G. WOLFF.

TIME LIMIT TRIPPING MECHANISM.

APPLICATION FILED JAN. 21, 1914.

1,250,746.

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Fig. 1.

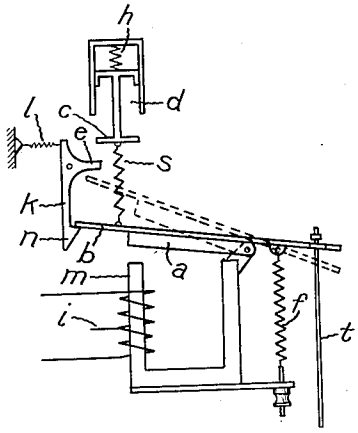
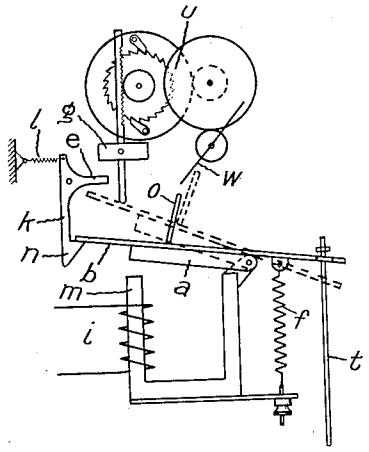


Fig. 2.



Witnesses:

Helen Orford

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Inventor:

Georg Wolff,

by Albert G. Davis

His Attorney.

UNITED STATES PATENT OFFICE.

GEORG WOLFF, OF HERMSDORF, BEI BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TIME-LIMIT TRIPPING MECHANISM.

1,250,746. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed January 21, 1914. Serial No. 813,471.

To all whom it may concern:

Be it known that I, GEORG WOLFF, a subject of the Emperor of Germany, residing at Hermsdorf, bei Berlin, Germany, have invented certain new and useful Improvements in Time-Limit Tripping Mechanism, of which the following is a specification.

My invention relates to protective devices and more particularly to relays of the time limit type.

Electric switches for the automatic interruption of circuits upon the occurrence of abnormal current or voltage conditions, are often equipped with a time limit tripping mechanism, in which a switching element, which responds to the abnormal current or condition and thereby causes the automatic interruption of the circuit, is retarded in its movement by a damping or retarding device, the operation of which is usually regulable. If, for example, we have overload tripping devices which are influenced directly by the current through the switch and in which the releasing element is, for example, an armature of a magnet, then both the force which acts upon the armature and also the time lag or duration of the retardation depends, as is well known, upon the intensity of the overload. This feature is in many cases undesirable.

In order to obtain a time lag or retardation which is completely independent of the intensity of the overload, it has heretofore been necessary to use the so-called indirect tripping comprising, usually, separate overload and time limit tripping devices. These devices, in turn, close the circuit of a trip coil situated upon the switch. Direct acting overload relays are also known in which by the attraction of an armature an energy storing device, in the form of a spring, for example, is first loaded and is then unloaded again under the control of the damping device, and after a definite time causes, in its turn, the opening of the switch. This arrangement however has the disadvantage that the energy storing device is almost unloaded at the end of its movement and can develop only a small amount of energy for tripping the switch. On the other hand, one advantage of tripping directly by the attraction of the magnet armature, is the fact that the armature develops the greatest force at the end of its movement.

In my invention, the above mentioned difficulties are avoided in a novel manner and in such a way that the feature of the damped discharge of an energy storing device is utilized while the final release of the switch is effected by means of a switching member, preferably a magnet armature, which is directly influenced by the tripping current.

The novel features of construction and the mode of operation of my invention will be understood by reference to the accompanying drawings in which, merely for purposes of illustration, Figures 1 and 2 show, diagrammatically, two of the many forms of relays in which my invention may be embodied.

