W. KAISLING.

RELAY.

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1,334,037. Patented Mar. 16, 1920.

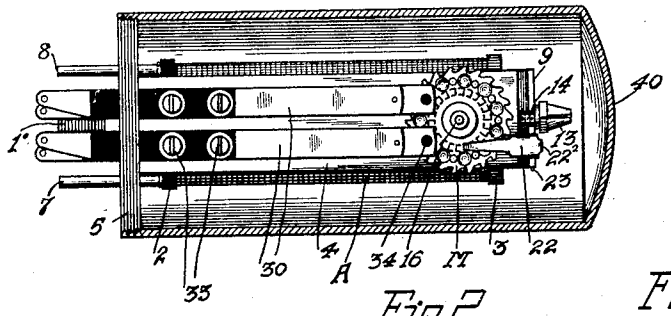

Fig. 2.

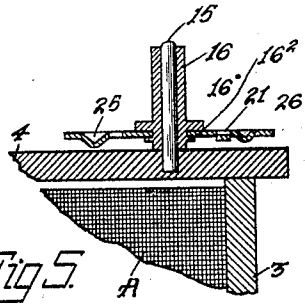

Fig. 5.

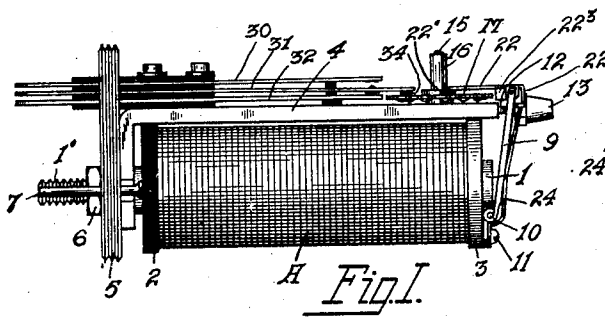

Fig. 1.

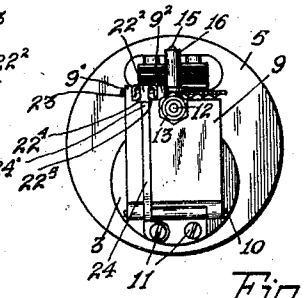

Fig. 3.

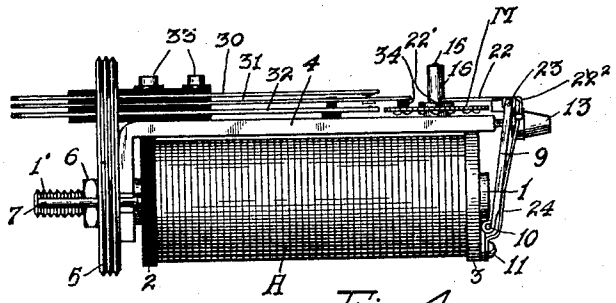

Fig. 4.

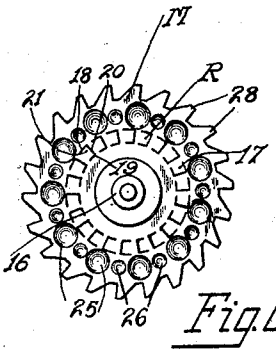

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM KAISLING, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

RELAY.

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To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States of America, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to electromagnetic relay structures and has more particularly to do with structures of the kind that are provided with a circuit changing spring movable to an off-normal position upon one operation of the electromagnetic structure and returnable to normal position upon a second operation of the electromagnetic structure.

The structures of the prior art which accomplished the above results have all been cumbersome, inefficient structures, most of which were provided with a pair of electromagnets, one electromagnet operating to mechanically lock up its armature when it energized and a second electromagnet operating to mechanically unlock the armature of the first electromagnet when it energized. It is devices of this kind which I have had especially in mind in developing my invention.

An object of my invention is the provision of an improved device of the class above described including an ordinary telephone relay provided with a single operating electromagnet and armature.

It is a further object of my invention to produce an improved device which obviates all the undesirable features found in the structures of the prior art and embodies desirable features and advantages all in a simple, efficient and economical manner; and to the accomplishment of this object and such others as may hereinafter appear, my invention consists in the novel details of construction, parts and combination of parts hereinafter described, and particularly pointed out in the appended claims.

