F. G. AGRELL.

DEVICE FOR CONTROLLING THE CONSECUTIVE OPERATION OF ELECTROMAGNETS.

APPLICATION FILED FEB. 27, 1907.

973,737.

Patented Oct. 25, 1910.

Fig. 1.

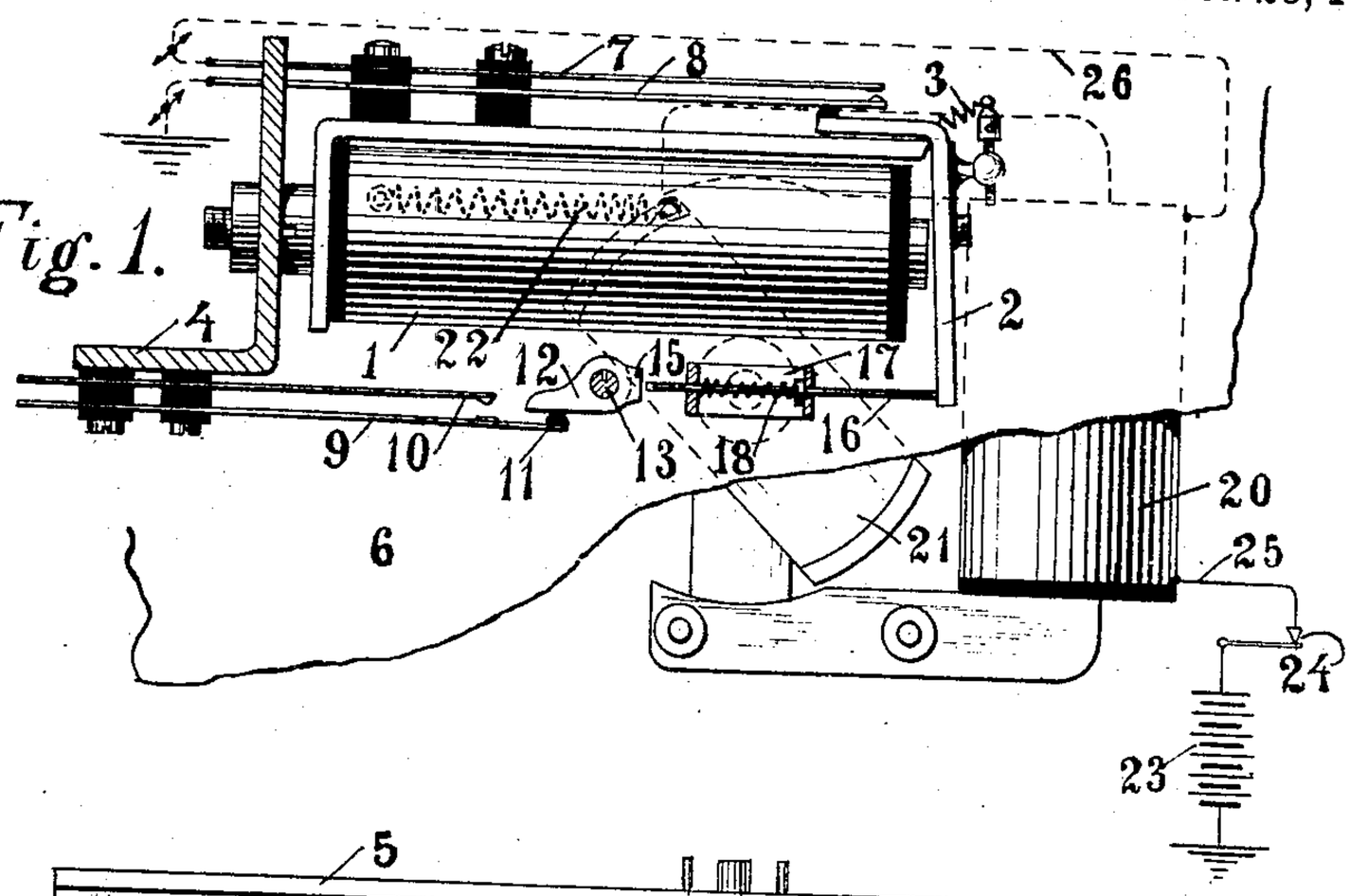
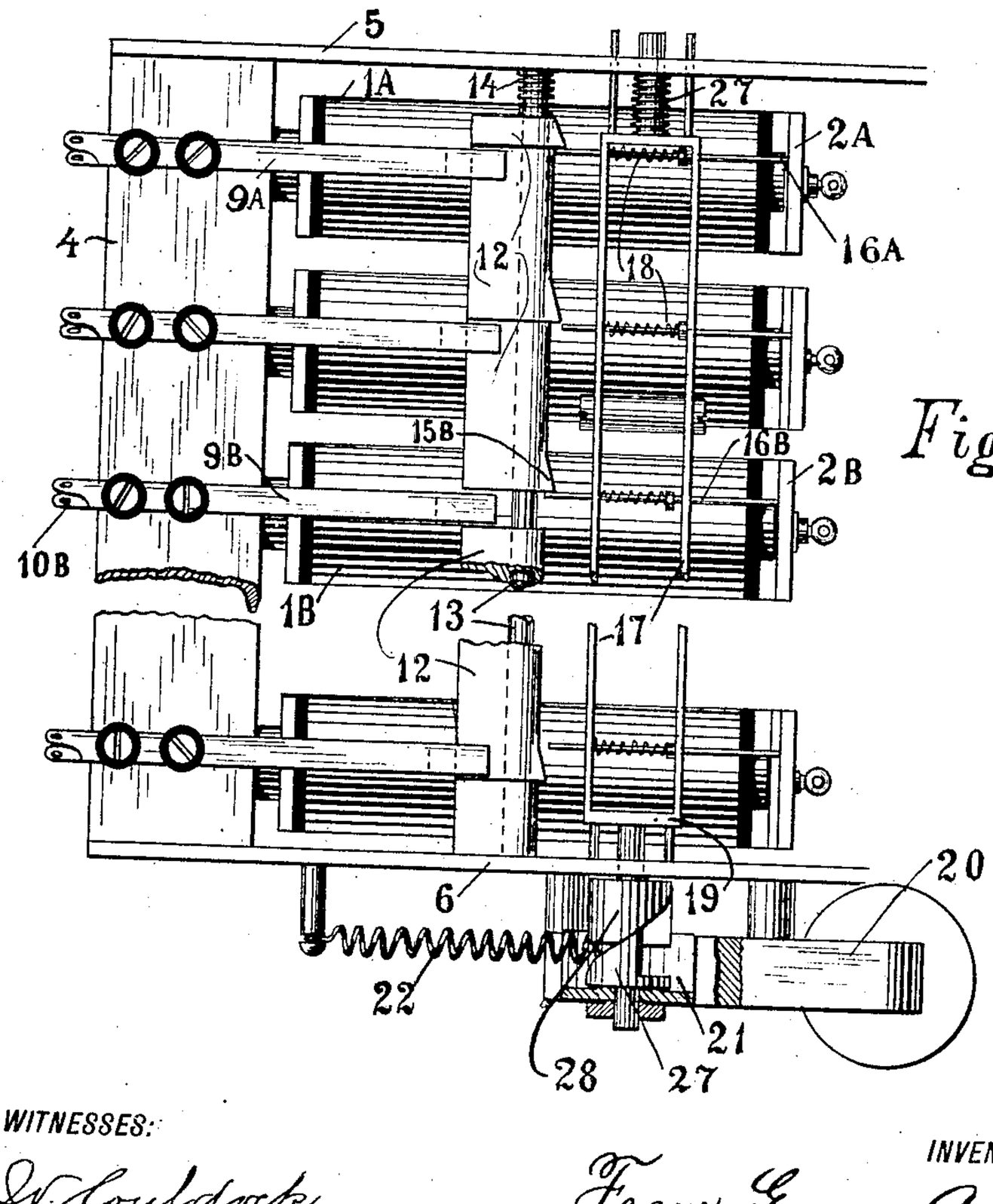


