

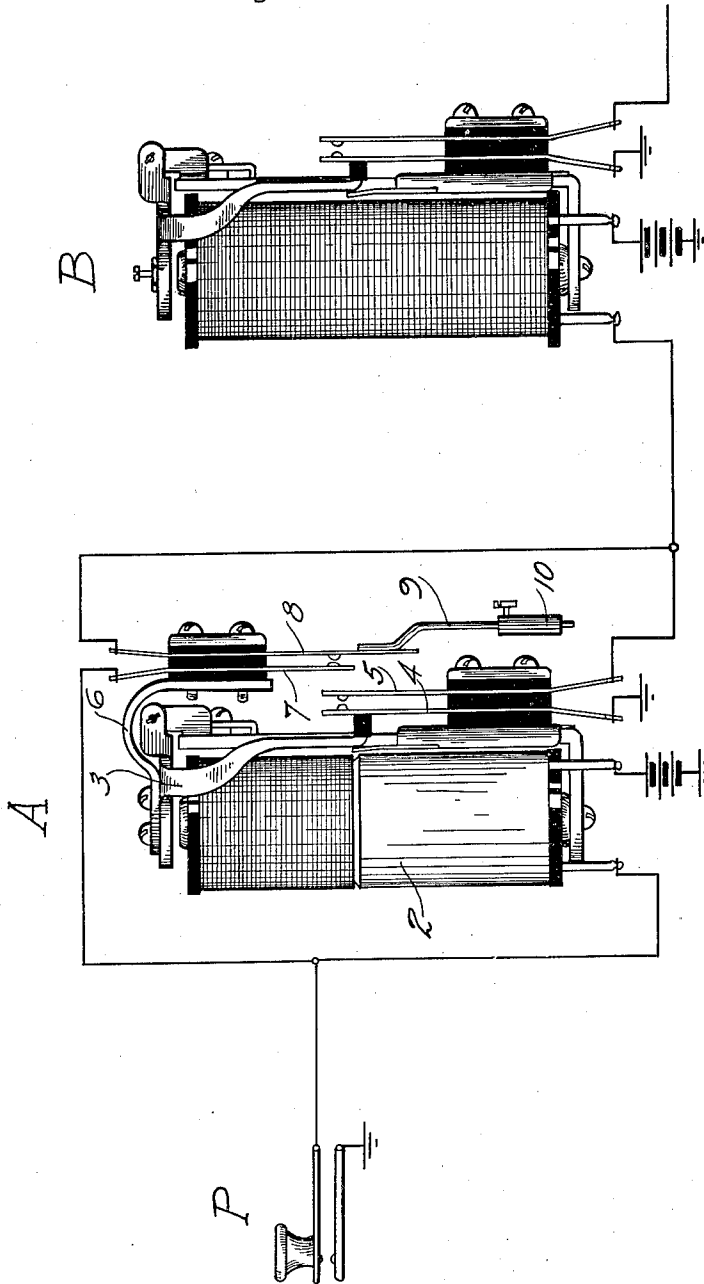
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ELECTROMAGNETIC RELAY

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ATTY

# UNITED STATES PATENT OFFICE.

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## ELECTROMAGNETIC RELAY.

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My invention relates in general to electro-  
magnetic relays, and has for its object the  
provision of a new and improved slow act-  
ing relay which is slow to retract its arma-  
ture when its energizing circuit is broken.  
More specifically, I provide a relay which  
may be energized by a short impulse of cur-  
rent and which will then retain its armature  
attracted for as much as five or ten seconds,  
depending on its adjustment, after the ener-  
gizing impulse has ceased.

There has been a frequent demand for a  
relay of this kind to produce a relatively  
long time interval in the control of electrical  
circuits, and it has been the practice hereto-  
fore to employ a chain of ordinary slow act-  
ing relays for this purpose. Since an ordi-  
nary slow acting relay will retain its arma-  
ture only about one second at the most, quite  
a number of relays are required and the re-  
sulting mechanism is both complicated and  
expensive. It will be evident therefore that  
a single relay which will accomplish the same  
object will have considerable utility.

My improved relay in its preferred form  
is illustrated in the drawing which will now  
be referred to for a more detailed explana-  
tion of the construction and operation.

In the drawing I have shown a circuit ar-  
rangement including a push button P, a slow  
acting relay A constructed according to the  
principles of my invention, and an ordinary  
quick acting relay B. If the push button P  
is actuated momentarily, the slow acting re-  
lay A will respond and will hold the circuit  
of relay B closed for as long as ten seconds,  
or thereabouts, depending on the adjust-  
ment. The manner in which this result is  
accomplished will be readily understood  
from a consideration of the construction of  
relay A. This relay has a heavy slug of  
copper 2 around one end of the core and an  
armature 3 for closing contact springs 4 and  
5. This much constitutes a slow acting re-  
lay of the ordinary type. I have added,  
however, a bracket 6 which is attached  
securely to armature 3 and which carries the  
contact springs 7 and 8. The latter spring  
is very flexible and has the rod 9 secured to  
it by soldering or other approved means.  
The weight 10 carried on rod 9 is adjustable  
up and down. When the device is at rest  
contact springs 7 and 8 are separated, no  
matter whether armature 3 is attracted or re-

tracted. These springs are adjusted rather  
close together, however.

