Nov. 24, 1925. 1,562,646

W. KAISLING

RECTIFIER RELAY

Filed Feb. 5, 1918 2 Sheets-Sheet 1

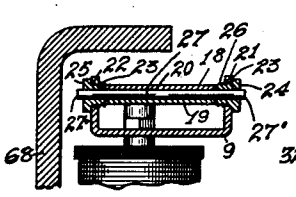

Fig. 9.

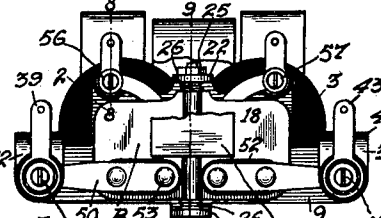

Fig. 4.

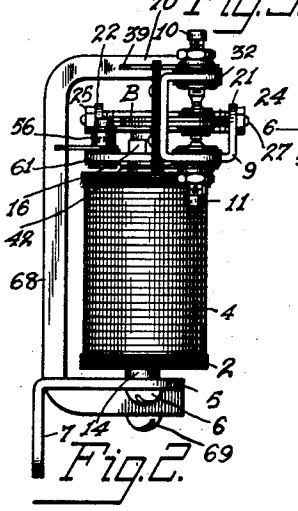

Fig. 2.

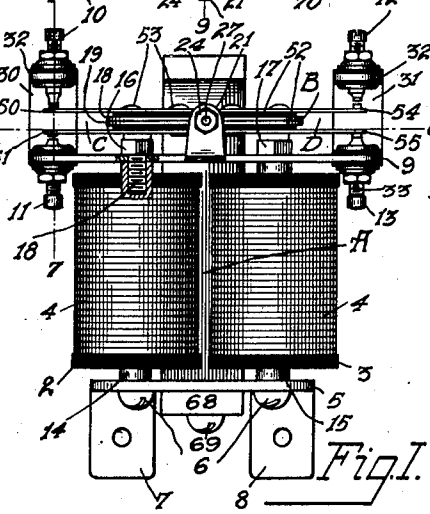

Fig. 1.

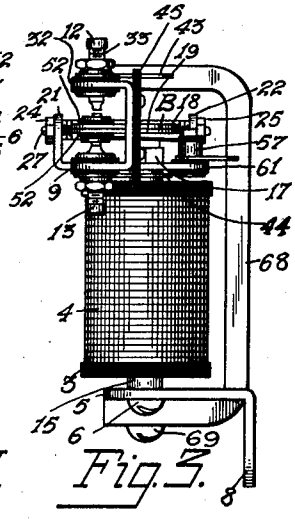

Fig. 3.

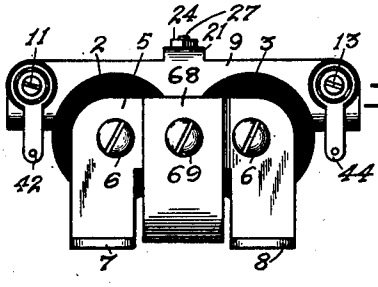

Fig. 5.

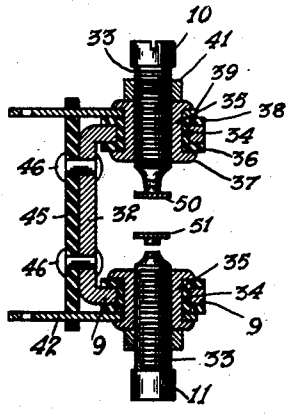

Fig. 7.

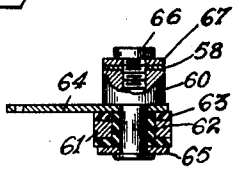

Fig. 8.

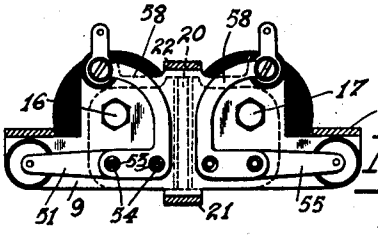

Fig. 6.