I will now refer to the accompanying drawing in which I illustrate one embodiment of my invention. The like reference characters in the different views denote like parts and in which—

Figure 1 is an elevation of the relay structure of my invention showing the contact springs in one of their positions;

Fig. 2 is a plane view of Fig. 1 showing the relay with its protective shell in section;

Fig. 3 is a right end view of Fig. 1;

Fig. 4 is a view showing the contact springs in an alternate position to that shown in Fig. 1;

Fig. 5 is an enlarged fragmentary sectional view showing one method of mounting the interrupter disk, and

Fig. 6 is an enlarged view of the interrupter disk.

Referring now more in detail to my invention as illustrated, it comprises a magnet coil A wound upon a core 1, which is provided with spool heads 2 and 3 mounted upon it. An angular heel iron 4 is provided, an arm of which extends forward parallel to the core 1 of the coil A to the front end of the same and serves to extend one pole of the magnet to the front end of the structure. The core 1 has a screw threaded extension 1^1 which extends through suitable openings or orifices in one arm of the heel iron 4 and in the mounting plate 5. The coil A and heel iron 4 as a whole are securely held to the mounting plate 5 by means of a nut 6 which has screw threaded engagement with the extension 1^1 of the core 1. Terminals 7 and 8 for the coil winding are suitably fastened to the spool heads 2, and extend through suitable openings in the mounting plate 5. An armature 9 is pivotally mounted upon the metallic spool head 3 by means of a hinge 10 suitably fastened to the said non-magnetic head 3 by means of screws 11. A screw threaded stud 12 suitably fastened to the forwardly extending portion of the heel iron 4 carries a split nut 13 having screw threaded engagement with the said stud 12. A suitable orifice 14 in the armature 9 is provided for the passage of the said stud 12. This nut 13 in conjunction with the stud 12 allows adjustment to limit the throw of the armature 9.

An interrupter disk M is rotatably mounted upon the forwardly extending arm of the heel iron 4 by means of a stud 15 fastened to the said heel iron 4 in any suitable manner. A cylindrical member 16 is rotatably supported by the pin 15 and is provided with a pair of flanges 16^1 and 16^2 which secures the disk M to the shank 16. The cylindrical member 16 rotatably supports the disk M and serves as a bearing for the

same. A ratchet R is formed integrally with the disk M by means of a shearing operation, that is, the metal of the disk to form one of the teeth 17, is ruptured on three sides as at 18, 19 and 20 and then the free portion 21 is pressed down to form the tooth, as clearly illustrated in Fig. 5, thus leaving a recess into which the pawl 22 fits. The pawl 22 is pivotally supported upon the armature 9 by means of the pivot pin 23 which passes through the ears 9^1 and 9^2 formed integrally with the armature, and provides means for rotatably stepping the disk M, step by step, as will be presently described. A tension spring 24 serves to keep the nose 22^1 of the pawl 22 in engagement with the ratchet of the disk. The spring 24 is fastened at its one end to the hinge 10 by means of one of the screws 11. The free end 24^1 of the tension spring 24 rests against the angular portion 22^2 of the pawl 22 and is held in place by the turned over portion 22^4 and 22^5 of the pawl 22. A plurality of depressions or recesses 25 and 26 are formed or punched in the disk M, the depressions 25 being of a greater depth than those bearing the reference numeral 26 for a purpose to be hereinafter explained.

A plurality of teeth 28 are formed upon the periphery of the disk M and in conjunction with the downwardly turned portion 22^3 of the pawl 22 acts as a check or stop so that for each attraction of the armature 9 the pawl 22 steps the disk one step only, and upon the full attraction of the armature 9 the part 22^3 engages a tooth 28, thus preventing an over-run operation of the disk M due to its momentum caused by the pawl striking the disk. Two sets of contact springs 30, 31 and 32 are insulatingly mounted upon the heel iron 4 by means of the screws 33. The terminal ends of the springs extend through a recess in the mounting plate 5. The contact spring 31 of each set is provided with an insulation stud or button 34 mounted upon its extreme free end and extending downwardly. The rounded end of the button 34 rests in either a depression 25 or a depression 26 as the case may be. A cylindrical casing 40 is provided to inclose the entire relay and has screw threaded engagement with threads on the mounting plate 5.

