A. EGNELL.

INTERLOCKING DEVICE.

APPLICATION FILED SEPT. 15, 1920.

1,392,630.

Patented Oct. 4, 1921.

4 SHEETS—SHEET 1.

Fig. 1.

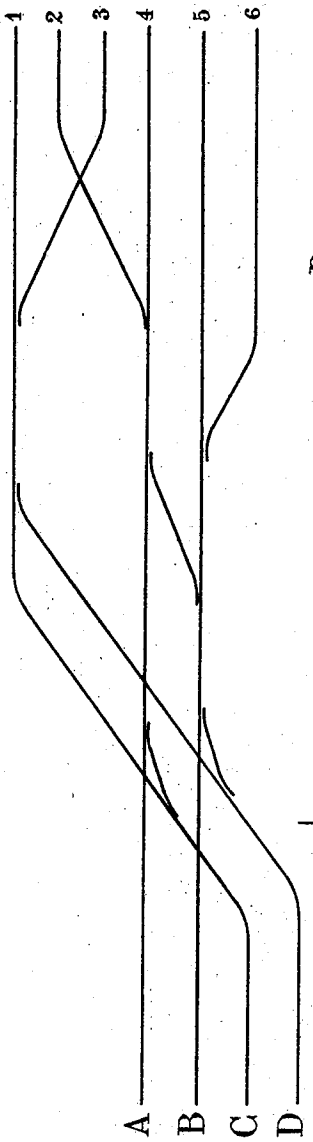


Fig. 2.

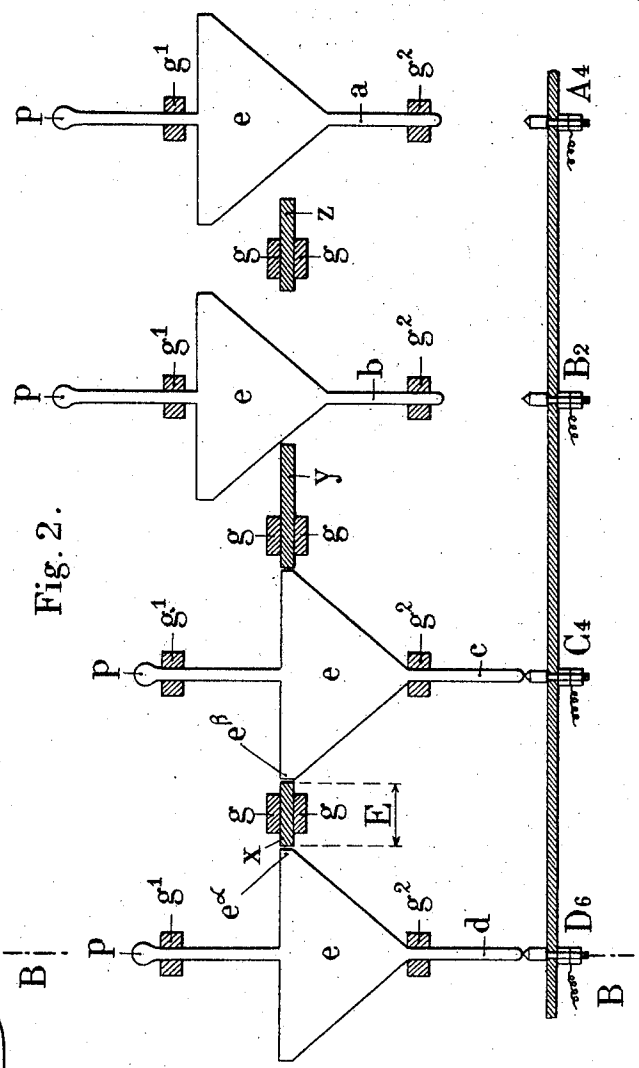
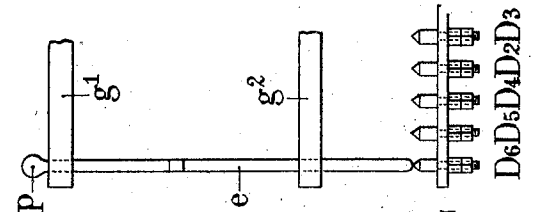


Fig. 3.