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RECTIFIER RELAY

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2 Sheets-Sheet 2

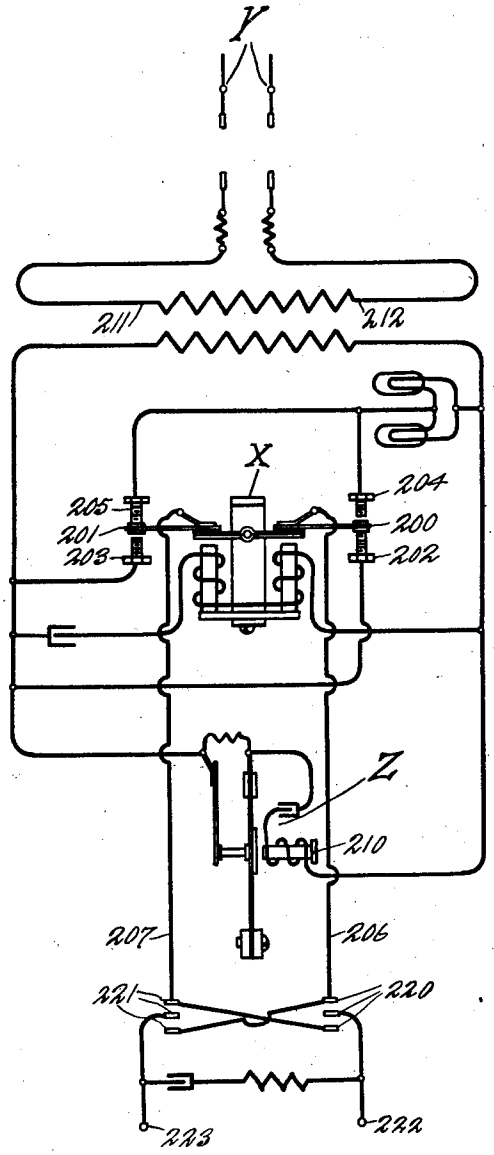

Fig. 10.

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Patented Nov. 24, 1925. 1,562,646

UNITED STATES PATENT OFFICE.

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

RECTIFIER RELAY.

Application filed February 5, 1918. Serial No. 215,454.

To all whom it may concern:

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

My invention relates to relays, and has to do more particularly with rectifier relays of the class used for rectifying or converting alternating current, such as that of an alternating current lighting circuit into unidirectional current, which current may then be used for any desirable purpose. The unidirectional current, thus rectified by the relay of my invention, may then be converted into alternating current of a frequency different than the frequency of the originally delivered current by means of a pole changer, and used for ringing telephone bells or call signals.

One of the features of my invention is the method of suspending the vibrating armature. Vibrating armatures are usually suspended by pointed bearings, but due to the continued vibration of the armature, the bearings soon wear and impair the efficient operation of the relay, thus necessitating frequent adjustments.

The pivoted armatures of the heretofore used relay rectifiers gave a great deal of trouble owing to the fact that it was impossible to keep the vibrating member or armature in adjustment so that the said member would operate in synchronism with the alternations of the current. To overcome the above-mentioned disadvantage of the previously used relays, I have arranged the armature of my relay so that it is held upon a shaft, which shaft is in turn supported by bearings at its opposite ends. These bearings are of sufficient length to provide a proper amount of bearing surface for the shaft which is frictionally held by the two halves of the armature.

Another feature of my invention is the novel method of securing the vibrating armature of the rectifying relay and the stationary contacts, with which active contacts carried by the armature co-operate, to a single mounting piece which is carried by the extended cores of the electromagnets. This method of mounting prevents the armature of the relay from getting out of adjustment with the stationary contacts with which it co-operates, as mentioned above.

A still further feature of my invention is the contact mounting means of the stationary and vibratory contacts and their construction. The above features, as well as others, will be more fully described in the ensuing specification.

For a better understanding of my invention, reference may be had to the accompanying drawing in which like reference characters in the several views denote like parts and in which:

Fig. 1 is a front elevation of the relay of my invention;

Fig. 2 is a left side elevation of Fig. 1;

Fig. 3 is a right side elevation of Fig. 1;

Fig. 4 is a top view of Fig. 1;

Fig. 5 is a bottom view of Fig. 1;

Fig. 6 is a sectional view on line 6—6 of Fig. 1;

Fig. 7 is a sectional view on line 7—7 of Fig. 1;

Fig. 8 is a sectional view on line 8—8 of Fig. 4;

Fig. 9 is a fragmentary sectional view on the line 9—9 of Fig. 4 showing the supporting bearings and the supporting means for the armature of the relay, and

Fig. 10 shows one circuit arrangement that I have devised for use with the rectifier relay shown in Figs. 1 to 9, inclusive.

