

Electrical Switching Mechanism

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 constantly varying speeds as the roller 10 rides on the periphery of cam 9. 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 39, 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:

6. In a mechanism of the character described, a pair of rotating bodies associated for operative movement relative to one another; friction drives arranged to move said bodies independently; 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 effect aperiodic movement of said bodies relative to one another.

7. 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 gearing for driving said commutator and said switching device independently, and means for differentially controlling the operation of the gearing.

8. A combination according to claim 7, in which the last named means includes cams of irregular contours individually operable with said gearing.

9. A combination according to claim 7, in which the last named means includes cams of different irregular contours.

10. 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; friction drives for operating said commutator and said conductor independently; 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 and in a random order.

11. 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 independently, and gearing for actuating the cams differentially.

12. 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 con-

nections; and means for continuously and aperiodically varying the relative speed of rotation of said switching devices to effect random permutations of the circuit connections, said means comprising change speed drives individually operative with said switching devices, interchangeable cams of different irregular contours independently operative with said drives, and a differential gearing system for operating the cams and drives in opposing relation.

13. A mechanism of the character described, comprising a set of switching devices provided with movable contacts for establishing a plurality of circuit connections; and means for varying the relation between said contacts in a random order.

14. 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 cams of irregular contours operative with each component for varying the relation of the contacts in a random order.

15. A switching mechanism comprising rotatable components, each provided with operatively related contact elements, and one of said components including a plurality of commutator rings having its contact elements electrically connected in random order; and means for rotating said components in opposing relation for varying the connection between contact elements of the respective components aperiodically.

16. 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 independently and differentially operating said mechanisms to vary the circuit connections in a random order.

17. 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 independently with said components; and means for changing the rate of movement of said mechanisms for randomizing the circuit controlling operation of the contacts.

18. A mechanism of the character described comprising a set of switching devices provided with movable contacts for establishing intermittent circuit connections; and means including slipping friction drive elements for varying the rate of movement of said devices in respect to the time interval between the successive operations of any given circuit.

19. A switching device comprising components provided with electrical contacts, said components being movably associated for establishing intermittent circuit connections; and means for varying the relative rate of movement of said components independently and differentially to change the time interval between circuit controlling operations of any given circuit.

20. A switching mechanism comprising relatively movable components, provided with electrical contacts for establishing intermittent circuit connections; means for varying said connections, including differential slip-disk driving systems operable with each of said components for randomizing the intervals of time between successive operations of any given circuit.

21. A switching mechanism comprising relatively movable components, provided with operatively associated contact elements, one of said components having its elements arranged in any order; and means for moving said components relative to each other whereby the time interval between the opening and closing operation of any given circuit is varied aperiodically.

22. A switching mechanism comprising rotatable components, each provided with operatively related contact elements, and one of said components having its contact elements electrically connected in a fortuitous order; and means for varying the relative rate of movement of said components for intermittently and aperiodically effecting the operation of any given circuit.

23. In a mechanism of the character described, complementary switching devices each provided with electrical contacts, one of said devices having its contacts spaced at irregular intervals with respect to each other and electrically interrelated for establishing a plurality of circuit connections; and means for independently and differentially operating said devices whereby the contacts are caused to effect circuit connections at varying time intervals.