Dec. 26, 1922. 1,439,905.

F. E. LULL.

INTERLOCKING RELAY.

FILED MAY 22, 1918. 2 SHEETS—SHEET 1.

Fig. 1.

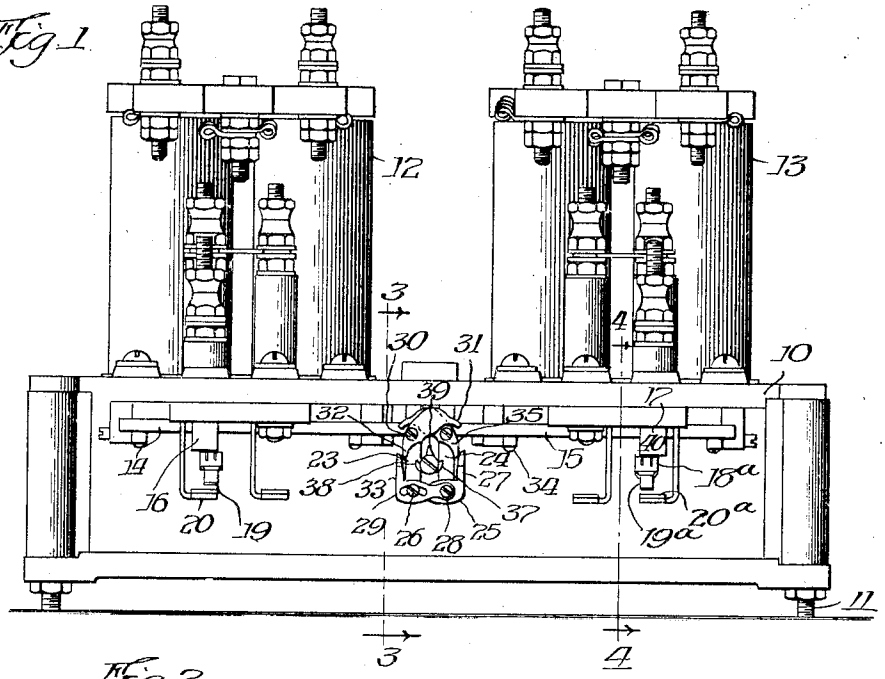
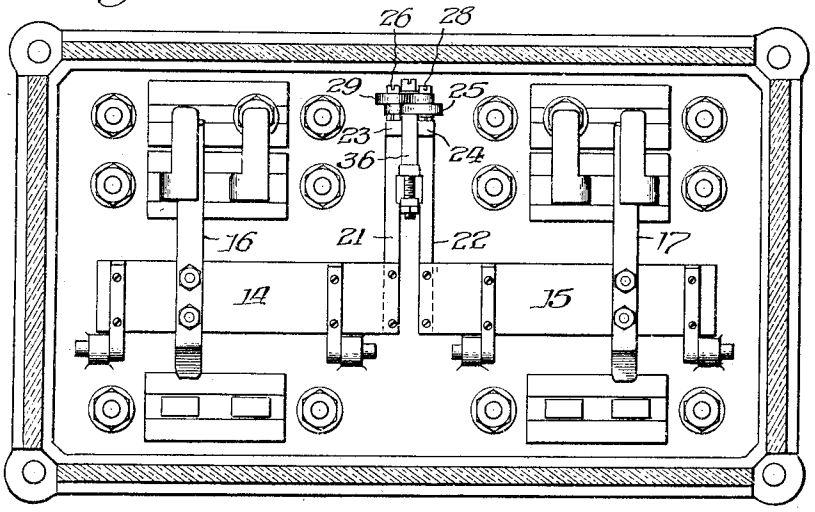


Fig. 2.



Witnesses:

Inventor

Frank E. Lull

By Wickinson & Huxley

Attys

Dec. 26, 1922.

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2 SHEETS—SHEET 2.

Fig. 3.

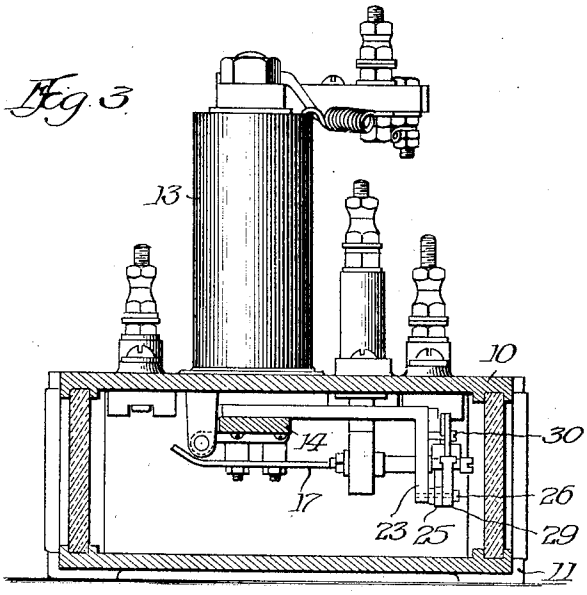


Fig. 4.

