

Jan. 12 , 1926.

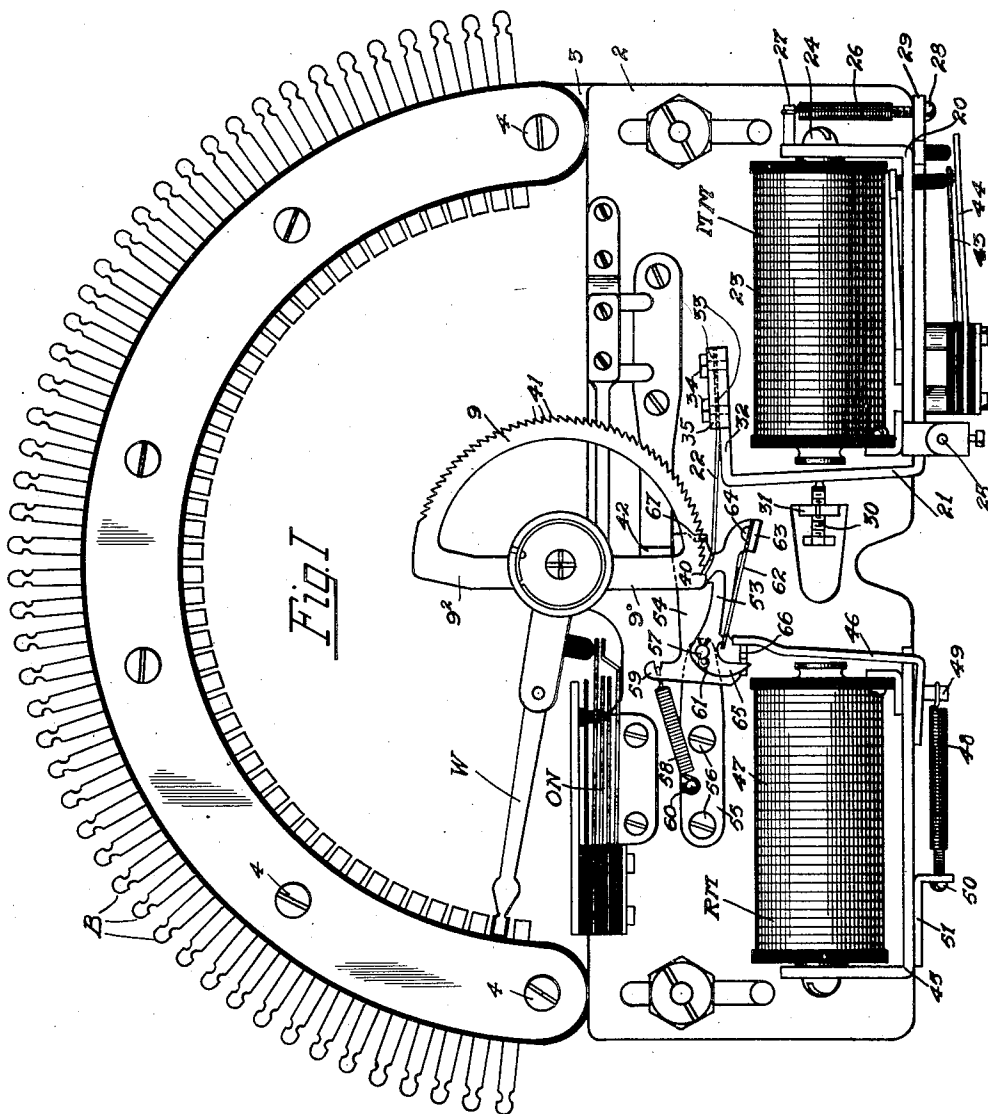
E. A. BOHLMAN

AUTOMATIC SWITCH

Filed Jan. 3, 1922

2 Sheets-Sheet 1

1,569,450



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2 Sheets-Sheet 2

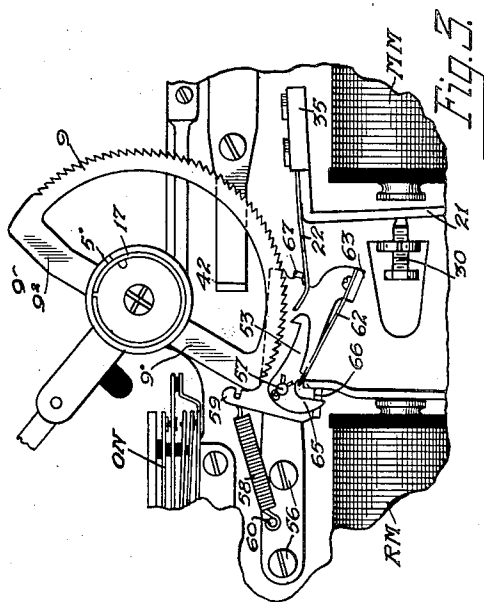


Fig. 3.

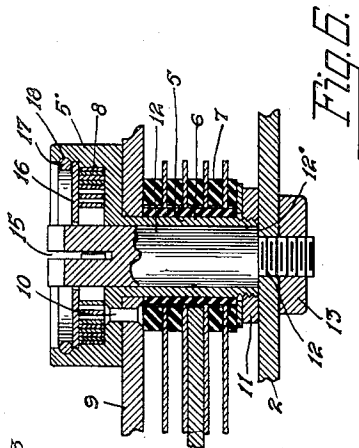


Fig. 4.

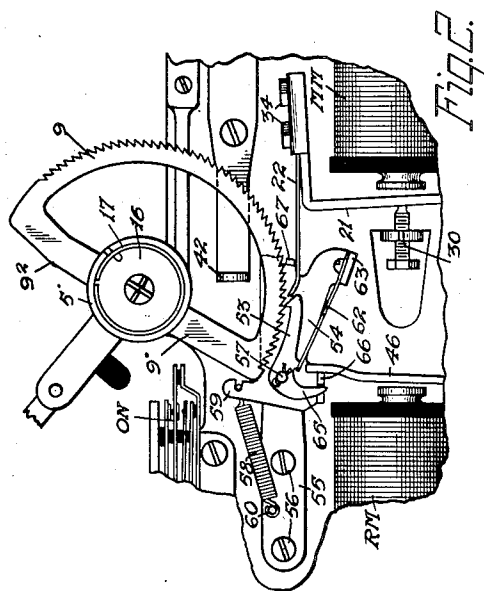


Fig. 5.

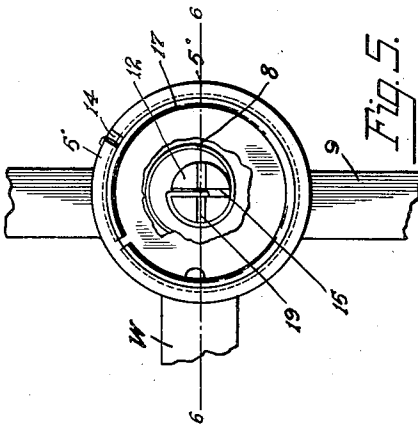


Fig. 6.

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UNITED STATES PATENT OFFICE.

ERNEST A. BOHLMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AUTOMATIC SWITCH.

Application filed January 3, 1923. Serial No. 526,532.

To all whom it may concern:

Be it known that I, ERNEST A. BOHLMAN, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Switches, of which the following is a specification.

My invention relates to selective switches and has to do more particularly with a switch of the step-by-step type that travels in a single direction during the selecting operation. The switch of my invention is adapted for use in semi-automatic and call-distributing telephone systems, but I do not wish to be limited to this use, as it may be used for a variety of purposes without departing from the invention.

A feature of my invention is the provision of a particular pawl and ratchet arrangement in association with a motor magnet that advances the wipers step by step over the contacts of a bank.

Another feature of my invention is the provision of a structure comprising a mounting plate which pivotally supports the retaining pawl and also pivotally supports the releasing dog which latter, when actuated by the release magnet, withdraws the retaining pawl and also the driving pawl to permit the restoration of the wipers to normal. A construction of this kind permits this portion of the switch to be assembled as a unit and secured to the switch without further adjustment.

Another feature of my invention is the provision of an improved spring barrel construction for housing the motor spring of the switch, and a novel adjusting means for the same to place the spring under proper tension.

