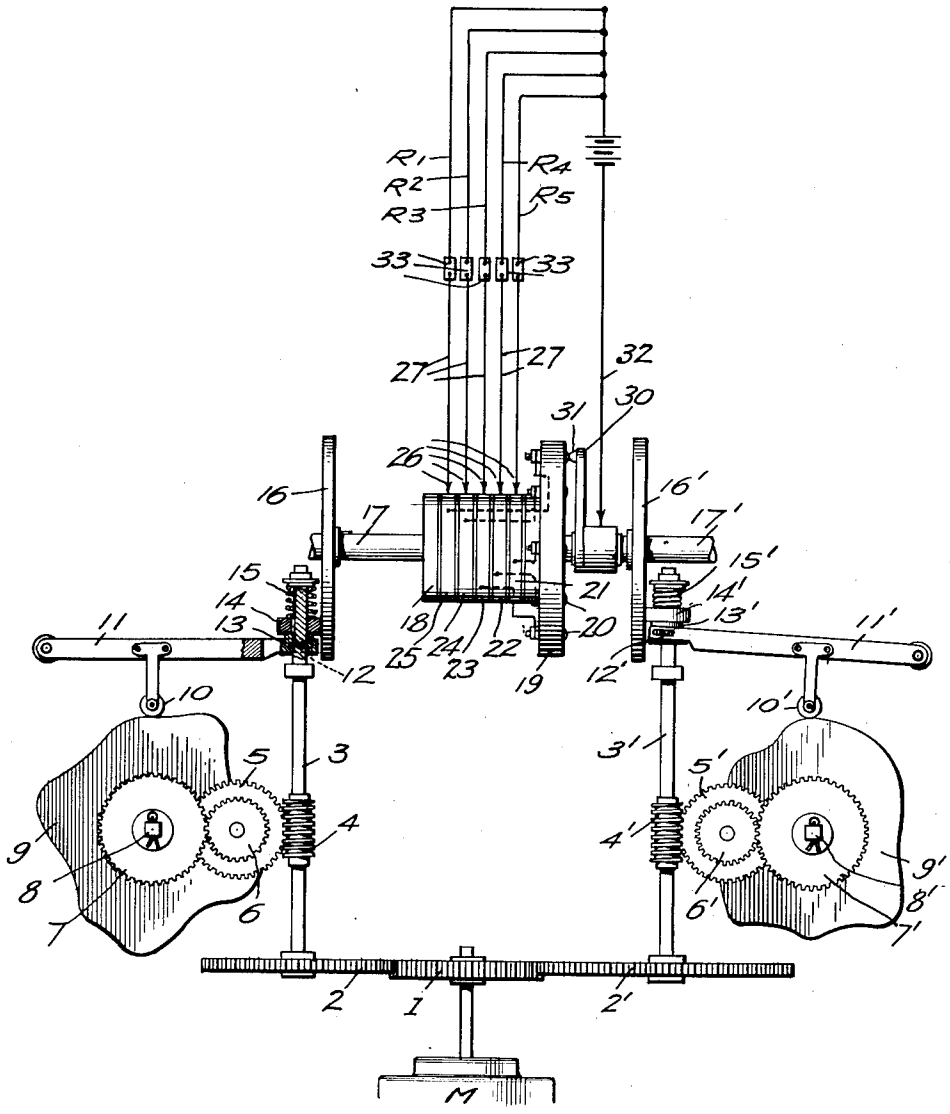
July 18, 1939. W. F. FRIEDMAN ET AL 2,166,137

ELECTRICAL SWITCHING MECHANISM

Filed Aug. 19, 1935



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Patented July 18, 1939 2,166,137

UNITED STATES PATENT OFFICE

2,166,137

ELECTRICAL SWITCHING MECHANISM

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Application August 19, 1935, Serial No. 36,868

10 Claims. (Cl. 200—17)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to a switching mechanism and proposes a mechanism of this character for automatically establishing and/or varying circuit connections in a random order.

