June 1, 1954 W. L. DIETRICH 2,680,166

MULTIPLE CIRCUIT CONTROL SWITCH

Original Filed Aug. 2, 1949 2 Sheets-Sheet 1

Fig. 1.

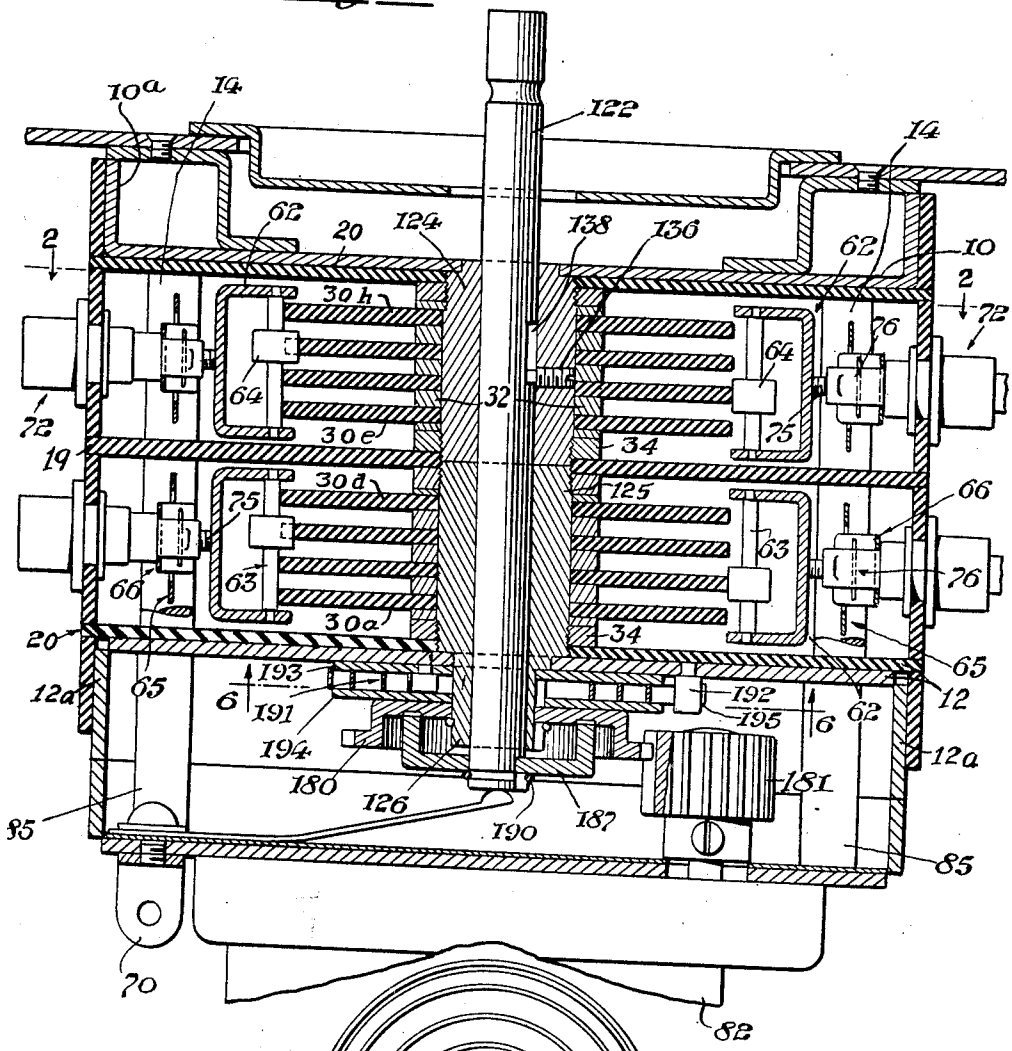
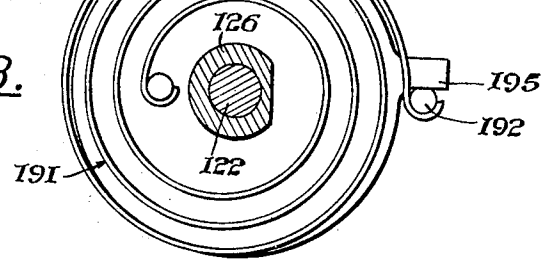


Fig. 3.