The above features, as well as others, will be more particularly pointed out in the ensuing specification and appended claims.

For a more complete understanding of my invention, reference may be had to the accompanying drawings, in which like reference characters in the several views denote like parts, and in which—

Fig. 1 is a plan view of a switch provided with the features of my invention;

Fig. 2 is a plan view of the ratchet and pawl mechanism of the switch showing the apparatus when the release magnet is, par-

tially actuated, to illustrate one of the positions of the release mechanism;

Fig. 3 is a view similar to Fig. 2, but showing the apparatus when the release magnet is in its fully actuated position to illustrate another position of the releasing mechanism;

Fig. 4 is a perspective view of the releasing dog which is associated with the retaining and stepping pawls;

Fig. 5 is a plan view of the spring barrel with parts broken away to more clearly illustrate the construction;

Fig. 6 is a sectional view along the line 6—6 of Fig. 5.

Referring now more in detail to the structure illustrated, the switch comprises a mounting plate 2, to which is secured the various operating parts, the said plate also carrying an auxiliary plate 3, to which the bank of contacts B is secured by means of suitable screws 4, which bank of contacts B cooperates with the wipers W carried by a suitable hub, as will now be described. The wipers W are provided with suitable orifices which permit their being slipped over the hub 5, but suitably insulated therefrom by means of the sleeve of insulation 6 and from each other by means of the insulation washers 7. The hub 5 has integrally formed therewith a cup-shaped portion 5', which forms a container for the motor spring 8. A sector 9 is provided having a central orifice of a size to permit its being slipped over the hub 4, said sector resting between the cup-shaped portion 5' of the said hub 5 and an insulation washer 7, and is secured to the cup portion 5' in proper relation by means of a rivet 10. The wipers W are clamped in place upon the hub 5 in proper relation by means of the clamping nut 11, which has screw-threaded engagement with the threaded portion of the hub 5. The hub 5, which carries the sector 9 and wipers W, as a whole is rotatably secured to the mounting plate 2 by means of a combined motor spring tension and bearing screw 12. The hub 5 is provided with a central opening through which the screw 12 passes, and its one end which is threaded protrudes through a suitable orifice in the mounting plate 2 and is adapted to receive a nut 13, which holds the screw 12 in rigid relation with the plate 2 by clamping the said plate between the

shoulder 12' of the screw 12 and the said nut 13. The motor spring 8 fits in the cup-shaped portion 5' of the hub 5, the said spring 8 having its one end inserted in a slot 14 of the cup-shaped portion 5' of the hub 5, and its outer end resting in a slot 15 in the head of the bearing screw 12. A cover-cap 16 is provided, which covers the motor spring 8, and a split ring 17 rests in an annular groove 18 in the cup portion 5' and holds the cover-cap 16 in place. The head of the bearing screw 12 is provided with a pair of slots 15 and 19 at right angles to each other, the slot 19 being of a suitable depth and width for screw-driver use only, for the purpose of adjusting the tension of spring 8 with reference to the moving parts of the switch, the nut 13, of course, being loosened while adjustment is being made and thereafter tightened. By providing the shallow slot 19, the deeper one 15 will not be used for adjusting as the slot 15 is of such width to prevent the insertion of a screw driver. If it were so used, the head of post 12 might be spread and cause the switch to bind.

The motor magnet MM, which is adapted to step the wipers W over the contacts of the bank B, includes a heel iron 20, an armature 21, a driving pawl 22 and a suitable electromagnet winding 23, which is secured to the pole piece or heel iron 20 by means of a screw 24, which has screw-threaded engagement with a suitable tapped orifice in the core of the electromagnet 23, the said motor magnet MM as a whole being fastened to the mounting plate 2. The armature 21 is pivotally supported upon the pole piece 20 by means of the pivot pin 25. A helical spring 26 for holding the armature 21 in its normal position and for placing it under proper tension, has its one end secured to a pin 27 which pin 27 is suitably secured to the heel iron 20 and its other end secured to a screw 28, which screw 28 passes through a suitable orifice in the free end 29 of the armature 21 and has its threaded end extending into and engaging the convolutions of the helical spring 26, the convolutions of said spring 26 adjusting themselves to the threads of said screw 28. The screw 28 may be used for adjusting the tension on the armature 21, as is readily apparent. An adjustable stop 30 is provided in the form of a screw, which has screw-threaded engagement with an angular extension 31 integrally formed with the plate 2, said screw 30 being used for properly adjusting the armature 21 in its normal position and its associated driving pawl 22 in proper engagement with the teeth 41 of the sector 9. The driving pawl 22 is adjustably secured to the angular portion 32 of the armature 21, and to that end the driving pawl 22 is provided with a pair of oblong orifices 33,

