United States Patent

[11] 3,591,737

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[45] Patented **July 6, 1971**
[73] Assignee **General Electric Company**

[54] **SWITCH MECHANISM FOR ELECTRIC SPRING WOUND CLOCK**
4 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **200/35,** 200/166, 58/41
[51] **Int. Cl.** **H01h 7/08,** H01h 1/18
[50] **Field of Search** ..... 58/41; 200/166 B, 166.1, 35

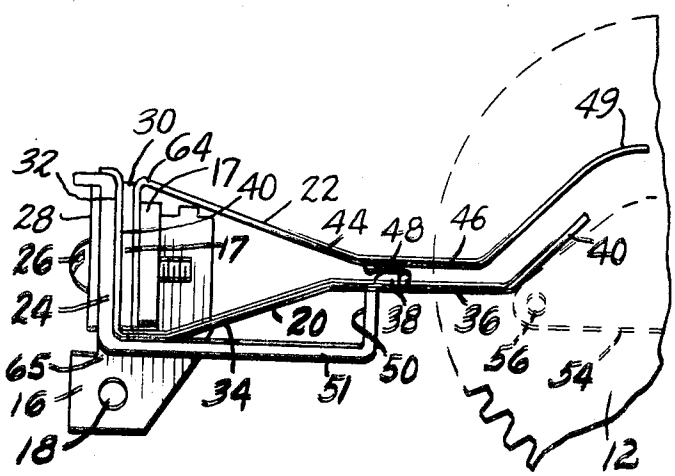
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ABSTRACT: A switch contact arrangement for starting and stopping an electric motor which periodically rewinds the main spring of a spring wound clock. Switch contacts are positioned at an angle to each other and are moved with respect to each other so that the switch is closed and contact is made at one of the ends of said contacts, the contacts slide on each other, and then the switch is opened and contact is broken at the opposite ends of the contacts.



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SHEET 1 OF 2

Fig. 1.

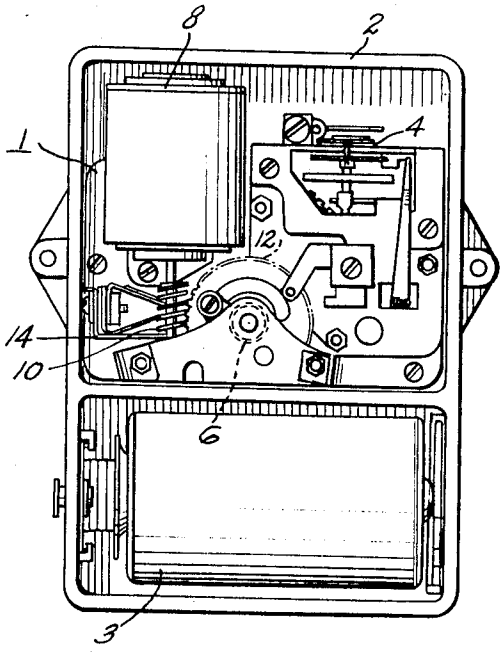


Fig. 2.

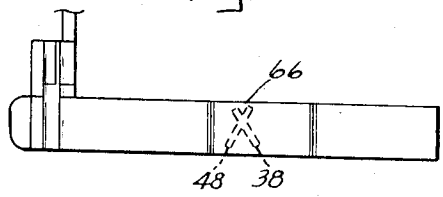


Fig. 3

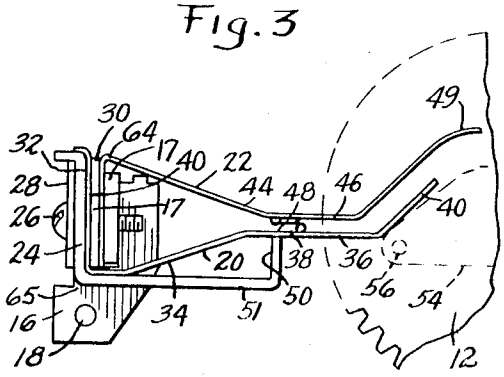


Fig. 4.