Referring now more in detail to my invention as illustrated in the accompanying drawings, it comprises a pair of electromagnet spools 2 and 3, each having an energizing winding 4 wound thereon. The electromagnets 2 and 3 are suitably mounted upon a yoke 5 by means of the screws 6. The yoke is of U-shaped construction, and its legs 7 and 8 are angularly disposed in relation to the yoke to form supporting means by which the relay may be mounted. The relay structure comprises a so-called horseshoe magnet A including a pair of electromagnet cores 14 and 15 connected by the yoke 5. A plate or mounting member 9 for supporting the stationary contacts 10, 11, 12 and 13 of the relay and also for pivotally supporting the armature B is constructed of suitable non-magnetic material and is secured to the cores 14 and 15 of the electromagnets 2 and 3 by means of extension cores 16 and 17. The extension cores 16 and 17 are provided with

threaded shanks 18 which have screw-threaded engagement with holes drilled and tapped in the cores 14 and 15, as shown most clearly in Fig. 1. The plate 9 is clamped between the shouldered portion of the extension cores 16 and 17 and the cores 14 and 15 so that when the extension cores 16 and 17 are screwed down they clamp the said plate 9 in position.

The armature B is constructed of two plates 18 and 19 similarly shaped and having their central portions formed so that when the two plates 18 and 19 are riveted together a circular opening 20 is formed which extends across the width of the said armature B. The plate 9 is provided with a pair of upturned ears 21 and 22 preferably integrally formed with the said plate. The said ears 21 and 22 are provided with suitably tapped openings 23 which receive the bearings 24 and 25. The bearings are provided with threaded shanks 26 which have screw threaded engagement with the tapped holes 23 in the ears 21 and 22. The apertures in the bearings are of a size to receive the shaft 27 which pivotally supports the armature B. The opening 20 through the armature which is formed as previously described, is slightly smaller in diameter than that of the shaft 27 so that when the shaft is inserted in the said opening the two plates 18 and 19 are slightly forced apart. The ends 27' of the shaft 27, which extend beyond the armature B, enter their respective bearings 24 and 25 to pivotally support the armature B in position. The bearings 24 and 25, which support the armature B, provide a long bearing surface for the ends of the shaft. With the type of bearing just described, I overcome the fault of previous armature supports, as previously described, by providing bearings of substantial construction which stand up under continued usage and which permit efficient operation without frequent adjustment. The threaded shanks 26 of the bearings 24 and 25 which pass through the ears 21 and 22 of the plate 9 also serve as stops so as to prevent the armature B from moving sideways on the shaft 27.

The plate 9 is provided with angular disposed extensions 30 and 31, which angular extensions have a portion 32 thereof bent so as to be substantially parallel with the plate 9. The stationary contacts 10, 11, 12 and 13 are in the form of adjustable screw contacts 33, and as all are constructed and insulatingly mounted in the same way I will only describe the construction of one. A suitable orifice in the bent portion 32 of the extension 30 is provided and is of a size to receive the shouldered insulating bushing 34. A shouldered sleeve 35 of suitable metal is provided and is of a size to fit into the insulation bushing, the shouldered portion 36 of the bushing serving as an insulation washer to insulate the shouldered portion 37 of the sleeve from the extension 30 of plate 9. A washer 38 of suitable insulation material and a terminal 39 are slipped over the protruding portion of the sleeve 35, the protruding end of the sleeve being then turned over to hold the parts in place upon the extension 30. The insulation washer 38 and the bushing 34 serve to insulate the terminal 39 from the extension 30 of plate 9. The adjustable screw contact 33 has screw threaded engagement with the sleeve 35, and may be turned to the right or the left to adjust the same, and when thus adjusted a lock nut 41 which has screw threaded engagement with the screw contact 33 locks the contact in adjusted position. The contact screw 12 is mounted in the extension 31 in a manner similar to that just described and the associated screw contacts 11 and 13 are mounted in the extensions of 31 and 32 of plate 9 in a similar manner. The contacts 11, 12 and 13 are also provided with terminals 42, 43 and 44 for wiring purposes. A strip of insulation 45 is riveted to each extension by means of rivets 46 and the ends of each are notched, into which notches the terminals rest, thus preventing them from rotating.

