Slectrical Suitching Mechanism

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

As distinguiehed from the idea of performing switching operations in an orderly secquence, the present invention conterplates an opposite function and provides means to vary the circuit connections in an irregular, aperiodic or fortuitous maner, Ihe Invention contemplates an operation which affords opportunity for the laws of probebility to fuaction in establishing the variation in circitt connections, rather than an operation controlled by the uanal laws of direct cause and affect.

An object of this inveation is to provide a means of selecting firon a plurality of available electrical circuits $a$ single circuit at randong, which electricel circuit will be operative for a period of tive, the length of which depeade upon one or several variable factore.

Another object of thie invention is to provide apparatus for varying the mpeed of roteting bodies by means of a friction drive mechanism morking in conjunction with can whesls of irregular outline and operatively coordinated with a differential gearing systea for the purpose of opening and closiag electrical circuits for varying periods of time.

A further object of the invention is to provide a device in the neture of a fortuitously-opereted devioe for selecting from a large assortiment of punched cardg; random mample.
a further object of the invention is to provide a device, in the nature of a scrambling device for arranging in a pursiy randon sequence,
a large number of punched cards originully arranged according to e definite eequence, ouch as en alphebetical or nuarical sequance. For example, in the wollmom card-sorting machines employei in accounting or atatistical morkg. the function of the madine is to arrange a large number of punched cards in a aequential order, such es alphabetical or numerical. In certain typee of operctions with punched cerde it is often necescary to disarrange the cards 00 as to deatroy the original sequantiaz order and bring the cerds Into purely random order. However, once a large number of cerds hae been escquantially arranged, sny attempts to destroy the arrengement by shurfling the cards would be extremely tedious and many cards would be'gamages. In the preaent invention, the device if operated in connection with an ordinary card-aorting machine, mould pernit, of placiag a sequentialiy-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 underatood, there is disclosed in the accomparing drawing and in the detailed following desoription thereof, ope form or abohiment of the invention.

In the drawing, the gingle Figure show in schematic form" apparam tus for carrying out the invention.

Referring to the Arawing, 1 is a gear, drivan by any grime mover such as a motor M; gear 1 meshes rith the two gears 2 end $\mathbf{2}^{2}$, heving different numbers of teeth. Geer 2 is fixad to shaft 3 and drives the worm gear 4, wich in turn, through the train of gears 5; 6, 7, drivea shaft 8 , on which is mounted oam 9 of irregular outine. Roller 10 rides on the periphory of cam and serves to move lever 11 , through a succesalion of engleb which are determined by the depreselong and elevation of cam 9.

The free eat of lever 11 is connected by a pin 12 to a collar 13 which is free to slide up end down on shaft 3 but is independent of the latter In its rotetion. The upper and of collar 13 presser against diak 14 , which is also mounted on ohaft 3 but, by alot and bar arrangement, is Ariven by shaft 3. Spring 15-cerves to keep the asembly 12, 13, and 14 In place on the shaft 3 and 2180 to ceute the roller 10 to follow the outilne of cem 9. Disk 14, by irictional effect, drives wheol 16, keyed to shaft 17 go that as shaft 3 turns disk 14 turns and slides up and down against the face of wheel 16 , cauding shaft 17 to rotate at constantily varying apeede as the roller 10 rides on the periphery of cam 9. On the shaft 27 is mounted the computitor generaliy degignated es 18 and a contect wheel 19, provided with plurality of contacts 20, connected in a random menner to the conmutator ringe'21, 22, 23, 24, 25. Resting ageingt the commutator ringe are collectars 26; whin are conteoted to conductors 27 leading to individual oircuiti, wich circuits may include any conventional means or instrumentalitiee suggested schematicaliy a0 at 33 for utiliaing', the rendomining function of the present invention.

The action of the members 2 to 17 inclugive is the same as that of the membere $2^{\prime \prime}$ to $17^{\prime \prime}$. Shaft $27^{\prime}$ rotates awitch arm 30 , carrying brugh 32 which sweeps over the contects 20 as it rotates. The comutator asembly which eseentially comprises commutator 19 and its manociated parts; inclurLag contact weel 29, may be regarden as one component of a emitching device, While switch arm 30 carrying brush 31 may be regarded as the other component of said owitching devioe. Brush 31 is connecter to the common retrua conductor 32 for the circuita $\mathrm{I}_{1}, \mathrm{~B}_{2} ; \mathrm{B}_{3}, \mathrm{R}_{4} ; \mathrm{I}_{5}$ to which conductors 27 1ad. Since wheel 19 and brugh arm 30 rotete in ifferent directions and at constantly varying speede, the circuits $R_{1}, R_{2}, \dot{R}_{3}, R_{4}$ end $R_{5}$ are
selected in the order of the contacts 20 on wheel 19 , but each circuit In operative for e different interval of time.

In the drawing, epecific mechenieal princlples are chow for offecting the novements of the various parts of the apparatus. However, thene are ghom only for the purpoes of demonstration of the principled incorporeted in this invention, and it is pointed out that any other mechanioal maans for varying the angular velocity of the commutator 18 roteting with contact 3ini 19 and the contact arm 39, eithar separately or conjointiys Will effect the resuit desired. It is also pointed out thaty wile five computator rimge are depleted in the drawing, any nuber may be used, and that the mumbar of contacte on the face of tho disk 19 may be equal to the number of contact ringe or greatar by any practicablo aumber. It sill also be noted that ceme 9 and 91 are intonded to be detachable and intarchangeable, means being shown in the irawing to fecilitate removal for that purpose, or to permit substitution of other cems of different shape.

