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A. L. DE LEEUW

1,652,708

PERMUTATION SWITCH

Filed April 9, 1921

Fig. 1.

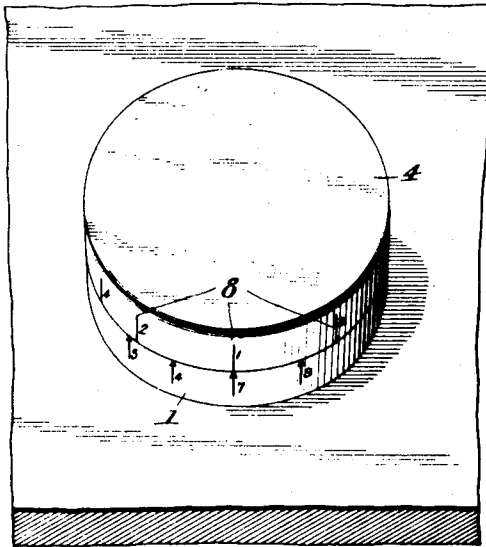


Fig. 2.

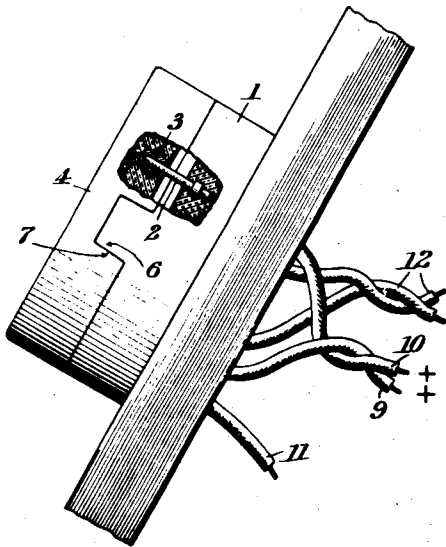


Fig. 3.

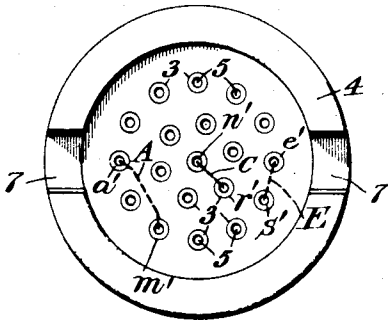


Fig. 4.

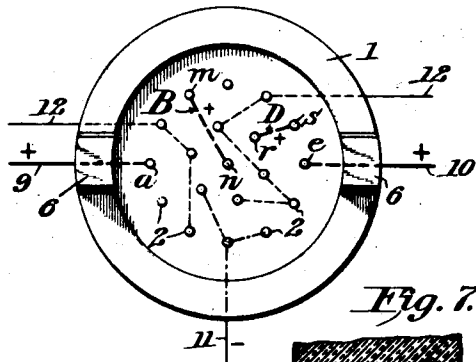
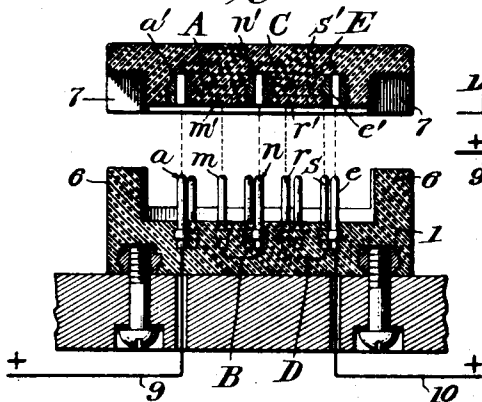


Fig. 7.

Fig. 5.



WITNESSES:

L. E. Fischer.

Fig. 6.

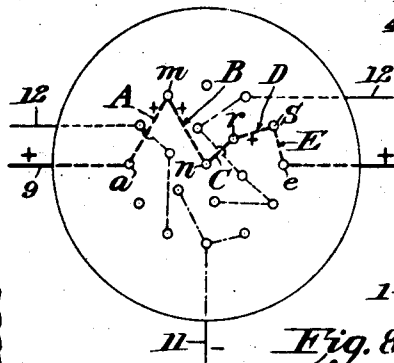
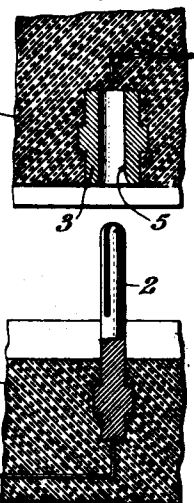


Fig. 8.