For the purpose of illustration, I have shown a make and break combination of contact springs, but it is to be understood that various other combinations may be used, also any number of sets of springs may be used, and by having recesses of three depths instead of two a three-position switch may be secured. Referring to Fig. 1, I show the studs 34 resting in the depressions 25, and when in this position, the contact springs 30 and 31 are open while contact springs 31 and 32 are closed. Now, when an impulse of current or a circuit is closed through the winding of magnet A, the electromagnet attracts its armature 9 and causes the pawl 22 to rotate the interrupter disk M through the space of one tooth only, due to the engagement of portion 22^3 of pawl 22 with a tooth 28 upon the periphery of the disk M, as previously described. This movement of the disk M causes the depressions 25 to be stepped from under the buttons or button 34 and to bring shallower depressions 26 in position under the buttons 34. When in this position, the contact spring 31 is forced into engagement with the contact spring 30 and disengages the contact spring 32, as illustrated in Fig. 4. Upon the next energization of magnet A, its armature 9 is again attracted causing the pawl 22 to thrust the disk M another step in the same manner as previously disclosed, causing the depressions 26 to move from under the buttons 34 and place the depressions 25 in position under the buttons 34. The depressions 25, being of a greater depth than depressions 26, permit the spring 31 to disengage spring 30 and to move into contact with spring 32. For each actuation of the relay armature 9, a circuit change is brought about as just described.

It will be thus apparent that I have provided a relay of novel form and while I have described the invention with particular reference to the details of a specific construction, it may be readily seen that various modifications, alterations and substitutions may be made thereon and still come within the spirit and scope of the appended claims. The interrupter disk M, for example, is shown having a certain combination of depressions which operate in conjunction with a certain spring combination, but it is evident that the combination of depressions may be changed to operate in different spring combinations and still come within the scope of the appended claims.

What I claim as new, and desire to secure by United States Letters Patent is:

1. The combination with a magnet having a core, of a member secured to the rear end of the core and serving to extend the magnetic circuit of the magnet toward the front end thereof, an armature adapted to bridge the gap between the fixed poles of the magnetic circuit when the magnet is energized, a contact spring supported by said member and having a normal and an alternate position, and means interposed between said armature and said spring whereby said spring is moved from its normal to its alternate position upon one energization of said electro magnet and from its alternate back to its normal position upon a subsequent energization of said magnet, said means including a disk rotatably secured to said member provided with depressions of differ-

ent depths for receiving buffers attached to said springs.

2. The combination with a magnetic coil, of a core extending through the coil, a member to which said core is secured, said member extending parallel with the core to a point adjacent to the front end of the core, an armature for said magnet, a contact spring extending parallel to said member, and means connecting said spring to said armature whereby for one energization of said magnet said contact spring is moved to its alternate position and for a second energization of said magnet said contact spring is moved to its normal position, said means including a disk rotatably attached to said member, and a pawl attached to said armature coöperating with teeth formed in said disk.

3. The combination with a magnet having a core, of a member secured to the rear end of the core and serving to extend the magnetic circuit of the magnet toward the front end thereof, an armature adapted to bridge the gap between the fixed poles of the magnetic circuit when the magnet is energized, contact springs supported by said member and having normal and alternate positions, and registering recesses and projections between said springs and said armature for moving said springs to their alternate position for one actuation of said armature and back to their normal position for a second actuation of said armature, said recesses being formed in a disk rotatably secured to said member and said projections being buffers attached to said contact springs.

4. The combination with a magnet having a core, of a heel iron secured to the rear of the core and serving to extend the magnetic circuit of the magnet toward the front end thereof, an armature adapted to bridge the gap between the fixed poles of the magnetic circuit when the magnet is energized, a contact spring supported by said member having a normal and an alternate position, a rotatable member pivotally secured to said heel iron for moving said contact spring from one of its positions to the other, a pawl operated by said armature for rotating said rotatable member to cause such operation of said contact spring, and means carried by the armature for preventing an overrun operation of said rotatable member.

5. The combination with a magnet having a core, of a heel iron secured to the rear of the core and serving to extend the magnetic circuit of the magnet toward the front end thereof, an armature adapted to bridge the gap between the fixed poles of the magnetic circuit when the magnet is energized, a contact spring supported by said member having a normal and an alternate position, a rotatable member secured to said heel iron, a pawl for said armature for rotating said member, said pawl adapted to prevent said rotatable member from being moved more than one step for each operation of said armature, and means interposed between said spring and said rotatable member for moving said spring from its normal to its alternate position when said pawl rotates said member one step and for moving said spring from its alternate back to its normal position when said pawl rotates said member a second step.

