Another difficulty which has been encountered has been in the attainment of a rigid supporting structure for the rotating unit, within the floor space limitations imposed in most commercial establishments, so that vibration and noise created by the unit will be minimized.

It is a further object to provide an improved laundering machine construction, in which the rotating parts are supported by an extremely rigid construction which nevertheless occupies a minimum of space and is economical to fabricate.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a front elevational view of the improved laundering machine of this invention showing the general configuration of the unit as well as the control housing;

Figure 2 is a side elevational view of the assembly, parts being sectioned, and showing the manner in which the drum and tub interfit;

Figure 3 is a perspective view of the lower portion of the machine with portions of the housing removed and showing the clutch, pulley and belt connections as well as the supporting post;

Figure 4 is a perspective view of the base and supporting frame together with the supporting post with the drum and tub removed;

Figure 5 is a fragmentary cross-sectional view of the bearing for the drum shaft, showing the two alternate drives for the shaft;

Figure 6 is a fragmentary elevational view taken in the direction of the arrow 6 of Figure 3 and showing the variable speed pulley; and

Figure 7 is a cross-sectional view taken along the line 7—7 of Figure 6 and showing the friction clutch for the high-speed pulley as well as the clutch actuator.

In general terms, the invention comprises a fabric laundering machine having a laundry-containing basket or drum which is rotatable on a horizontal axis and is enclosed within a circular stationary tub. The tub and drum are supported by a novel base and support construction which includes a tubular post mounted on a rectangular base and extending upwardly therefrom, the upper end of the post carrying bearing means which support the drum shaft. This shaft extends from both sides of the post, the latter being secured in position on the base

by means of a plurality of gusset plates or webs to provide maximum rigidity. The drive means for the shaft includes high and low speed pulleys which are mounted on the shaft and are connected thereto by means of an overrunning clutch so that the low speed pulley may be continually driven while the high speed pulley is intermittently connected with the prime mover as conditions require. In order to accelerate the loaded drum with maximum efficiency to its extraction speed, the low speed drive train is provided with a variable speed V-belt pulley in the form of two members, one of which is axially adjustable with respect to the other. During periods of slow speed rotation, this pulley is adjusted to its maximum width or minimum diameter, giving a relatively high reduction ratio. A friction clutch is provided between the high speed pulley and the drive shaft, and when this clutch is engaged, it simultaneously urges the variable speed pulley towards its closed or large-diameter position, thus accelerating the drum speed while the friction clutch slips due to the inertia of the loaded drum. This will aid the drum in overcoming its inertia to attain the higher speed with a minimum of wear on the friction clutch and the other parts of the drive train.

Referring more particularly to the drawings, the laundering machine is generally indicated at 11 and comprises a base generally indicated at 12, an annular tub 13 supported by the base and a rotary drum 14 disposed within the housing. The construction of base 12 is perhaps best seen in Figures 2 and 4, the base comprising front and rear frame members 15 and 16 and side frame members 17 with appropriate bracing members therebetween. A bed blade 18 extends across the top of base 12 and serves to support four standards 19, best seen in Figure 4. A pair of saddle members 21 extend between standards 19, and tub 13 rests in these saddle members, straps 22 surrounding tub 13 and being secured to the ends of the saddles. The tub is provided with a front panel 23, best seen in Figure 2, and a rear panel 24, a door 25 being provided in the front panel. The front plate 26 of drum 14 has a central opening 27 with a flanged portion surrounding door 25. Drum 14 is provided with perforations 28 for the passage of water into the annular space between drum 14 and tub 13, it being understood that the outer wall of drum 14 could be made of other water-permeable material.

Novel means are provided for rigidly supporting tub 13 and drum 14 for rotation therein. This support comprises a post 29 secured at its lower end to base 12 and extending upwardly therefrom adjacent the central portion of rear base frame member 16. Post 29 is welded or otherwise rigidly secured to a lower plate 31 of base 12 and to upper plate 18, a plurality of webs or gusset plates 32 being secured to plate 18 and post 29 at circumferentially spaced locations. Post 29 is preferably of hollow or tubular construction and is of sufficient diameter to afford maximum rigidity with respect both to bending and twisting forces. The upper end of post 29 is provided with a flange 33 which is surmounted by a bearing housing 34 secured thereto by bolts 35. The central portion of rear wall 24 of tub 13 is secured to a projecting portion 36 of bearing housing 34, as best seen in Figures 2 and 5, by means of a seal 37.