A pair of vibrating contacts C and D are insulatingly mounted upon the armature B, the contact C being in operative relation with contacts 10 and 11, and contact D being in operative relation with contacts 12 and 13. The contacts C and D are insulatingly secured to the armature B. The spring C comprises two springs 50 and 51, mounted on the top and bottom face, respectively, of the armature B. The springs 50 and 51 are insulated from the armature B by means of strips of insulation 52, and secured to the said armature by means of rivets 53, which are insulated from the armature by means of insulation bushings 53'. The rivets in addition to securing the springs 50 and 51 to the armature B also serve as a conductive means between the two springs. The contact D is also constructed of two springs 54 and 55 which are mounted in a manner similar to that just described in connection with spring C. The spring C is operatively associated with the contacts 10 and 11, and when the armature vibrates, the contact C alternately connects with stationary contacts 10 and 11, and contact D alternately connects with stationary contacts 12 and 13. The contact springs C and D are conductively connected to their respective terminals 56 and 57 by means of thin flexible metallic strips 58 which are connected to their respective contacts by placing them between the insulation strips 52 and their respective springs 51 and 55.

The terminal posts 56 and 57, to which the conductive strips are connected, are similar in construction, so only one will be described. A shouldered stud 60 is provided which is insulatingly mounted on the extension 61 of plate 9. A suitable insulation bushing 62 and a washer 63 insulate the stud 60 from the extension 61. A terminal 64 is placed between the shouldered portion of the stud 60 and the washer 63. The end of the stud which extends through the bushing 62 is staked or turned over, as shown. A washer 65 is placed between the staked portion of the stud and the shouldered portion of the bushing 62. The stud 60 has a hole drilled and tapped to receive a screw 66, which screw 66 and washer 67 are used to clamp the conductive strip 58 between the said washer 67 and stud 60. A U-shaped permanent magnet 68 is fastened to the yoke 5 by means of a screw 69. The free end or leg 70 of the U-shaped permanent magnet 68 extends over the armature B in proximity thereto for the customary purpose.

Referring to Fig. 10, X diagrammatically represents the rectifier relay of Figs. 1 to 9, inclusive, for rectifying the source of alternating current supplied through terminals Y, and Z diagrammatically represents a pole changer for changing the rectified source of uni-directional current into alternating current of the desired frequency. The operating magnet 210 of the pole changer Z is bridged directly across the secondary winding of the transformer, and therefore, of course, is supplied with alternating current, and likewise the magnets of the rectifier X are bridged across the terminals of the secondary winding of the transformer.

Assuming that the armature of the device X is in the position shown in the drawings, then a positive impulse will be transmitted from terminal 212 of the transformer, through the lamps in parallel, through stationary contact 205 and movable contact 201 of the rectifier to the conductor 207, and a negative impulse of current will be supplied from terminal 211 of the transformer, through stationary contact 202 and movable contact 200 of the rectifier relay X to conductor 206. Now, when an impulse of current is induced in the secondary winding in the reverse direction, the armature of the device X will move its contacts 200 and 201 to an alternating position, that is, to a position in which contact 200 engages stationary contact 204, and contact 201 engages stationary contact 203. In this position, a positive impulse of current will be transmitted from terminal 211, through stationary contact 203, movable contact 201 to conductor 207, and a negative impulse of current will be transmitted from terminal 212, through the lamps in parallel, stationary contact 204, movable contact 200 to conductor 206. From this it will be seen that positive impulses of current are always supplied to conductor 207, while negative impulses of current are always supplied to conductor 206.

The contacts 220 and 221 of the pole changer Z are operated by the magnet 210 of the changer and operate to intermittently supply positive and negative current from the conductors 206 and 207 to the terminals 222 and 223, thereby producing alternating current of a frequency different than the frequency of the original source of supply. The device Z may be arranged to vibrate at any desired frequency.

