Aug. 27, 1929. F. E. QUEENEY 1,726,164

RELAY

Filed Aug. 11, 1926

Fig. 2.

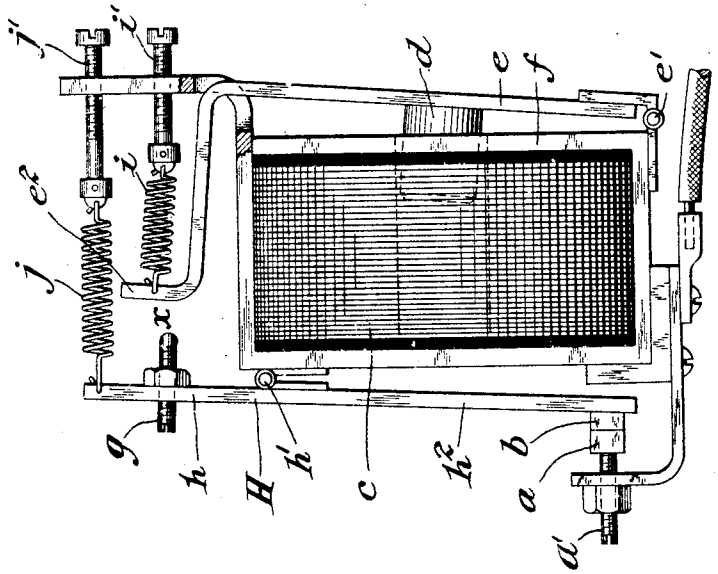
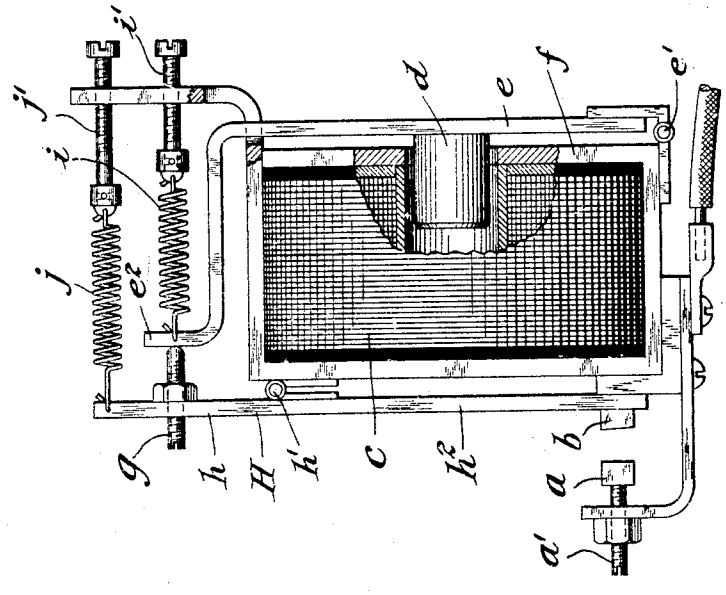


Fig. 1.



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UNITED STATES PATENT OFFICE.

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RELAY.

Application filed August 11, 1926. Serial No. 128,665.

The relay according to the present invention has been designed particularly for use in connection with the generator winding in what is known as a gas electric drive for self-propelled vehicles. In such vehicles an internal combustion engine drives a generator and current from the generator is availed of for one or more motors turning the driving wheels. The function of the relay is to initiate a reduction in the generator loading thereby to permit the engine to accelerate and operate at a more efficient point on its power curve, say, approximately 1600 to 1800 R. P. M. To cause the reduction in the loading of the generator its shunt field is weakened. To this end the relay, which has a series coil and is operated by the main generator current, opens the contacts at a predetermined current, say, of 180 amperes, and thereby interposes a resistance in the shunt field circuit.

When the vehicle has accelerated so that less power is required or as when arriving at the top of the hill the current is reduced to say 150 amperes, the relay causes the contacts to close short circuiting the resistance, loading the generator and thereby the engine, and reducing its speed to approximately 1200 to 1400 R. P. M.

One object of the present invention is to obtain a quick break of the contacts. Accordingly, the separation of the contacts is effected after a predetermined movement of the core, under the influence of the energized solenoid, has permitted it to overcome its inertia. More particularly, the core and one of the contacts are carried with levers which are so compounded as to be unaffected by the initial movement of the core while the effect of the final movement is magnified to obtain a quick separation of the contacts.