Changes, modifications and equivalent arrangements are contemplated Within the scope of the invention as dafined by the appenced clatmas
6. In a mechanian of the oharacter deseribed, a pair of rotating bodies associated for operative movement pelative to one anothery friction srives arranged to move said bodies indopondentlys and means incluing e syatel of differeatial gearing and cama of irregular contours oporatively coordinated with rald gearing and with each of maid arives inalvidually to effect aperfodic movement of said bodies relative to one another.
7. A mechanisn of the chapacter demcribed fow controlifg the operation of an eleotriond eyaten, compriaing a rotatable commatator provided, with contact elemate and a rotatable aritching device operable with said elements for oetabliabing a plurality of circuit connections
and mean to effect a random operation of seid aystem comprising gearing for driving said commtotor and said avitching device independentzy, and meens for fifferentially controlling the operation of the gearing.
8. A combination according to claim 7, in which the last named means includes asms of irregular contoure individually operable with add gearing.
9. combination acoriing to clain 7, in whioh the last namad mans includes cams of different irregular contours,
10. A switching meohanism comprising in combination, rotatablo comutator provided with contact lement and rotatable conduotor operable With said elemats for astablishing a plurality of oirouit comactionss friction drivea for operating aid computator and asid conductor indepantoutly and means including differential gearing and cams of irregular contours operatively coordinated. with said gearing and individually with each of asid drives to vary the circuit connections eperiodically and in ( E random order.
11. A randomining switching mechani om of the chareeter aesoribed. compriaing rotateble comutator provided with a plurality of contact - lements and a rotatable conductor opereble \#ith aid element: for establishing a plurelity of circuit connetions and menas for continuouoly and irregularly changing the relative spesd of mali comutator mid said conAuctor to vary the circuit connections aperiodically, gaid meane including a friction arive operative with the commator and conductor indivilunily, cams of irregular contour operativaly coordineted mith each drive independentiy, and gearing for actuating the cams differentiaily.
12. A mechandim for controling the opertation of an electricsi. syatan; comprising relatively rotatable awitohing devices provided with cooperating contact elements for ostabliehing a plurality of circult con
nectiong and masns for continuously and aperiodicsily parying the relative speed of rotetion of autd suttching devices to effeot random pernutation of the circult connectiong, said means comprising ohange speed driven int divieualiy opergtive with sald switching deviees, interchangeable cams of afferent irregular eontoure independently operative with aaid drives, and a differontial goaring systom for operating tho camb and drives in opposing relation.
13. A mechanism of the charactar described, compriaing a set of awitching devicas provided with movable contacts for eatablighing a plurality of circuit competions: and means for varying the relation between said contacte in a random order.
1.. A mechanism of the character described, comprising switching components movable relative to ach other and provided with contegete for establishing a plurality of circuit comsctiones and msens including cams of irregular contours operative with each component for verying the ; relation of the contacts in a randon order.
15. A switching mechanisin comprising rotatable components, oach provided with operatively related contact elements, and one of said componente including a plurality of comutator rings heving its oontact eloments electricelly connected in randon orders and mans for rotating said components in opposing relation for varying the connection betweas contact elements of the reapecive conponents aperiodically.
16. A smitohing ravice compriaing componente proviAed with electrioal contacts, said components being rotatable with reapect to each ohar for eatablishing a plurality of circuit connectional a friction drive mechent an for each of eaid components, and ineluding means for independentiy and difforentially operating said mechanien to vary the elecuit conneotions in a random order.
17. switching mechanism, comprising relatively movable component o provided with contacts for establishing a plurality of different circuit connections means for varying the circuit connections, comprising frictional drive mechanisms operable independently with enid components and mana for changing the rate of movement of said mechanisms for randomizing the circuit controlling operation of the contacts.
18. A nechanicn of the character described comprising a aet of stitch Ing jevices provided with movable contacts for establishing intermittent circuit connections; and means including clipping friction drive elements for varying the rate of movement of said devices in respect to the time interval between the successive opertitione of nay given circuit.
19. A Bitching device comprising components provided with electrical contacts, sid components being movably associated fer establishing intermitten circuit connections; and mann for vising the relative rete of movement of eld component e independently and ilfferentisily to change the time interval between circuit controlling operations of any. given circuit. 20. A switching mechanism comprising relatively movable components, provided with elactrionl contacts for establishing intermittent circuit connections mane for voTing said connections, incluilug differential slipdisk driving gystome operable with each of gain component for randomizing the intervale of time between successive operations of eng given circuit.
21. A switching macheniam comprising relatively movable components, provided with operatively associated contact elements, one of aril components having its elements arranged in any order i and mane for moving call conjonents relative to each other whereby the time interval between the opening and closing operation of eng sivan circuit is varied aporionicaliy.
22. switching mechanden comprising rotatable componente, ach proviled nith oparetively raluter contact elaments, phi one of soid component: baving its contact elaments alectric:ily sonnected in a fortuitous order: and means for varying the relative rate of movenent of sald componente for internittently und aperiodic:lly effacting the operation of any given ciront.
23. In a mechanism of the character described, complemental switcinge devicee ench provided with electrical contacte, one of said Aevices haing 1 to contacts apaced at irregular intervala with respect to ach other cud elactricelly interrelated for establishing a plurality of circuit connectionas and mans for indepeniontly and differentially operating asin devices whereby the contacts are caused to effoct circuit conneotions et varying time intervelh.