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4 SHEETS—SHEET 2.

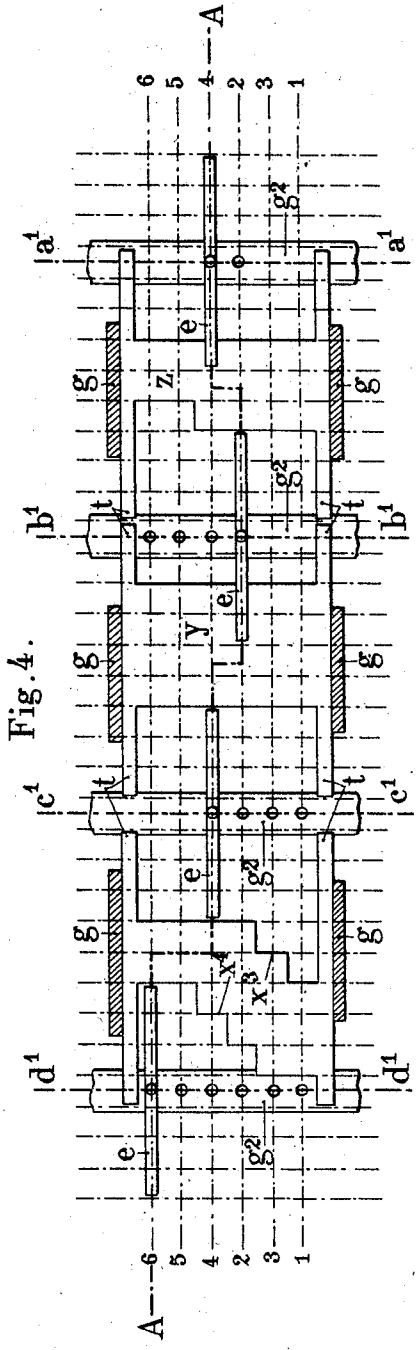

Fig. 4.

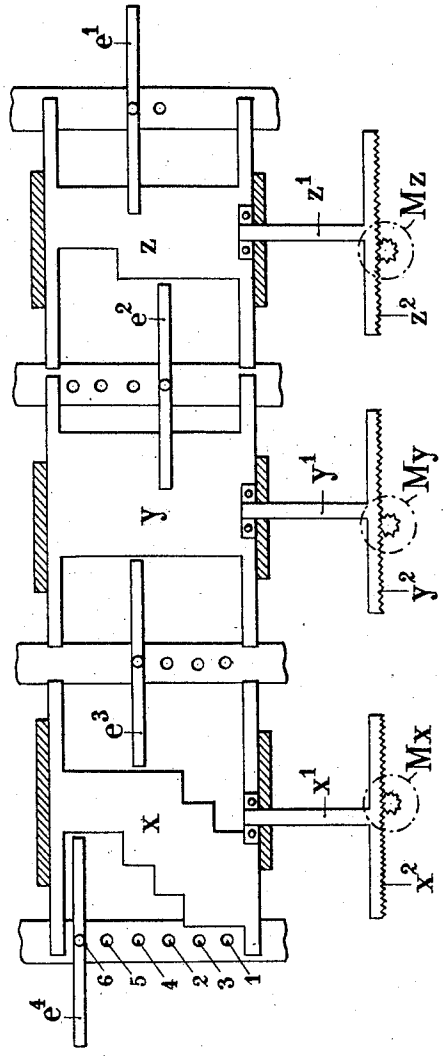

Fig. 6.

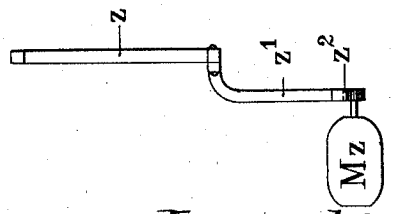

Fig. 7.

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4 SHEETS—SHEET 3.

