

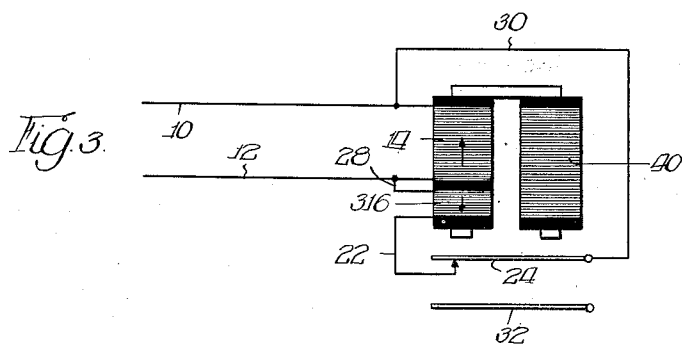
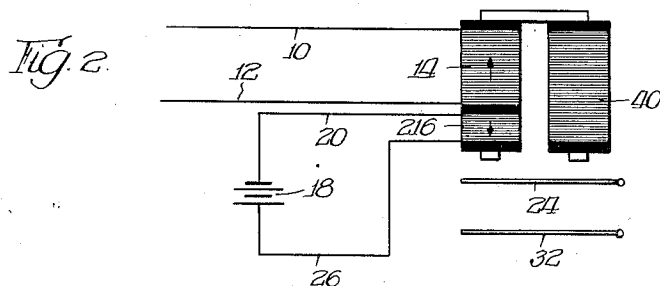
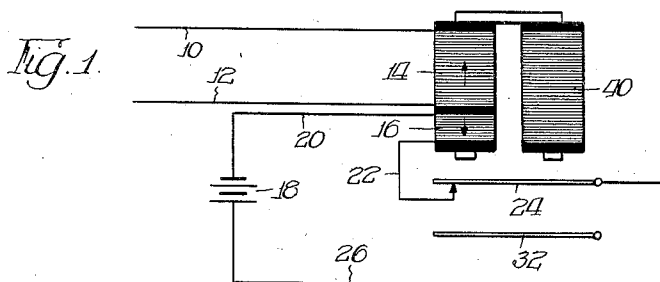
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SLOW ACTING RELAY

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SLOW ACTING RELAY

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2 Claims. (Cl. 175—320)

This invention relates to relays and more especially to relays which are so constructed and connected that their action will be retarded. The invention contemplates a relay having a retardation coil to generate a magnetic flux opposing its picking up flux either before or simultaneously with the generation of said pickup flux.

One object of the invention is to provide a relay which has retarded pickup.

Another object of the invention is to provide a relay, the action of which is reliably retarded a determinable amount.

An additional object of the invention is to provide a relay system in which the relay is caused to pick up slowly and at the same time to avoid the common mechanical retarders with their various difficulties.

It has formerly been considered necessary to use a special thermal retarding unit in conjunction with relays when it was desired to retard the relay's pickup. This not only resulted in a fairly large extra expense but also meant occasional trouble due to failure of the thermal unit or a change of its time interval speed of action.

Other objects of the invention will appear from the following description, drawing and claims.

In the drawing, in which like numerals are used for similar parts throughout—

Figure 1 is a diagrammatic illustration of a relay constituting one embodiment of this invention;

Figures 2 and 3 are similar views of different embodiments of the invention.

In each of the embodiments illustrated the main pickup circuit includes the line wires 10 and 12 and pickup coil 14. These wires may be connected to a suitable source of electricity whenever it is desired to energize and operate the relay. According to former practice, when it was desired to delay the energization of the relay, some additional means were used to delay the connection of the wires 10 and 12 to the source of current.

According to the present invention the operation of the relay is delayed even after the wires 10 and 12 have been fully connected to the source. This delay is accomplished by providing in addition to the coil 14, which is energized by wires 10 and 12 in the usual way, a separate coil 16 which is so connected that its magnetism opposes the magnetism of coil 14.

In the embodiment of the invention shown in Figure 1 the retardation coil 16 is connected to the battery 18 whenever the relay is in released position. The circuit for this coil may be called the retardation circuit and may be traced as follows:

From battery 18 through wire 20, through coil 16, through wire 22, armature 24 and wire 26, back to battery 18. Suitable resistance may also be included in the circuit to regulate the current flow to give the proper degree of retardation. The effect of this retarding circuit is to set up a magnetism which is not sufficient to pick up the armature 24 and which is opposed to the pickup magnetism induced by the coil 14. When the coil 14 is energized, magnetism thereby generated must overcome the retarding magnetism of coil 16 and then continue to build up a magnetic circuit in its own direction until this magnetic circuit is sufficient to pick to the armature 24. When the armature 24 is picked up the retarding circuit through coil 16 is broken and the magnetism of coil 14 remains unopposed until wires 10 or 12 are disconnected from the source of current. The relay then becomes deenergized and drops the armature 24 which again completes the retarding circuit through coil 16 so that when the wires 10 and 12 are again connected to their source of coil 14 will again have to overcome the retarding magnetism.

