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VARIABLE SPEED LAUNDRY MACHINE

Filed May 29, 1939

2 Sheets-Sheet 1

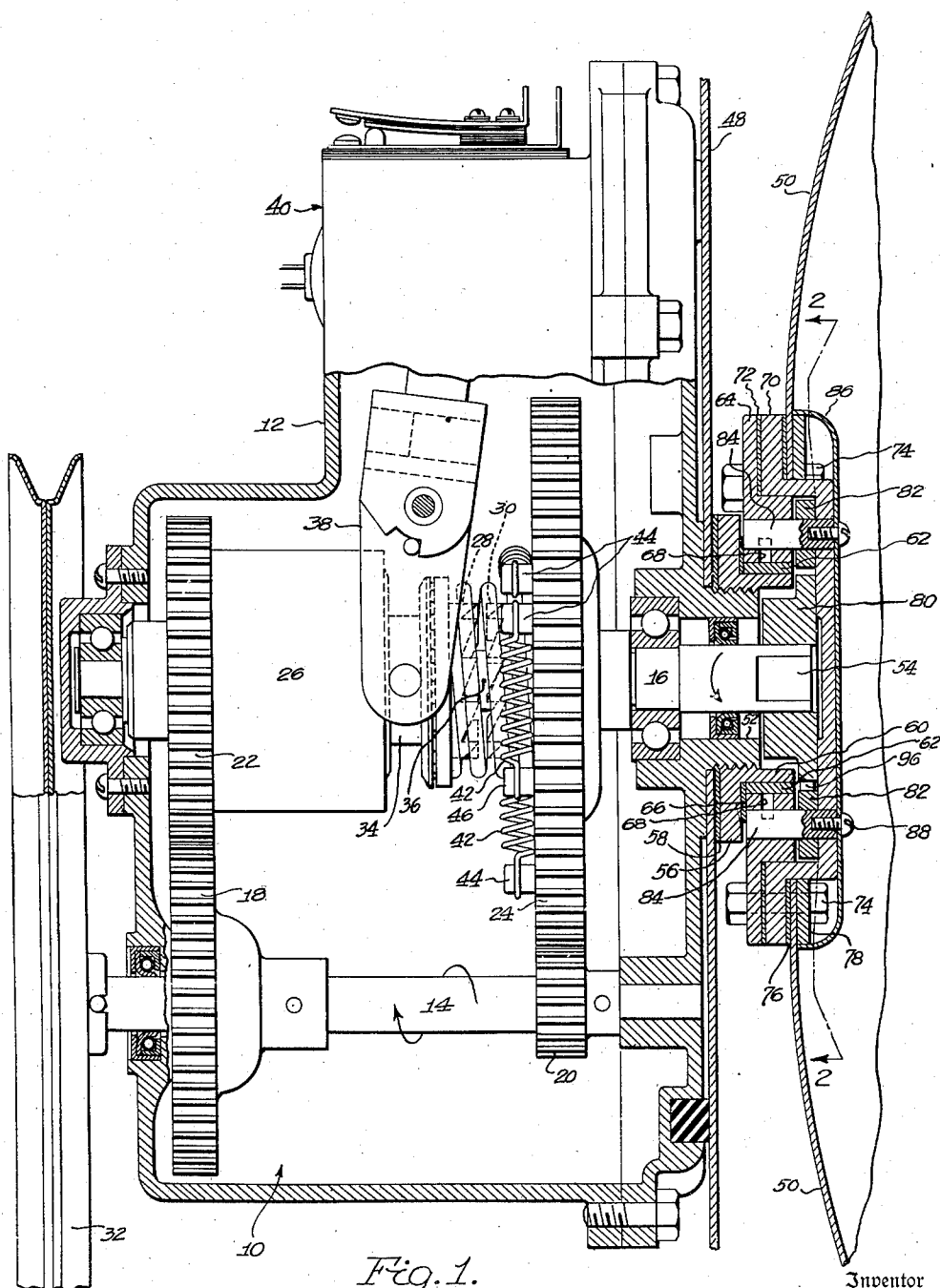


Fig. 1.