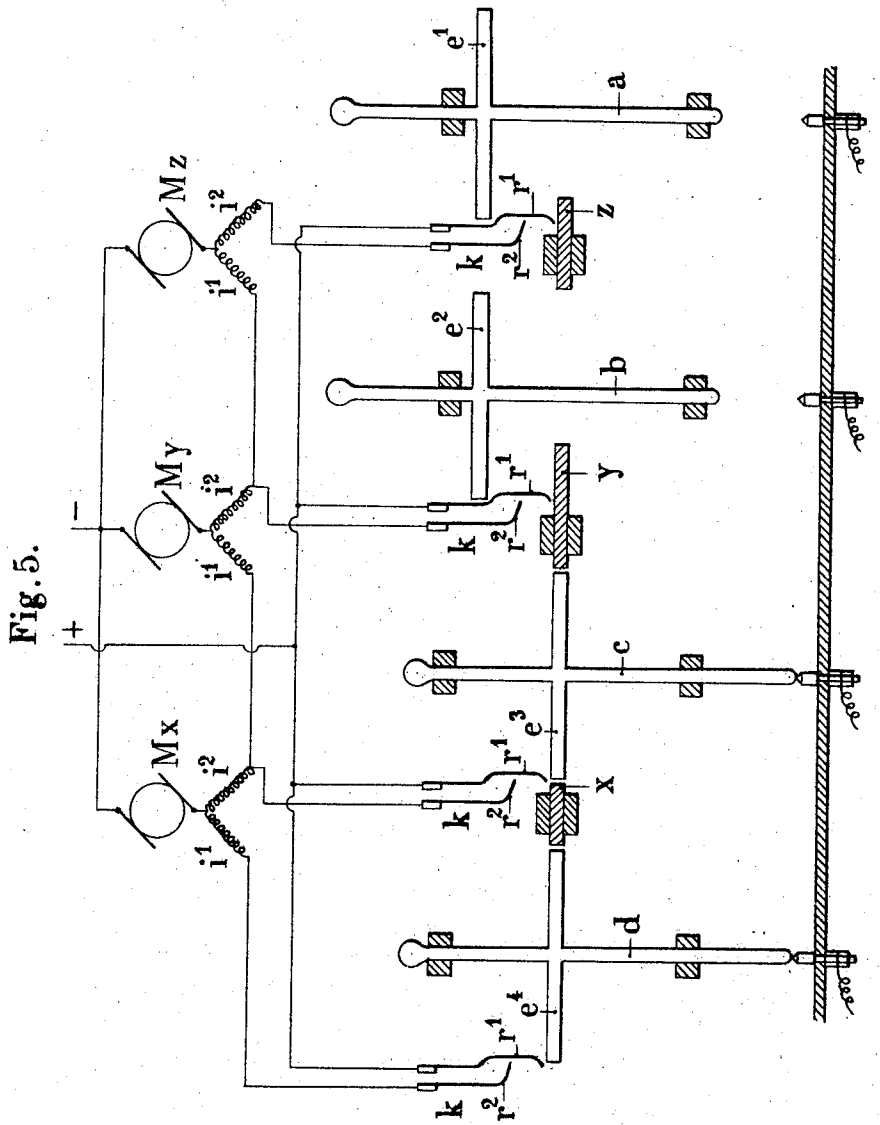

Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 8.

	C	B	A	D
D.6		B.6-B.5-B.4-B.2		
D.5		B.6-B.5-B.4-B.2		
D.4	C.4-C.2	B.6-B.5-B.4-B.2	A.4-A.2	I
D.2	C.4-C.2-C.3	B.6-B.5-B.4-B.2	A.4-A.2	
D.3	C.4-C.2-C.3-C.1	B.6-B.5-B.4-B.2	A.4-A.2	
D.1	C.4-C.2-C.3-C.1	B.6-B.5-B.4-B.2	A.4-A.2	
C.4		B.6-B.5-B.4-B.2	A 4-A 2	D.4-D.3-D.2-D.1
C.2	I	B.6-B.5-B.4-B.2	A 4-A 2	D.4-D.3-D.2-D.1
C.3		B.6-B.5-B.4-B.2	A 4-A 2	D.4-D.3-D.2-D.1
C.1		B.6-B.5-B.4-B.2	A 4-A 2	D.4-D.3-D.2-D.1
B.6	C.4-C.2-C.3-C.1			D.6-D.5-D.4-D.2-D.3-D.1
B.5	C.4-C.2-C.3-C.1	I		D.6-D.5-D.4-D.2-D.3-D.1
B.4	C.4-C.2-C.3-C.1		A.4-A.2	D.6-D.5-D.4-D.2-D.3-D.1
B.2	C.4-C.2-C.3-C.1		A.4-A.2	D.6-D.5-D.4-D.2-D.3-D.1
A.4	C.4-C.2-C.3-C.1	B.4-B.2	I	D.4-D.3-D.2-D.1
A.2	C.4-C.2-C.3-C.1	B.4-B.2		D.4-D.3-D.2-D.1

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UNITED STATES PATENT OFFICE.

