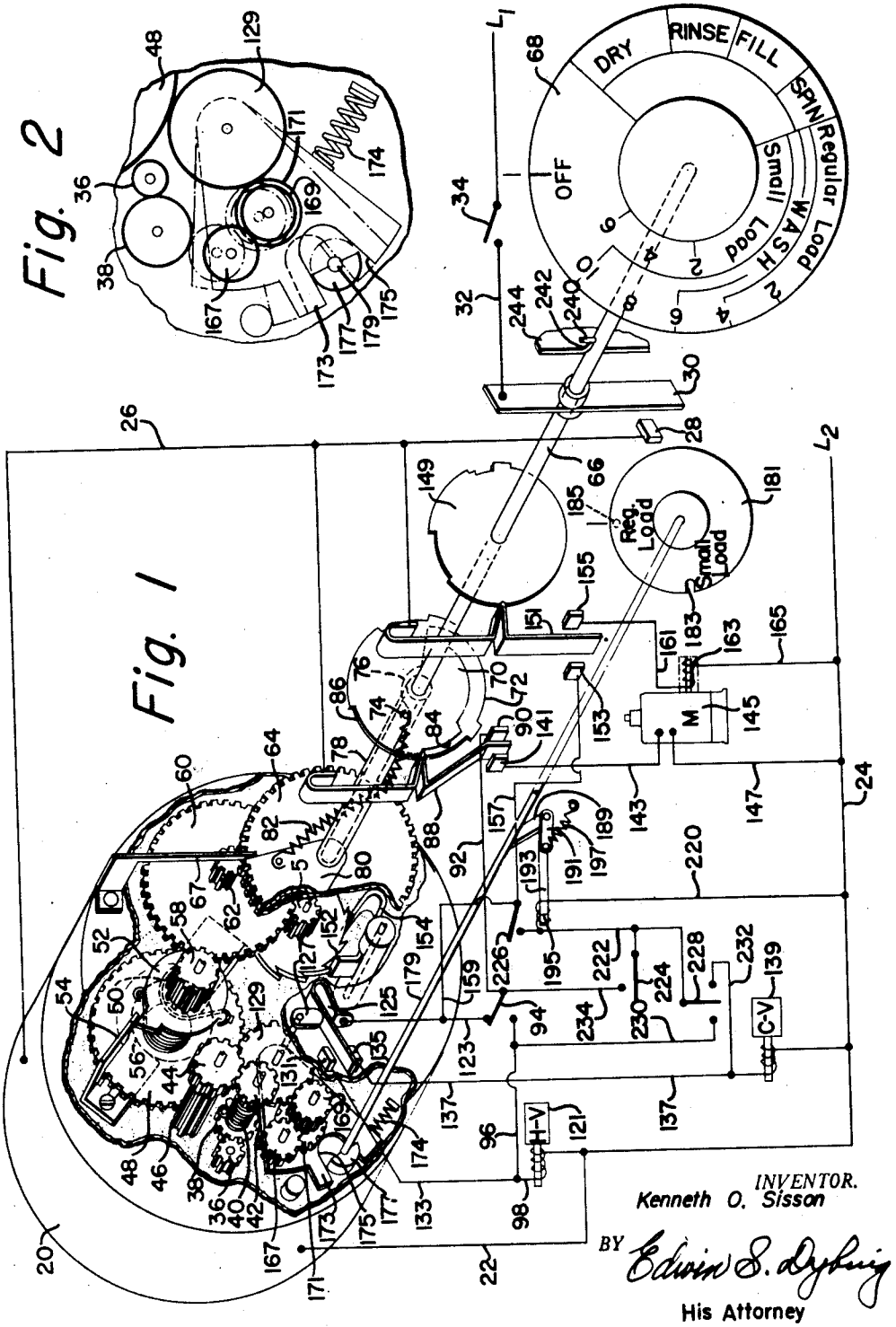
Aug. 15, 1961 K. O. SISSON 2,995,916

DOMESTIC APPLIANCE

Original Filed Jan. 31, 1955 2 Sheets-Sheet 1



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Fig. 4

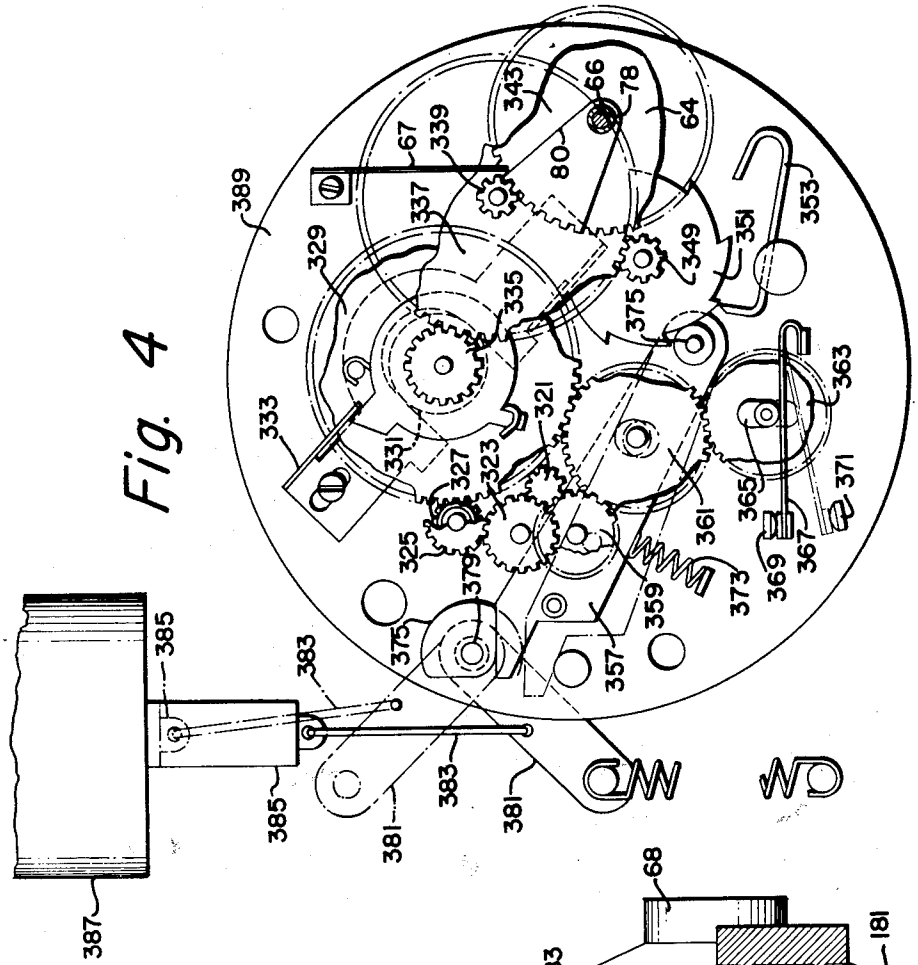
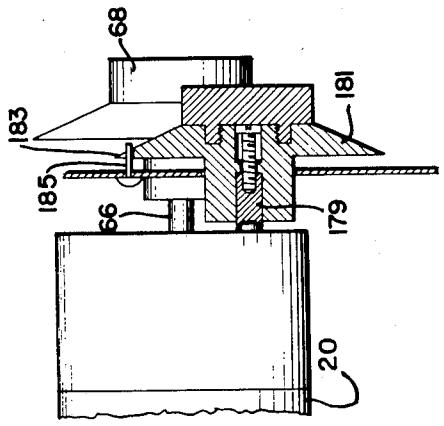


Fig. 3



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DOMESTIC APPLIANCE

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Original application Jan. 31, 1955, Ser. No. 485,181. Divided and this application May 22, 1958, Ser. No. 737,173

9 Claims. (Cl. 68—12)

This application is a division of my copending application Serial No. 485,181, filed January 31, 1955, now Patent No. 2,870,834.

This invention relates to a domestic appliance and more particularly to control systems for automatic washing machines.

When introduced, automatic washing machines provided the same amount of water and the same time periods for agitation and drying regardless of the amount or types of clothes. Since then some washers have been provided with means for shortening the agitation periods and some have been provided with means for reducing the amount of water used for small loads.