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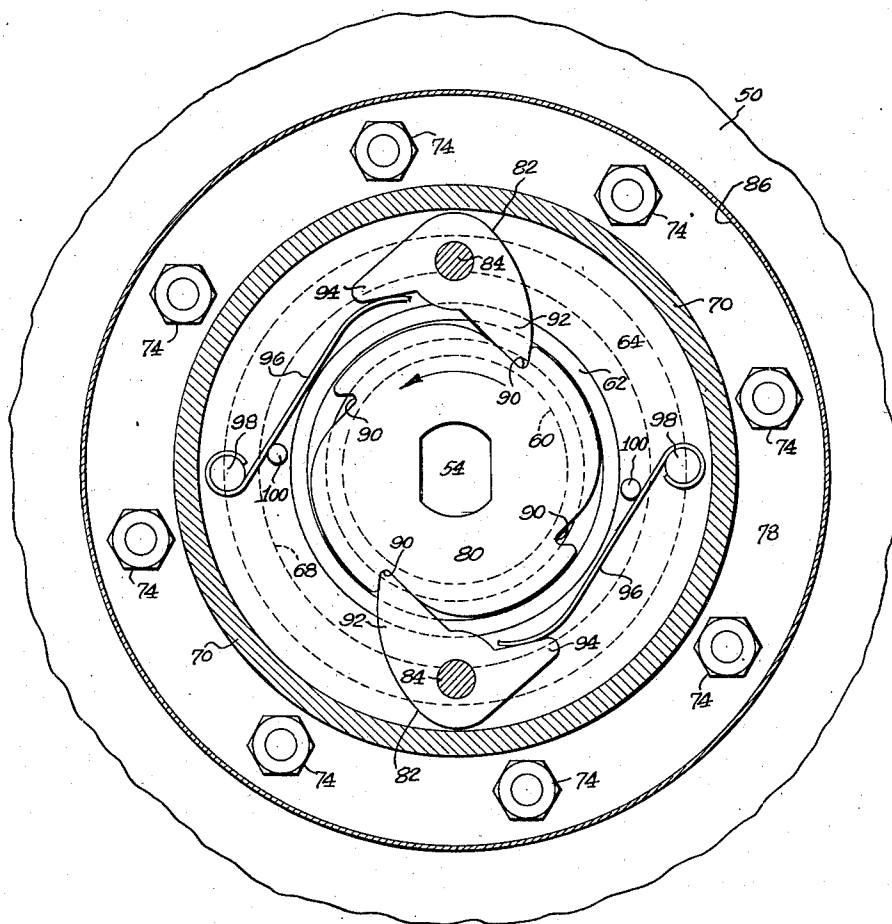


Fig. 2.

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## UNITED STATES PATENT OFFICE

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## VARIABLE-SPEED LAUNDRY MACHINE

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12 Claims. (Cl. 192—3.5)

This invention relates, in general, to laundry machines and, in particular, to improvements in machines having variable speed transmissions.

A laundry machine employs a variable speed transmission for the purpose of enabling said machine to perform as a clothes-washing means as well as a clothes-drying means, said transmission driving the clothes-containing tub at a relatively low rotary speed during the washing phase and driving said tub at a relatively high rotary speed during the drying phase. In this type of machine there has been employed a direct and positive driving connection between its tub and its drive shaft so as to assure the driving of said tub at and in accordance with the speed of said shaft, but this type of connection has caused said tub and said shaft to be driven together not only during the operation of said machine at either of its two speeds but also immediately upon the changing over from one of said speeds to the other.

It has been and naturally still is desirable to have the tub rotate at the same speed as its drive shaft, as long as the machine is being operated at either of its two speeds, and any shock resulting from the change-over from slow speed to high speed, when the aforementioned direct and positive driving connection between the tub and its drive shaft has been employed, is no longer a matter of worry because various means have been discovered and are at present incorporated in the transmission itself to eliminate this shock. But, in the change-over from high speed to low speed severe shock has been encountered because of the great momentum of the tub and its tendency to continue its high speed of rotation. If the machinery has been of such heavy construction as to withstand this shock in the change-over from high to low speed, it has been too massive and expensive; otherwise, breakage has occurred often.