AXEL EGNELL, OF PARIS, FRANCE.

INTERLOCKING DEVICE.

1,392,630. Specification of Letters Patent. Patented Oct. 4, 1921.

Application filed September 15, 1920. Serial No. 410,565.

To all whom it may concern:

Be it known that I, AXEL EGNELL, a subject of the King of Sweden, and residing at 28 Rue de la Bienfaisance, Paris, France, engineer, have invented Interlocking Devices, of which the following is a full, clear, and exact description.

Devices adapted to produce the mechanical interlocking of a number of control members are already in use; these devices are applicable when these control members receive for their operation a single movement or eventually two movements reverse from each other.

This invention relates to a device capable of receiving numerous applications and in more complicated cases, when two or more groups of members are to be interlocked, each member being able to occupy any number of positions which are consistent or inconsistent with the positions of the members of the other groups.

In order that the invention may be clearly understood, it will be described as applied for obtaining the interlocking of operating levers for railway switches and signals, per itineraries, in a station.

For simplification, it will be supposed that the simple closing of a contact, causing current to be sent to the motors of the points or switches and signals, suffices for establishing any itinerary.

It will also be supposed that the itineraries form groups each comprising the itineraries issued from one of the station arrival lines.

The new device allows of producing the mutual interlocking of any two groups of itineraries and, by superposition, of producing the interlocking of all the groups of possible itineraries in the station.

On the other hand, each group being interlocked with the two groups the original line of which is immediately adjacent to its own original line, the adjunction to the new device of certain very simple mechanical means usually permits of producing the mutual interlocking of any of the groups with those which are not already interlocked with the same.

In the form of execution which will be described, the contacts corresponding to the various itineraries are arranged in parallel lines or rows, each line comprising the contacts of a group of itineraries, the whole forming a kind of keyboard, in front of which can be moved the members adapted to close the required electric circuits,—or to produce any suitable control action,—and to effect at the same time the necessary interlockings so that the itineraries inconsistent with the chosen itinerary cannot be made at the same time as the latter.

These members are substantially constituted by fingers which can be moved opposite the keyboard and to which can be imparted a downward movement when they are opposite the required contact, these fingers being arranged so as to act directly or indirectly on shutters capable of preventing the movement of the fingers of the control members of the other groups, when this movement would have for effect to establish itineraries inconsistent with that chosen.

The above shutters can be moved by wedges or inclines integral with the control fingers; they may also be actuated by any other suitable means independent or not from the control fingers.

Thus these shutters can be moved by small electric motors capable of rotating in one direction or the other and of pushing the shutters in the required direction toward the right or toward the left, according to the phases of the working.

The accompanying drawing shows, by way of example, a form of the new device.

In this drawing,

Figure 1 is a diagrammatic view illustrating the arrangement of the shunting or switching tracks to which the new device is supposed to be applied.

Fig. 2 is a vertical section of the apparatus made according to line A—A of the plan view of Fig. 4.

Fig. 3 is a section made according to line B—B of Fig. 2.

Fig. 4 is a plan view.

Fig. 5 is an elevation showing diagrammatically a modification.

Fig. 6 is a plan view.

Fig. 7 is a corresponding side view.

Fig. 8 is a table showing the respective situation of the various itineraries relating to their inconsistencies.

In the example illustrated, the station having tracks arranged as indicated in Fig. 1, the possible itineraries are:

D—6, D—5, D—4, D—3, D—2, D—1.
C—4, C—3, C—2, C—1.
B—6, B—5, B—4, B—2.
A—4, A—2.

The inconsistencies are indicated on the table of Fig. 8.

