June 20, 1967 L. W. BEMENT ETAL 3,327,073

QUICK MAKE SWITCH WITH NEUTRAL POSITION

Filed Sept. 16, 1965

2 Sheets-Sheet 1

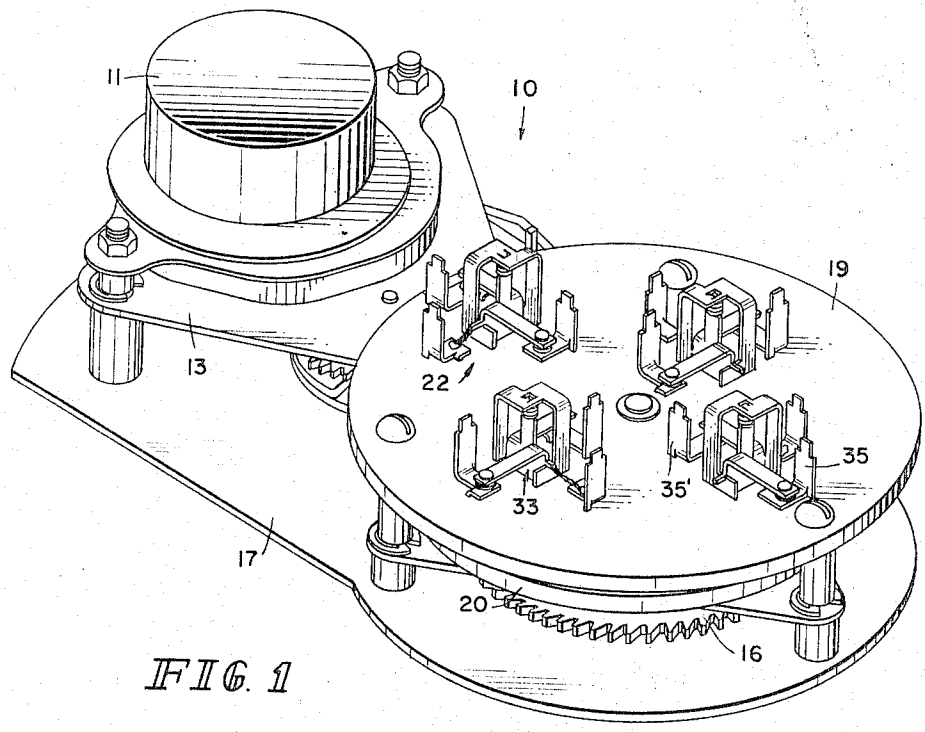

FIG. 1

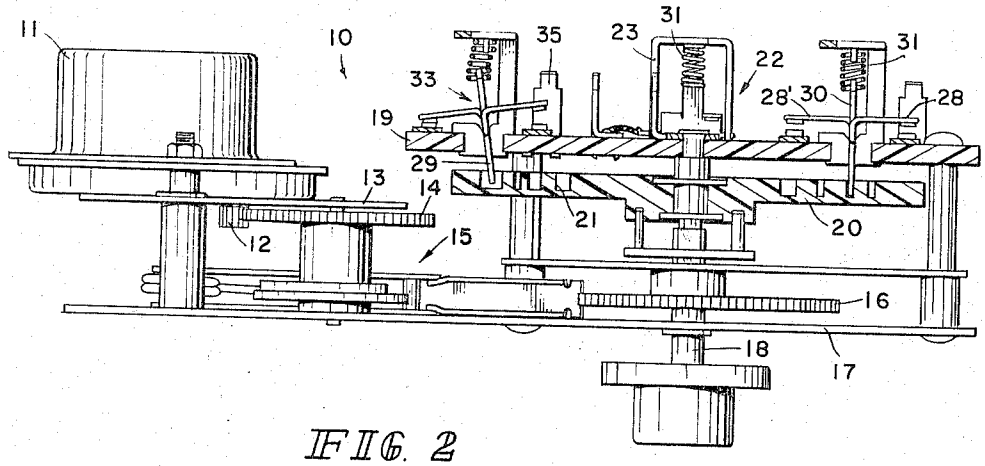

FIG. 2

INVENTORS
LYLE W. BEMENT
KARL F. CUMMINGS
BY
ATTORNEY

June 20, 1967 L. W. BEMENT ETAL 3,327,073

QUICK MAKE SWITCH WITH NEUTRAL POSITION

Filed Sept. 16, 1965 2 Sheets-Sheet 2

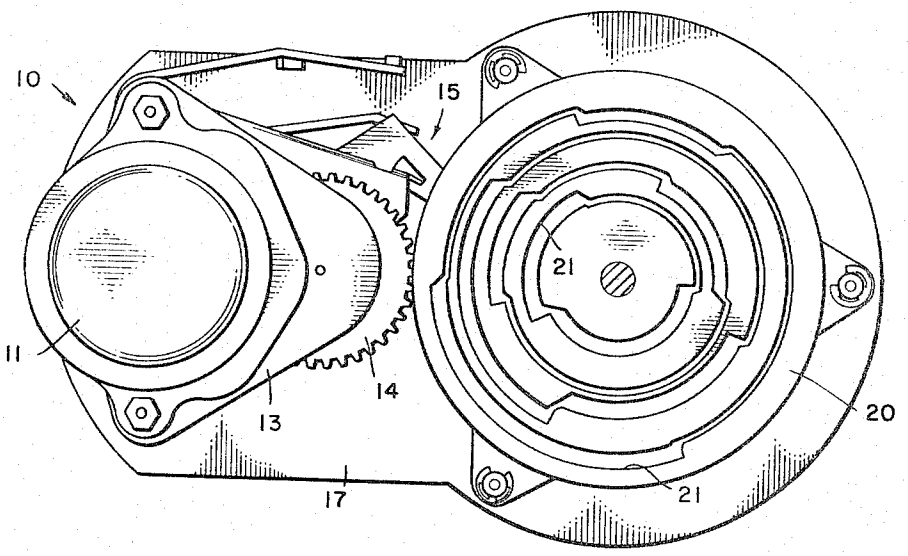