In Fig. 1 *m* indicates an electromagnet under the influence of the current-winding *i*, and provided with a pivotally mounted armature or an electro-responsive tripping member *a*, which at normal operating current assumes the position indicated in dotted lines and which is biased to normal position by a spring *f*. When the current exceeds a certain limit of intensity, the value of which is regulable by means of the spring *f*, the armature *a* is attracted until, in the position indicated in full lines in the drawing, its portion or extension *b* strikes a projection *n* on a pivotally mounted catch or stop *k*, and consequently the tripping does not occur as yet. In this first or initial movement of the armature the spring *s*, serving as an energy storing device, is strained and exerts upon the damping device *d*, represented as a dashpot, a pull under whose effect the dashpot piston slowly moves downward, until, after a certain time, its portion or member *c* presses upon the arm *e* of the catch or stop *k*. The projection *n* thereupon releases the member *b* of the armature, and the latter, under the action of the excess current that still flows, is completely and with great force attracted by the magnet *m* resulting in an equally strong pull on the releasing rod *t*, whereby the tripping of the switch is positively accomplished. After the winding *i* has been deprived of current by disconnection from the circuit, the armature *a*, under the action of the

spring *f*, returns into the initial dotted line position, and likewise the dashpot piston, after the complete relaxation of the spring *s*, is returned by the spring *h* into its highest position.

In this arrangement the charging of the energy storing device *s* is effected by the movement of the switching element as far as the stop; however, an arrangement may also be provided by which the charging of the energy storing device is effected by the counter-force which returns the switching element into its original position after the overload effect has ceased, as shown in Fig. 2. Here the energy storing device is represented by a weight *g* situated on a rack. The weight is lifted by the counterforce of the spring *f* as soon as the magnet *m* ceases to attract its armature *a*. The damping of the discharge of the energy-storing device, which is effected by the descent of the weight *g*, is secured by means of a clock-work mechanism *u* engaging the rack and provided with a fly or vane *w*. The idle upward movement of the weight *g* with the rack is permitted by means of ratchet wheel in the ordinary way. If, upon overload, the armature *a* is attracted by the magnet *m*, it moves, exactly as shown in Fig. 1, first until the member *b* rests upon the projection *n* and remains in this position until the weight *g* has descended and released the catch *k* by depressing the arm *e*. The armature *a* now completes its movement with great force and draws the rod *t* quickly upward to open the switch.

It is clear that the arrangement shown not only in Fig. 1 but also in Fig. 2 must afford a retardation of the tripping operation which is entirely independent of the amount of overload since in every case the energy storing device discharges with the same force. Any change in the retardation, therefore, could occur only if the armature *a* is attracted by the magnet *m*, not instantaneously, but gradually, according to a slow increase of the current up to the releasing limit. In such a case, in the arrangement shown in Fig. 1, a discharge of the energy-storing device would already have begun before the armature has reached the stop. In order to avoid even this possible inexactness, a pin *o* is fastened to the armature, Fig. 2, against which the fly or air-vane *w* of the clock-work rests so long as the armature *a* has not moved completely to its stop. It is not until this instant that the air-vane is released and the discharge of the energy storing device can begin.

It is evident that in the relays shown in both the figures the magnitude of retardation may also be regulable as is the intensity of the release current. For example, the weight *g* may be suitably shifted on the rack. By suitable construction of the projection *n* and of the return spring *l* on the catch *k*, it is also possible to make the device such that in case of very great overload, caused by a short circuit, the armature *b*, itself, in consequence of the attractive force of the magnet *m*, then intensified, immediately presses the projection *n* to one side overcoming the spring *l*, and then cause the release instantaneously before the retarding device has come into action.

I therefore do not wish to be restricted to the precise construction shown but intend to cover by the appended claims all changes and modifications which are within the scope of my invention and will be apparent to those skilled in the art.

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

1. A time limit tripping mechanism comprising an electro-responsive tripping member movable into tripping position, a movable stop normally in the path of movement of said tripping member for interrupting the movement of said member into tripping position, an energy storing device set into action in response to the movement of said member to engage said stop comprising a releasing member movable into position to move said stop and release said member, and means for retarding said releasing member to cause the release of said tripping member a predetermined time after its initial movement.

