Feb. 24, 1953 D. E. HOOKER 2,629,475

SCRAMBLING SWITCH

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FIG. 1.

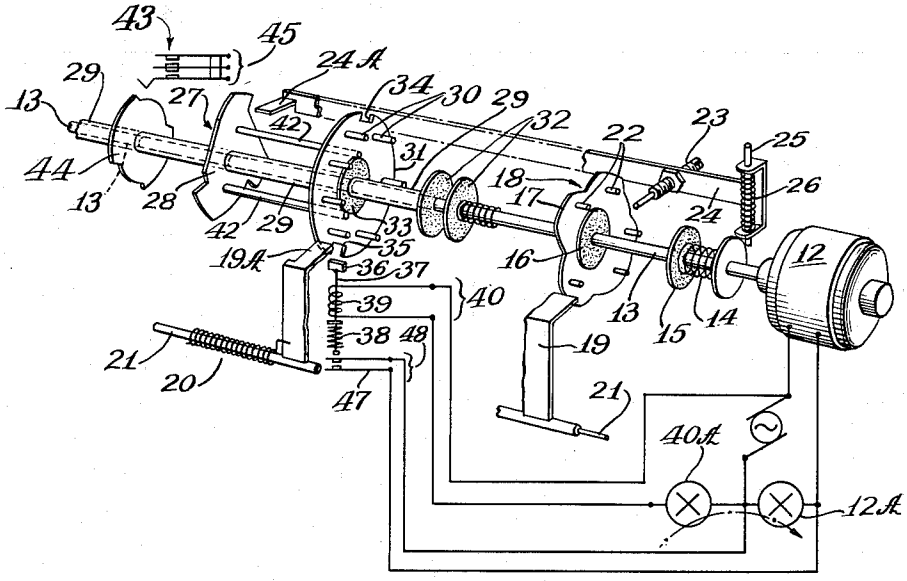

FIG. 2.

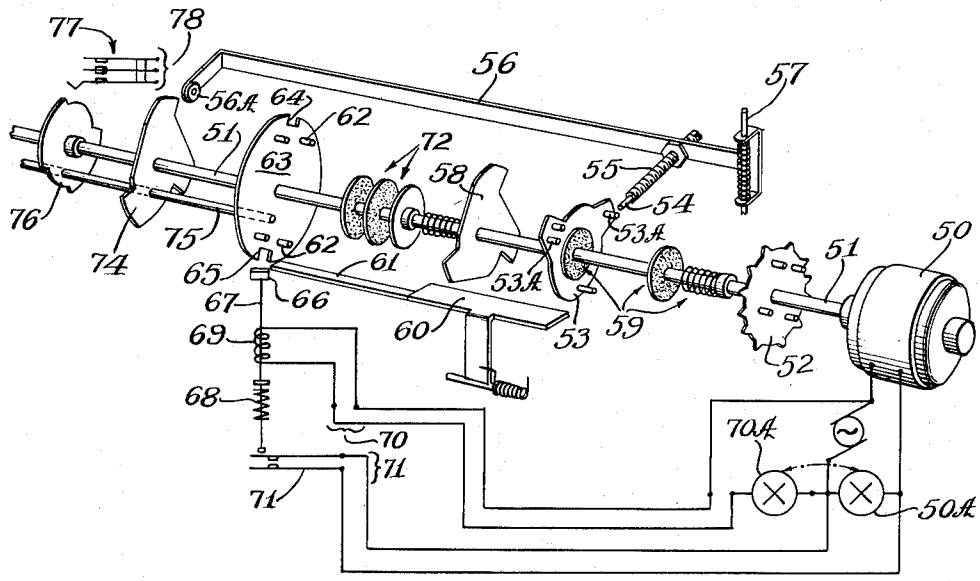

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FIG. 3.