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PERMUTATION SWITCH

Application filed April 9, 1921. Serial No. 460,137.

This invention relates to permutation switches and it deals more especially with an instrumentality operating through the agency of an electric circuit for permitting or preventing, at the will of an authorized person, the usage of any device, or structure, such as an automobile or door, to which it is applicable.

One of the most effective ways, consistent with traffic regulations (which usually prohibit a lockage of the running-gear), to prevent an unauthorized usage of automobiles, is to provide special means for retaining the usual ignition system in an inoperative condition. To this end, various mechanical-locks have been put into practice which render it very difficult for anyone not in possession of the key to actuate the controlling switch.

Such mechanical-locks are, of necessity, composed of a multiplicity of movable elements and, accordingly, their construction becomes quite complicated in nature and correspondingly expensive to build, and also troublesome to install. Consequently, the tendency is to resort to the cheaper sort of constructions, in the interests of economy with a resultant sacrifice of effectiveness to cost. Furthermore, it is ordinarily not unduly difficult for a skilled thief to "pick" such locks, even of the better type, or to force the same, and often times a skeleton or master-key will suffice to release any of the combination locks used on a given series of automobiles.

The same objections apply to many of the locks habitually employed in connection with safes and cabinets, and also to a considerable extent with respect to the conventional types of so-called tumbler combination locks which are, of course, very complicated in structure.

One of the primary objects of this invention is to render available a lock devoid of movable or complicated or delicate elements, but which will, nevertheless, exhibit all of the advantages and safeguarding characteristics of combination locks of the better sort. A further object of this invention is to provide a lock for an ignition system which may easily be adapted to sound an alarm or display a signal in case it is being tampered with, and also which will effect a

short-circuiting of the electrical system under certain conditions, and, thereby, defeat the purpose of any unauthorized person attempting to tamper with or operate the lock.

Another object is to provide an instrumentality for opening the circuit of an automobile ignition-system which will effectively resist its closure by anyone not possessed of the "key" and which will render such ignition-system inoperative through the establishment of a short-circuit in case anyone should attempt to close the normal circuit through the agency of an all-metal key, or a key in the nature of a "master-key".

Another object is to create a lock of an extremely simple nature which may be made most cheaply and readily in large quantities in a way such that each individual lock will respond only to its own individual "combination" and be incapable of being operated by any "master-key" or other device suitable for any other lock produced.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art to so fully apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as a part of this disclosure, and in such drawings like characters of reference denote corresponding parts throughout all the views, of which—

Fig. 1 is a perspective of one form of this device with the parts assembled. Fig. 2 is a side elevation of the same partly broken away. Fig. 4 is a plan of the stationary member presenting the fixed field of contacts. Fig. 3 is a plan of the removable member showing the complementary contacts. Fig. 5 is a diametral section with the key partly removed. Fig. 6 is a diagram of the electric circuits with the key in place. Figs. 7 and 8 represent cross-sections depicting the mounting of the contacts in the insulating material and the manner in which they are connected.

Continuing now by way of a more detailed description of the herein-mentioned

illustrative embodiment of this invention, it may at the outset be explained that this invention is predicated upon a unique utilization of the mathematical principles of permutations and combinations, whereby a predetermined combination can be speculatively attained only after an extraordinary large number of trials. The number of trials will, of course, depend upon the number of primary elements and sub-combinations thereof subject to speculative selection and arrangement.

This invention presents a field of contacts, some of which are real and some of which are false; the real contacts being connected together in isolated pairs, and one of the contacts being connected with one end of the true circuit and another of the contacts being connected to the other end of said true circuit, these last mentioned contacts being themselves preferably isolated from the others in the field. For the purpose of establishing a continuous connection through these various real contacts and their connectors it is proposed to use a plurality of simple circuit-closers, each circuit-closer preferably consisting of two suitably-connected contacts. While these circuit-closers may be used as isolated loops, it is ordinarily within the spirit of this invention to assemble them on a single piece in the nature of a key, together with a plurality of false contacts.