It is obvious that all the itineraries D are inconsistent with each other, as well as all the itineraries C and B and A. This has been indicated by the mention I in the corresponding divisions.

By examining this table, it will be seen that, as far as the inconsistencies with the itineraries C are concerned, the itineraries D form four auxiliary groups:

The first D—6, D—5 is consistent with all the itineraries C.

The second D—4 is inconsistent with the itineraries C—4 and C—2.

The third D—2 is inconsistent with the itineraries C—4, C—2 and C—3.

The fourth D—3, D—1 is inconsistent with all the itineraries C.

In the same way, if for instance the inconsistencies of the itineraries B with the itineraries A are considered, there are two auxiliary groups:

B—6, B—5 is consistent with all the itineraries A.

B—4, B—2 is consistent with all the itineraries A.

The new device is adapted to materialize between the control members the inconsistencies of the corresponding itineraries. For that purpose the above mentioned movable shutters, adapted to prevent from acting on the contacts of the itineraries inconsistent with that to be established, are provided with steps corresponding to the above indicated auxiliary groups.

As shown, all the itineraries of the group D are inconsistenet with each other and the same is true respectively for the itineraries C, B and A; thus, it is possible, in the well known manner, to avoid any interlocking between the itineraries of one and the same group by providing a single contact finger for all the itineraries D, C, B or A, this finger being capable of establishing any of the itineraries of its group and only one.

As illustrated in Figs. 2, 3, 4, the device comprises fingers d, c, b, a, each integral with a wedge e and an operating handle p. These fingers bear upon slides g^1, g^2, which allow them to be moved according to the axes d^1, d^1, c^1, c^1, b^1, b^1, a^1, a^1, Fig. 4, and to be depressed or withdrawn, as shown in Fig. 2, so as to come in engagement with fixed contacts D^6, C^4, etc., arranged at the points of intersection of the lines d^1, d^1, c^1, c^1, etc., and of the lines 1, 3, 2, etc.

The shutters x, y, z are constituted by plates cut out as shown in Fig. 4. These shutters are guided by the fixed slides g which allow them to take horizontal movements parallel to the lines 1, 3, 2, etc.

In the example shown, it has been supposed that the itineraries D—6 and C—4 were established, while the fingers b and a are located opposite the contacts corresponding to B—2 and A—4.

The examination of the figure shows that it has been possible to depress or drive in the fingers d c at the same time, but these fingers being thus driven in, it is not possible to drive in the fingers b and c, this corresponding to the inconsistency of B—2 and A—4 with C—4.

It is also easy to understand how the necessary interlockings are affected:

1°—Mutual interlocking of two groups of adjacent itineraries. The shutter x effects the interlocking between two adjacent groups D and C.

The shutter must be cut out in such a manner that, if E is the width of the plate which is between the horns $e\alpha$ $e\beta$ of the two contiguous wedges driven in at the same time, Fig. 2, the spacing apart between two faces of the steps, viz: x^4 and x^3 presented between the two adjacent wedges, is equal or less than E when the itineraries are consistent and greater than E when the itineraries are inconsistent.

In the same way, the shutter y effects the interlockings between the itineraries C and B, and z between B and A.

By superposing the similar devices, it is obviously possible to interlock the groups D B, D A, C A, which give the complete interlocking of all the itineraries.

2°—Simplified interlocking between all the groups of itineraries.

In most cases, it is not necessary to use these supplementary interlocking members.

In fact, the shutters x, y, z are provided, as illustrated in the drawing, with heels t, opposite each other, through the medium of which the side thrust imparted to a shutter is transmitted to the following shutters.

Thus, in the example shown, the driving in of the finger c, coming in contact with C—4 has produced the interlocking of A—4, although the two groups C and A are not contiguous, because the lateral displacement imparted to the shutter y by the driving in of the finger c has been transmitted to the shutter z.

The two shutters y and z separating C and A, have operated in this case as a single shutter.

As will be understood from the foregoing, the wedges e have two distinct functions: 1°—producing the interlocking, which is their main function; 2°—producing beforehand a suitable spacing apart of the interlocking plates.