Drum 14 is supported for rotation within tub 13 by means of a shaft 38 extending through bearing housing 34. More specifically, shaft 38 is supported by a pair of anti-friction bearings 39 and 41 disposed within bearing housing 34, these bearings providing both radial and thrust bearing support for the shaft. Seals 42 are provided at the end of bearing housing 34 adjacent tube 13 to prevent water leakage. A sleeve 43 is secured to the projecting end 44 of shaft 38 by means of a key 45 and a retaining bolt 46 and cap 47. Secured to sleeve

43 are a pair of spaced end walls 48 and 49 of drum 14, these walls tapering toward each other as seen in Figures 2 and 5 with wall 48 flaring outwardly while wall 49 is substantially in a vertical plane. The outer edge of wall 49 is secured to an intermediate portion of wall 48, the latter wall extending outwardly from this juncture and being joined to the perforated outer wall of drum 14. An additional annular bracing plate 51 is disposed between walls 48 and 49, as seen in Figure 2, this plate flaring toward the other end of the drum and being secured at its opposite edges to the inner portion of wall 49 and an intermediate portion of wall 48. It will thus be observed that drum 14 is firmly supported for rotation within tub 13 and that the supporting structure, including the triangular cross-sectional shapes of walls 48 and 49 and brace 51, will offer high resistance to vibrational, drooping and twisting movements of the drum while providing maximum drum capacity.

The means for rotating drum 14 comprises an electric motor 52 mounted on base plate 18 as seen in Figures 2 and 4, although it will be understood that other rotary driving means could be used as the prime mover within the principles of the invention. Motor 52 may be controlled either manually or automatically, the illustrated embodiment including a partial showing of a conventional automatic electrical control circuit which may be connected to the machine. The controls for this circuit may be enclosed in a housing 53 surmounting tub 13, the controls being connected to motor 52 through electrial conduits 54 and 55 and a terminal box 56. For example, control housing 53 is shown as having a panel 57 with a "machine-on" light 58 which stays on during the complete cycle, a "soap" light 59 which is illuminated to indicate that soap should be added, and an "extract" light 61 lighted during extraction. Figure 1 also illustrates a soap chute 62 on tub 13 and a portion of the water inlet 63, it being understood that the above-described parts in themselves do not form part of the present invention.

As seen best in Figure 4, motor 52 is connected by a belt 64 to a pulley 65 mounted at one end of a jack shaft 66 which is supported adjacent the opposite end of base 12. The means for suporting jack shaft 66 is seen best in Figure 7. A pair of standards 67 and 68 are secured to base plate 18 and extend upwardly therefrom, bearings 69 and 71 being mounted at the upper ends of these standards. Jack shaft 66 is rotatably supported by these bearings, being prevented from axial movement by collars 72 and 73 adjacent the bearings. As illustrated, the ratio of diameters between pulley 74 on the shaft of motor 52 and pulley 65 is such that jack shaft 66 will rotate at a fraction of the speed of the shaft of motor 52.

Means are provided for rotating drum 14 at two different speeds, a relatively slow speed used during the washing and rinsing portions of the cycle and a relatively high speed for extraction purposes. The low speed is so selected as to create a tumbling action of the laundry within drum 14, this action being facilitated by a plurality of bars 75 disposed within the drum as seen in Figure 2. The high speed, on the other hand, is such that the laundry will be forced to the perforated outer wall of drum 14 forcing the water outwardly through the perforations and into the annular space between the drum and tub 13 from where it is drained through a drain pipe 76, best seen in Figure 2.

As part of the drive means of this invention, the slow speed drive comprises an adjustable diameter V-belt pulley generally indicated at 77 mounted on the end of jack shaft 66 remote from pulley 65. Pulley 77 comprises two sides 78 and 79 having facing flared surfaces for the reception of a belt 81. Pulley side 78 is fixed to shaft 66 by means of a set screw 82 and carries a plurality of axially extending pins 83 extending through apertures in pulley side 79, as best seen in Figure 7. Side 79 is slidably mounted on shaft 66 by means of a sleeve 84 for movement toward and away from side 78, both pulley sides being connected for common rotation by pins 83. It is to be noted that when side 79 approaches side 78, belt 81 will ride to a larger diameter on the facing flared pulley walls, thus increasing the belt speed so as to drive the drum at an intermediate speed. When side 79 is retracted from side 78, the belt speed will be correspondingly reduced so that drum 14 rotates at a slow speed. Movement of side 79 toward side 78 is limited by engagement of the two sides.

Pulley side 79 also carries one element 85 of a friction clutch generally indicated at 86, the other element of this clutch comprising a surface 87 of friction material mounted on a plate 88 which is secured to a high speed pulley 89. More specifically, pulley 89 is rotatably mounted on shaft 66 by means of a bearing sleeve 91, hub 92 of pulley 89 surrounding this sleeve. A connecting sleeve 93 extends between pulley 89 and clutch element 88, being secured to these two members. Provision is made for axial sliding movement of pulley 89 together with clutch element 88 toward and away from clutch element 85. A coil compression spring 94 is provided within sleeve 93, one end of this spring engaging hub 92 of pulley 89 while the other end engages the hub of pulley side 79. Spring 94 urges pulley 89 and clutch element 88 in a direction away from clutch element 85, a position in which shaft 66 will not drive pulley 89, as seen in Figure 7.