It is an object of this invention to provide a simple effective means for reducing the amount of water used for small loads.

It is another object of this invention to not only reduce the amount of water used but also to reduce the other operating times for small loads.

It is another object of this invention to provide a simple means for reducing the amount of water used during the rinsing cycle only.

It is another object of this invention to provide simple means for changing the temperature of the water provided for the tub of the washing machine with or without changing other portions of the operating cycle.

These and other objects are obtained in the form shown in the drawings in which the timing drive means is connected to the cam operated switch means through two different sets of gearing providing two different operating speeds for the cam operated switch mechanism. A selective control is provided so that the switch means may be operated to make effective either of said gear connections during either the entire cycle or during any desired period in the cycle.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a perspective view, partly diagrammatic, of an automatic timing and control system embodying one form of my invention;

FIGURE 2 is a fragmentary view in elevation of a portion of the controls shown in FIGURE 1;

FIGURE 3 is a vertical sectional view of the control knob arrangement for changing the length of the periods; and

FIGURE 4 is a view in elevation of a modified form of control.

Referring now to the drawings and more particularly to FIGURE 1, there is shown a timing drive motor **20** connected through the conductors **22** and **24** to the supply conductor L_2 and connected through the conductor **26**, the switch contact members **28** and **30** and the conductor **32** and the safety switch **34** to the second supply conductor L_1. The timing drive motor **20** drives a small pinion **36** meshing with a gear **38**. This gear **38** is connected through a normally connected wound spring clutch **40** with a gear **42**. The gear **42** drives a gear **44** connected directly to the small pinion **46** which drives a large gear **48** at a normal slow speed.

The large gear **48** is connected to a spring **50** which in turn is connected to a stop plate **52** coaxial with the gear **48** and the spring **50**. This stop plate **52** is held from rotation by a slidable detent **54** which is moved to releasing position every one-half revolution of the gear by a cam **56** which is fixed to the gear **48**. The stop plate **52** is connected to the pinion **58** which drives the gear **60**. This mechanism provides an intermittent movement of the pinion **58** and gear **60** and is similar to the mechanism in Patent 2,227,133 issued December 31, 1940.

The gear **60** intermittently drives a pinion **62**. The pinion **62** is the only portion of this gear train which protrudes from the enclosing casing. This pinion **62** meshes with a large gear **64** upon the cam shaft **66**. Mounted upon this cam shaft **66** is the spring contact member **30**. This contact member **30** may be moved to closed position with the contact **28** by pushing the dial knob **68** on the outer end of the shaft inwardly toward the timer motor **20**. The cam shaft **66** moves axially a limited distance with the knob **68** and the spring contact member **30**. The cam shaft **66** has a first cam **70** thereon. At the side of this cam **70** is a second or floating cam **72** connected to the first cam **70** by a pin **74** which rides in the long notch **76** in the cam **72** to provide a limited lost motion connection between the cams **70** and **72**. The floating cam **72** is connected by a sleeve **78** surrounding the shaft **66** directly to a sector gear **80**. When the shaft **66** is pushed in the sector gear **80** will mesh with the pinion **62**. A spring finger **67** determines the initial position of the sector gear **80**. When the pinion **62** is in mesh with both the sector gear **80** and the gear **64** the cams **70** and **72** are driven in unison. A tension type coil spring **82** connects the sector gear and the cam **70** to hold the pin **74** normally against one end of the notch **76**. Further description and disclosure of this mechanism may be found in the Sisson Patent 2,549,025 issued April 17, 1951. To prevent reverse rotation of the cam shaft **66**, the gear **60**, which is part of the gear train driving the shaft **66**, also meshes with a pinion **5** connected to a ratchet wheel **152** controlled by an escapement mechanism **154**.