The second function might be accomplished by other means or parts than the members e; in this case, the inclines may be done away with and the members e reduced to simple T-members e^1, e^2, e^3, e^4, as illustrated in Figs. 5, 6, 7.

In this modification, the plates or shutters x, y, z are provided with members x^1, y^1, z^1, integral with racks x^2, y^2, z^2 with which gear pinions carried by motors M^1, M^2, M^3. The latter are direct current series motors, comprising two exciting windings through each of which the current can pass at the same time as it passes through the armature; the direction of rotation is different according to the field magnet which is energized.

Each member e^1, e^2, e^3, e^4, when passing from its raised position to its depressed position, comes in engagement with a spring blade r^1 and brings it in contact with a second blade r^2, while at the ends of stroke the contact r^1, r^2 is broken.

There is of course, as many pairs of blades r^1, r^2 as there are holes 1, 2, 3, 4, 5, 6.

The connections are established for instance as shown in Fig. 5; it will be seen that if the field-magnets i^1 determine the displacement from left to right of the plates x, y, z and i^2 from right to left, the operation of a member a, b, c, d has for effect to remove on either side the plates which might interlock therewith.

For instance, if the member b is driven in, the left-hand contact k is closed and the current passes through the field-magnet i^2 and the armature of the motor M y. The latter then rotates and pushes the plate y toward the left. On the other hand, the current passes also through the field-magnet i^1 and the armature of the motor M z, so that the latter rotates in the reverse direction relatively to the previous one and pushes the plate 2 toward the right.

Another circuit is established through the field-magnets l^1 of M y and l^2 of M x, thus producing the two following effects:

1°—the excitation of the field-magnet i^1 of M y, with this direction of current, reinforces the effect of the field-magnet i^2 of the same motor; 2°—the passage of the current in the field-magnet i^2 and the armature of the motor M x, determines the displacement from right to left of the plate x.

Generally speaking, considering any number of plates x, y, z, the driving in of a member a, b . . . determines the rotation in the suitable direction of all the motors of the apparatus.

It is to be noted that the examples described and shown have been indicated only in order that the principle of the invention may be understood, this invention being capable of receiving numerous other forms of execution.

It is also to be particularly noted that in the method of execution described, instead of having a single finger per group, any number of fingers might be provided in each group, this number being at most equal to that of the itineraries of the group.

The interlocking shutters, instead of being moved in a plane under the action of wedges carried by the contact fingers, might take a rotary movement about an axis or a point.

On the other hand, the shutter which, in the example chosen, produces the mutual interlocking of the two members to be interlocked, might be replaced by two distinct members; one producing the locking of the first member through the second one, the other producing the locking of the second member through the first one.

The above arrangements are given only by way of example; the forms, dimensions, detail arrangements and materials used may be varied according to circumstances without departing thereby from the principle of the invention.

Claims:

1. In an interlocking device, control members movable according to guide lines, each capable of taking a series of positions on these lines, cut out members movable according to other lines, a cut out member being interposed between the paths of two adjacent control members, projecting parts on the edges of the cut out parts controlling the possible positions of the control members.

2. In an interlocking device, control members movable according to guide lines, each capable of taking a series of positions on these lines, contacts with which these control members come in engagement, cut out members movable according to other lines, a cut out member being interposed between the paths of two adjacent control members, projecting parts on the edges of the cut out parts controlling the possible positions of the control members.

3. In an interlocking device, control members movable according to guide lines, each capable of taking a series of positions on these lines, cut out members movable according to other lines, a cut out member being interposed between the paths of two adjacent control members, projecting parts on the edges of the cut out parts controlling the possible positions of the control members, means tending to remove two successive cut out members when the intermediate control member is operated.

4. In an interlocking device, control members movable according to guide lines, each capable of taking a series of positions on these lines, cut out members movable according to other lines, a cut out member being interposed between the paths of two adjacent control members, the cut out parts forming projecting portions corresponding to the itineraries, the said cut out parts controlling the possible positions of the control members, projecting parts on the edges of the cut out parts controlling the possible positions of the control members.

5. In an interlocking device, control members movable according to guide lines, each capable of taking a series of positions on these lines, cut out members movable according to other lines, a cut out member being interposed between the paths of two adjacent control members, projecting parts on the edges of the cut out parts controlling the possible positions of the control members, means through the medium of which a cut out member acts, when it is moved, on the other cut out members.