FIG. 5

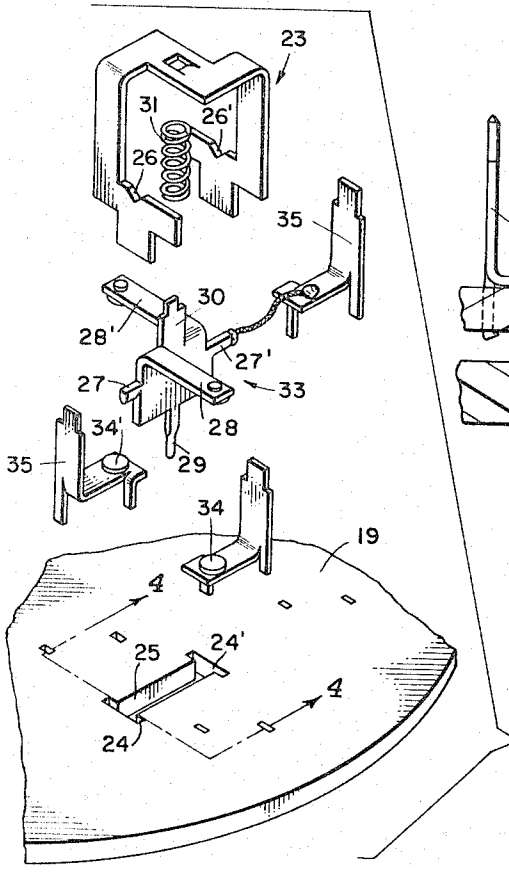

FIG. 3

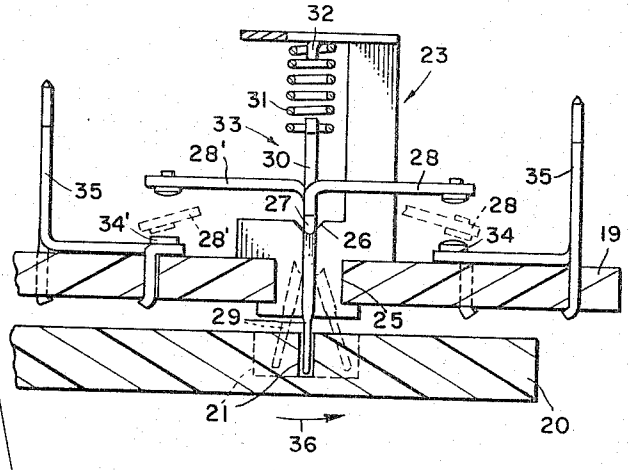

FIG. 4

INVENTORS
LYLE W. BEMENT
KARL F. CUMMINGS
BY
ATTORNEY

United States Patent Office 3,327,073
Patented June 20, 1967

3,327,073

QUICK MAKE SWITCH WITH NEUTRAL POSITION

Lyle W. Bement and Karl F. Cummings, Indianapolis, Ind., assignors to P. R. Mallory & Co. Inc., Indianapolis, Ind., a corporation of Delaware