Assume now that the push button P be  
momentarily depressed, thereby transmit-  
ting a short impulse of current through the  
winding of relay A. Armature 3 is at once  
attracted and closes contact springs 4 and 5,  
thereby completing a circuit for relay B,  
which also energizes. When armature 3 is  
attracted the weight 10 is thrown suddenly  
to the right and is thus started vibrating  
rapidly. The vibrations will continue for a  
considerable interval, perhaps five or ten  
seconds, as previously mentioned, and dur-  
ing such interval the flexible spring 8 inter-  
mittently makes contact with spring 7, there-  
by transmitting a series of impulses through  
the winding of relay A. These impulses  
continue long after the original energizing  
circuit of relay A is broken at the push but-  
ton, and since relay A is slow acting its  
armature 3 is held down as long as the weight  
continues to vibrate. It will be seen that  
the circuit through springs 7 and 8 is a kind  
of locking circuit which is automatically  
broken by the permanent separation of  
springs 7 and 8 when the weight has ceased  
to vibrate. When the vibration stops the  
relay A will receive no further current im-  
pulses, armature 3 will be retracted after an  
instant, and springs 4 and 5 will separate to  
break the circuit of relay B.

The frequency of the vibrations can be ad-  
justed by moving weight 10 up or down.  
The duration of series of vibrations, or the  
interval during which relay A will remain  
operated, can be adjusted by adjusting the  
stroke of armature 3 which controls the  
initial amplitude of the vibrations.

It will be understood that the circuit ar-  
rangement shown herein is purely for illus-  
trative purposes and the use of the new slow  
acting relay is not necessarily confined to  
such precise circuit arrangement. A relay  
of this type may be interposed in any circuit  
in which its use is desirable and it will per-  
form its function as set forth.

What I claim as my invention is:

1. The combination, with a relay and an  
energizing circuit therefor, of means inde-  
pendent of the relay for closing said circuit  
momentarily, and means for maintaining  
said relay energized after its original ener-  
gizing circuit is broken, said means compris-

ing a locking circuit and a vibrating pendulum for controlling said locking circuit.

2. In combination, a slow acting relay, means for energizing said relay, a locking circuit for said relay, and means set in motion by said relay when the same is energized and operating independent of said relay for transmitting a series of impulses over said locking circuit.

3. In combination, a slow acting relay and a circuit therefor, means for transmitting a momentary current impulse over said circuit to energize said relay, a locking circuit for said relay, and a mechanical device operated by the initial energization of said relay for transmitting a pre-determined series of current impulses over said locking circuit.

4. In combination, a slow acting relay and a circuit therefor, means for transmitting a momentary current impulse over said circuit to energize said relay, a vibrating member set in motion when said relay is energized and operating thereafter independent of magnetic attraction, and a locking circuit for said relay closed by said member while the same is vibrating.

5. In combination, a slow acting relay and a circuit therefor, means for transmitting a momentary impulse of current over said circuit to energize said relay, a vibrating member set in motion when said relay is energized and operative during a pre-determined interval of time, a locking circuit for said relay, and means controlled by said vibrating member for transmitting impulses over said circuit.

6. In combination, a slow acting relay, a circuit for momentarily energizing said relay, a locking circuit for said relay, a vibrating pendulum for transmitting a series of impulses over said locking circuit, and means for automatically setting said pendulum in motion whenever said relay is energized.

7. In combination, a slow acting relay and a circuit therefor, means for transmitting a momentary current impulse over said circuit to energize said relay, a vibratory member set in motion when said relay is energized, said vibratory member vibrating with constantly decreasing amplitude, and a lock-

ing circuit for said relay closed by said member while the same is vibrating,

8. In an electromagnetic device, an electromagnet, an armature, a vibratory member, means for energizing said magnet to cause the attraction of said armature and to initiate a vibratory action of said member, said vibratory member thereafter vibrating with constantly decreasing amplitude, and a circuit for said magnet controlled by said member while vibrating to maintain said armature attracted.

9. In an electromagnetic device, an electromagnet, an armature therefor carrying a vibratory member, a circuit for said magnet, a second circuit for said magnet, means for momentarily closing said first circuit to cause the attraction of said armature to initiate a vibratory action of said member, said vibratory member thereafter vibrating with decreasing amplitude, and a contact operated by said member while vibrating for controlling said second circuit.

10. In a slow acting relay, an armature, a vibrating device set in motion by said armature when the same is attracted, a locking circuit for said relay, and a pair of contacts closed by said armature when the same is attracted and opened by said vibrating device at regular intervals thereafter to control said locking circuit.

11. In a slow acting relay, an operating circuit therefor, an armature, a vibrating device set in motion by said armature when the operating circuit is closed, a pair of contacts jointly controlled by said armature and vibrating device, and a second circuit for said relay independent of the first circuit controlled by said contacts.

12. The combination, with a relay, of a locking circuit for said relay, a non-magnetic vibrating device controlling said locking circuit, and means connecting said device with the armature of the relay so that said device is set in motion when the armature is attracted.

Signed by me at Chicago, Cook County, Illinois, this 1st day of September, 1920.

JOHN ERICKSON.