Therefore, the main object of this invention is to provide a new and improved driving mechanism for a laundry machine which will obviate the above objections existent in the present types.

Another object is to improve a variable speed laundry machine so as to eliminate the shock heretofore occurring at the time of changing from one of its speeds to another.

Another object is to improve a variable speed laundry machine so as to eliminate undue stresses in its mechanism when changing the speed of said machine from its higher speed to its lower speed.

Another object is to improve a variable speed

laundry machine so as to lengthen its life by providing a smoother operation during the speed change-over periods.

Still other objects and advantages of the invention will become readily apparent from a reference to the following specification taken in conjunction with the accompanying drawings of which there are two (2) sheets and wherein:

Figure 1 is a longitudinal section through the transmission of a laundry machine and showing in detail the invention incorporated therein, the tub being shown in part; and

Fig. 2 is a section taken along the lines 2—2 in Fig. 1.

The variable speed transmission, which is generally indicated at 10 in Fig. 1, may be any one of several well known arrangements characteristic of this type of mechanism, but the arrangement chosen for purposes of illustration is the same as that disclosed in my co-pending application, Serial No. 260,013, filed March 6, 1939, and entitled "Laundry machine." Transmission 10 is shown as being automatic in its operation, but it is clear that it need not be, it being contemplated that said transmission could also be any one of the well known types of manually operated mechanisms, such as the one disclosed in my co-pending application, Serial No. 195,293, filed March 11, 1938, and entitled "Laundry apparatus."

Transmission 10 is enclosed within a housing 12 and comprises, in general, a constant speed driving shaft 14, a variable speed driven shaft 16, a pair of gears 18 and 20 fixedly mounted on said shaft 14 and in constant mesh with a second pair of gears 22 and 24 freely mounted on said shaft 16, a friction clutch 26 operable for effectuating the driving of said shaft 16 at the higher of its two rotary speeds, and a positive clutch 28—30 operable for effectuating the driving of said shaft 16 at the lower of its two speeds. The driving shaft 14 is driven through the agency of a pulley 32 which is mounted on said shaft for rotation therewith externally of the housing 12, and said pulley is driven through the agency of any well known prime mover (not shown) at substantially constant speed. The gears 18 and 22 are of substantially the same diameter so that the shaft 16, when driven through the agency of said gears 18 and 22 and the clutch 26, will be driven at substantially the same speed as the shaft 14. The gears 20 and 24, on the other hand, are in the ratio of approximately 1:6 so that the shaft 16, when driven through the agency of said gears 20 and 24 and the clutch 28—30, will be driven

at substantially one-sixth the speed of the shaft 14.

A clear description of the clutches 26 and 28—30 is to be found in my aforementioned co-pending application, Serial No. 260,013, so it is unnecessary to describe the construction of said clutches herein to any greater extent than to point out that the driving section of the clutch 26 is fixed to the constantly rotating gear 22 for rotation therewith, the driving section 30 of the clutch 28—30 is fixed to the constantly rotating gear 24 for rotation therewith, and the driven section 34 of and common to each of said driving clutch sections is independently mounted on a splined portion 36 of the shaft 16 for rotation therewith and selective or automatically timed axial movement therealong between said driving clutch sections. Said co-pending application also clearly describes the function and operation of each of these clutches, so it seems only necessary to point out herein that axial movement of the driven clutch section 34 along the splined section 36 of shaft 16 toward and into engagement with the constantly rotating driving clutch section of clutch 26 causes said shaft to be driven at substantially the same speed as the shaft 14, and that axial movement of said driven clutch section 34 along said splined section 36 toward and into engagement with the constantly rotating driving clutch section 30 of clutch 28—30 causes said shaft 16 to be driven at substantially one-sixth the speed of said shaft 14.