Filed Sept. 16, 1965, Ser. No. 487,862
12 Claims. (Cl. 200—38)

ABSTRACT OF THE DISCLOSURE

A snap switch including a bracket means having spaced parallel legs and oppositely located seats formed in the legs. A contact carrying follower means including means interfitting with the seats pivotally retain the contact follower means. Contact carrying arm means are integral with the contact carrying follower means. An upwardly extending protruberance and a cam follower means are formed on the contact carrying follower means. The cam follower means responds to the contours of a cam means so as to displace the contact carrying follower means. Fixed contacts are adjacent the contacts of the contact carrying arms. A helical overcenter spring is compressively positioned between the bracket means and the protuberance of the contact carrying follower means. The helical spring releases stored energy when the contact follower means is pivotally displaced by the cam means to further displace the contact follower means with a snap action motion into engagement with one of the fixed contacts.

The present invention relates generally to an electromechanical means, and more particularly to a means and method for rapid switching of electrical circuits of the type commonly associated with a control timer.

Although the present invention is adaptable for use in a multiplicity of devices, a particularly useful application of the means and method of the present invention is found in control timers of the general type employed to regulate cycle programs of electrical appliances such as washing machines, dishwashers, dryers and the like. Generally, the sequential timers utilized to control the sequence of operations of the cooperatively associated electric appliance are of the type having a plurality of drum-shaped cams attached to a rotatably driven shaft. The drum-shaped cams have peripheral coded indicia, generally rise and fall contours, on which one or more follower switches ride. The state of actuation of any particular follower switch is determined by the contours of the drum-shaped cam cooperatively associated with the follower switch. Each follower switch effectively controls the state of actuation of an electrical circuit associated therewith. Such electrical circuits control the cycling of the electrical appliance.

The follower switches generally associated with a sequential timer are of the type that have a slow make time thereby increasing the probability of arcing between the slow engaging contacts of the switch. Arcing causes erosion damage to be suffered by the switch contacts thereby having a deleterious effect on the operation of the switch. The present invention contemplates the use of a novel snap switch used in conjunction with a single cam means having a plurality of radial grooves cut therein. The snap switch affords fast make time so as to minimize the arcing between the contacts and thereby reduce the deleterious arcing effect on the contacts. The use of the novel snap switch also allows the use of radial cam tracks whose grooves need not be as critical in contour as if one of several prior art follower switches was utilized. It is seen that if a follower switch is utilized, the peripheral

contours of the cam must be sufficient to insure that positive make of a contact carrying blade with a fixed contact is afforded whereas if the novel snap switch of the present invention is utilized, an overcenter spring assembly of the snap switch need only to be displaced from its initial position to an overcenter position which will cause the contact carrying blade to snap from its initial position to a predetermined position with a rapid motion. It is seen that the snap switch of the present invention permits the use of a cam track having a less critical shape.

Therefore, it is an object of the present invention to provide a novel snap switch means used with a sequential timer that has rapid make contact time.

Another object of the present invention is to provide a snap switch means having two engaged position and a neutral position.

Still another object of the present invention is to provide a novel snap switch means wherein the actuating force of the snap switch means is directly coupled to a contact carrying follower means of the snap switch means.

Yet another object of the present invention is to provide a rotatable switch actuating means of unitary construction, the actuating means operating a plurality of snap switch means.

Another object of the present invention is to provide a novel sequential timer means that is characterized by its simplicity.

Yet still another object of the present invention is to provide a rotatable switch actuating means having radial grooves cut therein, the grooves coded so as to actuate a snap switch means to one of a plurality of positions.

Still another object of the present invention is to provide a novel sequential timer means having optimum reliability characteristics afforded by compact construction having a minimum number of parts.

Yet another object of the present invention is to provide a snap switch means that is efficient, effective and accurate.

Another object of the present invention is to provide a snap switch means which can be readily fabricated and formed at low cost.

Yet another object of the present invention is to provide a sequential timer usable in shallow depth locations.

