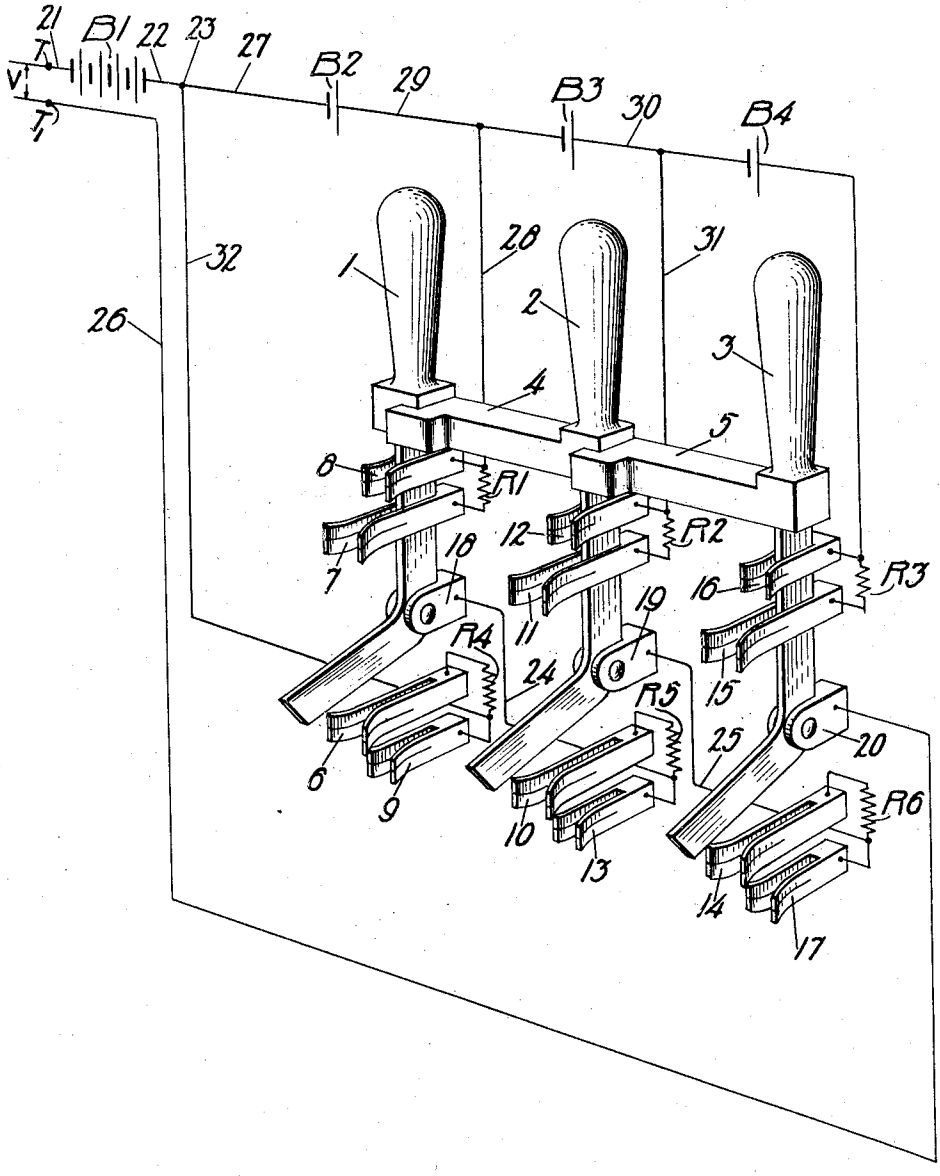
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L. C. WESCOAT

INTERLOCKING SWITCH

Filed Nov. 15, 1919




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Att'y.

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# UNITED STATES PATENT OFFICE.

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## INTERLOCKING SWITCH.

Application filed November 15, 1919. Serial No. 338,219.

*To all whom it may concern:*

Be it known that I, LEWIS C. WESCOAT, a citizen of the United States, residing at Elmhurst, in the county of Queens, State of New York, have invented certain new and useful Improvements in Interlocking Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to electric switches and more particularly to interlocking switches, and has for its object the provision of means whereby two or more switches are made interdependent so that each of said switches can be operated only in a definite order with respect to the other switches in the group.

The application of this invention to a pair of knife switches for example, comprises an arm attached to one of the switches projecting laterally therefrom and overlapping the other switch. The two switches, of course, are mounted adjacently on a common base member or panel. Both switches are thus interdependent in operation; the second switch cannot be opened until the first switch has been opened and conversely, the first switch cannot be closed until the second switch has been closed.

While this invention is applicable to any desired number of switches in a group, its application to a group comprising more than two switches merely results in a multiplication of the parts as applied to only two switches.

In the drawing, Nos. 1, 2 and 3 are single blade double-throw knife switches of the continuous contact type, two of which are provided with projecting arms 4 and 5, each arm being arranged to overlap the switch adjacent to that to which the arm is attached. The switch blades are V-shaped and are fulcrumed at the points 18, 19 and 20 respectively. Nos. 6 to 17 inclusive are spring contacts cooperating with the blades of the switches. These contacts are arranged in pairs, each pair consisting of a long and a short contact, the reason for which will be clear from a description of the associated circuit hereinafter. There is shown in the drawing associated with the switches, a typical circuit illustrating an example wherein these interlocking switches are particularly applicable. $B^1$ is a storage battery consisting of a number of cells and will be hereinafter referred to as the main battery. $B^2$, $B^3$ and $B^4$ are auxiliary storage batteries consisting of single cells or small groups of cells and will hereinafter be referred to as end cells. $R^1$ to $R^6$ inclusive are resistances shunting each pair of spring contacts. T and $T^1$ are terminals. It is required to maintain a nearly constant discharge voltage between the terminals T and $T^1$ and this is accomplished by adding in series with the main battery from time to time as the latter declines, one or more of the end cells. It is required that the addition of end cells shall be accomplished without interrupting the circuit and this, of course, must be done without short-circuiting the end cells.