Of course, the connections between the various leading-in wires and between the various true contacts connected in pairs, are concealed from the user, and, to this end, these various connections are embedded in suitable insulating material in such a manner that the arrangement of the connections cannot be ascertained by inspection or by any examination not resulting in the demolition of the lock, or the key, therefor:

Referring to the drawings, a base 1 of insulating material is constructed and adapted to be affixed to the dash-board of an automobile, or to the door of a room or cabinet, so as to become a permanent part thereof. This base 1 may, of course, be shaped and formed in any convenient manner, as for example as shown and it will preferably be made of material capable of being moulded, such as hard-rubber, or the like.

The essential purpose of this base is to support and position a plurality of contact-elements 2 and to conceal the manner in which they are mutually isolated or connected, as the case may be, as will be explained.

These contact-elements are here shown as pins 2 having their shanks firmly imbedded in the base 1 and having their ends protruding, or otherwise exposed, and split so as resiliently to engage and establish an electrical connection with complimentary contact-

elements 3 which may conveniently be assembled on an independent member 4 also of insulating material. These contact-elements 3 are shown as providing sockets 5 in their ends which are adapted to receive, or otherwise interfit with, the contact-elements 2; it being, of course, immaterial what detail is adopted.

When the "key" is engaged with the "lock" or base 1, all of the contacts 2 and 3 will, respectively, be engaged. Preferably, the contacts comprising each field will be identical with one another; although this is not of paramount importance so long as they all engage with their mates and do not enable a user to determine from inspection which ones are or are not false conductors. Likewise, the two members 1 and 4 preferably have interfitting portions 6 and 7 to facilitate the proper intermeshing of the contact-elements; although indicator marks 8 may serve that purpose and thereby render it difficult for anyone improperly in possession of the key, but not knowing its key-number, to make use of it.

The electric-circuit which controls the ignition-system of the automobile, or the circuit which controls a suitable mechanical or magnetic-lock for other usages, has its leading-in wire 9 connected to the contact *a*, and the leading-out wire 10 to the contact *e*. The matching contact *a'* is electrically joined by the connector A to anyone in its field, such as *m'* so that the current may flow to the contact *m* when the key is in place. The contact *m* is likewise joined by the conductor B with anyone of the contacts in the stationary field, such as *n* to establish a flow of current to the matching contact *n'*. The contact *n'* is likewise, by means of the connector C, connected with the contact *r'*, and the contact *r* is connected to the contact *s* by means of the wire D. The contact *s'* is connected to the contact *e'* by means of the conductor E.

By this arrangement, the current may flow from the wire 9 to the wire 10 only when the key is properly in place. The conductors A, B, C, D and E are all concealed in the insulating material so as not to be visible; the arrangement being made during the course of manufacture in a systematic manner so that no two of the locks are alike, or at least so that very few of them are alike.

It will be perceived that an extremely large number of combinations are possible with any given number of elements; only a few of the elements in each field being selected as real elements, and the remainder, being dummies, will serve to prevent anyone by trials from determining the true combination.

To prevent the normal circuit to be closed merely by connecting all of the contacts, it is proposed to lead a short-circuiting wire

11 into connection with one or more of the dummy contacts so that the ignition-system will be short-circuited as a result of such an attempt. This will effectively prevent the use of a master or all-metal key.

So also, this device lends itself easily to the use of an additional safe-guard consisting in running one or two wires 12, from a suitable horn or other alarm, to certain of the dummy terminals; whereby the alarm will be sounded should the lock be surreptitiously handled.

It will thus be seen that this invention, in an extremely simple manner, achieves the objects enumerated, and that it admits of being modified and adapted in many different ways and for many different purposes.

Having thus revealed my invention, I claim as new and desire to secure the following combinations of elements or equivalents thereof by Letters Patent of the United States.

1. A permutation switch comprising a plurality of separable members each provided with a multiplicity of complemental false and real electrical contact terminals, only certain of said terminals co-operating to complete an electrical circuit between said members when the latter are assembled in predetermined relation, said circuit being broken when said members are separated, and means, concealed in one of said members, to connect electrically the selected terminals of that member which are involved in said circuit.

