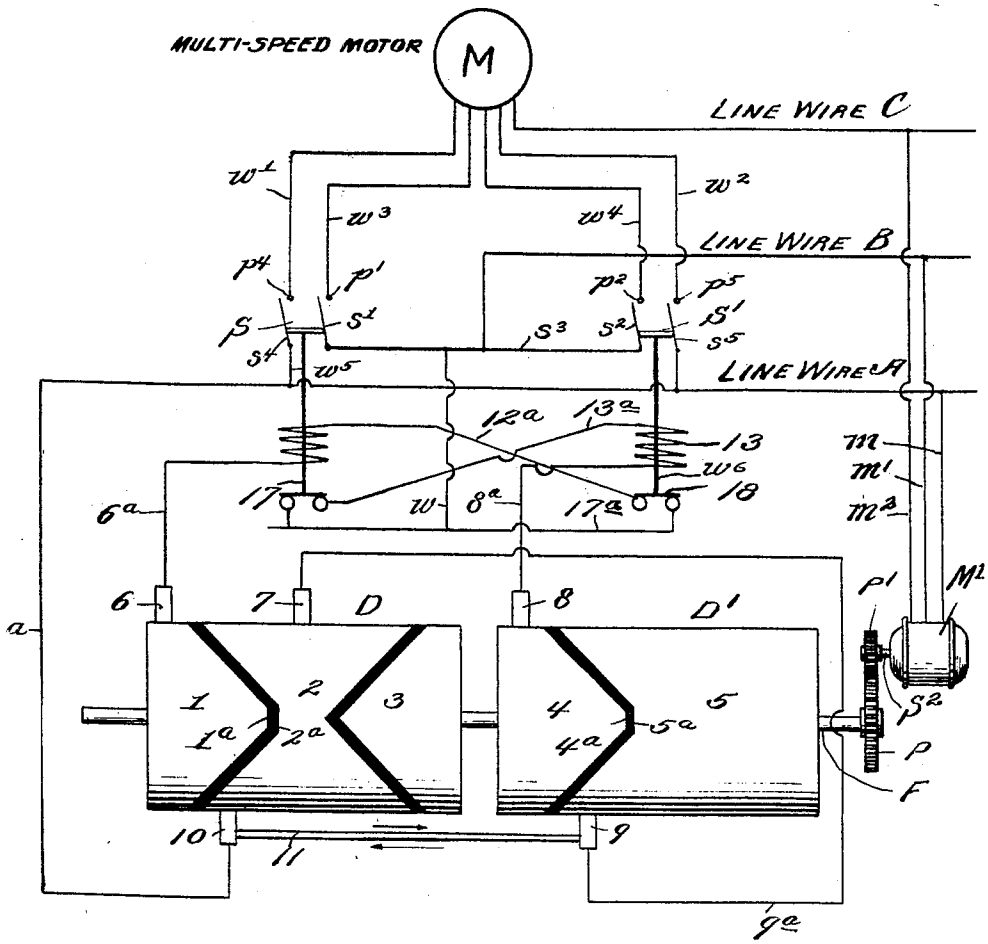
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J. Y. HARTMAN

ROTARY TIMING SWITCH

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Inventor
Jacob Y. Hartman

By

T. H. Cook
Attorney

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JACOB Y. HARTMAN, OF NEW ORLEANS, LOUISIANA, ASSIGNOR OF FIFTY PER CENT TO WALTER H. COOK, OF NEW ORLEANS, LOUISIANA.

ROTARY TIMING SWITCH.

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This invention relates to a rotary timing switch, and the purpose of the same is to provide means whereby the duration of the interval of time elasping between the opening of one set of electrical contacts and the closing of another set of a series of contacts may be varied or maintained between predetermined limits.

The invention essentially comprises a plurality of drums revoluble at the same speed by motor and gear connections and adjustable about their axes angularly with respect to one another, the said drums having mounted thereon insulated contacts which make contact with fixed brushes and also with other brushes embodying two brushes held at a fixed distance apart by an insulated connecting means so that the said latter two brushes may be shifted or moved as a unit parallel to the axis of the drums.

The accompanying drawing shows a diagrammatic view of a rotary timing switch embodying the features of the invention.