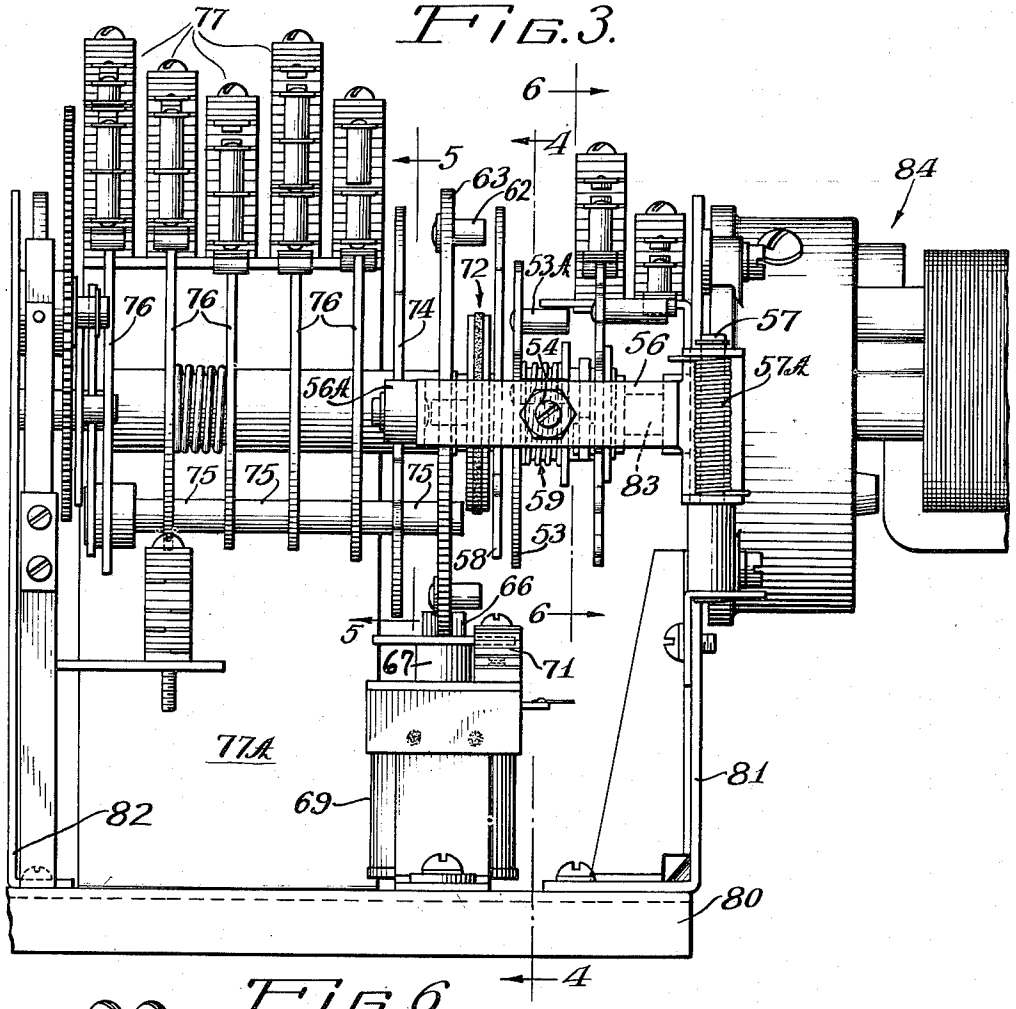
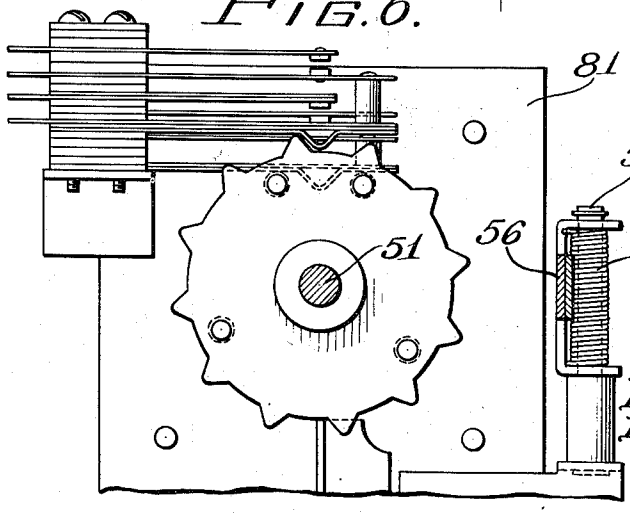


FIG. 6.



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SCRAMBLING SWITCH

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FIG. 4.