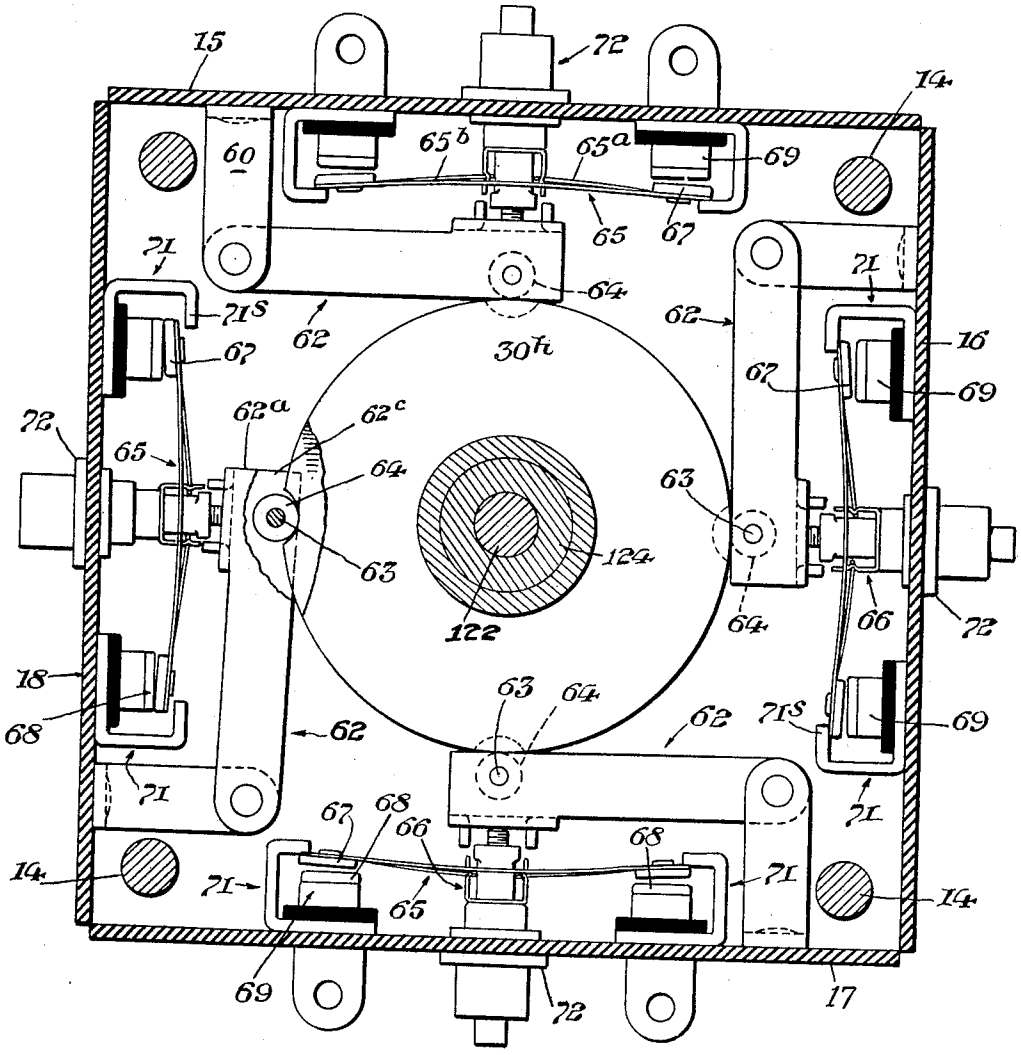
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MULTIPLE CIRCUIT CONTROL SWITCH

Original Filed Aug. 2, 1949 2 Sheets-Sheet 2

Fig. 2.