The present invention, in another of its aspects, relates to the novel features of the instrumentalities of the invention described herein for teaching the principal object of the invention and to the novel principles employed in the instrumentalities whether or not these features and principles may be used in the said object and/or in the said field.

With the aforementioned objects enumerated, other objects will be apparent to those persons possessing ordinary skill in the art. Other objects will appear in the following description, appended claims, and appended drawings. The invention resides in the novel construction, combination, arrangement, and cooperation of elements as hereinafter described and more particularly as defined in the appended claims.

The appended drawings illustrate an embodiment of the present invention constructed to function in the most advantageous modes devised for the practical application of the basic principals involved in the hereinafter described invention.

In the drawings:

FIGURE 1 is a perspective view of the sequential timer illustrating the several components thereof and the relative position of these components.

FIGURE 2 is a partial side view of the sequential timer showing the cooperative relation between the snap switch

means and the radial grooves of the rotatable switch actuating means.

FIGURE 3 is an exploded perspective view of the snap switch means illustrating the various components thereof, and their relative position on a mounting means.

FIGURE 4 is an enlarged sectional view taken across the lines **4—4** of FIGURE 3 showing the operation of the snap switch in full and dotted lines.

FIGURE 5 is a top view of the sequential timer with the snap switch means and the mounting means therefor removed illustrating the contours of the radial grooves of the switch actuating means.

Generally speaking, the means and method of the present invention relate to a snap switch means. The snap switch means includes a mounting means or bracket means having spaced parallel legs and oppositely located seats in the legs. A contact carrying follower means of the switch includes means interfitting with the seats, the seats pivotally retaining the contact carrying follower means. A plurality of contact carrying arms are integral with and extend angularly from the axis of the contact carrying follower means. An upwardly extending protuberance and a downwardly projecting follower means or needle-shaped follower means are formed on the contact carrying follower means. The needle-shaped follower means responds to the contours of a switch actuating means or cam means so as to pivotally displace the contact carrying follower means. Fixed contacts substantially underlay the contact of the contact carrying arms. A helical overcenter spring is compressively positioned between a node of the bracket means and the protuberance of the contact carrying follower means. The helical overcenter spring, the node, and the protuberance are axially aligned when the contact carrying follower arm is in a neutral position. The helical overcenter spring releases its stored energy when the follower means is displaced by the cam means to further pivotally displace the contact carrying follower means with a snap action motion into engagement with one of the fixed contacts.

The snap switch means may be used as an important component of a novel sequential timer. The sequential timer may be utilized for actuating a plurality of electrical circuits. The timing device includes a drive means having a constant rotary motion output and an escapement means coupled to the output of the drive means. The escapement means translates the constant rotary motion of the drive means to an intermittent rotary motion output. A cam carrying shaft is coupled to the intermittent rotary motion output of the escapement means and is driven thereby. A timing cam means having a plurality of concentric grooves formed therein is carried by the shaft and is rotatable therewith. A plurality of snap switch means are actuated by the displacement of the cam to thereby open and close electrical circuits coupled to the snap switch means.

Referring now to FIGURE 1 and FIGURE 2, more specifically to FIGURE 2 of the drawings, the sequential timer means is generally indicated by numeral **10**. The timer includes a drive motor means **11** which is mechanically coupled to a pinion **12** so as to rotationally displace the pinion in a predetermined direction such as the counterclockwise direction with a substantially continuous rotary motion. The drive motor is fixedly secured to a mounting plate **13** by a plurality of suitable mounting means such as bolts, rivets or the like. The mounting plate substantially prevents deleterious horizontal and vertical displacement of the drive motor due to vibration, abusive handling or the like. The mounting means predeterminately locates the pinion with respect to a drive gear **14** of a knee action escapement means **15**. The gear meshes with and is driven by the pinion in a clockwise direction with a substantially constant rotary motion. The escapement means translates the substantially constant rotary motion output of the motor to an intermittent or step-by-step rotary motion output. The constructional details of the drive means of the sequential timer have been held to but a minimum since these components are standard.

The intermittent motion of the escapement means is transferred to a large reduction gear **16** fixedly retained on a cam carrying shaft **18**. It is seen that the intermittent motion of the escapement means is transferred to the cam carrying shaft through the large reduction gear.

Mounted in spaced, parallel relationship with the main mounting means **17** is a plate **19**. The plate **19** is retained in spaced, parallel relationship by a plurality of retaining means such as bolts or the like.