The means for moving pulley 89 and clutch element 88 toward clutch element 85 comprises a forked lever 95 which is pivotally supported at its mid-portion by a bolt 96 secured to standard 68, a spring 97 being disposed between the head of bolt 96 and lever 95 to provide a transversely yieldable type of pivot. Lever 95 is vertically disposed and of bowed or bent shape so that it may rock about its mid-portion which engages standard 68 at bolt 96. The upper end 98 of lever 95 is forked and engages a plate 99 secured to hub 92 of pulley 89. The lower end of lever 95 is apertured at 101 and receives a piston rod 102 which is secured to a piston 103 disposed within a cylinder 104. This cylinder is mounted on a bracket 105 disposed between standards 67 and 68, and encloses a spring 106 which engages piston 103 to urge piston rod 102 to the right as seen in Figure 7. A spring 107 is mounted at the outer end of piston rod 102 and engages lever 95 at one end, the other end of spring 107 engaging a collar 108 secured to the end of piston rod 102. A fluid conduit 109 is connected to the end of cylinder 104 remote from spring 106, so that pressurization of conduit 109 will cause leftward movement of piston 102, thus rocking lever 95 clockwise, as seen in Figure 7. This will cause pulley 89 and clutch element 88 to move toward clutch element 85. When friction surface 87 engages clutch element 85, further clockwise rocking of lever 95 will result in rightward movement of pulley side 79 toward pulley side 78, thus causing belt 81 to assume a larger diameter on pulley 77 when the parts are rotated. The spacing of the coils of spring 94 is of course such that friction surface 87 will engage clutch element 85 before the spring is fully collapsed, thus maintaining firm engagement of the clutch element while belt 81 is being adjusted to its larger diameter. Pressurization of conduit 109 may be accomplished by suitable medium such as air or water pressure, the control of pressure and exhaust of line 109 being accomplished by any conventional manual or automatic means. A solenoid or a manual control could also be substituted for cylinder 104 within the principles of the invention. When fluid is exhausted from line 109, spring 106 will cause rightward shifting of piston rod 102, and spring 94 will thus cause leftward shifting of pulley 89 and clutch element 88. With the parts rotating, belt 81 will thus

assume a smaller diameter on pulley **77** and clutch **86** will become disengaged.

Both low speed pulley **77** and high speed pulley **89** are connected to shaft **38** for rotation of drum **14**. More specifically, belt **81** drives a pulley **111** mounted on a shaft **112**, as seen in Figure 3, this shaft being rotatably supported on base **12** by a bracket **113**. A sprocket **114** of smaller diameter than pulley **111** is also mounted on shaft **112** and drives a chain **115** which is connected to a large diameter sprocket **116** mounted on drum shaft **38**. An idler pulley **117** is mounted on base **12** and is urged by a spring **119** against belt **81**, as best seen in Figure 3, to take up the belt slack. Pulley **117** is mounted on an arm **118** pivoted on the base. High speed pulley **89** drives a belt **121** which is connected to a pulley **122** mounted on shaft **38** adjacent sprocket **116**. Pulley **122** is secured to shaft **38** by a key **123**, whereas sprocket **116** is connected to shaft **38** by an overrunning clutch generally indicated at **124**. This clutch comprises a coil spring **125** surrounding a sleeve **126** which is secured to sprocket **116** and a sleeve **127** which is keyed to shaft **38**, sleeve **126** being rotatably mounted on shaft **38** by a bearing sleeve **128**. The arrangement is such that when belt **121** is not being driven, sprocket **116** will serve to drive shaft **38** at a relatively slow speed through clutch **124**. However, when pulley **122** is being driven at its relatively high speed, it will drive shaft **38** at this higher speed without interference or drag from pulley **116** which will continue to rotate at the slower speed.

The operating mechanism of the machine may be appropriately enclosed by sheet metal plates or mesh screens as desired. Figure 1 shows a front plate **128** enclosing the front lower portion of the machine while Figure 3 shows a side plate **129** secured to uprights **19**.