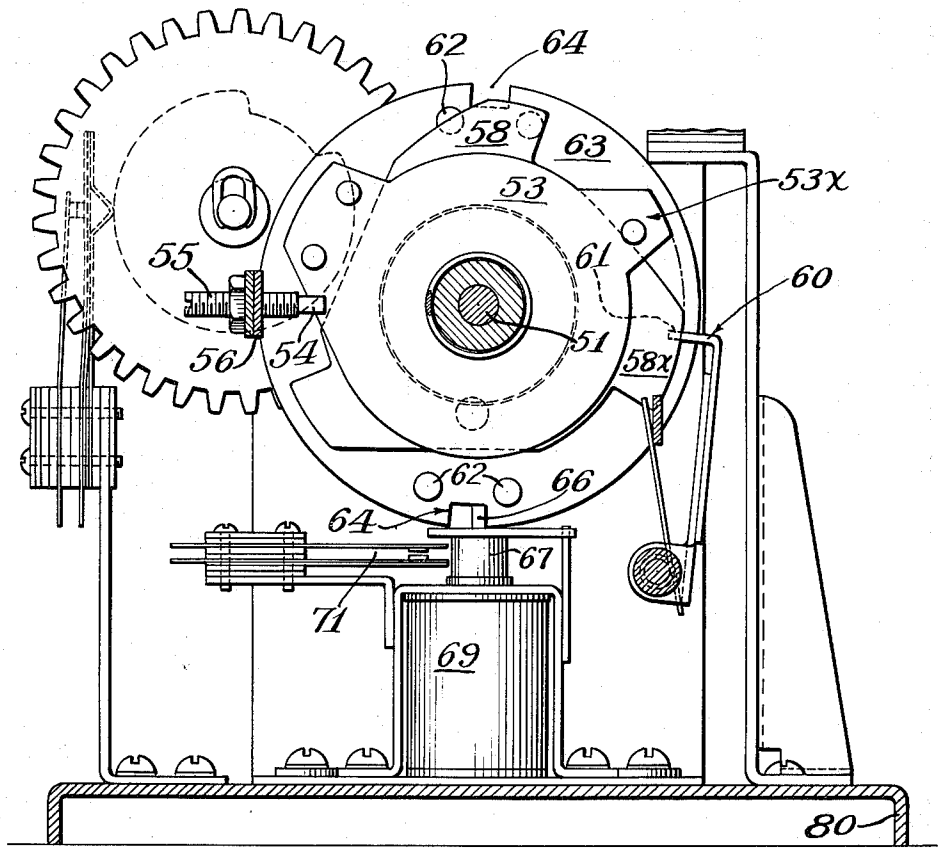
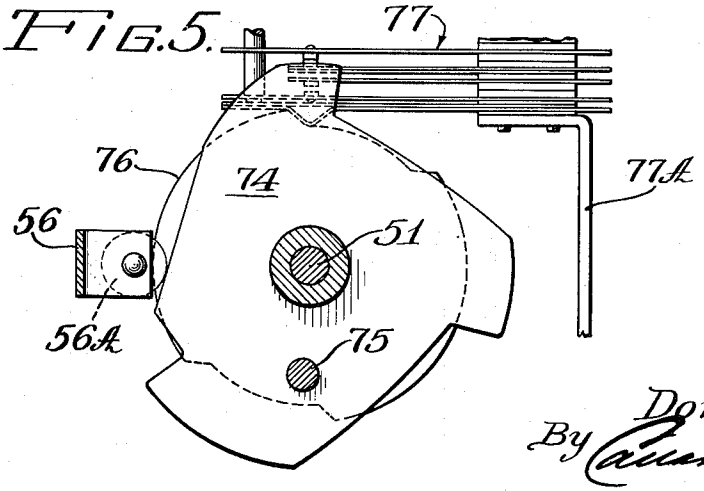


FIG. 5.



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UNITED STATES PATENT OFFICE

2,629,475

SCRAMBLING SWITCH

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Application September 21, 1949, Serial No. 117,031

17 Claims. (Cl. 192—142)

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This invention pertains to electrical switching apparatus, timers, and variators referred to hereinafter as a scrambling means or switch and characterized mainly by the use of motor-driven switch operating means and clutch means actuated in an irregular pattern through the agency of an irregularly operating cam control.

The principal object of the novel apparatus is the operation of one or more control switches at irregular intervals with a practically imperceptible pattern of repetition whereby to scramble the operation of the control switches for any desired application, for instance, in conjunction with amusement apparatus wherein the control switches may be connected to render various scoring circuits operative or inoperative in a highly variable manner.

Another application of such a scrambling switch may be in conjunction with various types of electrically operated training mechanisms, for example, in a photoelectric marksmanship training apparatus such as shown in U. S. Patent No. 2,442,240, in which a simplified version of the present apparatus is disclosed in Figs. 10 and 11 thereof.

The present improvements are also useful in conjunction with or as variants of the switching mechanisms shown in U. S. Patents Nos. 2,291,749 and 2,138,243.

The various aspects of novelty and utility characteristic of the present improvements reside in details of the construction and operation of the embodiments described hereinafter in view of the annexed drawings, in which:

Fig. 1 is an exploded perspective of one form of scrambler control;

Fig. 2 is a skeletonized and exploded schematic of a modified form of scrambler utilizing a compound form of scrambling cam;

Fig. 3 is a fragmentary side elevation of a control unit embodying the compound cam scrambler illustrated in Fig. 2;

Fig. 4 is a transverse section of the compound scrambling cam means seen in the direction of lines 4—4 of Fig. 3;

Fig. 5 is a transverse sectional fragment of the secondary scrambling cam means of the device of Fig. 3 looking in the direction of lines 5—5 thereof;

Fig. 6 is a transverse fragmentary section looking in the direction of lines 6—6 of Fig. 3;

A "Summary of operation" will be found hereinafter.

Referring to Fig. 1 a motor 12, caused to be continuously running during the operation of

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the scrambler, turns a driving shaft 13 equipped with a conventional type of slip clutch including, for example, a pressure spring 14 and one or more frictional clutch discs 15, drivingly engageable with coacting clutch disc means 16, fixed to a cam disc 17 having an irregularly developed cam periphery 18, engaged by a riding brake or stop pawl 19, urged by spring means 20 on pin 21 so that the pawl 19 moves back and forth in response to the cam pattern.

The cam disc 17 is provided with a plurality of irregularly positioned stop pins 22, which bear against a pivot or stop arm 23 on a pivoted arm 24, turning on pin means 25 and urged toward the cam by spring means 26.

The stop arm 24 has an extension 24A which rides on the irregular periphery 27 of a secondary cam 28 on a driven shaft 29, concentric with the drive shaft 13, with the result that the stop arm 24 will be moved in and out of the path of the pins 22 varying distances at different times, and when completely out of blocking position relative to pins 22 the cam disc 17 will take motion through the action of the clutch means 15—16 and thereby cause a similar in and out movement of the brake pawl 19 and its integral stopping pawl 19A, the latter being normally urged by spring 20 into the path of a plurality of stop pins 30 on a driven cycling or stop disc 31 to free the latter for rotation at various times through another slip clutch means 32—33 provided said disc is released for motion in a manner now to be described.