The cam carrying shaft is journalled respectively by the plate **19** and the main mounting means **17** to thereby axially retain the shaft yet allow the cam carrying shaft to be rotationally displaced. As shown in FIGURE 2, a unitary timing cam **20**, fabricated from any suitable insulative material such as rigid plastic, is fixedly coupled to the cam carrying shaft between the main mounting means and the plate **19**. The timing cam includes on the face underlying the plate **19** a plurality of concentrically disposed, radially spaced, continuous arcuate grooves **21**. The number of concentric grooves will vary in accordance with the number of operations desired to be furnished by the sequential timer.

As shown in FIGURE 5, each of the concentrically spaced grooves includes segments thereof that are displaced from the axis of the cam carrying shaft at varying distances. Each of the segments of any particular groove is of a predetermined length, the segment length corresponding to a desired time interval. The segment of the groove provides the desired actuation of a snap switch means **22** cooperatively associated with the groove. The groove by way of its segments governs whether a particular electrical circuit associated with the snap switch means is energized or deenergized. FIGURES 2 and 5 illustrate the use of four separate and distinct grooves, however, it will be understood that the number of grooves shown is merely illustrative and not limiting in scope. The number of grooves utilized is dependent only on the number of circuits desired to be actuated by the timing cam.

The snap switch means of the present invention is most clearly shown in FIGURES 3 and 4 of the drawings. A mounting bracket means **23** of the snap switch means is used as the main support means of the snap switch means. The mounting bracket is press fitted with apertured portions **24** and **24'** of I-shaped aperture **25** so as to substantially overlay the I-shaped aperture. The bracket includes notched portions **26** and **26'** in spaced, parallel relationship that serve as a seat for the projections **27** and **27'** of the contact carrying follower means **33** of the snap switch means. As will be more fully disclosed herein later, the seats **26** and **26'** are points about which projections **27** and **27'** respectively pivot.

The contact carrying follower means includes a pair of oppositely extending contact carrying arms **28** and **28'** and a longitudinally extending needle-shaped follower means **29** that rides in a cooperatively associated concentric groove. It will be noted that the oppositely extending contact carrying arms are perpendicular to the longitudinal axis of the contact carrying follower means. Extending longitudinally upwardly as an integral part of the contact carrying follower arm is protuberance **30**. The protuberance provides a seat for the lower extremity of helical overcenter spring **31**. A node **32** of the bracket means **23** overlays the protruberance in spaced relationship. The node **32** serves as an upper extremity seat for the helical spring. Thus, it is seen that the overcenter helical spring is compressively seated between the node **32** and the protuberance **30** of the contact carrying follower means.

Underlaying the movable contact of the contact carry-

ing arm 28 is fixed contact 34 and likewise underlaying the movable contact of the contact carrying arm 28' is fixed contact 34'. The fixed contacts 34 and 34' are carried by a terminal means 35 and 35' respectively.

A snap switch means is illustrated in FIGURE 4 as being in the "neutral" position. The "neutral" position as illustrated is the position wherein neither of the movable contacts engage with either of the cooperatively associated fixed contacts.

As the needle-shaped follower means of the contact follower means is displaced in the direction of arrow 36 as shown by the dotted lines of FIGURE 4, the projections 27 and 27' slowly pivot in their respective cooperatively associated notched portions 26 and 26'. The protuberance is arcuately displaced in the counterclockwise direction slowly. The arcuate displacement causes the helical overcenter spring to be slightly displaced. Continued arcuate displacement of the protuberance causes a slight decompression of the helical overcenter spring until the compressive forces of the helical spring act at a predetermined angle with respect to the longitudinal axis of the contact carrying follower arm. Ideally, as soon as the compressive forces of the spring act at an angle with respect to the axis of the contact carrying follower arm, the energy stored by the helical spring will be released so as to displace the extending contact carrying arm 28' in the counterclockwise direction. However, due to the existing frictional forces of the snap switch means and the inertia of the displaceable components of the snap switch means, the contact carrying follower arm must be arcuately displaced in the counterclockwise direction a small distance by the contour of the cooperatively associated timing cam prior to the sudden release of the energy stored in the helical spring. The release of the energy stored by the spring causes the extending contact carrying arm 28' to engage with the fixed contact 34' with a snap action motion. Further arcuate displacement of the unitary timing cam 20 causes the needle-shaped follower means to be displaced in the clockwise direction in accordance with the contours of the grooves of the timing cam. The clockwise displacement of the contact carrying follower means through the integral needle-shaped follower means causes the helical spring to be compressed between the protuberance and the node 32 of the bracket thereby storing energy. The contact carrying follower means is displaced to the "neutral" position as shown by the solid lines of FIGURE 4 or is displaced to the dotted line position of FIGURE 4 illustrating the contact carrying arm 28 engaged with the fixed contact 23. The position of the contact carrying arm depends directly on the contours of the groove cooperatively associated with the needle-shaped follower means. It is seen that the described snap switch means differs from several of the prior art snap switch means in that the input force to the snap switch is through the contact carrying follower means to the helical spring rather than through the spring to the contact carrying follower means.