As distinguished from the idea of performing switching operations in an orderly sequence, the present invention contemplates an opposite function and provides means to vary the circuit connections in an irregular, aperiodic or fortuitous manner. The invention contemplates an operation which affords opportunity for the laws of probability to function in establishing the variation in circuit connections, rather than an operation controlled by the usual laws of direct cause and effect. An object of this invention is to provide a means of selecting from a plurality of available electrical circuits a single circuit at random, which electrical circuit will be operative for a period of time, the length of which depends upon one or several variable factors.

Another object of this invention is to provide apparatus for varying the speed of rotating bodies by means of a friction drive mechanism working in conjunction with cam wheels of irregular outline and operatively coordinated with a differential gearing system for the purpose of opening and closing electrical circuits for varying periods of time.

A further object of the invention is to provide a device in the nature of a fortuitously-operated device for selecting from a large assortment of punched cards, a random sample.

A further object of the invention is to provide a device in the nature of a scrambling device for arranging in a purely random sequence, a large number of punched cards originally arranged according to a definite sequence, such as an alphabetical or numerical sequence. For example, in the well-known card-sorting machines employed in accounting or statistical work, the function of the machine is to arrange a large number of punched cards in a sequential order, such as alphabetical or numerical. In certain types of operations with punched cards it is often necessary to disarrange the cards so as to destroy the original sequential order and bring the cards into a purely random order. However, once a large number of cards has been sequentially arranged, any attempts to destroy the arrangement by shuffling the cards would be extremely tedious and many cards would be damaged. In the present invention, the device if operated in connection with an ordinary card-sorting machine, would permit of placing a sequentially-ordered batch of cards in the machine and taking out of it a purely fortuitously-ordered batch of cards.

In order that the invention and its mode of application may be readily understood, there is disclosed in the accompanying drawing and in the detailed following description thereof, one form or embodiment of the invention.

In the drawing, the single figure shows in schematic form an apparatus for carrying out the invention.

Referring to the drawing, 1 is a gear, driven by any prime mover such as a motor M; gear 1 meshes with the two gears 2 and 2', having different numbers of teeth. Gear 2 is fixed to shaft 3 and drives the worm gear 4, which in turn, through the train of gears 5, 6, 7, drives shaft 8, on which is mounted cam 9 of irregular outline. Roller 10 rides on the periphery of cam 9 and serves to move lever 11, through a succession of angles which are determined by the depressions and elevations of cam 9. The free end of lever 11 is connected by a pin 12 to a collar 13 which is free to slide up and down on shaft 3 but is independent of the latter in its rotation. The upper end of collar 13 presses against disk 14, which is also mounted on shaft 3 but, by a slot and bar arrangement, is driven by shaft 3. Spring 15 serves to keep the assembly 12, 13, and 14 in place on the shaft 3 and also to cause the roller 10 to follow the outline of cam 9. Disk 14, by frictional effect, drives wheel 16, keyed to shaft 17 so that as shaft 3 turns disk 14 turns and slides up and down against the face of wheel 16, causing shaft 17 to rotate at continuously varying speeds as the roller 10 rides on the periphery of cam 9. Inherent in the mechanism here disclosed and as the result of such a friction drive a slipping action is produced, which action is aided by the sliding movement of disks 13 and 13' on the face of wheels 16 and 16', respectively. The cams 9 and 9' as well as the system of gearing previously described, contribute an important part to this slipping action and consequent lost motion whereby the switching operation is performed in an irregular, aperiodic or fortuitous manner. This constitutes an important object of the invention all as fully set forth in the specification and shown in the drawing. On the shaft 17 is mounted the commutator generally designated as 18 and a contact wheel 19, provided with a plurality of contacts 20, connected in a random manner to the commutator rings 21, 22,

23, 24, 25. Resting against the commutator rings are collectors 26, which are connected to conductors 27 leading to individual circuits, which circuits may include any conventional means or instrumentalities suggested, schematically as at 33 for utilizing the randomizing function of the present invention.

