March 29, 1932. C. R. BEALL ET AL 1,851,485

ALTERNATING CURRENT RELAY

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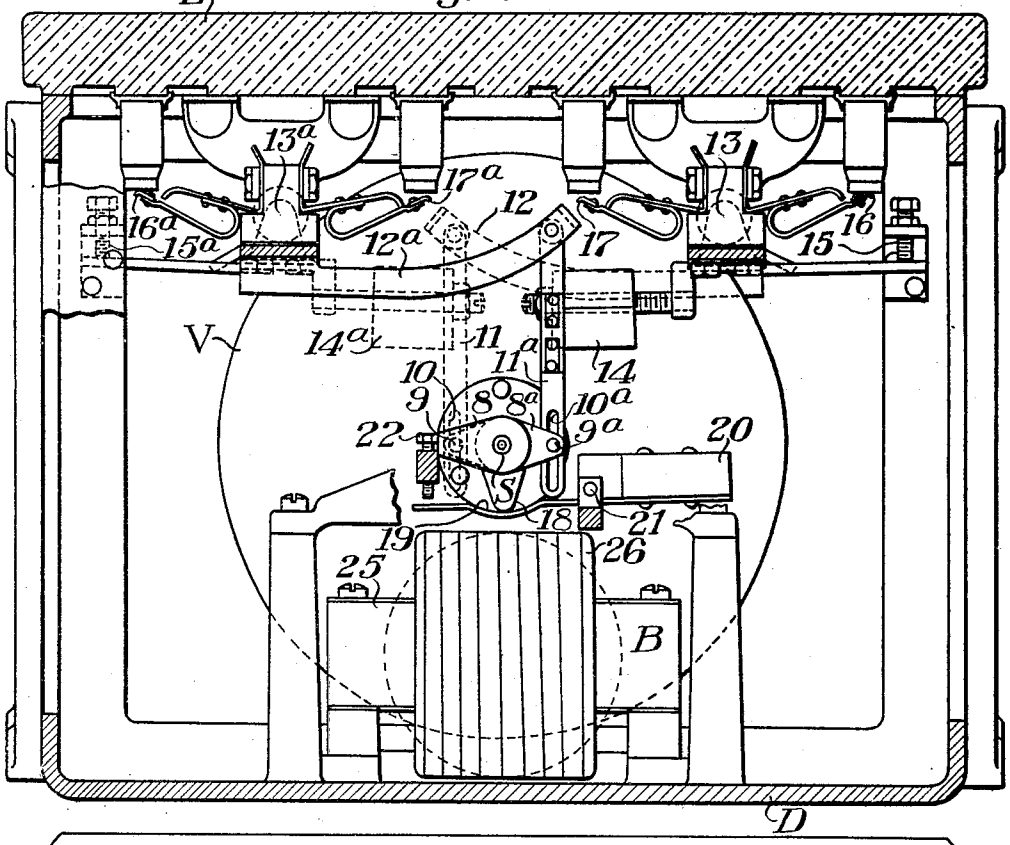
Fig. 1.