The shiftable clutch member 34 is shown in Fig. 1 as being driven by a lever 38, and said lever is shown, diagrammatically, as being automatically timed and actuated by and through the agency of a timer-shifter mechanism, generally indicated at 40. Mechanism 40 is clearly described, both in construction and in function, in my aforementioned co-pending application, Serial No. 260,013, and, in view of the fact that said mechanism comprises no part of the present invention, same will not be further described or discussed herein. Obviously, the shifting of the shiftable clutch member 34 may, instead of being shifted by the automatic mechanism 40, be shifted by a manually operable mechanism such as that shown in my aforementioned co-pending application, Serial No. 195,293. In short, in the present invention it matters not how the shaft 16 is driven at variable speeds, just so long as some provision is made whereby said shaft may be driven first at one speed and then at another.

In order to eliminate shock normally occurring at the relatively movable jaw clutch sections 28 and 30 of the transmission 10 when changing the speed of the shaft 16 from the higher speed to its lower speed, that is, when the driven clutch section 34 is shifted from engagement with the driving section of the clutch 26 into engagement with the driving section 30 of the clutch 28—30, a plurality of springs 42 is provided, and one end of each of said springs is connected to one of a series of annularly spaced pins 44 fixedly mounted on the constantly rotating gear 24, while the other end of each of said springs is connected to one of a series of annularly spaced pins 46 which are fixedly mounted on the driving clutch section 30. The arrangement and function of these springs and pins are clearly set forth in my aforementioned co-pending application, Serial No. 260,013, and it will be noted in said application that the hub of the present gear 24 freely carries the present jaw clutch section 30 of clutch 28—30

and that the present pins 46 which carry the ends of the present springs 42 opposite the ends carried by the present pins 44 have play connections with said gear 24, so that there is a slight relativity in rotary movement between said gear 24 and said clutch section 30 in opposition to said springs 42 at the time the present jaw clutch section 28 is being engaged with said jaw clutch section 30. This type of shock absorber has been chosen purely for the purpose of illustration, and, since it has no bearing upon the invention herein, its use is optional or its replacement by some other well known means possible.

Though it is not shown in the drawings, an outer, main casing is preferably provided for enclosing the entire laundry machine, such provision being in the interests of safety and appearance, and to and within this casing in any well known manner is secured a wall 48 which supports not only the transmission 10 but one end of a tub 50, said wall being one of the side walls of an inner casing (not shown) preferably provided for enclosing said tub, and said tub being any one of the well known types of rotary tubs employed in a laundry machine of the type being described. Wall 48 is formed with an opening through which an externally threaded, hollow boss 52 projects, said boss being integral with the transmission housing 12 and internally accommodating the squared end 54 of the shaft 16. For rigidly holding the transmission and its housing in proper place with respect to the wall 48, a nut 56 is screwed onto the boss 52 into tightened position, there being optionally provided a sealing washer 58 between said wall and said nut.

The nut 56 has an annular neck portion 60 integral therewith and extending beyond the end of the boss 52, and on said neck portion 60 there is freely mounted an annular flanged plate 64 having a permanently lubricated bearing surface in the nature of a press-fitted, oil-saturated bushing 62. Between plate 64, bushing 62 and nut 56 there may be provided a thrust or sealing washer 66. Between bushing 62 and plate 64 there is provided an annular lubricant reservoir 68 which is formed in said plate and filled with lubricant prior to the assembly of said plate and said bushing so that said bushing is constantly in the presence of lubricant.

The hub portion of the plate 64 carries thereon a dished end plate 70 the rim of which cooperates with the flanged portion of the plate 64 and the dished or base portion of which is axially spaced from the hub of plate 64, the bushing 62, the neck 60 of nut 56 and the end 54 of shaft 16, there being preferably provided between the flanged and rim portions of said plates 64 and 70 a sealing washer 72. The dished or base portion of the plate 70 fits into an opening provided therefor in the tub 50, this opening being at and symmetrical with the axis of movement of said tub, and said plate 70 and the plate 64 are secured together at their flanged and rim portions to said tub 50 by means of a series of annularly spaced bolt and nut units 74. If desired, a pair of washers 76 and 78 is employed in the assembly of the plates 64 and 70 and the tub 50, one on each side of said tub. The tub 50, therefore, is carried by the plates 64 and 70, and this unit 50—64—70 together with the bushing 62 is rotatably carried on the stationary nut 56, the nut being carried on the boss 52 of the transmission housing 12.