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UNITED STATES PATENT OFFICE

2,680,166

MULTIPLE CIRCUIT CONTROL SWITCH

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Original application August 2, 1949, Serial No. 108,185, now Patent No. 2,603,725, dated July 15, 1952. Divided and this application February 28, 1952, Serial No. 274,025

8 Claims. (Cl. 200—38)

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This invention relates to electric switches for controlling a multiple of circuits. More particularly it relates to a multiple circuit control switch driven by a time mechanism in which the time mechanism or clock motor can be disengaged from the switch to permit operation of the switch manually when desired. Devices of the type to which this invention relates are commonly used now on automatic washing machines and other devices which require time control of multiple circuits and which, additionally, require the switch to be capable of manual operation to shorten or change the sequence.

This application is a division of my application Serial No. 108,185 filed August 2, 1949, entitled "Multiple Circuit Control Switch," patented July 15, 1952, No. 2,603,725.

It is an object of the invention to provide an improved multiple circuit clock-controlled switch which will be of sturdy construction and reliable in operation.

Another object of the invention is to provide a switch of the foregoing type wherein the clock motor may be disengaged from the control mechanism so that the control mechanism may be manually operated to shorten or eliminate any stage of the cycle or to enable the cycle to be started at any point therein as desired.

Another object of the invention is to provide a switch of the foregoing type wherein there are two sets of control contacts in which the operation of one set is adjustable so that it may operate simultaneously or differently than the other set.

Another object is to provide for automatic resetting or return of one of two sets of control contacts when the clock motor is disengaged from the contacts.

Another object is to provide for quick and accurate action of the switch contacts in the type of mechanism wherein control of the contacts is by rotary cams driven by a clock motor.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:

Fig. 1 is a longitudinal section view taken through a device embodying the invention;

Fig. 2 is a transverse section view taken along line 2—2 of Fig. 1;

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Fig. 3 is a transverse section view taken along line 6—6 of Fig. 1.

Referring to the drawings, fixed and movable contact elements and cams for selectively operating them are housed within a cubical container comprising a square top plate of metal 10 whose side edges are bent up at right angles to form flanges 10*a*. A bottom plate 12 also of sheet metal also has its side edges bent down at right angles to form flanges 12*a*. The top and bottom plates may be spaced apart by rods 14 placed in or near the four corners of the plates. Four insulating plates 15, 16, 17, 18 are at right angles to one another and secured by screws to the flanges 10*a* and 12*a* of the top and bottom plates, forming the side walls of the housing.

The casing may be divided, if desired, in two compartments by placing a wall of sheet insulation 19 within the housing, parallel to the top and bottom plates 10 and 12. Also the housing may be entirely insulated inside by placing sheet insulation plates 20 against the interior surfaces of the top and bottom plates 10 and 12.

The operating mechanism for the switch contacts may be set or controlled manually by a rotary handle (not shown) mounted on one end of a rotary spindle 122 which is movable to a limited extent longitudinally in sleeves 124, 125 within which the spindle is mounted. The sleeves 124, 125 have reduced top and bottom ends or necks providing shoulders abutting the inner surfaces of the top and bottom plates 10 and 12. These necks form bearings rotating in bearing apertures in the center of the top and bottom plates. The sleeves 124, 125 carry a plurality of sheet insulation cam discs, such as 30*a*, 30*d*, 30*e* and 30*h* mounted coaxially thereon and spaced apart by spacing washers 32 placed between the discs. For the purpose of illustration eight cam discs are shown but this number may be increased or decreased as conditions require. The cam discs and washers are secured in place upon the sleeves by nuts 34 screwed upon threads formed on the top and bottom parts of the sleeves.

The cam discs have high parts and depressions to cause operation of individual switches. The individual switches may comprise movable contacts to engage and disengage fixed contacts. The switches may be of any suitable form but

preferably are of the snap-acting type known as sensitive switches in which a small amount of movement of the operating members of such a switch suffices to actuate the movable contact. It is desirable to use the snap-acting sensitive switches because as hereinafter described, the cams are rotated by a clock motor and hence move slowly. Thus, the opening and closing of the contacts is most satisfactory with the snap-action type of switch.