The cycling or stop disc 31 is provided with one or more peripheral brake formations or notches 34 and 35 into which projects the stopping end 36 of an armature 37 urged by spring means 38 toward the disc, the foregoing parts constituting a second or indexing brake means.

Energization of the cycling solenoid 39 by any desired circuit means connected to terminals 40 will result in withdrawal of the stopping end 36 from a notch 35 to free the stop disc 31 for rotation through the intermediary of clutch means 32—33, it being understood that the driving shaft 13 is disposed to rotate freely within the driven shaft 29 and drives the second clutch means 32—33 for rotation of disc 31 notwithstanding the fact the cam disc 17 may be arrested.

The release of the cycling and brake disc 31 by energization of solenoid means 39 causes the secondary cam disc 28 to rotate in step by reason of the interconnecting rod means 42 between members 28 and 31, there being one or more control switches 43 actuated by cams 44 fast on the

driven shaft 29, the switch or switches 43 being adapted to having their terminals 45 connected in any desired circuit to be controlled.

Upon release as aforesaid the cycling disc 31 may rotate not more than a half revolution in the example shown, since there are two notches 34—35. However, disc 31 may be stopped in any of several positions between the half-revolution limits by impingement of any of the intervening pins 30 against the stop pawl 19A, if the latter happens to be in stopping position. As a result switch or switches 43 may be operated various amounts to close one or more contacts, it being understood that in practice there are a plurality of the cam and switch devices 43—44 with the cams displaced different amounts, so that different switches are opened and closed different amounts in the various angular positions of the shaft 29.

From the foregoing description, it will now appear that as soon as the cycling brake disc 31 takes motion the secondary cam 28 is likewise moved with a resultant displacement of the stop arm means 24—24A and corresponding positioning of the stop pin 23, and the further result that the cam disc 17 may or may not move varying amounts to change the position of the stopping pawl 19A as a result of the movements of the riding arm 19 following the cam pattern on cam disc 17.

Accordingly, the pattern of the cam periphery 18 and location of pins 22 on disc 17 determines the stopping positions of pawl 19A, and in turn the displacements of the secondary cam 28 determine the movements of disc 17 with the ultimate result that the driven shaft 29 has its angular position changed repeatedly but in a pattern so variable as to avoid predictable positions of the switch control cams 44 and the switches 43.

A further feature in the timing function of this embodiment resides in the provision of a starting switch 12A for the scrambler motor and a supervisory switch 47, having terminals 48 which shunt the switch 12A, the contacts of switch 47 being closed by the solenoid plunger 37 when the latter is withdrawn to release the cycling or brake disc 31; thus disc 31 may start and stop a plurality of times (depending upon the number and spacing of pins 30) before the half revolution is completed.

Switch 12A is intended to be momentarily closed merely to start motor 12 at the beginning of a predetermined period of intended operation, and the solenoid terminals 40 are connected to be momentarily energized by switch 40A preferably simultaneously with the switch 12A, as indicated by the dash-dot line connecting said switches, so that motor 12 starts and solenoid 39 is momentarily energized long enough to withdraw the brake stop 36 to permit the cycling disc 31 to make the necessary half revolution, the time required for the latter, however, being variable for the reasons hereinabove stated.

In the embodiment of Fig. 2 the basic elements of the scrambler of Fig. 1 are reproduced with additional scrambling means in the nature of a compound cam means of modified character. For purposes of illustration, the commercial embodiment of the compound cam mechanism, as shown in Figs. 4 through 6, is depicted schematically to include a driving motor 50, a driving shaft 51, and a pin disc 52 rotatingly fixed thereto and providing an abutment for clutch means 59, said driving shaft 51 extending through the entire control unit.

A primary cam disc 53 is arranged to float on the shaft 51 and is normally stopped by stop pin 54 on pawl 55, part of the stop arm 56, which is pivoted at 57 (analogously to stop arm 24 of Fig. 1). However, when the stop 54 is withdrawn from pins 53A the cam disc 53 is free to be rotated through slip clutch means 59 driven from shaft 51.

A compounding cam 58, positioned close to the primary cam 53, is fast on shaft 51 and rotates continuously, whereas the cam 53 may rotate only intermittently when freed by stop 54.

A cam rider or brake pawl 60 is positioned to engage the peripheries of both of the scrambling cams 53 and 58 to be pivoted back and forth to dispose a brake or stop projection 61 in and out of the path of pins 62 on a cycling or stop disc 63 having stop notches 64 and 65 180° apart. A second stopping or braking projection 66 on solenoid plunger 67 (urged upwardly by spring 68) engages in either of the notches 64 or 65 normally to arrest the cycling disc 63. When the solenoid 69 is energized by any desired means through terminals 70 the plunger 67 is withdrawn and disc 63 is freed to be rotated through slip clutch means 72 driven from shaft 51.