The cams **70** and **72** are provided with portions **84** and **86** which together present portions of reduced diameter to the double throw spring contact member **88** for the purpose of holding it in engagement with the initial fill contact **90**. The initial fill contact **90** is connected by a conductor **92** to a double throw selector switch **94** having one contact connecting to a conductor **96** which in turn connects to a conductor **98** for providing an initial fill of all hot water. This conductor **98** connects to the solenoid operating means of a hot water valve **121** provided with a constant flow control. This hot water valve **121** controls the flow of hot water at a constant rate into the tub. This control may be used with many types of automatic washing machines. One example of a washing machine to which this control may be applied is disclosed in the Clark Patent 2,618,141 issued November 18, 1952. This automatic washer disclosed by Clark includes a drive motor **21** and a spin solenoid therein designated by the reference character **24**. The hot water valve **121** controls the discharge of hot water at a constant rate into the washing machine tub. This hot water may come directly from a hot water heater which may supply water at a temperature of about 140° F. The solenoid of this hot water valve **121** is connected to the conductor **24**.

For an initial fill of mixed hot and cold water, the selector switch **94** may be moved as shown in FIGURE 1 to an alternate or second contact connecting with a conductor **123**. This conductor **123** connects with a

spring type double throw switch member 125. This switch member is operated by a cam 127 directly connected to a gear 129 meshing with the large gear 48. This cam 127 continuously moves the switch member 125 between the contact 131 connected to a conductor 133 connecting to the solenoid operating coil of the hot water valve 121 and a contact 135 connecting through a conductor 137 with the solenoid operating coil of a cold water valve 139. This operating coil connects to the conductor 24. This cold water valve 139 controls the supply of cold water to the tub of the automatic washing machine. Each of these valves preferably has a constant flow device in series with it so that the amount of water supplied is directly proportional to the elapsed time the valves are open.

By this arrangement, when the contact 88 is in engagement with the contact 90, the selector switch 94 when in its lower-most position will control the valves 121 and 139 to supply all hot water to the tub, while in its upper alternate position, the alternate positioning of the contact 125 will cause the valves 121 and 139 to alternately open and to alternately supply hot and cold water to the tub of the washing machine. The cams 70 and 72 also control the engagement of the contact 88 with the contact 141 connected by the conductor 143 to the drive motor 145 of the automatic washing machine. This motor is also connected by the conductor 147 to the conductor 24. The cam shaft 66 is provided with another cam 149 which operates the double throw switch member 151 either to a neutral position or into contact with either of the contacts 153 or 155. The contact 153 is connected by the conductors 157 and 159 to the cam operated double throw contact member 125 to provide normal rinse fills of alternating hot and cold water. The contact 155 is connected by the conductor 161 to the spin solenoid 163 in turn connected by the conductor 165 to the conductor 24. The spin solenoid controls the spinning of the tub to centrifuge the water out of the tub and out of the clothes in the tub. Additional description and disclosure may be found in my copending application Serial No. 320,598, filed November 14, 1952, now Patent 2,748,585, issued June 5, 1956.

According to this invention, I provide a second gear train which includes a pinion 167 meshing with a small gear 169 connecting directly with the gear 171 which meshes with the gear 129. The gears 167, 169 and 171 are mounted upon a movable plate 173 which is pivoted on the axis of the gear 129. This plate 173 is provided with a notch 175 within which is located a rotatable cam 177. This rotatable cam 177 is connected to a rotatable shaft 179 provided with a dial knob 181. This dial knob in FIGURE 1 is shown in the regular load position. It may also be turned clockwise 90° to a small load position. The dial knob 181 is provided with a notch 183 which may be moved inwardly into engagement with a stationary pin 185 to latch it in the small load position as indicated in FIGURE 3. The movement of the knob 181 and the cam 177 and the plate 173 to the small load position moves the gear 167 into meshing engagement with the gear 38. This provides a second gear train in between the gear 38 and the gear 48 which drives the gear 48 at about a 50% higher rate of speed than is provided by the gears 42, 44 and 46. The overrunning clutch 40 releases to allow the second train gear to take precedence and drive the gear 48 and the remainder of the gear train connection with the cam shaft 66 at a higher rate of speed. This reduces all the fill periods and all the agitation periods and all the spin periods in the same proportion in light loads.