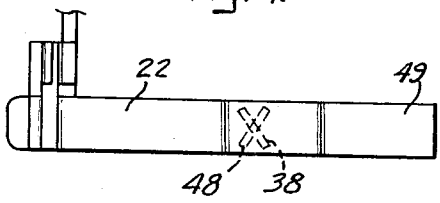
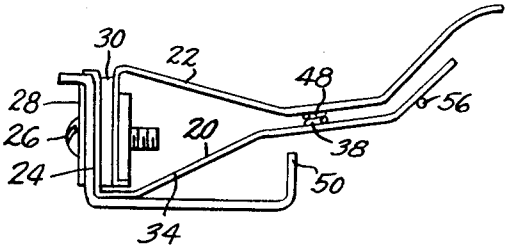


Fig. 5.



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Fig. 6.

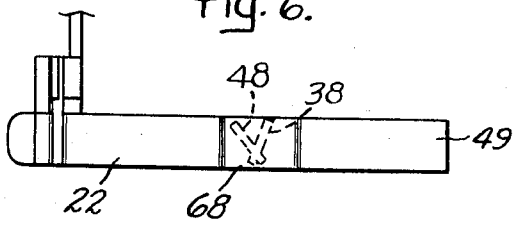


Fig. 7.

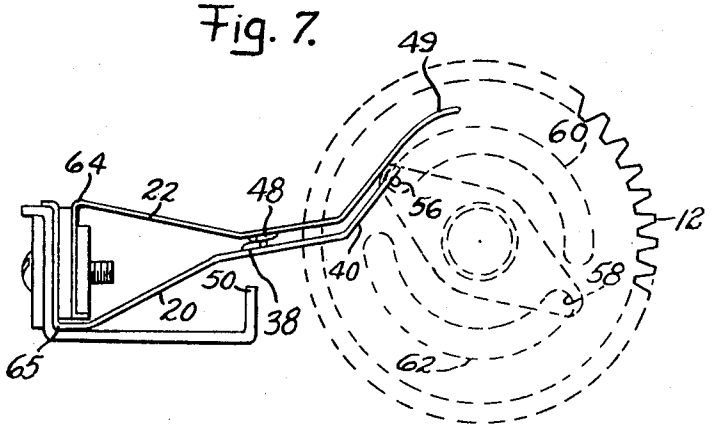


Fig. 8.

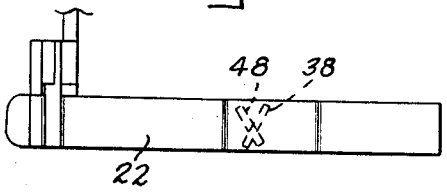
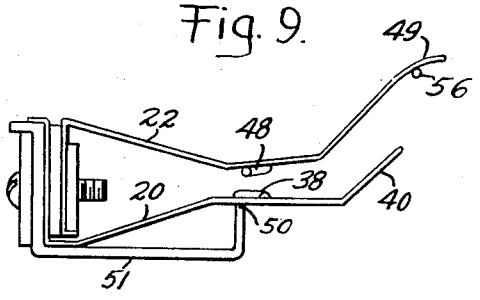


Fig. 9.



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SWITCH MECHANISM FOR ELECTRIC SPRING WOUND CLOCK

BACKGROUND OF THE INVENTION

This invention relates to an automatically spring wound clock wherein a battery driven electric electric motor periodically rewinds the main spring of the clock, and more particularly, to an improved switch construction for energizing the electric motor of such a clock.

In a prior U.S. Pat. No. 3,276,199 to Kazuo Ishikawa et al. dated Oct. 4, 1966, there is disclosed an automatically spring wound clock including a switch which is periodically actuated for energizing an electric motor. Switches which are used to actuate such an electric motor have to be opened and closed a large number of times during the life of a clock and arcing associated with disconnect causes an oxide coating to form on the switch contacts, thereby wearing away the contacts and impairing their reliability. Accordingly, it is a primary object of this invention to provide an improved reliable switch contact arrangement for periodically energizing an electric motor for driving a clock main spring.