The action of the members 2 to 17 inclusive is the same as that of the members 2' to 17'. Shaft 17' rotates switch arm 30, carrying brush 31 which sweeps over the contacts 20 as it rotates. The commutator assembly which essentially comprises commutator 18 and its associated parts, including contact wheel 19, may be regarded as one component of a switching device, while switch arm 30 carrying brush 31 may be regarded as the other component of said switching device. Brush 31 is connected to the common return conductor 32 for the circuits R_1, R_2, R_3, R_4, R_5 to which conductors 27 lead. Since wheel 19 and brush arm 30 rotate in different directions and at constantly varying speeds, the circuits R_1, R_2, R_3, R_4 and R_5 are selected in the order of the contacts 20 on wheel 19, but each circuit is operative for a different interval of time.

In the drawing, specific mechanical principles are shown for effecting the movements of the various parts of the apparatus. However, these are shown only for the purpose of demonstration of the principles incorporated in this invention, and it is pointed out that any other mechanical means for varying the angular velocity of the commutator 18 rotating with contact disk 19 and the contact arm 30, either separately or conjointly, will effect the result desired. It is also pointed out that, while five commutator rings are depicted in the drawing, any number may be used, and that the number of contacts on the face of the disk 19 may be equal to the number of contact rings or greater by any practicable number. It will also be noted that cams 9 and 9' are intended to be detachable and interchangeable, means being shown in the drawing to facilitate removal for that purpose, or to permit substitution of other cams of different shape.

Changes, modifications and equivalent arrangements are contemplated within the scope of the invention as defined by the appended claims.

We claim:

1. In a mechanism of the character described, a pair of rotating bodies associated for operative movement relative to one another; friction drives having a slipping action and arranged to actuate said bodies in a discrete time relation; and means including a system of differential gearing and cams of irregular contours operatively coordinated with said gearing and with each of said drives individually to aid the slipping action and to effect aperiodic movement of said bodies relative to one another.

2. A mechanism of the character described for controlling the operation of an electrical system, comprising a rotatable commutator provided with contact elements and a rotatable switching device operable with said elements for establishing a plurality of circuit connections; and means to effect a random operation of said system comprising variable driving units for operating said commutator and said switching device asynchronously, and means for differentially controlling the operation of the units.

3. A combination according to claim 2, in which the last named means includes cams of irregular contours individually operable with said units.

4. A combination according to claim 2, in which the last named means includes cams of different irregular contours.

5. A switching mechanism comprising in combination, a rotatable commutator provided with contact elements and a rotatable conductor operable with said elements for establishing a plurality of circuit connections; independently variable friction drives for operating said commutator and said conductor respectively; and means including differential gearing, and cams of irregular contours operatively coordinated with said gearing and individually with each of said drives to vary the circuit connections aperiodically.

6. A randomizing switching mechanism of the character described, comprising a rotatable commutator provided with a plurality of contact elements and a rotatable conductor operable with said elements for establishing a plurality of circuit connections; and means for continuously and irregularly changing the relative speed of said commutator and said conductor to vary the circuit connections aperiodically, said means including a friction drive operative with the commutator and conductor individually, cams of irregular contours operatively coordinated with each drive, and gearing for actuating the cams differentially.

7. A mechanism for controlling the operation of an electrical system, comprising relatively rotatable switching devices provided with cooperating contact elements for establishing a plurality of circuit connections; and means for continuously and aperiodically varying the relative speed of rotation of said switching devices, said means comprising change speed drives individually operative with said switching devices, interchangeable cams of different irregular contours operative with said drives, and a differential gearing system for operating the cams and drives in opposing relation.

8. A mechanism of the character described, comprising switching components movable relative to each other and provided with contacts for establishing a plurality of circuit connections; and means including continuously slipping drive elements and cams of irregular contours operative with each component for continuously and irregularly varying the timing of the contacts in a random manner.

9. A switching device comprising components provided with electrical contacts, said components being rotatable with respect to each other for establishing a plurality of circuit connections; a friction drive mechanism for each of said components, and including means for separately and differentially operating said mechanisms to vary the timing of the circuit connections in a random manner.

10. A switching mechanism, comprising relatively movable components provided with contacts for establishing a plurality of different circuit connections; means for varying the circuit connections, comprising frictional drive mechanisms operable variably with said components; and means for changing the rate of movement of said mechanisms to assist in randomizing the circuit controlling operation of the contacts.

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