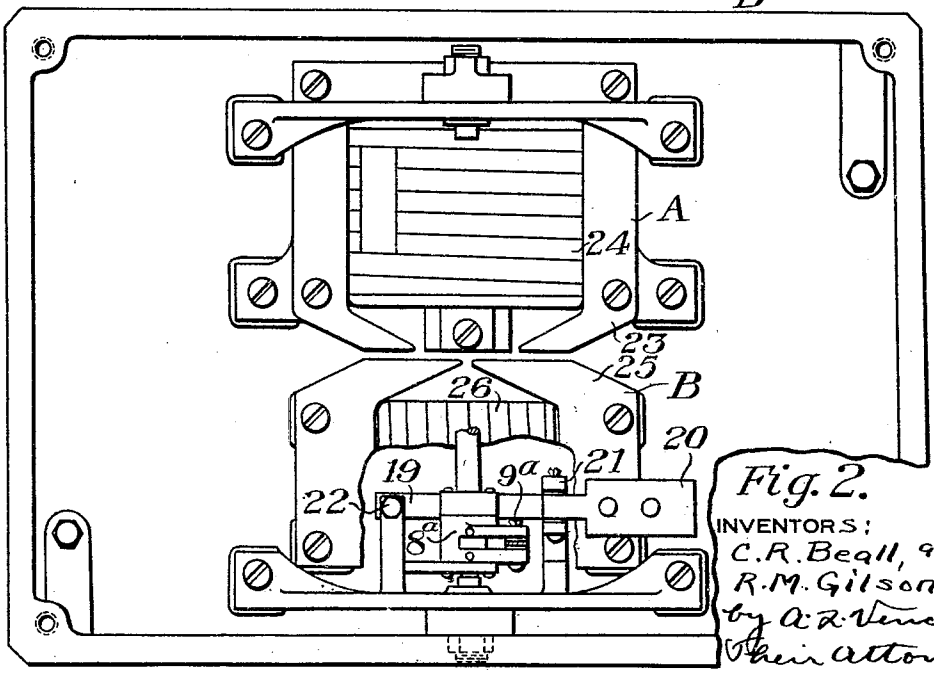


Fig. 2.

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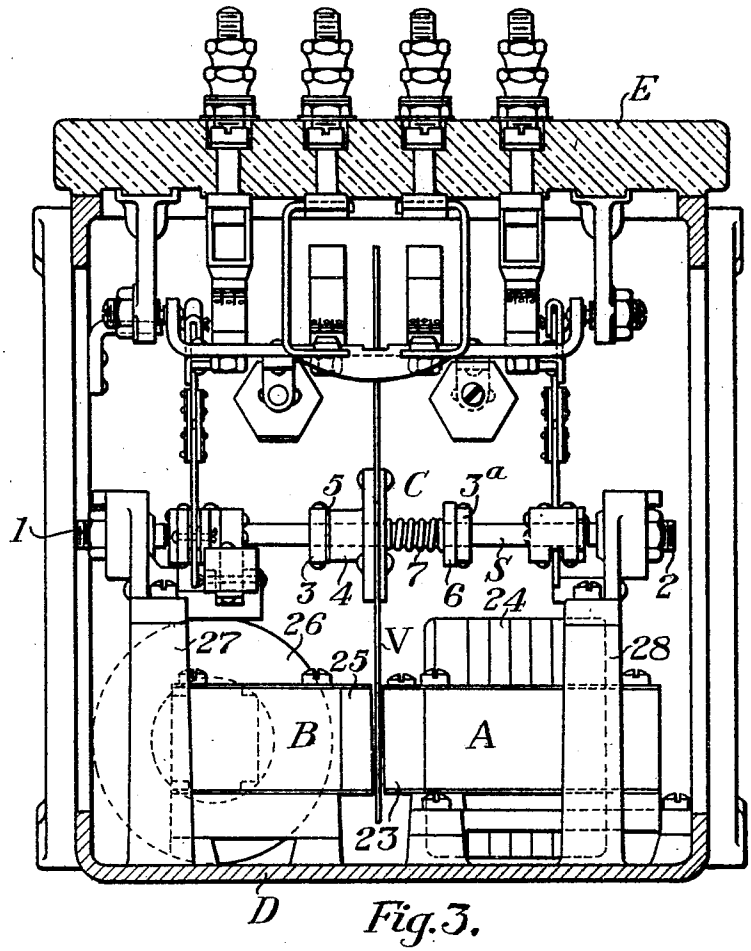

Fig. 3.

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UNITED STATES PATENT OFFICE

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ALTERNATING CURRENT RELAY

Application filed February 17, 1930. Serial No. 429,043.

Our invention relates to alternating current relays of the three-position vane type. One feature of our invention is the provision of a braking device acting on the vane of a relay of this character when the vane passes through its middle position.