In the embodiment of the invention illustrated in Figure 2, the retardation coil 216 is permanently connected to the battery 18. In this figure the retardation circuit goes from battery 18 through wire 20, through coil 216 and directly back to the battery 18 through wire 26. The operation of this relay is the same as the relay of Figure 1 except that the coil 14 is always opposed by the coil 216 instead of having the opposition cut off when the relay picks up. This has the incidental effect of causing the relay to release more quickly.

In the embodiment of the invention shown in Figure 3, the auxiliary battery 18 has been dispensed with. However, the retardation coil 316 remains. In Figure 3 the retardation circuit is from a source of current through wire 12, through wire 28, through coil 316, through wire 22, through armature 24 through wire 30 to wire 10 and back to the source of current. As in the other forms of the invention, the energizing or pickup coil 14 is connected to the line wires 10 and 12 which are connected to the source of current when it is desired to energize and operate the relay. As the retardation circuit is merely a branch of the energizing or pickup circuit it is clear that the retardation coil 316 can be connected to the source of current only when the energizing coil 14 is thus connected. Here again, as in both the other modifications, suitable resistance may be included in the circuit with the re-

tardation coil in order to properly regulate the time interval of the relay's retardation. The operation of the relay of Figure 3 is similar to that of the relay of Figure 1. When the line wires 10 and 12 are connected to the source of current both the energizing coil 14 and the retardation coil 316 receive current simultaneously. However, the retardation coil 316 even when energized simultaneously has sufficient effect to retard the pickup of the relay for a reasonable time. As soon as the relay picks up, the armature 24 breaks the retardation circuit so that the energizing coil 14 is no longer opposed. Though, of course, if desired, the relay 316 may be connected permanently to the wires 10 and 12.

The form shown in Figure 3 has the advantages that its retardation coil uses current only during the process of retardation, and that it retards even if the polarity of the line wires 10 and 12 is reversed. As an aid to determining the proper windings to use for a given retardation, it is noted that a relay made in accordance with Figure 3, with 12,000 turns of number 29 copper wire (400 ohms) in coil 14, and 1000 turns of number 30 copper wire plus 175 turns of a resistance wire to give a total resistance of 295 ohms in coil 316 has a retardation of three seconds when 8 volts are supplied to wires 10 and 12 at the relay and when copper washers are used. Of course if desired, similar sets of coils may be used on both pole pieces, or either type of coil may be used alone on one of them.

According to the usual relay practice, there are provided as many armatures, or additional contacts 32 on the armatures as may be wanted. Whenever it is desired, the usual means for retarding the pickup and/or the release of the relay may also be employed. Thus in the relays illustrated part of the magnetic core has been surrounded by copper washes 40. These have the customary effect of retarding and change of magnetic flux due to the induction of current in the washers by such change.

It should of course be understood that various other means not shown may be employed for generating the retardation magnetism. Such means might include a variety of types of coils or coils in a variety of locations or permanent magnets in a variety of locations either within or without the main magnetic circuit, and are of course within the scope of this invention, except when they merely act as springs acting directly on the armature to draw the armature to release position as distinguished from having a nullifying effect on the pickup magnetism.

It is to be understood that many other embodi-

ments of the invention, including some in improved form, will be apparent and in the course of time will be devised by those skilled in the art. My invention includes all of these which come within the spirit of the following claims construed as broadly as the prior art will permit.

I claim:

1. A slow to pick up relay comprising a core, an armature pivotally mounted to move toward and away from said core and biased to an open position, a source of current, a first winding on said core connected with said source when and only when said armature occupies its open position and effective when energized for setting up in said core a flux which is insufficient to move said armature away from its open position, and a second winding on said core adapted to be connected with a source of current in such manner that the current flowing in said second winding will build up to its ohms' law value at a rate which is determined solely by the inductance of the winding and so proportioned that when said second winding is energized it will set up in said core a second flux which opposes and exceeds said first flux, whereby said armature is moved from its open to a closed position by said second flux at the expiration of a relatively long interval of time after said second winding first becomes energized.

2. In combination, a pair of current supply wires, a magnetizable core, an armature pivotally mounted to move toward and away from said core and biased to an open position, a first winding on said core connected with said wires when and only when said armature occupies its open position and effective when energized for setting up in said core a flux which is insufficient to move said armature away from its open position, and a second winding on said core connected directly with said supply wires in such manner that the current supplied to said second winding from said wires will build up to its ohms' law value at a rate which is determined solely by the inductance of the winding and so proportioned that when said second winding is energized it will set up in said core a second flux which opposes and exceeds said first flux and which has sufficient magnitude to move said armature from its open position to a closed position, whereby when said current supply wires are connected with a source of current said armature will thereafter move to its closed position at the expiration of a fixed time interval of relatively long duration.

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