To provide other options for certain periods of the complete cycle, the shaft 179 is provided with an arm 189 and a link 191 connecting with the armature 193 of a solenoid operating coil 195. The armature 193 is normally held in the retracted position by the spring 197 which also tends to turn the shaft 179 and the cam 177 into the position keeping the movable gear 167 out of mesh with the gear 38. The solenoid operating coil 195 is connected by the conductor 220 to the supply conductor 24 and is also connected by the conductor 222 to the normally open switch members 224, 226 and 228. The double throw switch 228 has one closed position connecting with the conductor 230 for energizing the solenoid operating coil 195 during all periods of energization of the operating coil of the hot water valve 121. This will reduce the time the hot water valve 121 is opened during any of its timed fill periods so that a reduced supply of hot water is provided while the same amount of cold water is used. This is useful when the cold water supply is relatively warm or the hot water is abnormally hot. The double throw switch 228 may be moved to its other closed position to connect to the conductor 232 which connects with the cold water valve 139. When in this position, the timed periods for the opening of the cold water valve 139 will be reduced. This will reduce the amount of cold water supplied during each filling period of the cold water valve 139. This is useful when the cold water is abnormally cold or the hot water is abnormally low in temperature.

The switch 224 may be closed to connect through the conductor 234 to the conductor 92 which will energize the solenoid 195 whenever the contact 88 engages the contact 90. This reduces both the hot and cold water fills during the first or wash fill. The switch 226 may be closed to connect to the conductor 159 connecting with the conductor 157. This will cause the solenoid 195 to be energized whenever the contacts 151 and 153 are closed to provide the rinse fills. This reduces the total amount of water provided for the rinse fills.

Thus by these additional controls either the hot or the cold water supplies may be reduced or the water supplied either during the initial hot wash fill or the rinse fill or both may be reduced without reducing the agitation or the spin periods during either the initial washing or during rinsing. The knob 68 and the cam shaft 66 may be pulled out to set the sector gear 80 and the cam 72 in different relationships to the gear 64 and the cam 70 so as to advance the initial fill period a lesser or greater amount ahead of the termination of the initial wash period to shorten or lengthen the initial wash period as explained and disclosed in the Sisson Patent 2,549,025 issued April 17, 1951. The cam shaft 66 is provided with a pin 240 cooperating with the cam projection 242 upon the front plate 244 by which at the end of the final drying period the engagement of the pin 240 with the cam surface 242 will move the cam shaft 66 outwardly upon its axis to separate the switch contact members 28 and 30 to stop the operation of the entire timing and control system as well as the washing machine.

In FIGURE 4 there is shown a modified form of two speed gearing arrangements in which an eight tooth drive pinion 321 drives a fifteen tooth gear 323. The fifteen tooth gear 323 drives a sixteen tooth gear 325 which through a wound spring clutch is connected to a twelve tooth gear 327 in engagement with a large sixty-four tooth gear 329 corresponding to the gear 48 in FIGURES 1 and 2. This sixty-four tooth gear 329 is connected by a torsion spring to the stop plate 331 normally held by the hold member 333. This mechanism is like that shown in the Hall Patent No. 2,227,133 issued December 31, 1940. The stop plate 331 is provided with gear 335 meshing with a large gear 337 provided with a drive pinion 339 corresponding to the drive pinion 62 in FIGURE 1. This drive pinion 339 drives the gear 64 and the sector gear 80 in a manner similar to that shown in FIGURE 1. The gear 337 also meshes with a pinion 349 connected to a ratchet wheel 351 controlled by an escapement mechanism 353 to prevent reverse rotation of the gear mechanism.