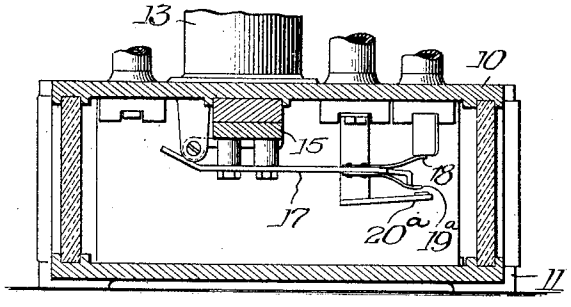


Fig. 5.

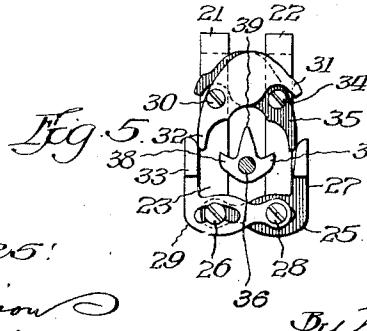
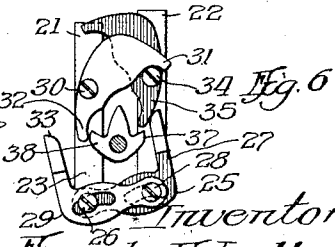


Fig. 6.



Witnesses:
H. C. Davison
Edwards

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Frank E. Lull,
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Attys.

Patented Dec. 26, 1922. 1,439,905

UNITED STATES PATENT OFFICE.

FRANK EDWARD LULL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE RAILROAD SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

INTERLOCKING RELAY.

Application filed May 22, 1918. Serial No. 235,932.

To all whom it may concern:

Be it known that I, FRANK E. LULL, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in an Interlocking Relay, of which the following is a specification.

My invention relates to relays and particularly to an interlocking relay.

One of the objects of my invention is to provide interlocking means for an electrical relay which will be positive in action and prevent manipulation thereof to incorrectly operate the circuits controlled thereby.

Another object is to provide a mechanical interlock for an electrical relay.

A further object is to provide an interlock for signal operating relays which will prevent the signal being changed until the relay is acted upon through the proper electrical circuits.

A still further object is to improve interlocking relays for successful commercial use.

I accomplish these and other objects by providing the contact fingers of an electrical relay with arms and mounting on the arms similar members arranged for cooperation, the various members acting to prevent a second set of circuits being closed while the first is closed and which will not prevent both sets of circuits being opened.

In the drawings:—

Fig. 1 is a front elevation of an electrical relay provided with the preferred embodiment of my invention.

Fig. 2 is a bottom plan view of the relay of Fig. 1 the bottom plate being removed.

Fig. 3 is a section on line 3—3 of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 1, and

Fig. 5 is an enlarged elevation of the interlock of my invention.

Fig. 6 is an enlarged elevational view of the interlock of Figure 5 with the parts in inter-locking position.

In providing a signal apparatus with relays for the operation of the signals by means of trains passing along tracks, it is essential especially on single track lines to interlock the signals so as to prevent collision between a train entering a block in which another train is approaching from the opposite direction. The interlocks which are now employed are of such a nature as to permit changing the signals by certain short circuiting of the various electrical circuits controlling the signaling device.

It is the object of my invention to overcome the objections to the present types of relays by providing an interlock for a relay in which the magnets are successively acted upon by the trains passing along the track so that a signal once being set by an approaching train is not changed until that train has changed circuit conditions to clear the signal. Also, the interlock prevents a signal being set in the opposite direction which sometimes happens when the train is passing rapidly over the various contacts in the track. I have shown the preferred embodiment of my invention as applied to a two pole relay which is the type shown employed in operating semaphore signals on a single track railway.

In the drawings, 10 designates a base portion which may be secured to a suitable support through the legs 11 preferably with the magnets in a vertical position. Mounted on the base 10 are the magnets 12 and 13. On the underside of the base 10 are the armatures of the magnets comprising elongated portions 14, 15, which are pivoted to the base portion for swinging movement. The armatures 14, 15, carry contact arms 16, 17, which arms are provided with spreading jaws 18, 19, (see Fig. 4). The electric circuits of the magnet are normally closed, that is to say, the magnets are energized. To operate the signals the circuits must be broken, or shunted, or the magnets otherwise de-energized. The magnets 12 and 13 are connected through suitable wiring and binding posts with the track rails so that a train approaching in one direction will de-energize magnet 12 and then 13, and after passing the crossing or highway or on leaving the block by engaging other contacts will energize both magnets, thereby opening the circuits to the signals. In like manner, a train approaching from the opposite direction will de-energize magnet 13 first and then magnet 12. The de-energizing of the magnets naturally permits the armatures to drop, therefore, the circuits to the signals are closed and the signals connected with contacts 20 and 20^a operated when the magnets are de-energized. It will readily be seen that such an arrangement permits a

signal to be set in the event the electrical current to the magnets is interrupted as would happen whenever the wires were cut or the source of energy stopped, the current acting to normally energize the magnets and retain the armatures out of signaling contact. When magnet 12 is de-energized, the contact 16 drops, thus making electrical connections through the end 19 and its mating portion 20, suitable wiring connections being made through the binding posts with a signal set by reason of the contact between the points 19 and 20. It is desirable to prevent setting of a signal in the opposite direction by contact being made between 19^a and 20^a under magnet 13 as magnet 13 is de-energized in a relatively short time after magnet 12 when the train is moving in that direction. Therefore, it is essential to prevent the member 19^a from making electrical contact with the member 20^a. To accomplish this is the object of my invention.