We will describe one form of relay embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a front view, partly sectioned, showing one form of relay embodying our invention. Fig. 2 is a top view, and Fig. 3 an end view, of the relay shown in Fig. 1. Certain parts are broken away in all of the views for the purpose of more clearly illustrating the structure.

Similar reference characters refer to similar parts in each of the views.

The relay comprises the usual base plate D and top plate E spaced by side wall members, which plates support all of the operating parts of the device.

Projecting upwardly from the base plate D are two standards 27 and 28 carrying trunnion screws 1 and 2, respectively, and a shaft S is mounted to rotate in these screws. A vane V of electro-conductive material is attached to the shaft S by means of a friction clutch C which is hereinafter described. This vane coacts with a motor device comprising two elements A and B, located on opposite sides of the vane and mounted on the base plate D. The motor element A comprises a three-legged field member 23 provided with a winding 24 on the middle leg, whereas, the motor element B comprises a U-shaped field member 25, provided with a winding 26. This motor device forms no part of our present invention, and it is sufficient to say that when the two windings 24 and 26 are supplied with alternating currents of one relative polarity, the vane V is turned in one direction, whereas, when these windings are supplied with alternating currents of the opposite relative polarity, the vane is turned in the other direction.

Attached to the shaft S near one end of the shaft, is a crank arm 8, and attached to the shaft near its other end is a similar crank arm 8^a, which arms are disposed diametrically opposite to each other. Arm 8 is provided with a pin 9, which coacts with a slot 10 in an upwardly projecting link 11, and the upper end of this link is pivotally attached to a contact operating member 12. Member 12 is pivotally mounted at 13 in a bracket suspended from the top plate E, and is biased to swing in counter-clockwise direction, as viewed in Fig. 1, by a counterweight 14. The member 12 controls a back contact 16 and a front contact 17. The other crank arm 8^a is provided with a pin 9^a coacting with a slot 10^a in a link 11^a, which is attached to a contact operating member 12^a pivotally mounted at 13^a and controlling a back contact 16^a and a front contact 17^a. Member 12^a is biased by a counterweight 14^a to swing in clockwise direction. The movement of the contact operating member 12 in response to the counterweight 14 is limited by a stop 15, and the member 12^a is provided with a similar stop 15^a for the same purpose.

The operation of the parts of the relay thus far described, is as follows: Normally the vane V occupies substantially the position in which it is shown in Fig. 1, wherein the pins 9 and 9^a are both slightly above the mid points of the slots 10 and 10^a. When the vane is turned in clockwise direction, as viewed in Fig. 1, pin 9 will move upwardly in the slot 10 until the vane has turned through an angle of substantially 30°, whereupon the pin will engage the upper end of the slot and will then swing the contact operating member 12 in clockwise direction until the back contact 16 has opened and the front contact 17 has closed. This will require a movement of the vane through substantially 65° from its middle position. During this entire operation pin 9^a will move in the slot 10^a, and so the operation will not be affected by the link 11^a.

When the vane is turned in counter-clockwise direction, as viewed in Fig. 1, from its middle position, the operation will be the same as before, except that the contact member 12^a will be operated and contact member 12 will remain at rest.

When the vane V has been turned to one extreme position to reverse one of the con-

tact members 12 or 12ª, and when the vane is then released by the motor device, the vane will be turned toward its middle position by the counterweight associated with the contact member which has been reversed. In the absence of means to prevent, the inertia which is thus imparted to the vane might be sufficient to cause the vane to swing beyond its middle position far enough to move the other contact operating member. To avoid this, we have provided a mechanical brake for retarding the motion of the vane as it passes through its middle position. This mechanical brake comprises an arm 18, preferably of fibre, fixed to the shaft S and projecting vertically downwardly when the vane is in its middle position. The end of this arm coacts with an arm 19 which is pivotally mounted at 21 and is provided with a counterweight 20 for normally biasing the arm 19 into the path of the arm 18. The movement of the arm 19 in response to the bias of the counterweight 20 is limited by an adjusting screw 22. The arm 19 is preferably concaved, as shown in Fig. 1. The parts of this braking device are so proportioned that when the vane V is returning toward its middle position, arm 18 will engage arm 19 when the vane is substantially 30° away from the middle position, and these parts will continue to engage until the vane has swung substantially 30° beyond its middle position. The frictional engagement of the arms 18 and 19 will absorb the inertia imparted to the vane by the contact operating member 12 or 12ª, so that the vane will come to rest before it has moved 30° beyond its middle position, that is, before it has started to move the other contact operating member.