For the purpose of illustration, only the essential elements of the improved timing switch are shown in the diagram, and consist of a pair of drums D and D′ respectively having fixed thereon insulated contacts 1, 2, 3, 4 and 5. Mounted to engage the insulated contacts are fixed brushes 6, 7 and 8, the brushes 6 and 7 being disposed to cooperate with the drum D and the brush 8 with the drum D′. Shiftably or movably disposed to engage the drums are brushes 9 and 10, which are connected by an insulating means or rod 11, whereby the said brushes 9 and 10 will be held spaced apart a uniform distance and also be caused to move as a unit when the said connected brushes 9 and 10 are shifted relatively to the cylinders D and D′. The contacts 1 and 4 are truncated, as at 1^a and 4^a and the adjacent contacts 2 and 5 are shaped similarly, as at 2^a and 5^a. The length of the truncation of these contacts corresponds to the measure of the maximum time that would elapse between de-energization and energization of electro-magnets which will now be described when the brushes 9 and 10 are set at this particular point. This truncated construction of the contacts as just explained gives ample time for the motor to slow down to its low speed, the time limit provided by this structure being more than enough to permit this slowing action of the motor.

Above and used in connection with this timing switch and also shown in diagram are electro-magnets 12 and 13, respectively connected to the brushes 6 and 8 and to the other side of the line through connections 17 and 18, which act to prevent simultaneous closing of the circuits through the electro-magnets 12 and 13. The electro-magnet 12 is connected by a wire 6^a with the brush 6 and also by a wire 12^a with the contact 18, and the electro-magnet 13 is connected by a wire 8^a with the fixed brush 8 and also by a wire 13^a with the contact 17, the latter also having a connection with the contact 18 by a wire 17^a, as clearly shown in the diagram and which is well understood in this art. A line wire A is connected to the one shiftable brush 10 and the other shiftable brush 9 is connected by a wire 9^a with the fixed brush 7. The line wire B is connected to a switch joining wire s^3, which connects switch blades s^1 and s^2 of pairs of switches S and S′, also including switch blades s^4 and s^5, the switch blades s^1 and s^4 cooperating with switch points p^4 and p^1, and the switch blades s^2 and s^5 cooperating with contact points p^2 and p^5. A coupling or connecting wire w is interposed between the wire 17^a and the switch connecting wire s^3, and as above indicated, the line wire B connects with the switch wire s^3. The switch S comprising the blades s^1 and s^4 constitute means for controlling high speed contacts and closures, and the switch S′ comprising the blades s^2 and s^5 controls the low speed contacts or connections, the blade s^4 and contact p^2 and the blade s^5 and contact p^5 being connected by wires w^1 and w^2 to to the motor M, as shown, and the blades s^1 and s^2 respectively cooperate with the contacts p^1 and p^2 which are connected to the motor M by wires w^3 and w^4. The line wire C is directly connected to the motor M. The blades s^4 of the switch S and s^5 of the switch S′ are respectively connected by wires w^5 and w^6 to the line wire A so as to complete the circuits. As hereinbefore indicated, the line wire A continues around, preferably by a wire a, to the adjustable brush 10.

The drums D and D′ with the contacts are revolved at a constant rate of speed, hence the time that the electro-magnets 12 and 13 are energized will depend upon the time the brush 10 makes contact with 1 and

2, respectively, and brush 9 makes contact with 4 and 5, respectively, and if the drums be in the same angular position on their axes, there will be no pause between the opening of the circuit through one elctro-magnet and the closing of the circuit through the other electro-magnet. If the angular position of the drums be changed relatively to each other, the interval of time elapsing between the opening of the circuit through line wire A, brush 10, contact 1, brush 6, wire 6^a, electro-magnet 12, contact 18, wires 17^a and w when 1 leaves 10, and the closing of the circuit a and line wire A, adjustable brush 10, contact 2, fixed brush 7, wire 9^a, adjustable brush 9, contact 4, fixed brush 8, electro-magnet 13 through the wire 8^a, contact 17, wire w, by way of the wire 17^a will be equal to the time that the drum D′ carrying the contact 4 has been set behind the drum D carrying contacts 1, 2 and 3. As the drums continue to revolve, the electro-magnet 12 will again be energized, but there will be no pause between de-energization of the electro-magnet 13 and energization of the electro-magnet 12.