SUMMARY OF THE INVENTION

In accordance with one aspect of this invention, a driving gear is rotated as a function of time by a clock mechanism, and a lifting pin for actuating a switch is positioned for rotation by the driving gear. The switch includes a pair of flexible blades which are fixed to a supporting member. Each of the blades has a fixed end portion secured to the supporting member, a converging portion, an intermediate portion, and a free end portion.

The contact bars are fixed to the intermediate portions of each of said blades are are uniquely arranged at an angle with respect to each other so that the two cooperating contact bars form an X-shaped arrangement. The ends of the blades are also uniquely shaped and one of the blades is constructed to be shorter than the other blade. With this arrangement, upon rotation of the driving gear and lifting pin, the lifting pin will first contact the shorter one of the flexible blades, and lift both of the blades with the contact bars initially abutting each other at one of the ends of the bars. Continued movement causes the bars to slide on each other, and when the lifting pin releases the shorter one of the blades but continues to hold the longer one of the blades, the contact bars separate from each other at the other ends of the bars. With this arrangement, the switch is closed at one of the ends of the contact bars and is opened at the other ends of the contact bars. Thus, the switch contacts are wiped with respect to each other to remove any debris or oxidized material, and the unique construction assures that arcing associated with interrupting the circuit and the oxides formed therefrom will occur at a different location on the contacts from the spot where the initial contact is made. Therefore, the initial contact making spot remains clean resulting in improved reliability of the contacts.

BRIEF DESCRIPTION OF THE DRAWINGS

Other specific and attendant advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a side elevational view of an electric motor spring wound clock provided with the improved switch contact arrangement with an outer casing partially cut away to provide a view of the interior;

FIG. 2 is a partial top plan view of the switch arrangement shown in FIG. 1 illustrating the switch blades normally biased to a closed position,

FIG. 3 is a partial side elevational view of the switch arrangement in the position shown in FIG. 2;

FIG. 4 is a partial top plan view of the switch arrangement illustrated in FIG. 1 showing a lifting pin starting to contact a lower short flexible blade;

FIG. 5 is a partial side elevational view of the contact arrangement in the position illustrated in FIG. 4;

FIG. 6 is a partial top plan view of the switch arrangement illustrated in FIG. 1 showing the lifting pin holding both blades in a top position;

FIG. 7 is a partial side elevational view of the switch arrangement in the position illustrated in FIG. 6;

FIG. 8 is a partial top plan view of the switch arrangement illustrated in FIG. 1 showing a top blade held by the lifting pin and a lower blade released from the lifting pin;

FIG. 9 is a partial side elevational view of the switch arrangement in the position illustrated in FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and first particularly to FIG. 1 there is shown an electric motor spring wound clock including our improved switch contact arrangement. The clock illustrated includes a support or mounting plate **1**, a casing **2** and a battery **3**. The hands of the clock (not shown) are rotated by an escapement movement **4** in a conventional manner. A main spring **6** is provided for driving the escapement movement **4** and a small electric motor **8** is provided for periodically winding the main spring. This rewind is accomplished through a drive worm **10** of the motor which drives the rewind gear **12**. The rewind gear **12** is suitably connected to one end of the main spring **6**. In the device illustrated, the main spring **6** is rewound about once every eight minutes, at which time the rewind gear **12** is driven one complete revolution.

In accordance with our invention, a unique switch arrangement **14** is provided for periodically energizing and deenergizing motor **8** in order to periodically rewind the main spring **6** of the clock. As shown more particularly in FIG. **3**, a switch support member **16** is fixed to mounting plate **1** by a screw **18** or other suitable securing means. As shown, lower blade **20** and upper blade **22** are fixed to an outwardly extending arm **17** of support **16** by means of a screw **26** or other securing means, and pieces of plastic or other suitable insulating material **28** and **30** are located to insulate the switch blades **20** and **22** from each other.