Fig. 2.



WITNESSES:

B. L. Couldock

P. Szabo

INVENTOR

Frans Gunnar Agrell,

BY

Lewis J. Doolittle

ATTORNEY

UNITED STATES PATENT OFFICE.

FRANS G. AGRELL, OF STOCKHOLM, SWEDEN.

DEVICE FOR CONTROLLING THE CONSECUTIVE OPERATION OF ELECTROMAGNETS.

973,737. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed February 27, 1907. Serial No. 359,660.

To all whom it may concern:

Be it known that I, FRANS GUNNAR AGRELL, a subject of the King of Sweden, and resident of Stockholm, Sweden, have invented certain new and useful Improvements in Devices for Controlling the Consecutive Operation of Electromagnets, of which the following is a specification.

This invention relates to a device for controlling the consecutive operation of relays or other electro-magnets.

Its object is to provide an arrangement by means of which relays energized simultaneously are prevented from operating simultaneously. Such an arrangement is especially advantageous in automatic telephone systems and more particularly in that class of automatic systems where several subscribers use the same apparatus and a simultaneous connection of several subscribers with said apparatus would bring about confusion. The spacing out of the operation has heretofore been accomplished by means of rotary switches which travel continuously over successive contacts and stop at the contact which is connected to a relay or other means which operates at the time. The disadvantage of such arrangements is the loss of time that takes place, for instance, when the rotary switch has passed a contact immediately before the energizing of the device connected to the same and, consequently, must travel over all other contacts before reaching this contact again. Another disadvantage of such an apparatus is that it must be in continuous motion or otherwise be provided with intricate clutch-arrangement to connect itself to a motive power when desired to operate it.

The arrangement herein specified and shown in the accompanying drawing as an illustration of an operative embodiment of my invention has no continuous motion and consequently avoids all losses in time except that required for the spacing out of the calls.

In the accompanying drawings Figure 1 is an end view of a relay bank provided with a consecutive arrangement incorporating my invention. Fig. 2 is a plan view of the relay bank seen from the underside of Fig. 1.

Like parts in both views have been given similar reference numbers.

Referring to the drawing 1 represents the relays. They are each provided in the usual manner with armatures 2 which are normally held away from their respective cores of the relays 1 by means of springs 3. Several such relays are attached to a support 4, which support has side walls 5 and 6 adapted to hold the consecutive arrangement. The relays have directly operating contact-springs 7 and 8, the purpose of which will be described hereinafter. For every relay there is also a set of contact springs 9 and 10 which correspond to the regular contacts of a relay. As shown in the drawings these contacts are normally open but for other purposes they could be normally closed. The spring 9 has an insulated knob 11 which normally rests against a member 12, holding the contact open between 9 and 10. One member, such as 12, is provided for each relay. The members are slidably mounted on a rod 13 extending between the walls 5 and 6 and are kept in their initial position of rest by means of a spring 14. Every member has a projection 15 adapted to be engaged by a pin 16 carried by a slide 17 which pin is brought into engagement with the projection 15 by the movement of the relay armature 2. When no relay is operated the pins 16 are held out of engagement with the projections 15 by means of the springs 18.

Fig. 2 shows the device in operation. The letters ^{A}—^{B} etc., have been used in connection with several of the reference numbers to distinguish between several like parts. The armatures 2^{A} and 2^{B} have operated. The end 19 of the slide 17 is normally held against the wall 6 by the spring 27 but may be moved to the position shown in Fig. 2 by means of any suitable motor.

In the drawings I have shown a motor comprising the following parts: An electro-magnet 20 arranged to operate an armature 21, and a cam-shaped member 27 mounted upon the armature shaft and which rotates with the armature 21 and engages a coöperating cam-shaped member 28 carried by the slide 17. The armature is normally held in the position shown in Fig. 1 by means of a spring 22 and the cams are so positioned that when the armature is in this position the slide 17 is in its normal position with the end 19 thereof resting against the wall 6. When current flows in the electro-magnet 20 the armature is operated and caused to turn sufficiently to move the slide 17 longitudinally by means of the cams above described to the position shown in Fig. 2.

If a relay, for instance 1^{B}, is energized its

armature 2^B will be attracted, closing the contact springs 7 and 8 and moving the pin 16^B into engagement with the projection 15^B. Through the closing of the contact between springs 7 and 8 current will go from a battery 23 over a contact 24 that is normally closed, the lead 25 to the electro-magnet 20 of the motor, causing the same to operate the slide 17 as above described, and from there through the lead 26, springs 7 and 8, to ground and battery. When the slide 17 is moved to this position the pin 16^B engages the projection 15^B and moves all the members 12 that are above said pins to the position shown in Fig. 2. The members which are positioned below said pin 16^B will remain in their original position and the result will be that an opening is formed between the members 12 at this point releasing the spring 9^B which then makes contact with the spring 10^B. In the drawing in Fig. 2 I have shown another relay 1^A as being operated simultaneously with 1^B. In this case it will be seen that the springs 9 and 10 belonging to relay 1^A are still kept out of engagement with each other as the releasing member 12 immediately below is also moved and no opening is formed.