To provide a second gear train when the plate 357 is

in the full line position, the eight tooth pinion 321 meshes with a twenty tooth gear 359 mounted upon the movable plate 357. The twenty tooth gear 359 meshes with a thirty-two tooth gear 361 which in turn meshes with the large sixty-four tooth gear 329. The drive from the pinion 321 through the gears 359 and 361 to the large gear 329 provides a faster speed of rotation than the drive through the gears 323, 325 and 327 to the gear 329 which is effectively declutched by the wound spring clutch between the gears 325 and 327. The gear 361 meshes with the gear 363 operating the cam 365 which corresponds to the cam 127 in FIGURE 1. The cam 365 operates the double throw switch member 367 which corresponds to the switch member 125. The switch member 367 is adapted to cooperate with the stationary switch contacts 369 and 371 corresponding to the contacts 131 and 135 in FIGURE 1. A coil spring 373 acts to urge the movable plate about its pivot pin 375 to move the gear 359 into engagement with the pinion 321. The plate 357 is moved to its dotted line position by a cam 375 corresponding to the cam 177 in FIGURE 2. This cam is mounted upon a rotatable shaft 379 corresponding to the shaft 179 in FIGURES 1 and 2. This shaft 379 is provided with an arm 381 connected by a link 383 to the armature 385 of a solenoid 387 corresponding to the armature 193 and solenoid 195 in FIGURE 1. In moving the plate 357 from the full-line position to the dotted-line position, the gear 359 is moved away from and disengaged from the gear 321. The gear 361 is fixed on a rotatable shaft which extends through a clearance hole in the plate 357 and is rotatably mounted in the base 389. In the dotted line position of the plate 357, the pinion 321 drives through the pinions 323 and 325, the wound spring clutch, the pinion 327, the gears 329, 361 and 363. This second form provides a slightly different gearing arrangement than is shown in FIGURE 1 but the method of changing the speed is essentially the same.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood the other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. An automatic washing machine control system including a timing drive means, a first electrical control means for cold water, a second electrical control means for hot water, third electrical means for operating an agitating means, fourth electrical means for controlling drying of clothes, switch means operably connected to and operated by said timing drive means for individually energizing said electrical means for predetermined timed periods to control the initial fill and initial agitating and initial drying periods and rinse fill and rinse agitating and final drying periods, means responsive to the switch means controlling one of said fill periods for alternately energizing said first and second electrical control means to provide a mixed water fill, means responsive only to the energization of said first electrical control means for changing the timed periods of said switch means only during the energization of said first electrical control means.

2. An automatic washing machine control system including a timing drive means, a first electrical control means for cold water, a second electrical control means for hot water, third electrical means for operating an agitating means, fourth electrical means for controlling drying of clothes, switch means operably connected to and operated by said timing drive means for individually energizing said electrical means for predetermined timed periods to control the initial fill and initial agitating and initial drying periods and rinse fill and rinse agitating and final drying periods, means responsive to the switch means controlling one of said fill periods for alternately energizing said first and second electrical control means to provide a mixed water fill, and means responsive only to the energization of said second electrical control means for changing the timed periods of said switch means only during the energization of said second electrical control means.

3. An automatic washing machine control system including timing drive means, water electrical control and circuit means for controlling water filling, agitating electrical control and circuit means for controlling agitating, drying electrical control and circuit means for controlling drying, a cam shaft provided with cam means, switch means individually operated by said cam means for individually energizing said electrical control and circuit means for predetermined timed periods to control the water filling and agitating and drying periods, first speed reducing gearing connecting said drive means and said cam shaft in a first drive ratio, second gearing providing a second higher speed speed-reducing drive ratio different than said first drive ratio for operating said cam shaft, at a higher rate, electrical operating means for operatively connecting said second gearing between said drive means and cam shaft to provide said second drive ratio, and selector switch means having one selective position for selectively electrically connecting said electrical operating means to said water electrical control and circuit means for coincidental energization during water filling, and having another selective position for preventing the effective operation of said electrical operating means to render said first gearing effective during water filling.

4. An automatic washing machine control system including timing drive means, water electrical control and circuit means for controlling water filling, agitating electrical control and circuit means for controlling agitating, drying electrical control and circuit means for controlling drying, switch means operably connected to and operated by said timing drive means for individually energizing said electrical control means at various times for various periods to control the initial fill and initial agitating and initial drying periods and rinse fill and rinse agitating and final drying periods, first speed-reducing transmission means connecting said drive means and said switch means in a first drive ratio, second higher speed speed-reducing transmission means connecting said drive means and said switch means in a second higher drive ratio, electrical operating means for rendering said second transmission means effective and said first transmission means ineffective, selective control means effective in one selective arrangement for energizing said electrical operating means in response to one of said switch means for operatively connecting said second transmission means between said drive means and said switch means to reduce the duration of one period and responsive to other of said switch means for effectively preventing the energization of said electrical operating means for operatively connecting said first transmission means between said drive means and said switch means for normal duration of the other periods, said selective control means being effective in a second selective arrangement for energizing said electrical operating means in response to another of said switch means for operatively connecting said second transmission means between said drive means and said switch means to reduce the duration of another period and responsive to other of said switch means for operatively connecting said first transmission means between said drive means and said switch means to provide for normal duration of the other periods.