A driving clutch member 80 is axially formed to fit onto the squared end 54 of the shaft 16 to

be driven by and in accordance therewith, the driving periphery of said clutch member being arranged for driving engagement with a pair of diametrically disposed pawls 82 which are pivotally mounted in the annular space between the hub and dished portions of the plates 64 and 70 on pins 84, said pins being press fitted into the hub portion of said plate 64 and extending into and through the dished portion of said plate 70. If desired, a shield 86 may be provided on the inner surface of the tub 50 and secured to the pins 84 by screws 88 for preventing the escape of water from within said tub past said shield.

As shown clearly in Fig. 2, the peripheral driving surface of the driving clutch member 80 is formed with a plurality of circumferentially spaced sockets 90 which face or open in the direction of rotation of said member and removably receive the pawls 82 to drive the driven unit 64-70-50 through the agency thereof. On the other hand, the general contour of the driving surface of the driving clutch member 80 is such that, when the driven unit 64-70-50 is rotating at a greater speed than the driving unit 54-80, such as when the speed of the shaft 16 is being changed from the higher of its two speeds to the lower of its two speeds and the momentum of the tub 50 causes said tub to continue rotating at said higher speed, said driven unit will freely over-run said driving surface. In other words, except for the sockets 90 which face or open in the direction of rotation of the driving clutch member 80 the driving surface of said member is circular to permit this over-running feature. Though two pairs of sockets 90 are shown, it is clear that only one pair is absolutely necessary in the event of employing two pawls 82.

Each pawl 82 comprises a socket-engaging portion 92 which faces the driving clutch member 80 in a direction counter to its direction of rotation, and a spring-engaging portion 94 which faces said member 80 in the same direction as its direction of rotation. These pawl portions 92 and 94 of each pawl 82 lie on opposite sides of the axis of its respective pivot pin 84, the portions 92 being operable, when the driving section of the over-running clutch is either rotating at the same speed or at a higher speed than the driven section of said clutch, for engaging the two sockets 90 provided therefor to cause said clutch sections to rotate together, and the portions 94 being constantly engaged by the free ends of the pair of springs 96 for urging constant engagement between the peripheral driving surface of the driving clutch member 80 and said portions 92 of said pawls 82. The opposite end of each of the springs 96 is fixedly or freely anchored to a pin 98 which is mounted in the hub portion of the plate 64 between the pawl supporting pins 84, and intermediate each respective pair of pins 84 and 98 there is mounted in said plate another pin 100 which abuts the inner face of the spring thereadjacent and guarantees exertion of spring pressure on the pawl whether the anchored end of the spring is loose or fixed.

The over-running clutch retains the advantages of a direct and positive drive between the transmission shaft 16 and the tub 50 after the speed change-over has been made and until the next change-over is to be made, and it eliminates all shock which would otherwise be due to the great momentum of the clothes- and water-filled tub at the time of changing from

the higher of the two available shaft speeds to the lower of said speeds.

Though it appears in Fig. 1 that the unit 62-64-70-82-50 is free to be displaced from the neck portion 60 of the nut 56 upon which it is supported, it is to be remembered, though it is not shown, that the end of the tub 50 opposite the end adjacent the transmission 10 is supported in any well known manner by that wall of the inner casing which is opposite the wall 48.

Although the invention has been described with some detail it is not intended that such description is to be definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will come within the purview of the attached claims.