Whenever the cycling or stop disc 63 is freed for rotation as aforesaid a secondary scrambling cam 74, tied to disc 63 by rods 75 and floating on shaft 51, rotates one or more control cams 76 to actuate corresponding control switches 77 in various manners for the control of circuits connected to terminals 78.

The stop arm 56 is provided with a cam rider 56A riding the periphery of secondary cam 74 to swing the stop arm 56 back and forth and position the stop pin 54 variously for control of the primary cam disc 53 analogously to the arrangement of Fig. 1.

A feature of the arrangement of Fig. 2 resides in the use of a plurality of compounding cams 53 and 58 closely positioned and having their peripheral cam formations correlated in accordance with a predetermined desired camming pattern such that the shifting of the cam 53 (when freed by stop 54) will result in a compounding of the net cam surface to be engaged by the rider 60 so that the cam pattern possible through the relative displacements of the compounding cams 53 and 58 is greatly extended and rendered more complex and unpredictable, particularly with respect to possible repetitions of the possible permutations over a relatively short period of time.

Stated in another way, the compound scrambling cam means makes possible in a compact and reliably operating unit a greatly amplified scrambling pattern, it being understood that the cam means 53—58—74 may be still further expanded by addition of similarly interacting compound and secondary cams and associated stop means 54—56A—60—61 to procure an even greater complexity of scrambling action.

A further timing feature in conjunction with the embodiment of Fig. 2 resides in the supervisory switch means 71 for the motor circuit—the latter being momentarily closed by any operation of switch 50A to start the motor and the solenoid winding 69 being simultaneously energized by switch 70A which may be arranged for joint operation with switch 50A, as indicated by the dash-dot arrow, with the result that solenoid plunger 67 is attracted to close switch contacts 71, shunting the motor switch 50A so that the motor is energized for the duration of a half revolution of cycling brake or stop disc 63; how-

ever, the time required for disc 63 to complete said half revolution will be variable, dependent upon the spacing and number of stop pins 62, analogously to the motor timing circuit described for the device of Fig. 1.

In the commercial embodiment of the unit illustrated in Fig. 2 there is provided, as depicted in Fig. 3, a base plate 80 having parallel journal plates 81 and 82 for the driving shaft 83 from motor 84, with the compound cams 53 and 58 situated close together and the cam 53 driven through the clutch means indicated at 59, while the cycling stop and brake disc 63 is driven through slip clutch means 72 and is joined to the secondary cam 74 and a plurality of control switch cams 76 by the tie-rod means 75.

Cams 76 actuate their respective control switches 77, mounted on a bracket plate 77A.

The stop arm 56 pivots on pin means 57, mounted on offsets of the journal plate 81, and is yieldingly urged by the spring means 57A to project the stop screw 54 for engagement with pins 53A on the primary cam 53 and also to project the cam roller 56A for engagement with the periphery of the secondary cam 74.

One form of development of the compound cam means is depicted in Fig. 4, from which it will appear that the primary and compounding cams 53 and 58 may be angularly displaced relative to each other to present a different peripheral surface to the cam rider 60—for instance, by assuming that the lobe 53X were displaced in a clockwise direction toward the lobe 58X, thereby presenting to the rider 60 a longer cam face than would be the case if said rider 60 were to engage either of the lobes 53X or 58X alone.

From Fig. 4 it will also be apparent how the cam rider 60 and particularly its stop portion 61 may be permitted to move toward the left into the path of any of the pins 62.

The engagement of the secondary cam rider 56A with the irregular peripheral portions of the secondary cam 74 is illustrated in Fig. 5, which also depicts the relationship of one of the control switches 77 with one of the plurality of control cams 76 rotating jointly with the secondary cam 74 (and the cycling disc 63).

It will be apparent that the number of cams may be increased to expand the compounding effect to procure a greatly extended resultant scrambling pattern; and this may be achieved either by the arrangement depicted in Fig. 1, utilizing remotely situated coaxial cams with interrelated or mutually interacting stop brake means, or by the arrangement of Fig. 2 where the compounding cams are adjacently situated and have a common rider to follow the resultant cam pattern, with a stop brake means for one or more of the compounding cams to cause a shift in the phasing or relative angular displacements of the several compounding cams.

It will also be understood that the cycling disc may be contrived to have additional or differently phased or angularly situated stopping notches to modify the cycling action thereof. Moreover, the supervisory switch means for the motor and coacting with the cycling disc means may be omitted and the motor allowed to run continuously or under control of any desired switch means to achieve continuous scrambing of the action of the control switches.

Summary of operation

The operation of the embodiment of Fig. 1 has as its ultimate object a scrambled or irregular operation of rotatably driven means or controlled instrumentality, such as the cam switches 43.

Motor 12 is started by operation of switch 12A, which has a jointly operated switch 40A acting at the same time to energize brake coil 39, the latter attracting the plunger 37 to withdraw the brake part 36 from notch 35 in cycling disc 31 on the driven shaft 29.

Upon starting of motor 12, the long driving shaft 13 thereof rotate and drives the secondary or driven shaft 29 (which floats on the main shaft 13) through slip-clutch means 32—33; and as soon as brake or stopping part 36 disengages the notch 35, the cycling disc will start to turn, and the brake part 36 cannot again stop disc 31 until another stop notch 34 comes around opposite brake or stop part 36.