With the hereinbefore structural disclosure in mind and by continued reference to the several figures of the drawing, the following analysis of the operation of the present invention will further serve to amplify the novelty of the present invention.

The operator of the timing device electrically couples the drive motor to a source of electrical energy by actuating any suitable means such as a line switch means to the closed position. The drive means translates the electrical energy of the electrical source to a mechanical energy output at pinion 12. The pinion is mechanically coupled to the drive gear 14 and drives the gear with a substantially constant rotary motion. The drive gear is a component of the escapement means 15. The escapement means translates the constant rotary motion of the drive means to a step-by-step or intermittent rotary motion output. The intermittent rotary motion output of the escapement is transferred from the escapement means, more particularly the ratchet wheel of the escapement, to the cam carrying shaft. Thus, the cam carrying shaft is driven in an intermittent fashion.

As disclosed hereinbefore, at least one of the snap switch means rides in each of the concentrically disposed, radially spaced, plurality of grooves. Each of the grooves is comprised of segments of varying radial distance from the major axis of the timing cam. The individual snap switch means include a needleshaped follower means that rides in the cooperatively associated groove of the unitary timing cam and follows the contours thereof. The unitary cam timing means is advanced with an intermittent motion due to the interaction between the escapement means and the cam carrying shaft. As the needle-shaped follower means follows the contours of the groove in which it rides, the contact carrying follower means is pivoted about the notched portions 26 of the bracket in accordance with the indicia of the grooves. The contours or indicia of the cooperatively associated groove determine the position of the contact carrying follower means, that is, engaged with one of the two terminal contacts or in the neutral position. The helical overcenter spring will cause an extending contact carrying arm to engage with one of the fixed terminals with a snap motion when the axis of the contact carrying follower means is displaced from a line drawn through the axis of the helical overcenter spring is released thereby rapidly displacing the contact spring. The stored compressive force of the overcenter carrying follower means into engagement with one of the fixed contact terminals.

It is seen from the aforementioned structure and its recited operation, that a minimum number of components are utilized while not diminishing the capacity of the sequential timer.

While the invention is illustrated and described in an embodiment, it will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of this invention and as set forth in the appended claims.

Having thus described our invention, we claim:

1. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located seats formed in said legs; a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means; a plurality of contact carrying arms integral with said contact carrying follower means; an upwardly extending protuberance and a cam follower means formed on said contact carrying follower means, said cam follower means for responding to contours of a cam means so as to displace said contact carrying follower means; fixed contacts, adjacent said contacts of said contact carrying arms; and a helical overcenter spring compressively positioned between said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

2. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located seats formed in said legs; a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means; a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means; an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means for responding to contours of a cam means so as to displace said contact carrying follower means; fixed contacts adjacent said contacts of said contact

carrying arms; and a helical overcenter spring compressively positioned between said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

3. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located seats formed in said legs; a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means; a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means; an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means for responding to contours of a cam means so as to pivotally displace said contact carrying follower means; fixed contacts substantially underlaying said contacts of said contact carrying arms; and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring, said node and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

4. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; and a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spaced parallel legs, oppositely located seats formed in said legs, a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means, a plurality of contact carrying arms integral with said contact carrying follower means, an upwardly extending protuberance and a cam follower means formed on said contact carrying follower means, said cam follower means riding in and responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts substantially underlaying said contact of said contacts carrying arms, and a helical overcenter spring compressively positioned between said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

5. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; and a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spaced parallel legs, oppositely located seats formed in said legs, a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means, a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means, an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means riding in and responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts adjacent said contact of said contact carrying arm, and a helical overcenter spring compressively positioned between said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

6. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; and a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spaced parallel legs, oppositely located seats formed in said legs, a contact carrying follower means including means interfitting with said seats for pivotally retaining said contact carrying follower means, a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means, an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts substantially underlaying said contact of said contact carrying arm, and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring, said node, and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

7. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located notched seats formed in said legs; a contact carrying follower

means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means; a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means; an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means responding to contours of a cam means so as to pivotally displace said contact carrying follower means; fixed contacts adjacent said contacts of said contact carrying arms; and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring, said node and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

8. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located notched seats formed in said legs; a contact carrying follower means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means; oppositely extending contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means; an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means responding to contours of a cam means so as to pivotally displace said contact carrying follower means; fixed contacts substantially underlaying said contacts of said contact carrying arms; and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means to thereby seat said overcenter spring therebetween, said helical overcenter spring, said node and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

9. A snap switch means comprising: a bracket means including spaced parallel legs; oppositely located notched seats formed in said legs; a contact carrying follower means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means; oppositely extending contact carrying arms integral with and extending substantially at a right angle with the axis of said contact carrying follower means; an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means responding to contours of a cam means so as to pivotally displace said contact carrying follower means; fixed contacts substantially underlaying said contacts of said contact carrying arms; and a helical overcenter spring compressively located between a node of said bracket means positioned in line with said follower means and said protuberance of said contact carrying follower means to thereby seat said overcenter spring therebetween, said helical overcenter spring, said node and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

10. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spaced parallel legs, oppositely located notched seats formed in said legs, a contact carrying follower means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means, a plurality of contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means, an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means riding in and responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts adjacent said contact of said contact carrying arm, and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means, said helical overcenter spring, said node and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

11. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; and a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spcaed parallel legs, oppositely located notched seats formed in said legs, a contact carrying follower means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means, oppositely extending contact carrying arms integral with and extending angularly from the axis of said contact carrying follower means, an upwardly extending protruberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means riding in and responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts substantially underlaying said contact of said contact carrying arm, and a helical overcenter spring compressively positioned between a node of said bracket means and said protuberance of said contact carrying follower means to thereby seat said overcenter spring therebetween, said helical overcenter spring, said node, and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is

displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

12. A timing device for actuating a plurality of electrical circuits comprising: a drive means having a constant rotary motion output; an escapement means coupled to said output of said drive means, said escapement means for translating said constant rotary motion of said drive means to an intermittent rotary motion output; a cam carrying shaft coupled to said intermittent rotary motion output of said escapement means; a timing cam means having a plurality of concentrically disposed radially spaced contoured grooves formed therein, said cam carried by said cam shaft and rotatable therewith; and a plurality of snap switch means actuated by said displacement of said cam to thereby open and close electrical circuits coupled to said snap switch means, said snap switch means including a bracket means having spaced parallel legs, oppositely located notched seats formed in said legs, a contact carrying follower means including oppositely extending projections interfitting with said notched seats for pivotally retaining said contact carrying follower means, oppositely extending contact carrying arms integral with and extending substantially at a right angle with the axis of said contact carrying follower means, an upwardly extending protuberance and a downwardly projecting needle-shaped follower means formed on said contact carrying follower means, said needle-shaped follower means

riding in and responding to said contoured grooves of said cam as said cam is rotationally displaced so as to pivotally displace said contact carrying follower means, fixed contacts substantially underlaying said contact of said contact carrying arm, and a helical overcenter spring compressively located between a node of said bracket means postioned in line with said follower means and said protuberance of said contact carrying follower means to thereby seat said overcenter spring therebetween, said helical overcenter spring, said node, and said protuberance axially aligned when said contact carrying follower arm is in a neutral position, said helical overcenter spring releasing said stored energy when said contact follower means is displaced by said cam means to further pivotally displace said contact follower means with a snap action motion into engagement with one of said fixed contacts.

References Cited

UNITED STATES PATENTS

2,749,400	6/1956	Chichester	200—67
2,995,043	8/1961	Lusk et al.	200—67
2,157,760	11/1964	Yeske	200—67
3,271,541	9/1966	Dotto et al.	200—38 X
3,280,276	10/1966	Dotto	200—38

BERNARD A. GILHEANY, *Primary Examiner.*

H. E. SPRINGBORN, *Assistant Examiner.*