2. A permutation switch comprising a plurality of separable members each provided with a multiplicity of complemental electrical contact terminals, only certain of said terminals co-operating to complete an electrical circuit when said members are assembled in predetermined relation, said circuit being broken in a plurality of places when said members are separated, and means, concealed in one of said members, to form a maze of circuit elements.

3. A permutation switch comprising a permanently mounted member; a detachable member; a plurality of complemental real and false contact-elements exposed on the normally adjacent faces only of said members; an electrical conductor connected to one of said contact elements; an electrical conductor connected to another of said contact elements; and a succession of bonds connecting certain of said elements in pairs on said stationary and said detachable members alternately, to complete an electric-circuit through said switch.

4. A permutation switch comprising a stationary member; a multiplicity of pairs of contact-elements arranged in two sets, the one set being arranged in said stationary member and the other set being adapted to be bodily separated therefrom; a plurality

of normally concealed bonds connecting certain elements of each of said sets in pairs, whereby an electric-circuit may be closed through the cooperation of said elements, and a plurality of pairs of said elements isolated from said bonds to mislead an unauthorized user attempting illegitimately to complete a circuit through said switch.

5. A permutation switch comprising a multiplicity of pairs of contact-elements arranged in two sets, one of said sets being permanently mounted and the elements of the other set being separable from the first set; a primary electrical circuit connected with two of said permanently mounted contact-elements; a secondary electrical circuit connected with two other permanently mounted contact-elements; and indicating means to enable an authorized user to establish electric connections between the separable set and the primary electrical connections of said permanently mounted set without contacting with the secondary electric-connections.

6. A permutation switch for an electric-circuit comprising two separable members; a plurality of complemental real and false electrical contacts carried by each of said members; means bonding together pairs of said contacts in each of said separable members; and means to indicate, to an authorized user only, the relative positions in which said members may be assembled to complete an electric-circuit through said switch.

7. A permutation switch comprising a support; a plurality of identical pins projecting therefrom, two of said pins being connected to an electric circuit and a plurality of said pins being isolated from said circuit; an independent separable member provided with a plurality of identical sockets adapted simultaneously to receive all of said pins; and concealed connections between pairs of said pins and pairs of said sockets and arranged to complete an electric-circuit when said pins are engaged in said sockets in a single predetermined manner only.

8. A permutation switch combining two separable interfitting members, the one member having a plurality of real and false symmetrically arranged electrically conducting sockets and the other having a plurality of real and false electrically conducting pins normally engaged within said sockets; a plurality of concealed connectors alternately bonding pairs of pins and pairs of sockets in said members, respectively, the unbonded contacts serving as a maze to preclude unauthorized use.

9. A permutation switch comprising a permanently-mounted member; a detachable member cooperating therewith; a multiplicity of pins and sockets respectively exposed on the matching faces only of said members; an interrupted electrical conductor con-

necting a plurality of pairs of said sockets certain of said sockets being insulated from said conductor; an interrupted electrical conductor connecting a plurality of pairs of said pins certain of said pins being insulated from said conductor; and means permitting said members to be united with said pairs of pins and sockets in contact to effect a continuous electrical conductor through said switch.

10. A permutation switch comprising a stationary member; a set of contact-elements carried by said member; normally concealed bonds connecting in isolated pairs certain elements of said set; a second set of contact elements carried by said member; normally concealed bonds connecting certain ones of said second set of contact-elements; a removable member; a plurality of contact-elements carried thereby; bonds connecting in isolated pairs certain ones of said contact elements in said removable member, the connecting pairs of contact-elements in said removable member being complementary to the connecting pairs in said stationary element;

and means permitting the connected contact elements in said removable member to be engaged with the connected series of either of said sets in said stationary member.

11. A permutation switch comprising a stationary member; a removable member cooperating therewith; a plurality of contact-elements carried by said stationary member; an interrupted electrical conductor connected to certain ones of said contact-elements; a plurality of contact-elements carried by said removable member; an interrupted electrical conductor connecting certain ones of said last-named contact-elements; and locating means comprising inter-fitting elements carried by said stationary and removable members active upon the uniting of said members to cause one of said interrupted conductors to complete the other interrupted conductor to effect a continuous electrical conductor through said switch.

In witness whereof, I hereunto subscribe my name.

ADOLPH L. DE LEEUW.