Where the starting switch 12A—40A is of the momentary variety, the holding switch 47 shunts switch 12A to keep the motor running for at least one-half cycle of disc 31, because the brake plunger 37 maintains the hold switch 47 closed owing to the face that the plunger part 36 rides on the periphery of disc 31 until the next notch 34 is available for it to enter.

So long as the secondary or driven shaft 29 is free to rotate the switch 43 will be actuated by the cam 44.

However, the device includes a first brake means for starting and stopping the driven shaft 29 in an irregular manner, and this means includes a stopping pawl 19A urged by spring 20 to engage spaced stop pins 30 on the cycling disc.

The stop pawl 19A is moved into and out of position to engage the stop pins by the action of a companion or riding pawl 19 oscillated by a first cam means such as cam disc 17, which is also driven through a slip-clutch 15—16, so that it can be started and stopped by the withdrawal or engagement of a second brake means including the stop arm 23 with stop pins 22 on this first cam disc 17.

In its turn, the first irregular cam disc 17 is controlled by a reflex brake means including the oscillating arm 24 moved by pawl 24A which rides another or secondary irregular cam means 28, which, however, is rotated by the secondary or driven sleeve shaft 29, so that the operations of the primary cam 17 in freeing the cycling disc 31 are reflexed back to itself by the secondary cam 28, and there is a mutual controlling interaction of these scrambling cams which can be said to be a function of the irregularities of their respective cam patterns or peripheries 17 and 27, and the spacing and number of stop pins 22 and 30.

When the next notch 34 comes around to the brake or stopping part 36 so that the latter can drop into such notch, the holding switch 47 will open the stop motor 12, thus completing an operating cycle.

The brake plunger 37 cooperating with cycling disc 31, constitutes a third brake means which is operable independently of the other two brake means 19—19A and 23—24A; and as many stop notches 34, 35 may be provided as desired on the cycling disc for the third brake means. It will also be noted that the spacing of stop pins 22 and 30 for the first and second brakes is not uniform. It is contemplated that any number of controlled instrumentalities or switches 43 may be used.

It will thus be seen that the embodiment of Fig. 1 employs a form of compounded cam vari-

ating by employing at least two irregular cams 17 and 28 having a mutual or reflexed interaction to achieve the ultimate irregular control motion of the driven shaft and such instrumentalities as may be actuated by it.

Moreover, the irregularity of movement of the driven shaft is further controlled and influenced by making the operation of the third brake means or pawl 19A and pins 30 on cycling disc 31 irregular, as pointed out above.

In the embodiment of Fig. 2, the principle of operation is the same as that described for Fig. 1, with the difference that the compounded or reflexed cam action is expanded by adding to the first cam means a compounding cam 58 in proximity to the primary cam 53 so that the peripheries of both cams will (as the cam faces from time to time permit) simultaneously be confronted and engaged by the cam rider 60 of the first brake system.

The tertiary or compounding cam 58 is fast on the main driving shaft 51 and rotates as long as motor 50 runs.

But the primary cam 53 (like cam 17 in Fig. 1) is driven intermittently through a slip-clutch means 59, so that there is a relative angular displacement between the primary cam 53 and the third or compounding cam 58, which changes from time to time to define a resultant cam pattern to the rider 60, as a function of the starting and stopping of cam 53.

As in the case of the arrangement of Fig. 1, the action of the secondary or reflex cam 74 is reflected back to the primary cam means 53—58; but this in turn will ultimately be reflected back to the secondary cam, while the tertiary compounding cam will affect the primary cam system, or more properly, will affect the resultant cam pattern of the compound primary cam system as defined by the two cams 53 and 58.

The two motors 12 and 50 (schematically representing the motor 84 of Fig. 3) are preferably of the type having built-in speed reducing means so that the main driving shafts 13 and 51 are turned slowly to make the operations of the controlled switch means 43 or 77 correspondingly slow in the commercial embodiment of the device as depicted in Fig. 3.

Thus, the control device will be seen to include the driving and driven parts with braking devices operated by cams started and stopped thereby, and the cam and brake actions being reflexive or mutually interdependent to compound and expand or complicate the cam action over a long cycle before the control pattern is likely to be repeated.

The invention claimed is:

1. A scrambling and variator control including rotatably driven control means, a drive shaft therefor, a motor driving said shaft, means providing a yieldable coupling between said drive shaft and driven means, a cycling brake disc rotatable with the driven means, an electromagnetically releasable indexing brake cooperable with said disc and operable to release the latter for predetermined rotative displacements and automatically stop the disc thereafter, a control instrumentality actuated from said driven means, scrambling stops arranged in predetermined angular spacing on said cycling disc, a second brake movable into and out of stopping relations with said scrambling stops, scrambling cam means driven from said drive shaft, said cam means including relatively angularly shiftable cam elements, stop means actuated through rotation of said driven means for intermittently effecting a shifting of the angular relationship between said cam elements, a second brake coacting with said cam means for movement thereby into and out of stopping relations as aforesaid to hold or free said cycling brake disc against rotation at times when said first brake is released, circuit means for energizing said motor, and circuit means for releasably energizing said electromagnetic brake means.