through which the clamping screws 34 pass. A clamping member 35 fits over the pawl 22, and when the proper adjustment of the pawl 22 is secured in relation to the sector 9, which adjustment is permitted through the agency of the orifices 33, the screws 34 are tightened, securely clamping the pawl 22 in its adjusted position. The pawl 22 is provided with a nose 40 angular in relation to the body portion of the pawl 22, the said nose 40 being normally in engagement with a tooth 41, of which there are a plurality cut in the circumferential face of the sector 9. The driving pawl 22 is constructed of comparatively thin spring metal, and it is so shaped and its tension is such as to permit its nose 40 to engage successive teeth of the sector 9. As the armature 21 of the motor magnet MM vibrates the nose 40 of the pawl 22 engages successive teeth 41 of the sector 9, stepping the wipers W from one contact set of the contact bank B to the next on each back stroke of the armature 21. A stop 42 is secured to the mounting plate 2 against which the sector arm 9 rests when in its normal position, 42 acting as a stop when the wipers W restore to normal and 42 also limiting the forward movement of the wipers W, in that the sector arm 9 engages the said stop 42 when the wipers W are in their farthest advanced position. A pair of interrupter springs 43 and 44 are insulatingly secured to the heel iron 20 associated with the motor magnet MM, for the usual purposes. A release magnet RM is provided to restore the wipers W, and comprises a heel iron 45, armature 46 and an electromagnet 47. The armature 46 is pivotally supported upon the heel iron 45 and held in its normal position by means of a helical spring 48, which has one end secured to a pin 49 which is secured to the armature 46 and has its other end secured to a screw 50 said screw 50 having its threaded end portion extending into and engaging the end convolutions of the helical spring 48, the said convolutions adjusting themselves to the threads of the screw 50, and by this arrangement the tension of spring 48 may be adjusted as is readily apparent. The screw is supported by a bracket 51, which is secured to the heel iron 45.

The retaining pawl 53 and releasing dog 54 associated with the release magnet RM are assembled as a unit structure upon a supporting plate 55, which latter on being mounted is suitably and adjustably secured to the mounting plate 2 by means of the screws 56. The releasing dog 54 is in the form of an irregularly shaped plate pivotally secured to the pivot post 57, which is fast on the supporting plate 55. The said releasing dog 54 is held in its normal position against the stop 42 by means of a helical spring 58, which has its one end secured

to an arm 59 integrally formed with the releasing dog 54 and its other end fastened to a pin 60 suitably secured to the supporting plate 55. The retaining pawl 53 is also pivotally supported upon pivot post 57 and held against displacement upon the post 57 by means of a cotter pin 61. The retaining pawl 53 is spring-pressed into engagement with the circumferential edge of the sector 9 by means of a leaf spring 62, which has its one end secured to an angular extension 63 of the releasing dog 54 by means of the screw 64, and its free end engaging the retaining pawl 53. When the wipers W are stepped from one contact set to the next, the retaining pawl 53 engages successive teeth 41 of the sector 9 to retain the said wipers in engagement with the different sets of contacts. The retaining pawl 53 is provided with an extended portion 65, which lies in the path of the armature 46 of the release magnet RM, for purposes as will now be described. To release the switch and permit the wipers W to move back to normal, the release magnet RM is energized and the free end of the armature 46 in its movement engages the angular extension 66 of the releasing dog 54, and rotates the releasing dog 54 about its pivot post 57. An angular extension 67 integrally formed with the releasing dog 54, due to the movement of the dog 54, engages the forward end of the driving pawl 22, causing the nose 40 of the driving pawl 22 to disengage the tooth 41 of the sector 9, as clearly illustrated in Fig. 2. The continued movement of the armature 46 of the release magnet RM now causes the extension 66 of the dog 54 to engage the extended portion 65 of the retaining pawl 53, also causing the said pawl 53 to rotate about its pivot, and when the armature 46 of the release magnet RM is in its fully attracted position as illustrated in Fig. 3, the retaining pawl 53 and driving pawl 22 have disengaged the respective teeth 41 of the sector 9 so that the motor spring 8 now restores the wipers W back to normal or starting position, whereupon the arm 9' of the sector 9 again engages the stop 42. From the above description it may be seen that when the nose 40 of the driving pawl has disengaged the tooth of the sector 9 upon the partial attraction of the armature 46 of the release magnet RM, that the retaining pawl 53 is still in engagement with a tooth of the sector 9, as clearly illustrated in Fig. 2. Upon the further attraction of release magnet RM, the retaining pawl is fully withdrawn, thus permitting a positive release of the switch wipers W upon the energization of the release magnet RM.