By shifting the brushes 9 and 10 together parallel to the axis of the drums, D and D′, the duration of time of energization of the electro-magnets may be varied through steps as follows:

Continuous energization of the electro-magnet 12, energization of 12 and 13 alternately for any part of the time of one revolution of the drums, continuous energization of the electro-magnet 13, energization of the electro-magnet 13 for any part of the time of one revolution of the drum and the complete de-energization of both electro-magnets 12 and 13. By using more than two drums similar to those illustrated, it is possible to control as many circuits as may be desired, but the same principle will apply throughout.

One of the applications of this device and the one particularly shown is the control of the multispeed motor M, wherein it is necessary in order to avoid undue shocks to the driven machinery that before passing from high to low speed the motor be allowed to slow down to approximately its normal low speed before energizing its low speed winding, but no shocks are apparent when passing from low to high speeds. In this application the electro-magnet 12 controls the set of contacts p^1 and p^4 with their cooperating switch blades s^1 s^4 for the high speed, and the electro-magnet 13 controls the set of contacts p^2 p^5 through the blades s^2, s^5 for the low speed winding of the multispeed motor.

As one convenient means for operating the shaft F upon which the drums D and D′ are mounted, a gear P is secured to the shaft and meshes with a pinion P′ on the armature shaft S^2 of a pilot motor M^1, which is connected by wires m, m' and m^2 respectively to line wires A, B and C as shown and operating as will be readily understood.

The contacts 1, 2, 3, 4 and 5 on the drums and shown as of segmental form will be preferably formed of metal, or any other conducting material adapted for the purpose may be used.

The brushes 9 and 10, connected by the rod 11 for unitary adjustment, may be held relatively to the frame that supports the improved switch by any suitable means and the rod 11 may also be of any suitable material.

From the foregoing it will be seen that the essential feature of the present improved timing switch is to dispense with the use of a dash pot and its attendant disadvantages without affecting the de-energization of the high speed winding of the main motor and the energization of the low speed winding of the same motor, the function of the dash pot being effected by the second drum with its adjustable brushes and other parts, which is a distinctly novel feature with respect to the present improved timing switch. As heretofore indicated, the present improved timing switch is intended for the control of a motor having a high speed, low speed and zero speed, but by the use of a third drum similar to the second drum hereinbefore described, it could be made to control a motor having a high, intermediate, low and zero speed. In fact as many circuits could be controlled as desired by the use of a greater number of drums connected up in the same manner as hereinbefore particularly described.

What is claimed as new is:

1. In a rotary timing switch, the combination of drums revoluble at a constant and same rate of speed and having insulated contacts thereon, fixed brushes engaging the contacts of the drums, other brushes held at a fixed distance apart and movable as a unit parallel to the axes of the drums, a motor, and electrical connections and devices providing circuits between the brushes and contacts of the drums and the said motor and including electro-magnets and switch devices operable to prevent closing of the circuits simultaneously.

2. A rotary timing switch comprising drums mounted to revolve at a constant speed and having insulated contacts thereon, fixed brushes disposed to engage the contacts of the drums, movable brushes connected and held at a fixed distance apart for unitary shifting movement relatively to the contacts on the drums, the movements of the latter brushes being parallel to the axes of the drums, electro-magnets, electrical connections between the magnets and the contacts on the drums and brushes, the energization of the electro-magnets being dependent upon the time of engagement of the movable

brushes with relation to the contacts of the drums and whereby when the drums are in the same angular position there will be no pause between the opening of the circuit through one magnet and the closing of the circuit through the other similar magnet, the rotary timing switch being adapted for connection to and control of the operation of a multi-speed motor, and means for operating the drums.

3. A rotary timing switch comprising drums revoluble at a constant speed and having insulated contacts, one of the contacts of each drum being truncated, electro-magnets, fixed brushes disposed to engage the contacts of the drums, movable brushes connected for unitary shifting movement parallel with the axes of the drums, and electrical connections between the brushes and contacts and the electro-magnets, the length of truncation of one contact of each drum being the measure of the maximum time that will elapse between de-energization of one electro-magnet and energization of the remaining electro-magnet when the movable brushes are adjusted to a certain point, the rotary timing switch and electro-magnets and their electrical connections being adapted to control a multi-speed motor.

In testimony whereof I have hereunto set my hand.

JACOB Y. HARTMAN.