2. Control apparatus according to claim 1 and further characterized in that said scrambling cam means includes at least two adjacently situated cams rotatably coaxially, at least one of said adjacent cams being driven from said shaft through yieldable coupling means, said adjacent cams having peripheral scrambling patterns developed for compounding by relative angular shifting, as aforesaid, to alter the resultant peripheral cam pattern thereof, said second brake having a common riding means presented to ride said peripheral cam pattern for actuating the second brake as set forth, said stop means acting to hold the yieldably coupled one of said cams to effect the relative angular shifting aforesaid.

3. A scrambling switch including a rotatably driven switch member, a rotatable driving member and motor means for driving the same, slip-clutch means yieldingly coupling the driving and driven members, a first scrambling cam rotated through slip-clutch means by the driving member, a second scrambling cam rotated with the driven member, releasable brake means normally holding the driven member against rotation and actuated by said first cam to release the driven member for rotation at times and for predetermined amounts of angular travel dependent upon the scrambling cam pattern of said first cam, together with stop means for the first cam and actuated by the second cam to stop and free the first cam in rotation dependently upon the cam pattern of the second cam and the relative angular relationships of both cams.

4. A scrambling mechanism for operating a controlled instrumentality irregularly and including a driving shaft and driving motor therefor, at least a primary cam and a secondary cam and yieldable clutch means drivingly coupling said cams for rotation by said shaft, a stop disc and an instrumentality-actuating member driven jointly with said secondary cam, a riding pawl following the cam pattern of said primary cam and including a stop pawl moved thereby into and out of stopping relations with said stop disc dependently upon the cam pattern of said primary cam, stop means arranged irregularly on said stop disc for stopping cooperation with said stop pawl in stopping relations as aforesaid, a second stop means cooperable with said primary cam to stop and free the latter in rotation dependently upon movements of said second stop means relative to said primary cam, said second stop means including a follower member engageable with said secondary cam for moving the second stop means relative to the primary cam as aforesaid, a controlled-instrumentality operating member moved jointly with said secondary cam, and a controlled instrumentality actuated by movements of said instrumentality-operating member.

5. In a scrambling switch, a driving shaft, a rotatably driven section including at least a stop disc, a scrambling cam means and at least one switch-operating member all coupled to be jointly rotatable, slip-clutch means yieldingly coupling said shaft and driven section, releas-

able brake means normally holding said stop disc against rotation, a second scrambling cam means and coupled by slip-clutch means to be driven from said shaft, said second cam means coacting with said brake means to move and release the latter at intervals as a function of the cam pattern of said second cam means, stop means actuated by the first-named cam means for holding and freeing rotation of a cam element of said second-named cam means, control-switch means actuated by said switch-operating member responsive to rotative movements thereof, and a motor energizable to drive said shaft.

6. Apparatus according to claim 5 and further characterized by the provision of an energizing circuit for said motor, a starting switch in said circuit, a supervisory running switch connected to shunt said starting switch when the supervisory switch is closed, an electromagnetically releasable indexing brake cooperable with said stop disc and normally stopping the same at predetermined positions, index means angularly spaced on the stop disc and cooperable with said indexing brake to permit a maximum determined angular travel of said disc between said positions when said index brake is released and said disc is free to rotate, said supervisory switch being closed by said index brake in releasing operation thereof whereby to shunt said starting switch and hold the motor in operation for a period at least sufficient to permit said maximum travel of the stop disc.

7. In a scrambling switch, driving and driven rotatable means and slip-clutch means coupling the same, control-switch means actuated by said driven means, releasable brake means operable to hold or permit unrestrained travel of said driven means in rotation, changeable compound cam means actuating said brake means for the purposes aforesaid, said cam means including a plurality of coaxially rotatable cams driven from said driving means and at least one of which cams is driven as aforesaid through slip-clutch means by said driving means so as to be holdable relative to movement of another of said cams, stop means operable to free or arrest rotation of the holdable one of said cams, and a further cam means rotatable with said driven means for variably actuating said stop means to hold and free the holdable cam and thereby modify the resultant cam pattern of said compound cam means.

8. In a scrambling control for switch mechanisms, a drive shaft and means for driving same, first and second scrambling cams driven from said shaft, slip-clutch means coupling the first cam to said shaft such that the first cam may be held against rotation, a stop disc and third cam jointly rotatable through slip-clutch means from said shaft, a switch-operating member rotatably driven by connection with said stop disc, control-switch means actuated by said operating member, a riding pawl engageable with cam track portions of said first and second cams and including a brake pawl following movements of the riding pawl to act upon said stop disc in different positions of the riding pawl determined by either one or both of the cam tracks, according to the relative angular displacements of said first and second scrambling cams from time to time, for the purpose of freeing or holding rotation of said stop disc, together with stopping means actuated by the third cam, dependently upon the cam pattern thereof, for holding the first cam to change the angular displacement between the first and second cams, whereby rotation of said stop disc and jointly movable members is controlled, in part at least, as a function of the resultant cam patterns of said first, second, and third cams acting at any particular time respectively upon said riding pawl and said stopping means.