What I claim is:

1. In a power transmission unit including a transmission casing having an external bearing member, a drive shaft, a driven shaft projecting through said bearing, an overrunning clutch element secured to said driven shaft on the outer end thereof, a power out-put element journaled on said bearing and extending about said clutch element, change-speed mechanism interposed between said drive shaft and said driven shaft for selectively driving said driven shaft at high and low speeds respectively, and detents carried by said power out-put element for cooperating with said overrunning clutch element whereby said power out-put element may overrun said driven shaft when the change-speed mechanism is operated.
2. In combination with a power-transmission unit including a transmission casing having an external bearing member, a drive shaft, a driven shaft projecting through said bearing, an over-running clutch element secured to the free end of the driven shaft to rotate therewith, a power out-put element journaled on said bearing, change-speed mechanism interposed between said drive shaft and said driven shaft for selectively driving said driven shaft at high and low speeds respectively, means carried by said power out-put element for operatively engaging said overrunning clutch element, a high speed clutch and a low speed clutch for selectively connecting said change-speed mechanism with said driven shaft for effecting said high or low speeds, and means for selectively operating said clutches, said low speed clutch comprising a positively engageable jaw clutch and said high speed clutch comprising a relatively slideable friction clutch.
3. In a power transmission unit including a transmission casing having an external bearing member, a drive shaft, a driven shaft projecting through said bearing, a one way clutch element secured to the driven shaft to rotate therewith, a power out-put element journaled in said bearing, change-speed mechanism interposed between said drive shaft and said driven shaft for selectively driving said driven shaft at high and low speeds respectively, a high speed clutch and a low speed clutch for selectively connecting said change-speed mechanism with said driven shaft for effecting said high or low speeds, means for selectively operating said high and low speed clutches, said low speed clutch comprising a positively engageable jaw clutch having resilient shock absorbing mechanism therein for absorbing the shock of engagement and said high speed clutch comprising a relatively slideable friction clutch, and means carried by

said power output element for operatively and drivingly engaging said one way clutch element whereby said power out-put unit may continue to rotate under its momentum when the change-speed mechanism is manipulated.

4. In combination in a washing machine, a rotary clothes container and an annular bearing member therefor, a driving shaft, a one-way clutch element having peripheral recesses secured to one end of the shaft to rotate therewith and within the confines of said annular bearing member, and an interchangeable gear mechanism associated with the other end of said shaft to rotate said shaft at various speeds, an annular power output element secured to the clothes container freely rotatable about and housing said clutch element, detents pivotally mounted between said output element and annular bearing member cooperable with the recesses in said one-way clutch element, spring means for urging said detents into driving engagement with said clutch element whereby said power output member may overrun said driving shaft during interchanging of said gear mechanism.

5. In combination in a washing machine, a clothes container and an annular bearing member therefor, a driving shaft, a one-way clutch element secured to the driving shaft for rotation therewith and having peripheral recesses sloping inwardly in a direction counter to the direction of rotation of said shaft, said clutch element being within the confines of said bearing member, an interchangeable gearing mechanism connecting the shaft to rotate said shaft at various speeds, an annular power output member spaced from and secured to the annular bearing member and surrounding said one-way clutch element to rotate freely thereon, a detent pivotally mounted between said annular bearing member and annular power output member for operatively engaging said clutch member to cause said output member to be driven at the same speed as the driving shaft when said interchangeable gearing is operative and to allow said power output and clothes container unit to rotate freely on the driving shaft when the interchangeable gearing is inoperative.

6. In combination in a washing machine, a clothes container and an annular bearing therefor, a drive and driven shaft, interchangeable gearing connecting said shafts, a one-way clutch element secured to the driven shaft within the confines of said annular bearing member, an annular power output member secured to and spaced from said annular bearing member also surrounding said clutch element and free to rotate thereon, detents pivotally mounted between the annular power output member and annular bearing member for engaging said clutch element, resilient means for urging said detent into engagement with said clutch element whereby said driven shaft may rotate independently of said power output member during the time intervals between speed changes by the interchangeable gearing.

7. In combination in a washing machine, a rotatable clothes basket and an annular bearing member therefor, a drive shaft and a driven shaft interconnected by change speed mechanism, a one-way clutch element secured to the driven shaft to rotate therewith within the confines of said annular bearing member, a power output member secured to and spaced from said annular bearing member and surrounding said clutch ele-

ment and free to rotate thereabout, a pair of arcuately spaced pivoted detents pivotally carried between said annular bearing member and said power output member for drivingly cooperating with said clutch element and means for normally urging said detents in engagement with said clutch element whereby said power output member, clothes basket and annular bearing member may continue to rotate under the impetus of the load in the basket during change speed intervals between the drive shaft and the driven shaft.