In describing my invention, I have illustrated a specific form of structure but do not wish to be limited to the same as changes and modifications readily suggest themselves to those skilled in the art, but I aim to cover all such changes and modifications which come within the spirit and scope of the appended claims.

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

1. A device of the character described including a mounting member, a pair of electromagnets having one end of their cores attached to said mounting member, a supporting member secured to the other end of said magnet cores, an armature comprising conducting and non-conducting plates carried by said supporting member, contact springs secured to the front and back of said armature, and adjustable contacts supported by said supporting member in operative relation with said contact springs so that said contact springs always have a contactual engagement with some one of said adjustable contacts when said armature is in either of its tilted positions.

2. A device of the character described including an armature formed of two plates of magnetic material, a shaft firmly held between the said plates, a supporting member and a pair of dependent ears on said supporting member provided with bearings through which said shaft extends.

3. A device of the character described including a supporting member provided with a pair of integrally formed contact carrying arms, said arms being arranged so that one contact carrying arm is immediately above the other, electrical terminals carried by said contact carrying arms, and a strip of insulating materials provided with bifurcated ends for preventing the said terminals from moving out of position.

4. A device of the character described including a contact carrying device formed in the shape of a U so that the one arm of the contact carrying device lies immediately above the other, an adjustable contact car-

ried by each of said arms, a terminal electrically connected to each of said contacts, and a strip of insulating material secured to the bridge part of said U device and provided with bifurcated end portions for preventing said terminals from moving from their normal position.

5. A device of the character described including a mounting plate provided with integrally formed ears, an armature supported by two of said ears, movable contacts carried by said armature, stationary contacts carried by other of said ears, terminals secured to said plate, and electrical conductors connecting said movable contacts to said terminals.

6. A device of the character described including a member supporting an armature, said armature being formed of two plates of metal, a pair of contact springs adapted to be insulatingly secured to said armature, and a pair of fastening members extending through said springs to electrically connect the same, said fastening members also being the means for securely holding said plates together that form the armature.

7. A device of the character described including an armature, an armature supporting member, contact spring secured to said armature, a pair of dependent ears formed integrally with said member, a pair of bearings having screw threaded engagement with said ears, a shaft that pivotally supports the armature and which extends through orifices in said bearings, and stationary contacts supported by said supporting member for engaging said contact springs to close circuits.

8. A device of the character described including an armature being formed of two plates of metal, each plate provided with a longitudinal groove and so arranged that the grooves come opposite each other when said plates are secured together, an armature supporting member, a pair of dependent ears formed integrally with said member, a pair of bearings having screw threaded engagement with said ears, and a shaft extending through the grooves in said armature that pivotally supports the armature and which extends through orifices in said bearings, said bearings being adapted to prevent sidewise movement of said armature.

9. A device of the character described including a pair of magnet spools provided with cores, a supporting member secured to said cores provided with dependent arms, an armature supported by two of said arms, movable contacts carried by said armature, and stationary contacts carried by other of said arms for co-operation with said movable contacts.

10. A device of the character described including a magnet core, a supporting member attached to said core, an armature having contact springs secured to the front and back thereof and cooperating contacts covered by said supporting member, a pair of U-shaped members formed integrally with said supporting member, and adjustable screw means secured in said U-shaped members for adjusting said co-operating contacts relative to said contacts secured on said armature.

11. A device of the character described including a pair of magnet cores, a supporting device secured to said cores, an armature and movable contact springs secured thereto, said armature being pivotally carried by said supporting device, a pair of U-shaped members formed integrally with said supporting device, and adjustable stationary contacts secured to the legs of said U-shaped members for making contact with said contact springs, said armature, movable contact springs and said stationary contacts being assembled to form a single unit.

12. A device of the character described including an electromagnet, an armature for said electromagnet, a vibratory contact carried by said armature, an armature supporting member having a pair of integrally formed ears provided with openings to receive adjustable means for pivotally supporting said armature, a vibratory contact spring carried by said armature, a terminal, and a flexible member connecting said vibratory contact spring to said terminal, said armature, vibratory contact springs, terminal and flexible member supported by the said supporting member and assembled to form a single unit.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 2d day of February, 1918.

WILLIAM KAISLING.