With the three switches 1, 2 and 3 closed in the lower position, main battery $B^1$ is connected to the terminals T and $T^1$, the circuit being from terminal T, conductor 21, main battery $B^1$, conductor 22 to point 23, conductor 32 to spring contact 9, the blade of switch 1 to fulcrum point 18, conductor 24, spring contact 13, the blade of switch 2 to fulcrum point 19, conductor 25, spring contact 17, the blade of switch 3 to fulcrum point 20, conductor 26 to terminal $T^1$.

Now, when the main battery $B^1$ has discharged to such an extent that the voltage between the terminals T and $T^1$ has dropped below a certain limit, one or more of the end cells must be added in series with the main battery to maintain the voltage and this is accomplished by throwing one or more of the switches into the upper position. It will be seen that, on account of interference imposed by the projecting arms 4 and 5, switches 2 and 3 cannot be thrown into the upper position until switch 1 has been thrown into that position and likewise switches 2 and 3 can only be thrown into the upper position in the order 2—3. To add end cell battery $B^2$ in series with main battery $B^1$, switch 1 is thrown from the lower to the upper position. The blade of this switch will make contact with the spring contact 7 before breaking with spring contact 9 and the end cell battery $B^2$ will be momentarily shunted through the resistances $R^1$ and $R^4$. A further movement of the switch 1 into the upper position will bring its blade into contact with the spring contact 8, but before contact is made with spring contact 8, it will be broken with spring contact 9, when $B^2$ will be shunted

through $R^4$ only, otherwise the end cell battery $B^2$ would be short-circuited. The resistances $R^1$ to $R^6$ inclusive are designed to limit the discharge of the end cells to their normal discharge current during the brief time that the end cells are shunted through these resistances when the switches are thrown from one position to the other. With the switch 1 in the upper position and the switches 2 and 3 in the lower position, the circuit between terminals T and $T^1$ will be as follows: Terminal T, conductor 21, battery $B^1$, conductor 22, conductor 27, battery $B^2$, conductor 29, conductor 28, spring contact 8, blade of switch 1 to fulcrum point 18 and from there on to terminal $T^1$ as before enumerated. When switch 2 is thrown into the upper position, end cell battery $B^3$ is connected in series with main battery $B^1$ and end cell battery $B^2$. Battery $B^3$ will be shunted momentarily by the resistances $R^2$ and $R^5$ just as battery $B^2$ was shunted by resistances $R^1$ and $R^4$. With switches 1 and 2 in the upper position and switch 3 in the lower position, a circuit between the terminals T and $T^1$ will be as follows: Terminal T, conductor 21, battery $B^1$, conductor 22, conductor 27, battery $B^2$, conductor 29, battery $B^3$, conductors 30 and 31, spring contact 12, blade of switch 2 to fulcrum point 19 and thence to terminal $T^1$ as before enumerated. The addition to the circuit of end cell battery $B^4$ is accomplished by throwing the switch 3 into the upper position and will not require further description. The operation of disconnecting the end cell batteries from the circuit is accomplished by throwing the switches into the lower position in the order 3, 2, 1, that is, in the order reversed to that in which the switches are thrown into the upper position. During the transition of switch 1 from the lower to the upper position, after the blade of switch 1 has broken with spring contact 9 and before it has broken with spring contact 6, the circuit between terminals T and $T^1$ is momentarily maintained through the resistance $R^4$ and the voltage between T and $T^1$ is of course, momentarily reduced thereby. In order that this reduction in voltage may not be excessive, the resistance of $R^4$ must be as small as possible consistent with the fact that it must be large enough to prevent excessive discharge of the end cell battery $B^2$ during the brief period in which said battery is shunted by said resistance. For similar reasons, all the other shunt resistances must be as small as the requirements will permit. Now if the arms 4 and 5 were not provided, it will be seen that the switches 1, 2 and 3 would be separately operable and they could be thrown from one position to the other without regard to sequence. If, for example, switch 3 were thrown into the upper position while switches 1 and 2 were still in the lower position, the batteries $B^2$, $B^3$, and $B^4$ in series would be momentarily shunted through the single resistance $R^6$ and as this resistance is small, being intended to shunt only one end cell, the result would be a momentary excess discharge from the end cell batteries.

What is claimed is:

1. A switch mechanism comprising a plurality of V-shaped knife blade switches interlocked so that they may be thrown from one position to another only in sequence, two sets of stationary contacts for each blade, each set cooperating with one of the arms of the blade and each set consisting of a long and short terminal connected together through a resistance, said long terminal situated nearer the pivotal point of the blade than the short terminal.

2. A switch mechanism comprising a bracket, a switch blade fulcrumed thereto and having arms extending on both sides of the fulcrum point, and a set of stationary contacts disposed on each side of said fulcrum point, each set cooperating with one of said arms and each set consisting of a long and short terminal connected together through a resistance, said long terminal situated nearer the fulcrum point of the blade than the short terminal.

In witness whereof, I hereunto subscribe my name this 11th day of November, A. D. 1919.

LEWIS C. WESCOAT.