As shown in FIGS. **3**, **5** and **7**, lower switch blade **20** includes a fixed end portion **32**, an upwardly extending converging portion **34**, an intermediate portion **36** to which a switch contact bar **38** is fixed and an upwardly extending free end portion **40**. The upper switch blade **22** includes a corresponding fixed end portion **42**, a downwardly extending portion **44** which converges toward the lower flexible switch blade, an intermediate portion **46** for mounting switch contact **48** and a curved upwardly extending free end portion **49**.

The switch blade **20** and **22** may be made of any suitable flexible conducting material; however, it has been found that bronze is particularly suitable to obtain a low voltage loss conduction. It can be appreciated that each of the switch blades may be formed from a single piece of sheet material and readily stamped into the forms illustrated.

As shown more particularly in FIGS. **2**, **4**, **6** and **8**, contact bars **38** and **48** are positioned on the intermediate portions of switch blades **20** and **22** respectively. The contact bars **38** and **48** are positioned at an angle of approximately 60° with respect to each other in order to achieve a wiping action to be more fully described hereinafter.

The normal switch closed position of our unique switch arrangement is illustrated in FIGS. **2** and **3**. As shown, both switch blade **22** and switch blade **20** are normally biased downwardly so that the lower surface of the intermediate portion of switch blade **20** abuts a stop member **50** which may be conveniently formed as the right upwardly extending arm **50** of a U-shaped support **51**. In the position illustrated in FIGS. **2** and **3**, the switch is closed and the electric motor **8** is being operated to wind the main spring of the clock.

A switch actuator which is rotated as a function of time by the clock is uniquely positioned in close proximity to the free ends **40** and **49** of our unique switch for periodically actuating

the switch. As shown more particularly in FIGS. 1 and 7, the switch actuator includes a driving gear 12 and a lifting pin arrangement 54 including lifting pins 56 and 58 which extend through slots 60 and 62, respectively of the driving gear for rotation by the driving gear 12. In the normal switch closed position illustrated in FIG. 2, the contact bars are arranged in a generally inverted "V" position with respect to each other to start the motor for rewinding the spring. The relative positions of the contact bars 38 and 48 are shown slightly exaggerated in FIGS. 2 and 6 for purposes of illustration.

In operation, the driving gear and lifting pins 56 and 58 are rotated in a clockwise direction as shown in FIGS. 3, 5, 7 and 9, and as shown more particularly in FIGS. 4 and 5, one of the lifting pins 56 abuts the lower surface of the free end portion 40 of blade 20 to lift both blade 20 and blade 22. It can be appreciated that blade 22 is lifted through the abutment of contact bar 38 with the lower surface of contact bar 48.

As the flexible blades 20 and 22 are lifted, the blades are their contact bars 38 and 48 move from the positions shown in FIGS. 2 and 3, 4 and 5, to the position illustrated in FIGS. 6 and 7. Our unique switch blade arrangement has been designed so that the blades and the contact bars move with respect to each other during this switch closed movement from the position illustrated in FIGS. 2 and 3 to the position illustrated in FIGS. 6 and 7. It can be seen that the contact blades 22 and 20 are spaced a substantial distance from each other at the junctures 64 and 65 of the fixed end portions 32 and 40 with the converging portions 34 and 44 of the blades. It can also be appreciated that the blades are shaped to bend differently under the forces exerted by lifting pins 56 and 58. Thus, the blades 20 and 22 and the contact bars 38 and 48 move with respect to each other. The lower contact bar 38 moves toward support arm 24 of the U-shaped support 16 while the upper contact 48 moves away from the upwardly extending arm 24 of the U-shaped support 16. As shown in FIGS. 2, 4 and 6, the bars 38 and 48 are positioned at an angle of approximately 60° with respect to each other, and therefore in the position illustrated in FIG. 2, the bars contact each other at a point 66 and then they slide on each other to contact each other at a point 68, as shown in FIG. 6. Thus, applicants' switch blades and contact bars are uniquely designed and positioned with respect to each other to achieve a wiping action in order to remove any debris or oxidizing material from the contact bars.