Each cam disc controls one switch in the example of the invention as illustrated. The switches are identical and are described and claimed in my co-pending application Serial No. 199,221 filed December 5, 1950, and hence detailed description need not be repeated here.

The switch mechanisms each comprise a stamped U-shaped metal supporting member **60** having its transverse part riveted to a side plate of the housing. Pivotally mounted upon the ends of the parallel arms of the supporting member **60** is a lever member **62** comprising parallel legs **62***a*, **62***c*, joined transversely at their free ends by an integral strut.

Extending between the legs **62***a*, **62***c* and journalled in them just above the strut is axle **63** upon which there is an integral roller **64**. The roller is positioned along the axle so as to engage one of the cam discs as may be seen in Fig. 1. By varying the position of the roller any one of the cam discs can be selected to engage that roller, and thus to control the movement of the lever **62** and the individual switch which it operates. The strut is engaged by an adjustable plunger arrangement which reciprocates when moved by the lever **62** so as to control the operation of the movable contact. The movable contact comprises a thin, flexible leaf spring member **65** which is stamped from sheet metal. Flexible apertured arms **65***a* and **65***b*, formed by the stamping out of the movable contact member are in the plane of the contact member as stamped. However they are later stressed or bowed upwardly by the insertion between them of a compression member **66** of substantially U-shape and stamped from thin flexible sheet metal, its arms being engaged by the ends of the arms **65***a*, **65***b*. The compression member **66** is mounted on the plunger **74**.

Movement of the arms **65***a* and **65***b* through the plane of the contact member **65** from one side to the other thereof causes snap action movement of the ends of the contact member **65** also with a snap action in a manner now well understood by those familiar with the art. At the ends of the contact member are contact buttons **67** to engage and disengage fixed contact buttons **68** mounted on fixed contact members **69**. Between the fixed contact member **69** and the inside surface of the insulating plate is located one leg of a rigid stop member **71** stamped from sheet metal into substantially J-shape. The portion **71***s* of the stop member **71** overlies the end of the movable contact to limit the switch opening or disengaging movement of the movable contact member at each end. The plunger is biased radially inwardly of the device by a spring (not shown) within a supporting or bearing member **72** mounted on the insulating side plate. Thus the plunger is normally biased inwardly but is moved outwardly when a high portion on the cam comes under the roller **64**.

In the embodiment illustrated, there are eight switch mechanisms of the sort just described. Two switches are mounted on each of the four

side plates of the housing, one set of switches being above another in position for the upper four to be controlled by the four upper cams and the lower four to be controlled by the four lower cams. The rollers of each switch are located at four different places on their axles so that one cam is in the plane of one roller of each switch and thus controls that switch.

If it is desired to have one cam control two switches, their rollers will be in the same plane or on the same level as the controlling cam. If the two cams are to control one switch, then two rollers will be formed on one axle of that switch in planes of the two controlling cams. It will be obvious of course that the number of cams and switches can be varied to suit the particular conditions.

In the form of the invention illustrated, the upper four operating cams are carried by the sleeve part **124** and the lower four cams are carried by the sleeve part **125**. In order to cause the sleeve part **124** and the operating cams carried thereby to turn with the spindle, the spindle **122** has a slot **138** therein engaged by the end of a radial pin **136** mounted in the sleeve part **124**. The sleeve part **125** is caused to turn with the spindle by a clutch mechanism between them.

The clutch mechanism comprises a cup-shaped gear member **187** having teeth formed on its peripheral edge facing in an axial direction. Gear **187** is non-rotatably mounted on the end of the spindle **122** by having the spindle end flattened on one side to cooperate with a similar flat space in a spindle-receiving aperture in the gear **187**. A spring ring **190** holds the gear **187** on the end of the spindle against the shoulder formed by adjacent flat portion of the end of the spindle.