5. An automatic control system including timing drive means, first electrical control and circuit means providing a first function, second electrical control and circuit means providing a second function, third electrical control and circuit means providing a third function, switch means operably connected to and operated by said timing drive means for individually energizing said electrical control means consecutively in two successive cycles at various times for various periods to provide two con-

secutive cycles of the first and second and third functions, first speed reducing transmission means connecting said drive means and said switch means in a first drive ratio, second higher speed speed-reducing transmission means connecting said drive means and said switch means in a second higher drive ratio, electrical operating means for rendering said second transmission means effective and said first transmission means ineffective, selective control means effective in one selective arrangement for energizing said electrical operating means in response to one of said electrical control means effecting one of said functions for operatively connecting said second transmission means between said drive means and said switch means to reduce the duration of said one period and responsive to the control means effecting the other functions for effectively deenergizing said electrical operating means for operatively connecting said first transmission means between said drive means and said switch means for normal duration of the other periods, said selective control means being effective in a second selective arrangement for energizing said electrical operating means in response to one of said electrical control means effecting another of said functions for operatively connecting said second transmission means between said drive means and said switch means to reduce the duration of said another function and responsive to the control means effecting other of said functions for operatively connecting said first transmission means between said drive means and said switch means to provide for normal duration of the other functions.

6. An automatic control system including timing drive means, first electrical control and circuit means providing a first function, second electrical control and circuit means providing a second function, third electrical control and circuit means providing a third function, a cam shaft provided with cam means, switch means individually operated by said cam means for individually energizing said first and second and third electrical control and circuit means consecutively in two consecutive cycles to provide two consecutive cycles of the first and second and third functions, first speed reducing gearing connecting said drive means and said cam shaft in a first drive ratio, second gearing providing a second higher speed speed-reducing drive ratio different than said first drive ratio for operating said cam shaft at a higher rate, electrical operating means for operatively connecting said second gearing between said drive means and said cam shaft to provide said second drive ratio, and selector switch means having one selective position for selectively electrically connecting said electrical operating means to said first electrical control and circuit means for coincidental energization during said first function and having another selective position for preventing the effective operation of said electrical operating means to render said first gearing effective during said first function.

7. An automatic control system including a timing drive means, a first electrical means for controlling a first function, a second electrical means for controlling a second function, third electrical means for controlling a third function, fourth electrical means for controlling a fourth function, switch means operably connected to and operated by said timing drive means for individually energizing said first and second and third and fourth electrical means for predetermined timed periods, means for alternately repeatedly energizing said first and second electrical means under the control of said switch means, and means responsive only to the energization of said first electrical means for changing the timed periods of said switch means only during the energization of said first electrical means.

8. An automatic washing machine control system including a first switch means for controlling the initial fill, a second switch means for controlling the rinse fill, third switch means for controlling agitation, fourth switch means for controlling drying, timing drive means for controlling said switch means in timed periods, electrical hot water control means, electrical cold water control means, means effectively controlled by said second switch means for alternately energizing said cold and hot water control means, and means effectively controlled by said first switch means for changing the timed period of said first switch means, and selective means for placing said alternate energization of said cold and hot wator control means under the control of said first switch means.

9. An automatic washing machine control system including a first switch means for controlling the initial fill, a second switch means for controlling the rinse fill, third switch means for controlling agitation, fourth switch means for controlling drying, timing drive means for controlling said switch means in timed periods, electrical hot water control means, electrical cold water control means, means effectively controlled by said second switch means for alternately energizing said cold and hot water control means, and means effectively controlled by said second switch means for changing the timed period of said second switch means.

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