6. In an interlocking device, control members movable according to parallel lines and each capable of taking a series of positions on these lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out parts and controlling the possible positions of the control members.

7. In an interlocking device, control members movable according to parallel lines and each capable of taking a series of positions on these lines, contacts with which these control members come in engagement, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out parts and controlling the possible positions of the control members.

8. In an interlocking device, control members movable according to parallel lines and each capable of taking a series of positions on these lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out parts and controlling the possible positions of the control members, means tending to remove two successive cut out members when the intermediate control member is operated.

9. In an interlocking device, control members movable according to parallel lines and each capable of taking a series of positions on these lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, the cut out parts forming projecting portions corresponding to the itineraries, the said cut out parts controlling the possible positions of the control members, projecting parts on the edges of the said cut out parts and controlling the possible positions of the control members.

10. In an interlocking device, control members movable according to parallel lines and each capable of taking a series of positions on these lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out parts and controlling the possible positions of the control members, means through the medium of which a cut out member acts, when it is moved, on the other cut out members.

11. In an interlocking device, control members movable according to parallel lines, each capable of taking a series of positions on these lines and capable of being moved at right angles to the plane of the said lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out members controlling the possible positions of the control members.

12. In an interlocking device, control members movable according to parallel lines, each capable of taking a series of positions on these lines and capable of being moved at right angles to the plane of the said lines, contacts with which these control members come in engagement, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out members controlling the possible positions of the control members.

13. In an interlocking device, control members movable according to parallel lines, each capable of taking a series of positions on these lines and capable of being moved at right angles to the plane of the said lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, projecting parts on the edges of the said cut out members controlling the possible positions of the control members, means tending to remove two successive cut out members when the intermediate control member is operated.

14. In an interlocking device, control members movable according to parallel lines, each capable of taking a series of positions on these lines and capable of being moved at right angles to the plane of the said lines, cut out members interposed between the paths of two consecutive control members and movable at right angles to the above lines, cut out parts forming projecting portions corresponding to the itineraries, the said cut out parts controlling the possible positions of the control members; projecting parts on the edges of the said cut out members controlling the possible positions of the control members.

15. In an interlocking device, control members movable according to parallel lines, each capable of taking a series of positions on these lines and capable of being moved at right angles to the plane of the said lines, cut out members interposed between the paths of two consecutive control members

and movable at right angles to the above lines, projecting parts on the edges of the said cut out members controlling the possible positions of the control members, means through the medium of which a cut out member acts, when it is moved, on the other cut out members.

16. In an interlocking device, contacts forming a keyboard, members movable according to certain lines of the keyboard and capable of coming in engagement with the said contacts, shutters having a movement of translation at right angles to the driving-in movement of the said members, means for moving the shutters when the said contact members are driven in.

17. In an interlocking device, contacts forming a keyboard, members movable according to certain lines of the keyboard and capable of coming in engagement with the said contacts, by a movement at right angles to the said lines, shutters having a movement of translation at right angles to the driving-in movement of the said members, means for moving the shutters when the said contact members are driven in.

18. In an interlocking device, contacts forming a keyboard, fingers movable according to certain lines of the keyboard and capable of coming in engagement with the said contacts, shutters having a movement of translation at right angles to the driving-in movement of the said fingers, means for moving the shutters when the said contact fingers are driven in.

19. In an interlocking device, contacts forming a keyboard, members movable according to certain lines of the keyboard and capable of coming in engagement with the said contacts, shutters having a movement of translation at right angles to the driving in movement of the said members, wedges or inclines integral with the control members for moving the shutters when the said contact members are driven in, means for moving the shutters when the said contact members are driven in.

20. In an interlocking device, contacts forming a keyboard, members movable according to certain lines of the keyboard and capable of coming in engagement with the said contacts, shutters having a movement of translation at right angles to the driving-in movement of the said members, means for moving the shutters when the said contact members are driven in, heel pieces on the cut out plates or members and through which these plates or members push each other.

The foregoing specification of my "interlocking device" signed my me this 2nd day of September, 1920.

AXEL EGNELL.