2. A time limit tripping mechanism comprising an electro-responsive tripping member movable into tripping position, a movable stop normally in the path of movement of said tripping member for interrupting the movement of said member into tripping position, a device in which energy is stored in response to the movement of said member to engage said stop comprising a releasing member movable by the energy stored in said device to move said stop out of interrupting position and thereby release said tripping member, means for retarding the movement of said releasing member to cause the release of said tripping member a predetermined time after its initial movement, and means for returning said device to normal position upon the return of said tripping member to normal position.

3. A time limit tripping mechanism comprising an electro-responsive tripping member movable into tripping position, a movable stop normally in position to interrupt the movement of said member into tripping position, a retarded energy storing device set in action in response to the movement of said member to engage said stop comprising a member movable at a predetermined rate into engagement with said stop to release said tripping member within a predetermined time after its initial movement, and means for simultane-

ously returning said tripping member from tripping position to its initial position and said energy storing device to normal position.

4. A time limit tripping mechanism comprising an electro-responsive tripping member movable into tripping position, a movable stop normally in position to interrupt the movement of said member into tripping position, a retarded energy storing device set in action in response to the movement of said member to engage said stop comprising a releasing member movable into engagement with said stop to release said member a predetermined time after its initial movement, and means for returning said energy storing device to normal position by the movement of said tripping member to normal position.

5. A time limit tripping mechanism comprising an electro-responsive tripping member movable into tripping position, a movable stop normally in position to interrupt the movement of said member into tripping position, a retarded energy storing device comprising a releasing member movable with a definite time lag in response to the movement of said tripping member into releasing engagement with said stop whereby said tripping member is released after a predetermined time after its initial movement, and means controlled by said tripping member for holding said device inactive during the initial movement of said member and rendering said device active when said member reaches said stop.

6. In combination with a current responsive device and a tripping member operatively related to said device to move into tripping position, of means in the path of movement of said member for normally interrupting the movement of said member into tripping position, and means in which energy is stored by the movement of said member, and a member normally inoperative but rendered operative by the energy stored in said means to move said stop and release said member a predetermined time after its initial movement.

7. A time limit tripping mechanism comprising an electro-magnet, a tripping member movable in response to said electro-magnet into tripping position, a movable stop normally in the path of movement of said tripping member and adapted to interrupt the movement of said member into tripping position, an energy storing device set in action by said movement of the member to engage said stop comprising a releasing member movable by the energy stored in said device into releasing engagement with said stop a predetermined time after the initial movement of said tripping member whereby said tripping member is released and completes its movement into tripping position with a snap action.

8. A time limit tripping mechanism comprising a tripping member biased to normal position and movable in response to predetermined electrical conditions into tripping position, a movable stop normally in the path of movement of said tripping member for interrupting the movement of said member into tripping position, means rendered operative in response to the movement of said tripping member to engage said stop for moving said stop out of interrupting position in a predetermined time independent of the electrical condition of the circuit whereby said tripping member is released and is free to move into tripping position with a snap action.

9. A time limit tripping mechanism comprising a tripping member biased to normal position and movable in response to predetermined electrical conditions into tripping position, a movable stop normally in position to interrupt the movement of said member into tripping position, a member normally inoperative but biased by the movement of said tripping member into engagement with said stop to engage said stop and move it out of interrupting position in a predetermined time independent of the electrical conditions of the circuit whereby said tripping member is released and is free to move into tripping position with a snap action, and means for simultaneously returning said member to normal position as said tripping member is returned to normal position.

In witness whereof, I have hereunto set my hand this 29th day of December, 1913.

GEORG WOLFF.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.

Correction in Letters Patent No. 1,250,746.

It is hereby certified that in Letters Patent No. 1,250,746, granted December 18, 1917, upon the application of George Wolff, of Hermsdorf, bei Berlin, Germany, for an improvement in "Time-Limit Tripping Mechanism," an error appears in the printed specification requiring correction as follows: Page 3, claim 7, strike out line 58 and insert the words and syllable *set in action by the movement of said mem-;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of February, A. D., 1918.

[SEAL.] F. W. H. CLAY,

Acting Commissioner of Patents.

Cl. 175—270.