8. In combination in a washing machine, a clothes container and an annular bearing therefor, a drive shaft and a driven shaft, a speed changing mechanism interconnecting said shafts, a one-way clutch element secured to the driven shaft having indentations extending in a direction counter to the direction of rotation of the driven shaft, an annular power output member secured to the annular bearing member and spaced therefrom encircling said driven shaft and rotatable relative thereto, a pair of detents pivotally carried between said annular bearing member and said output member cooperating with said clutch element, a spring for each detent for normally urging said detent into driving engagement with said clutch element whereby said output member may rotate freely during speed changing intervals between the drive shaft and driven shaft.

9. In combination in a washing machine, a clothes container and an annular bearing therefor, a drive shaft and a driven shaft, a speed changing mechanism interconnecting said shafts, a one-way clutch element mounted on said driven shaft to rotate therewith and having detent receiving notches, said one-way clutch element being located within the confines of said bearing member, an annular output member spaced from and secured to said annular bearing member also confining said clutch element and free to rotate relative thereto, a plurality of arcuately spaced, power transmitting members pivotally mounted between said annular bearing member and said power output member for rotation therewith and each having a section extending in a direction counter to the direction of rotation of the power output member and another section extending in an opposite direction, a plurality of springs anchored to said power output member and annular bearing member for rotation therewith and each having a free end in constant engagement with one of said power output members for urging its respective first section into driven engagement with one of said portions to drive said power output member with said clutch element through driving cooperation of said notches and said power transmitting members and for permitting the overrunning of said clothes container member with respect to said clutch element during change speed intervals whereby said clothes container power output and annular bearing members may rotate independently of said change speed mechanism.

10. In combination in a washing machine, a rotating clothes cylinder and an annular bearing member therefor, a drive shaft and a driven shaft, a speed change mechanism for interconnecting said shafts, a one-way clutch element carried by said driven shaft confined within said annular bearing member, an annular power output member connected to the clothes washing cylinder of said washing machine and surrounding and freely rotatable about said clutch ele-

ment, a plurality of recesses formed in the periphery of said one-way clutch element opening in a direction facing the direction of rotation of said member, a multi-section pawl pivotally mounted between said annular bearing member and said annular power output member for rotation therewith and having one of its sections extending in a direction counter to the direction of rotation of said annular power output member and another of its sections extending in an opposite direction, and a spring anchored to said power output member for rotation therewith and having a free end in constant engagement with said second section for urging said first section into driven engagement with said one-way clutch element for maintaining a drive between the driven shaft, clothes cylinder, annular bearing member, and power output member as long as the speed of the latter is equal to that of the former, said free end being operable for yielding to the force of said second section created by the departure of said first section from said socket when the speed of the driven shaft is decreased below that of the clothes cylinder, annular bearing member, and output member whereby said clothes cylinder may continue to rotate by the impetus of its load during speed changing intervals of the change speed mechanism.

11. A combination in a washing machine, a rotary clothes container, a driven shaft, a one-way driving clutch between the container and shaft for driving the container in one direction while allowing the latter to turn independently of and faster than the shaft in the same direction, a driving shaft, and a two-speed driving mechanism between the driving and driven shafts for driving the latter at a low or at a relatively high speed.

12. A combination in a washing machine, a rotary clothes container, a driven shaft, a one-way driving clutch between the container and shaft for driving the container in one direction while allowing the latter to turn independently of and faster than the shaft in the same direction, a driving shaft, and a two-speed driving mechanism between the driving and driven shafts for driving the latter at a low or at a relatively high speed, said mechanism including a low-speed clutch having positively engageable jaw devices provided with resilient shock absorbers for absorbing the shock of the engagement, and the high speed clutch comprising a relatively slidable friction device.

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