The invention also seeks to effect a reinstatement of the generator circuit instantaneously upon a predetermined minimum current condition in the main circuit. To this end, when the energization of the solenoid diminishes to the prescribed degree, the core is withdrawn from the solenoid by a resilient device, the strength of which is so proportioned as to be rendered effective upon a predetermined weaking of the solenoid and this movement of the core is availed of to close the contacts.

The invention also has to do with a structure of the relay which shall be practical from the standpoint of manufacture and use.

In order that the invention may be clearly understood and readily carried into effect, the same will now be described more particularly in connection with a preferred embodiment thereof which is illustrated in the accompanying drawings and in which:

Figure 1 is a view in side elevation and partly in section, of the relay according to the present invention with the contacts open.

Figure 2 is a similar view of the same relay with the contacts closed.

Referring first to Figure 2 it will be noted that that figure illustrated the contacts a and b closed, a condition in which the resistance is short circuited and the generator loaded. The series coil c is included in the main generator circuit and when the current reaches the maximum point at which the solenoid c is adapted to operate, say, 180 amperes, the solenoid is energized attracting the core d which is shown or carried upon a lever e pivoted at its lower end as at e' on the frame f surrounding the solenoid. The first movement of the core is necessarily sluggish due to inertia and since such sluggish movement would cause an indefinite break in the circuit, it is therefore, not used but is dissipated in lost motion caused by the movement of the turned over end e^2 traveling through the space indicated at x between the end e^2 and the bearing member adjustably carried on the arm h of lever H. So soon as the inertia of the core is overcome the movement of the core within the solenoid is rapid and at this time the end e^2 strikes the contact g throwing the lever H about its fulcrum h' against the action of the spring j to cause the electrical contact b carried on the end of the arm h^2 to separate smartly from the contact a and interrupt the circuit as shown in Figure 1 to thereby throw in a resistance in the main generator circuit and reduce the loading of the generator.

It is to be noted that the spring i reacts against the solenoid core during the movement marked x, at which point the second spring comes into play to increase the reaction to the magnetic movement of the solenoid core. This compound spring action is found necessary in order that the relay operate satisfactorily between the current lim-

its which are extremely close together, i. e., 180 amperes and 150 amperes. In other words the magnetic pull on the core is increased at each step to a point where the reaction of the spring is overcome before movement of the core takes place.

So soon as the current is reduced, say to about 150 amperes, the energization of the solenoid is weakened permitting the tension spring to withdraw the lever e and with it the core d from the solenoid. As the end e^2 is retracted the tension spring j is permitted to draw the upper end h of lever H to the right, as shown in the drawings, to again close the contacts a and b. The tension of the springs is adjusted by the threaded rods i' and j' so that the strength of the springs is sufficient to overcome the attraction of the solenoid when weakened by a current falling to approximately 150 amperes to close the contact.

Adjustments are also effected by the adjustable nature of the contact support a'.

It will thus be seen that a series current relay has been provided in which the opening of the circuit is retarded for a predetermined time interval after the energization of the actuating mechanism upon the attainment of the prescribed maximum current condition in order to obtain a quick break between the contacts. The circuit is re-instated instantaneously upon the attainment of a predetermined minimum current by mechanical devices.

No limitation in the scope of the invention is intended by the phraseology of the preceding description or illustrations in the accompanying drawings except as defined in the attached claims.

What is claimed is:

1. In a relay, in combination, a solenoid, a contact carried with the solenoid, a lever pivotally carried with the solenoid, a second contact carried with the lever, a resilient device to close the contacts, a second lever pivotally carried with the solenoid, a core carried with the second lever, a resilient device to retract the core, means to move the first lever through the instrumentality of the second lever to open the contacts after a predetermined time interval, and means to adjust the spacing between the levers to vary the time interval.

2. In a relay, in combination, a solenoid, a frame for the solenoid, an arm extending outwardly from the frame, an electrical contact carried adjustably thereby, a lever pivoted between its ends to the frame, an electrical contact carried on one arm of the lever, a second lever pivoted at its end on the frame, the end of said lever being bent toward the other arm of the first lever to engage therewith, a core carried on the lever, a second arm carried by the frame, a spring connecting the second arm with the other arm of the first lever, an adjustable means carried by the last named arm of the first lever for engaging the bent end of the second lever, a spring connecting the bent end of the second lever with the second arm, and means to adjust the tension of the springs.

This specification signed this 9th day of August, A. D. 1926.

FRANK E. QUEENEY.