Upon continued rotation of lifting pin 56 in a clockwise direction, the pin 56 moves out from underneath the free end 40 of the lower blade permitting the lower blade to snap downwardly to its normal position against abutment stop 50. Naturally, this action opens the switch contacts 38 and 48. In accordance with our invention, it can be appreciated that the switch is opened when the contact 38 and 48 are in the relative positions generally illustrated in FIGS. 6 and 8. Thus, any arcing associated with interrupting the circuit will occur generally at point 68 on the contact bars, and with reference to FIG. 2, it can be appreciated that the motor 8 is started when the contacts abut each other at point 66. In this manner, the portion of the contact bars used for closing the circuit remain clean, and the reliability of the contact bars is improved.

With reference to FIGS. 8 and 9, it can be appreciated that upon continued rotation of the driving gear 12 and the lifting pin 56, the switch remains open as long as the lifting pin 56 continues to hold the curved free end portion 49 of the upper switch blade 22. When the lifting pin 56 moves out from under the upper blade 22, the upper blade 22 snaps downwardly onto the lower blade 20 to the position illustrated in FIGS. 2 and 3 to close the switch and restart the electric motor to rewind the main spring 6. As indicated above, when the upper blade 22 snaps downwardly, the upper contact bar 48 abuts lower contact bar 38 at a relatively clean point 66 on the contact bars.

With this improved construction, it can be appreciated that a very reliable switch arrangement has been achieved which solves the problems inherent with prior art switch constructions. The switch bars are wiped with respect to each other to remove any debris or oxidized material, and the unique construction assures that arcing associated with interrupting the circuit will occur at a different location on the contact bars from the location used for closing the circuit. Thus, the contacts stay cleaner and are more reliable. All of the parts including the uniquely shaped flexible switch blades 20 and 22 may be readily formed in simple manufacturing operations. Thus, an exceedingly simple and reliable switch arrangement for periodically energizing an electric motor for rewinding a main spring is achieved.

What we claim is:

1. A switch for starting and stopping an electric motor which winds the main spring of a spring wound clock comprising;
   a. a driving gear rotated as a function of time;
   b. a lifting pin for actuating said switch positioned for rotation by said driving gear;
   c. a supporting member;
   d. a pair of flexible blades, each of said flexible blades having fixed ends secured to said supporting member, a converging portion, an intermediate portion, and a free end portion;
   e. a contact bar fixed to the intermediate portion of each of said flexible blades, the contact bar on one of said flexible blades arranged at an angle with respect to the contact bar on the other one of said flexible blades so that said contact bars form a generally X-shaped arrangement;
   f. said driving gear and said lifting pin located in close proximity to the free ends of said flexible blades and one of said flexible blades being shorter than the other one of said flexible blades so that upon rotation of said driving gear and said lifting pin, the lifting pin will first contact the shorter one of said flexible blades, lift both the shorter one and longer one of said flexible blades thereby causing the contact bars to start to slide along each other at one of the ends of said contact bars, and then separate from each other at the other ends of said contact bars when the lifting pin releases the shorter one of said flexible blades but continues to hold the longer one of said flexible blades.

2. A switch as defined in claim 1 wherein said flexible blades are spaced a substantial distance from each other at the location where the fixed end portions of each of said flexible blades meet the converging portions of the flexible blade.

3. A switch as defined in claim 1 wherein the contact bars on said flexible blades are arranged at an angle of approximately 60° with respect to each other.

4. A switch as defined in claim 1 wherein said supporting member includes an integrally formed stop portion and said flexible blades are biased toward said stop portion.