9. The combination set forth in claim 8 and further characterized by the provision of indexing parts on said stop disc, a spring-urged indexing brake cooperable with said indexing parts to stop the disc in predetermined angular positions, and means for releasing said indexing brake.

10. Apparatus according to claim 8 and further characterized by the provision of angularly spaced indexing formations on said stop disc, an electromechanical brake engageable with said indexing formations, means for operating said brake to free and hold the disc for limited rotation predetermined angular amounts dependent upon the angular spacing between successive indexing formations, said driving means for the shaft being an electric motor, an operating circuit for said motor, a starting switch in said circuit, a supervisory holding switch operable to shunt said starting switch and actuated cooperatively with said electromechanical brake responsive to disc-freeing operation thereof for the duration of any of said predetermined amounts of limited rotation of said disc following energization of said motor by operation of said starting switch.

11. In a scrambling switch, a motor, a drive shaft driven by said motor, at least two compounding cams, one of which is driven through slip-clutch means from said shaft and the other of which is driven positively by said shaft, a brake member movable back and forth by riding engagement with cam track portions of either or both of said cams in variable displacement depending upon a resultant cam pattern determined at any instant by the relative rotative positions of said cams with respect to each other; rotatively driven means yieldingly coupled to be driven, when unrestrained, from said shaft, control-switch means actuated by certain movements of said driven means, a rotatable stop member movable with said driven means, stop elements located in a prescribed pattern of angular spacing on said stop member and engageable by said brake member in certain positions thereof to prevent rotation of the stop member; additional stop elements located in a prescribed pattern of angular spacing on at least one of said compounding cams, a stopping device movable into and out of stopping relation to said last-mentioned stop elements to hold or free rotation of said last-mentioned cam, spring means normally urging said stopping device into position for stopping engagement with any of said additional stop elements on the compounding cam positioned by the latter for such engagement; means rotating with said driven means and acting in certain predetermined positions of angular displacement thereof upon said stopping device to move the latter out of stopping position relative to additional stop elements on the compounding cam, as aforesaid, together with a second brake means operable to hold said stop member in certain rotative positions independently of any freeing action of said first brake means, and means for actuating said second brake means.

12. A variable-action control device comprising a source of driving power including a rotated shaft; a first irregular cam means rotated through

a yieldable coupling with said shaft; a rotatably driven means also driven through yieldable coupling means from said shaft; an instrumentality to be controlled actuated by said driven means; a second irregular cam means rotating cooperably with said driven means; brake means for the driven means and actuated by said first cam means to start and stop the driven means intermittently as a function, at least, of the irregular cam pattern of said first cam means; a reflex brake means actuated by the second cam means intermittently as a function, at least, of the irregular cam pattern thereof, to arrest and free the first cam means for intermittent rotation.

13. A control device according to claim 12 further characterized in that said first cam means includes a compounding cam system comprised of at least two cams, one of which is rotated by said shaft relative to the other when the latter is arrested by said reflex brake means, and the respective peripheries of said compounding cams define in their relative angular relations a changeable resultant cam pattern.

14. In a variable control mechanism, a drive shaft and a driven shaft; slip-clutch means coupling said shafts; a first cam means rotated by the drive shaft; a second cam means rotated by the driven shaft; a first brake means actuated by the first cam means for holding and freeing the driven shaft; a reflex brake means actuated by the second cam means for holding and freeing the first cam means; a third brake means operable independently of the first brake means and the reflex brake means for controlling operation of said driven shaft; and a controlled instrumentality actuated dependently upon rotation of the driven shaft.

15. In a variating control device, a driving member and a driven member; slip-clutch means drivingly interconnecting said members; a first cam means rotated by the driving member through slip-clutch means; a second cam means rotated by the driven member; a first brake means operable to hold and free the driven member and actuated by the first cam means; a second brake means for holding and freeing the first cam means and actuated by the second cam means; and control switch means actuated by the driven member.

16. In a variating control device, a driving member and a driven member; slip-clutch means drivingly interconnecting said members; a first cam means rotated by the driving member through slip-clutch means; a second cam means rotated by the driven member; a first brake means operable to hold and free the driven member and actuated by the first cam means; a second brake means for holding and freeing the first cam means and actuated by the second cam means; and control switch means actuated by the driven member; a third brake means including a cycling member rotating with said driven member and having angular spaced stopping parts thereon cooperable with the third brake means whereby the latter can stop the driven member only in certain rotated positions thereof.

17. For a variable control device, compound control cam means including two cams mounted to rotate about a common axis; means for jointly rotating said cams; means yieldingly coupling at least one of said cams for rotation by the rotating means as aforesaid, such that the one cam is holdable and can be held while the other is rotatively displaced relative thereto, said cams respectively having peripheral cam patterns correlated such that the two cams in various conditions of rotative displacement with respect to each other will jointly define a resultant cam pattern which changes according to such displacement; and brake means for holding and freeing the holdable cam to effect relative displacement of said cams and change the resultant cam pattern as aforesaid.

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