Referring to Fig. 1, it will be observed that when the switch is at normal, the pawl

22 engages the first tooth of the ratchet sector while the retaining pawl 53 rests on an unserrated portion of sector 9. With the first energization and de-energization of magnet MM, pawl 22 drives the switch a step and pawl 53 then drops into a tooth of sector 9 and holds the sector while magnet MM energizes and de-energizes to drive another step, the pawl 53 engaging successive teeth in sector 9 as successive steps are made. After the operation of magnet RM and the spring actuated restoration of the switch, an ensuing de-energization of magnet RM will allow spring 58 to restore, releasing plate 54 and the pawls 22 and 53 take their normal positions shown in Fig. 1.

A set of off-normal contacts ON are also provided and assume their alternate position upon the first step of the wipers W off-normal and again assume their normal position when the wipers W restore to normal.

While I have illustrated and described my invention in connection with a specific form of switch, I wish it to be understood that I do not wish to be limited to the same, as my invention is applicable in a variety of ways and I, therefore, aim to cover these various applications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A switch of the character described comprising a rotary shaft, a motor magnet and a driving pawl for advancing said rotary shaft, a release magnet, an adjustable plate, a releasing dog pivotally secured to said adjustable plate, a retaining pawl pivotally secured to said plate independently of said releasing dog for holding said shaft in an advanced position when moved thereto, means associated with said release magnet for controlling the releasing movement of said pawl and said dog, said adjustable plate adapted to be removed from said switch as a unit, and said release magnet as another unit.

2. A switch of the character described comprising a movable element, a motor magnet and a spring driven pawl for advancing said element, a release magnet, an adjustable plate, a releasing member pivotally secured to said adjustable plate and a spring for holding said member in its normal position, a retaining pawl pivotally secured to said plate independently of said releasing member and spring pressed into engagement with said element for holding said switch in an advanced position, an armature for said release magnet for controlling the releasing movement of said releasing member, said retaining pawl and said driving pawl.

3. A switch of the character described

comprising a rotary shaft, a motor magnet and a driving pawl for advancing said rotary shaft, a release magnet, a supporting stud, a releasing member pivotally supported upon said stud and spring means for holding said member in its normal position, a retaining pawl pivotally supported upon said stud independently of said releasing member for retaining said shaft in an advanced position, an armature for said release magnet and a part for said member adapted to be engaged by said armature upon the energization of said release magnet to rotate said member about its pivot stud to start the release movement of said member.

4. A switch of the character described comprising a rotary shaft, a motor magnet and a driving pawl for advancing said rotary shaft, a release magnet, a supporting stud, a releasing member pivotally supported upon said stud and spring means for holding said member in its normal position, a retaining pawl pivotally supported upon said stud independently of said releasing member for retaining said shaft in an advanced position, an armature for said release magnet and a part of said member adapted to be engaged by said armature upon the energization of said release magnet to rotate said member about its pivot stud to start the release movement of said member, and a part of said member adapted to engage said driving pawl to move it out of engagement upon a partial attraction of said armature.