The cup gear **187** can mesh with a drive gear **180** which is non-rotatably mounted on the end of an extension **126** of the sleeve part **125** in a fashion similar to the mounting of the gear **187** on spindle **122**. Engagement of the gear **187** with the gear **180** is by a ring of teeth formed in the face of gear **180** to engage with the axially-positioned tooth of the gear **187**. The gear **180** also has peripheral teeth meshing with a driving pinion **181** of the clock mechanism as hereinbefore described. A spring ring is or may be employed to hold the gear **180** on the end of the sleeve part **125**.

Since spindle **122** can be moved axially, it is possible to disengage the gear **187** from the ring of the teeth in the face of gear **180**. The sleeve part **124** and spindle **122** can therefore be rotated separately from the sleeve part **125**.

In order to automatically return the sleeve part **125** and cams which it carries when the clutch is disengaged, a flat spring **191** is coiled spirally around the extension **126** of the sleeve part **125**, one end of the spring being attached to that sleeve part and the other end of the spring being anchored to a pin **192** mounted on and extending from the bottom face of the housing part **112**. The spring **191** may be housed in a cage comprising parallel disc plates **193**, **194**, on each side of the spring. These plates may be keyed to the sleeve extension **126**. Stop arms **195** extending radially, in register, from the spring cage plates **193**, **194** abut against spring pin **192** which also serves as a stop pin to locate the spring cage and sleeve part **195** with reference to the housing part **112** in expanded position of the spring. Thus, when the clutch is engaged the clock mechanism causes rotation of both gears

180, 187. Hence both sleeve parts 124 and 125 and their cams are driven together. During this rotation the spring 191 is wound up. The clock mechanism is known as a gear shift motor and is available on the market. When it is deenergized the motor of the clock mechanism is automatically disconnected by means (not visible) within the clock housing, from the driving pinion 181. Hence the pinion 181 can turn freely when the spring 191 returns the parts to their starting position.

Thus the upper set of cams are manually adjustable by rotation of the spindle on merely pushing the spindle. The lower set of cams are not adjustable for they are constantly connected with the clock motor while it is energized; when deenergized the lower cams are returned at once by the return spring to original starting position. This arrangement can be used where an adjustable wash period, for example, is desired in automatic washing machines, although the invention obviously has other uses.

Many modifications within the scope of my invention will occur to those skilled in the art. Therefore I do not limit it to the specific embodiments illustrated and described.

What is claimed is:

1. In a time-controlled switching device, a spindle, a plurality of sleeve members on said spindle, said spindle and sleeve members being relatively slidable, cam members on said sleeve members, separable contact members operated by said cam members, one of said sleeve members being separately rotatable upon said spindle and the other rotating with said spindle, in combination with a clock motor driving said spindle and driving said separately rotatable sleeve member.

2. A device as claimed in claim 1 having clutch means between the clock motor and spindle whereby the cams carried by the sleeve member rotatable with the spindle can be manually adjusted relative to the clock motor.

3. A device as claimed in claim 2 wherein the clutch means comprises a toothed member fixed on the spindle and a toothed member fixed on the separately rotatable sleeve member, said

toothed members being disengageable by axial movement of the spindle.

4. A device as claimed in claim 1 having clutch means between the clock motor and spindle whereby the cams carried by the sleeve member rotatable with the spindle can be manually adjusted relative to the clock motor, and return spring means associated with the separately rotatable sleeve member to return the same to starting position when the clutch means is disengaged.

5. In a time-controlled switching device, a spindle, a plurality of sleeve members on said spindle, said spindle and sleeve members being relatively slidable, cam members on said sleeve members, separable contact members operated by said cam members, one of said sleeve members being separately rotatable upon said spindle and the other rotating with said spindle, a clutch connection between the sleeve members, said clutch being disengageable by axial movement of said spindle whereby the one sleeve can be driven independently of the other or with the other as desired.

6. A device as claimed in claim 5 having a return spring means for returning one sleeve to its starting position when said clutch connection is disengaged.

7. A device as claimed in claim 1 wherein the clutching connection comprises a toothed member on and rotating with the separately rotary sleeve member, and a toothed member fixed on said spindle meshing with said first toothed member.

8. A device as claimed in claim 5 wherein at least one of said sleeve members is axially immovable and said spindle is slidable within the same.

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