When the operation that is to be performed by the current in the circuit which is closed by contacts 9^B and 10^B has advanced so far that no confusion can take place the contact 24 is broken for a moment by any suitable means, allowing the slide 17 and connected parts of the consecutive arrangement except pins 16^A and 16^B to go back to their positions of rest. The member 12 engaging the knob 11 will lift the spring 9^B so that the contact between said spring and spring 10^B is broken. Assuming now that the relay 1^B has been deënergized and the contact 24 closed again, pin 16^B will go back to its position of rest and the relay 2^A will operate the consecutive arrangement in the same manner as described for the relay 2^B and allow the contact spring 9^A to close its circuit. It is thus seen that when a single relay is energized it is instantaneously operated independently of the other relays and when several relays are energized simultaneously the same will be prevented from operating simultaneously but will operate successively. If a relay below the one which has operated its springs is energized its pin 16 will rest against the inclined side of the projection 15 and will not operate the consecutive arrangement until the relay above has finished its operation when upon the return of the slide 17 the pin 16 rides over the inclined side of 15 and assumes its position ready to operate its releasing member 12 in the same manner.

The consecutive arrangement described can, of course, be utilized to produce a spacing out of simultaneous operations of any nature either mechanical or electrical. It is not necessary that the parts operated by the releasing members 12 be contact springs, as the same would operate other devices or other members of an escape arrangement, equally well.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention designed without departing from the scope thereof, I intend that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative merely of an operative embodiment of my invention and not in a limiting sense.

I claim—

1. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating releasing members operative to release one of said releasable members, and means for operating said releasing members.

2. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of releasing members operative to release one of said releasable members, means for simultaneously operating a number of said releasing members, and means for predetermining how many of said releasing members are to be operated by said last named means.

3. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating releasing members each operative to release one of said releasable members, means for selectively operating one or more of said releasing members, and means for preventing the operation of any other of said releasing members to release said releasable member controlled thereby.

4. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating releasing members operative to release one of said releasable members, means for operating said releasing members, and means for preventing the release of more than one of said releasable members at the same time.

5. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating releasing members operative to release said releasable members, means for operating said

releasing members consecutively to successively release a number of said releasable members.

6. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating releasing members operative to release said releasable members, means for operating said releasing members consecutively in predetermined order to release a number of said releasable members, and means for predetermining the order of said release.

7. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating movable releasing members operative when moved to release one of said releasable members, and means for moving a number of said releasing members.

8. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating relatively movably releasing members adapted to hold the releasable members in their inoperative position and also adapted when moved relatively to one another to release one of said releasable members, and means for moving any one of said releasing members relative to another member.

9. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of mechanically coöperating relatively movable releasing members adapted to hold the releasable members in their inoperative position and also adapted when moved relatively to an adjacent releasing member to release one of said releasable members, and means for moving any one of said releasing members relative to an adjacent member.

10. In a device for controlling the consecutive operation of electro-magnets, the combination with a series of releasable members adapted to perform a mechanical operation, of a series of coöperating movable releasing members operative when moved to release one of said releasable members, a movable member carrying a number of engaging members each adapted to engage and move one of said releasing members, means for operating said movable member, and means for operating selectively any one or more of said engaging members.

11. In a device for controlling the consecutive operation of electro-magnets, a series of releasable members adapted to perform a mechanical operation, a series of coöperating releasing members against which said releasable members normally rest, said releasing members normally holding said releasable members in their inoperative position, means for moving said releasing members so as to release any one of said releasable members, and electrically operated means adapted to cause said movable means to engage any of said releasing members.

12. In a device for controlling the consecutive operation of electro-magnets, a series of electro-magnets, a series of releasable members each adapted to perform a mechanical operation and each indirectly operated by one of said electro-magnets, a series of movable releasing members against which the releasable members normally rest in inoperative position, said releasing members coöperating to prevent the release of more than one releasable member at a time, means for moving said releasing members so as to release any of said releasable members after the energization of the corresponding electro-magnets, and means adapted to cause said movable means to engage any of the releasing members, the operation thereof being controlled by the corresponding electro-magnet.

Signed at New York, in the county of New York and State of New York this 11th day of Feb. A. D. 1907.

F. G. AGRELL.

Witnesses:

LEWIS J. DOOLITTLE,

H. W. FORSYTH.