6. The combination with a magnet having a core, of a heel iron secured to the rear of the core and serving to extend the magnetic circuit of the magnet toward the front end thereof, an armature adapted to bridge the gap between the fixed poles of the magnetic circuit when the magnet is energized, a contact spring supported by said member having a normal and an alternate position, a rotatable member secured to said heel iron, a pawl for said armature for rotating said member, means interposed between said spring and said rotatable member for moving said spring from its normal to its alternate position when said pawl rotates said member one step and for moving said spring from its alternate back to its normal position when said pawl rotates said member a second step, and means for preventing said rotatable member from moving more than one step for each operation of said driving pawl.

7. A device of the character described including a rotatable member provided with teeth, a driving pawl for engagement with said teeth to rotate said rotatable member, a second set of teeth for said rotatable member, and means carried by said driving pawl for engagement with said second set of teeth to prevent said rotatable member from moving more than one step for each actuation of said driving pawl.

8. A device of the character described including a flat rotatable disk provided with peripherally disposed teeth, intra-peripherally disposed teeth for said rotatable member, a driving pawl for engagement with said latter teeth for rotating said member, and a member carried by said driving pawl for engagement with said peripherally disposed teeth for preventing an overrun operation of said rotatable member.

9. A device of the character described including a flat rotatable disk provided with peripherally disposed teeth, intra-peripherally disposed teeth for said rotatable member, a driving pawl for engagement with said latter teeth for rotating said member, and a member carried by said driving pawl for engagement with said peripherally disposed teeth to insure that said rotatable member will be moved only one step for each operation of said driving pawl.

10. A device of the character described

including a rotary disk provided with peripherally disposed teeth and with intraperipherally disposed teeth, a driving pawl for engagement with one of said sets of teeth for rotating said member, and a member carried by said driving pawl for engagement with the other set of said teeth to limit the actuation of said disk.

11. A relay structure including a magnet spool, a heel iron attached to the rear end of said magnet spool, an armature carried by said magnet spool, a contact spring secured to said heel iron, and mechanism actuated by said armature for moving said contact spring from a normal to an alternate position for one actuation of said armature and for moving said spring from its alternate to its normal position for a second actuation of said armature, said mechanism including a disk provided with two sets of teeth and a pawl for coöperation with both sets of teeth.

12. A relay structure of the class described including a heel iron, a contact spring carried by said heel iron, a rotary member carried by said heel iron, an armature provided with a pawl for rotating said rotary member, said rotary member also carrying means coöperating with said pawl to prevent said rotary member from being moved more than one step for each operation of said armature, and a projection for said spring adapted to register with depressions of different depths in said rotary member whereby said spring is moved from one of its positions to the other and vice versa.

13. A device of the character described including a magnet, a heel iron to which the core of said magnet is secured, a pin secured to said heel iron, a disk rotatably held in position by said pin, and an armature for said magnet connected to one of the spool heads of said magnet and provided with a pawl for rotating said disk.

14. A device of the character described including a magnet, a heel iron to which the core of said magnet is secured, a pin secured to said heel iron, a disk rotatably held in position by said pin, an armature for said magnet connected to one of the spool heads of said magnet and provided with a pawl for rotating said disk, and contact springs secured to said heel iron adapted to be operated by the rotation of said disk.

15. A device of the character described including an electromagnet provided with a core, a heel iron secured to said core, a disk rotatably supported upon said heel iron, an armature for said electromagnet, a pawl pivotally secured to said armature for rotating said disk, and a spring associated with said armature for maintaining said pawl in engagement with said rotary disk.

16. A device of the character described including a magnet, an angular heel iron connected to said magnet and having one of its limbs extending forward parallel to the core of the magnet, an armature connected to a spool head of the magnet and adapted to close a magnetic circuit between the free extremity of the magnet and the free extremity of said heel iron, a rotary disk supported on the free extremity of said heel iron, and a spring-pressed pawl carried by said armature for rotating said disk, said disk being arranged to alternately open and close a set of contacts upon alternate energizations and deënergizations of said magnet.

17. A device of the character described including a magnet, an angular heel iron connected to said magnet and having one of its limbs extending forward parallel to the core of the magnet, an armature connected to a spool head of the magnet and adapted to close a magnetic circuit between the free extremity of the magnet and the free extremity of said heel iron, a rotary disk supported on the free extremity of said heel iron, and a spring-pressed pawl carried by said armature for rotating said disk, said disk being arranged to alternately open and close a set of contacts upon alternate energizations and deënergizations of said magnet, and means carried by said armature for coöperation with said rotary disk to prevent an improper operation of the same.

Signed by me at Chicago, in the county of Cook and State of Illinois, in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:
MARIE BREEN,
M. R. ROCHFORD.