5. A switch of the character described comprising a rotary shaft, a motor magnet and a driving pawl for advancing said rotary shaft, a release magnet, a supporting stud, a releasing member pivotally supported upon said stud and spring means for holding said member in its normal position, a retaining pawl pivotally supported upon said stud for retaining said shaft in an advanced position, an armature for said release magnet and a part of said member adapted to be engaged by said armature upon the energization of said release magnet to rotate said member about the pivot stud to start the release movement of said member, a part of said member adapted to engage said driving pawl to move it out of engagement upon a partial attraction of said armature, and a portion of said retaining pawl adapted to be engaged by the said member upon a further excursion of said armature to cause said retaining pawl to disengage said switch to permit said rotary shaft to restore to its normal position.

6. A switch of the character described comprising a rotary shaft and a toothed sector associated therewith, a motor magnet including a driving pawl for advancing said rotary shaft, a motor spring for said

rotary shaft and a spring barrel for enclosing said spring, a pair of slots in one end of said rotary shaft, one of said slots being of shallow depth and of such width to permit the insertion of a screw driver for adjusting purposes, and the other of said slots being of greater depth to permit the insertion of said motor spring for anchoring its one end, and means for anchoring its other end to said spring barrel.

7. A switch of the character described comprising a rotary shaft and a toothed sector associated therewith, a motor magnet including a driving pawl for advancing said rotary shaft, a motor spring for said rotary shaft and a spring barrel for enclosing said spring, a pair of slots in one end of said rotary shaft, one of said slots being of shallow depth and of such width to permit the insertion of a screw driver for adjusting purposes and the other of said slots being of greater depth to permit the insertion of said motor spring for anchoring its one end thereto and being of such width as to prevent the insertion of a screw driver for adjusting purposes, and means for anchoring the other end of said spring to said spring barrel.

8. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means, a release magnet, a separately removable release unit supported on said switch independently of said magnet and having a pivot supporting a release member operable by said armature, holding mechanism for said switch also supported on said pivot independently of said release member and controlled by said release member, means for causing said release member to engage said travel adjusting means, and an armature for said magnet for actuating said release member.

9. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means and a release magnet, a release unit including a release member and a holding member for said switch, a stud for said release unit for supporting independently and rotatably said members, said stud forming a common axis of rotation for said members, said adjusting means including a travel controlling magnet having armature mechanism adapted to be engaged by said release member, and an armature for said release magnet controlling said last mentioned member.

10. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means, a release magnet, an independently mounted release unit comprising a movable release member and also a holding member for said switch, a travel controlling magnet included in said adjusting means, armature controlled

mechanism for said magnet and effecting travel of said switch, a pair of integrally formed parts of said release member adapted on actuation of said member, the one to engage said armature controlled mechanism, the other to thereafter engage said holding member, and armature means for said release magnet controlling said release member.

10 11. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means, a release magnet, a supporting member, a release controlling element supported on
15 said supporting member independently of said magnet, a pair of elements for said switch each holding it in adjusted position and arranged to be engaged in predetermined sequence by said release controlling
20 element, and an armature for said magnet for actuating said release controlling element.

12. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means, a release magnet mounted on said switch, a release controlling unit and means adapted for mounting said release control unit on
25 said switch independently of said magnet, a movable release member included in said unit, a movable holding element included in said unit, controlled by said member, a travel controlling magnet included in said
30 adjusting means and having armature mechanism adapted to be engaged by said re-

lease member independently of said holding element, and an armature for said release magnet for actuating said release member.

13. The combination with an electrically controlled traveling switch for automatic
40 telephone exchanges or the like, of driving mechanism for said switch, holding mechanism for said switch, an independent pivotally supported releasing element having
45 means for releasing said driving mechanism and said holding mechanism, a release magnet for actuating said element, mounting means for fastening said magnet to said
50 switch, and means for mounting said element on said switch independently of said release magnet.

14. A traveling switch for automatic telephone exchanges or the like including electrically controlled travel adjusting means, a release magnet, a release element rotatably
55 supported independently of said magnet, a holding element for said switch rotatably supported independently of said release element, a stud forming a common axis of rotation for said elements, a restoring spring for
60 said holding element carried by said release element, a device controlled by said release element for withdrawing said holding element, and an armature for said magnet for
65 actuating said release element.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 30th day of December, 1921.

ERNEST A. BOHLMAN.