The friction clutch for connecting the vane V with the shaft S is illustrated in Fig. 3, and comprises two spaced collars 3 and 3ª fixed to the shaft. A hub 4 is mounted to rotate freely on the shaft between these collars, and this hub carries the vane V. Located between the hub 4 and the collar 3 is a fibre washer 5, and located adjacent the other collar 3ª is a metal washer 6. Interposed between the washer 6 and the hub 4 is a compression spring 7, so that this spring presses the washer 6 against the collar 3ª and the washer 5 against the collar 3. The purpose of this clutch is to prevent rebound of the moving parts when either front contact 17 or 17ª becomes closed.

Although we have herein shown and described only one form of relay embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. A relay comprising a pivotally mounted vane, electromagnetic means for moving said vane in opposite directions from a middle position, two contact arms each biased to a normal position, means for moving one arm or the other to a reverse position according as said vane moves in one direction or the other from such middle position, whereby when the vane is released by said electromagnetic means it is returned to the middle position by the arm which had been reversed, and a mechanical brake acting on said vane when it passes through said middle position to prevent the inertia imparted thereto by either of said arms from carrying the vane far enough to operate the other arm.

2. A relay comprising a pivotally mounted vane, motor means for moving said vane in opposite directions from a middle position, two contact operating members each biased to a normal position, means for moving one member or the other to a reverse position according as said vane moves in one direction or the other from such middle position, whereby when the vane has reversed either member and is released it is moved toward its middle position by the biasing force acting on such member, and a mechanical brake acting on said vane as it passes through the middle position to prevent the inertia imparted thereto by either of said members from carrying the vane far enough to reverse the other member.

3. A relay comprising a pivotally mounted vane, motor means for moving said vane in opposite directions from a middle position, two contact operating members each biased to a normal position, means for moving one member or the other to a reverse position according as said vane moves in one direction or the other from such middle position, whereby when the vane has reversed either member and is released it is moved toward its middle position by the biasing force acting on such member, a braking arm moving with said vane, and a braking segment coacting frictionally with said arm as the vane passes through the middle position to prevent the inertia imparted thereto by either of said members from carrying the vane far enough to reverse the other member.

4. A relay comprising a pivotally mounted vane, motor means for moving said vane in opposite directions from a middle position, two contact operating members each biased to a normal position, means for moving one member or the other to a reverse position according as said vane moves in one direction or the other from such middle position, whereby when the vane has reversed either member and is released it is moved toward its middle position by the biasing force acting on such member, a braking arm moving with said vane, and a pivotally mounted braking

element having a concave surface and biased to such position that when the vane passes through its middle position the end of said arm engages said surface with sufficient friction to prevent inertia imparted to the vane by either of said members from carrying the vane far enough to reverse the other member.

5. A relay comprising a pivotally mounted vane, two contact operating members each biased to a normal position, means for moving one of said members or the other while said vane is moving between approximately 30° and 65° in one direction or the other from a middle position, and a mechanical brake acting on said vane during movement of the vane from a position approximately 30° on either side of such middle position to a position approximately 30° on the other side thereof.

6. A relay comprising a pivotally mounted vane, two contact operating members each biased to a normal position, means for moving one of said members or the other while said vane is moving between approximately 30° and 65° in one direction or the other from a middle position, a braking arm moving with said vane, and a movable braking element having a concave surface biased toward the end of said arm and engaging the arm throughout movement of the vane from a position approximately 30° on either side of such middle position to a position approximately 30° on the other side thereof.

In testimony whereof we affix our signatures.

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ROBERT M. GILSON.