Operation

Assuming an initial condition in which drum **14** has been loaded with laundry and door **25** closed, manual or automatic means will be utilized to energize motor **52** and cause hot or warm water to flow into tub **13** through connection **63**, soap being added through chute **62**. Assuming that it is initially desired to rotate drum **14** at a relatively slow speed for a washing or rinsing operation, cylinder **104** will be depressurized, so that spring **94** will move pulley **89** and clutch element **88** to the left in Figure 7, disengaging clutch **86**. Motor **52** will thus cause rotation of pulley **77** while pulley **89** is not driven. Side **79** of pulley **77** will move axially away from pulley side **78**, the limiting position of side **79** being established by its engagement with a collar **131** mounted on shaft **66**. Belt **81** will drive intermediate sprocket **111** which in turn will cause rotation of sprocket **116** through sprocket **114** and chain **115**. Drum shaft **38** will thus be driven through overrunning clutch **124**, causing slow speed rotation of drum **14**.

When it is desired to rotate drum **14** at a relatively high speed to extract water from the laundry therein, cylinder **104** will be pressurized to shift piston rod **102** to the left in Figure 7. This will rock lever **95** clockwise in this figure, shifting pulley **89** and clutch element **88** to the right to engage clutch **86**. Due to the inertia of drum **14** which carries the laundry and water, clutch **86** will initially slip. Continued pressure on clutch element **88**, however, will cause side **79** of pulley **77**, together with pulley **89** and the clutch elements, to shift to the right in Figure 7, narrowing the gap between the sides of pulley **77**. This will cause belt **81** to assume a larger diameter on pulley **77**, increasing the speed of belt **81** and thus the speed of drum shaft **38**. This progressive acceleration of drum **14** will aid clutch **86** in assuming a solidly engaged condition and will greatly decrease wear on friction surface **87**. The drum will thus attain its higher speed more quickly than would be the case if clutch **86** were used to accelerate the drum and its contents, the transition nevertheless being smooth and uninterrupted. Pulley **122** on shaft **38** will drive the shaft directly without interference from the relatively slow sprocket **116** because of the presence of overrunning clutch **124**.

When it is desired to again rotate drum **14** at a slower speed, cylinder **104** will be depressurized, permitting spring **106** to move piston rod **102** to the right in Figure 7. Spring **94** will thus cause withdrawal of pulley **89** and clutch element **88** from clutch element **85**. As this occurs, moving belt **81** will force its way down between sides **78** and **79** of pulley **77**, thus assuming a smaller diameter on this pulley so that drum **14** will be again driven at its slower speed.

During this operation, the rotating drum will be supported by post **29**, which is firmly secured to base **12**. The tubular nature of this post and its disposition and supporting elements including gusset plates **32** will maintain a vibration-free condition for the entire mechanism at both transitional and steady speeds, the construction occupying a minimum of space as will be obvious from an examination of the figures.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a fabric laundering machine, a rigid base, saddle means supported on said base, a tub supported on said saddle means, fastening means for securing the tub to the saddle means, a post extending upwardly from and rigidly supported on said base, a drum disposed within said tub, and means for rotatably mounting said drum on said post independently of said tub.

2. In a fabric laundering machine, a rigid base having a rectangular frame with upper and lower horizontal plates, a post extending through and secured to said plates and projecting upwardly therefrom, saddle means supported on said base, a tub supported on said saddle means, fastening means for securing the tub to the saddle means, a drum disposed within said tub, and means for rotatably mounting said drum on said post independently of said tub.

3. In a fabric laundering machine, a rigid base, saddle means supported on said base, a tub supported on said saddle means, fastening means for securing the tub to the saddle means, a post extending upwardly from and rigidly supported on said base, a horizontally disposed shaft rotatably mounted on the upper end of said post with one end thereof projecting into said tub, a drum disposed within said tub and mounted on said one end of said shaft for rotation therewith, and seal means disposed between said tub and said rotatable shaft to prevent water within the tub from leaking between the rotatable shaft and the tub.

4. In a fabric laundering machine, a base having a rectangular frame with upper and lower horizontal plates, saddle means supported on said base, a tub supported on said saddle means, fastening means for securing the tub to the saddle means, a tubular post extending through and secured to said plates and projecting upwardly therefrom, a plurality of circumferentially placed gusset plates secured between said post and upper base plate, bearing means mounted on the upper end of said post, a horizontal drum shaft rotatably supported by said bearing means with one end of the shaft projecting into said tub, and a drum disposed within said tub and mounted on said one end of the shaft for rotation therewith.

5. In a fabric laundering machine a rigid base, a pair of spaced saddles supported on said base, each of said saddles comprising a pair of spaced standards having an arcuate metal strap supported therebetween, a cylindrical

tub mounted on said arcuate metal straps, a metal strap encircling the upper portion of said tub at each end thereof, the ends of said last-mentioned straps being secured to the saddle adjacent thereto, a post extending upwardly from and rigidly supported on said base, a drum disposed within said tub, and means for rotatably mounting said drum on said post independently of said tub.

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