Referring to the drawings, I attach at the end of the armatures 14, 15, forwardly extending arms 21, 22, having depending front ends 23, 24, the arms being arranged a slight distance apart. It will be observed that because of the pivotal mounting of the armatures 14, 15, when the magnets are de-energized, the arms 21, 22 will drop. Pivoted on the lower end 23 of the arm 21 is a bell crank 25 the pivotal connection 26 being at the end of one arm. The other arm of the crank is arranged to extend upwardly as at 27. Similarly, upon the lower end of arm 22 is a pivot 28 that carries a reversely positioned bell crank 29 having an upwardly presented arm 33. For supporting the bell cranks 25 and 29 in the positions shown in the drawings, I provide in each a slot that receives the pivot pin 28 or 26 of the other bell crank. Thus the bell crank 25 is pivoted to the depending end 23 of arm 21 and supported on the depending end 24 of arm 22 while crank 29 is pivoted on the depending portion 24 of arm 22 and supported by portion 23 of arm 21. Pivoted to the upper part of the portion 23 of arm 21 by a pin or similar member 30 is a dog 31. The dog is substantially crescent shaped in elevation, the pivot point being placed near one of the points preferably the lower which results in the dog being mounted in unbalanced position. The point 32 is arranged adjacent the upstanding end 33 of the bell crank 29 with the other point overlying the pivot 34 of another similar but reversely positioned dog 35. The dogs are pivoted and supported on the arms 21, 22, similarly to the pivot and support of the bell cranks 25, 29, but in reverse order. Normally the lower points of the dogs 32 and 35 are engaged by the upper ends 33 and 27 respectively of the bell cranks 29 and 25 and maintained with the upper points out of engagement with the pivot pins 30 and 34. It will be observed that bell crank 29 is in front of crank 25 as seen in Figures 1, 2, 5 and 6 and that dog 31 is in front of dog 35. When arm 21 is dropped by reason of the de-energization of coil 12, the depending portion 23 and its accompanying members will also drop. This tends to move the end 27 of crank 25 inwardly and the end 33 of crank 29 outwardly pivoting about and sliding on the pin 26. It also causes the upper end of dog 32 to drop onto the pivot pin 34 by reason of its support on the pivot 30. The lower point or end of the dog is made sufficiently long so as to be engaged by the upper end 27 of the crank 25, when the end 27 is swung inwardly, the inner end of the dog 35 is likewise pushed inwardly and the outer end is raised from its rest on the pivot 30. Projecting between the depending ends 23, 24, of the arms is a stop 36, securely fastened to the under portion of the base 10. This stop is provided on each side with notches formed by outstanding ears 37 and 38, and with an upwardly extending wall 39, the stop being arranged in position so that as the inner end of the dog 35 is directed inwardly by reason of the contact therewith of the upstanding portion 27 of the crank 25, the end will then overlie the ear 37, the wall 39 preventing the dog 35 from being swung past its pivotal point and becoming inoperative. Whereupon, when magnet 13 is de-energized, the arm 22 which supports the dog 35 can drop but a relatively short distance, which distance is that between the end of the dog 35 and the ear 37 and which is sufficient to move the point 18^a out of contact with the point 40 (see Fig. 1), but which prevents the point 19^a moving into electrical contact with the point 20^a. It will thus be observed that a circuit is made by reason of the closing of the circuit through the points 19 and 20 and that another circuit, that controlled by the points 19^a and 20^a is prevented from closing by reason of the interlock as above described. This condition prevails until the train reaches a point beyond the crossing or block where circuit conditions are changed in a suitable manner to energize both coils 12 and 13, whereupon the armatures 14 and 15 are drawn upwardly into contacting position and the electrical circuit through the points 19 and 20 is broken and the contact points are moved to the position shown in Fig. 1, while the dogs 32 and 35 and the bell cranks 25 and 29 are restored to normal position as shown in Fig. 5 of the drawings.

A train approaching from the opposite direction will de-energize coil 13 first which permits a contact to be made through points 19^a and 20^a controlled thereby, the operation of the lock being the reverse of that previously described.

It will be apparent to those skilled in the art to which this invention pertains that once a circuit having been made through contact points 19^a and 20^a, said circuit will be maintained and the closing of the other circuit, namely, that controlled by points 19 and 20, cannot under any circumstances be closed to operate the signal controlled thereby. It is clearly pointed out herein that the magnets are both de-energized and remain so until the train reaches a point which will restore circuit conditions, that is, which will energize the magnets to break the circuit controlled by the points 19^a and 20^a, and also raise the armature of the other magnet to prevent the signal being moved by the circuit controlled by the points 19 and 20. An important feature of this invention, as has been observed, resides in the provision of circuit-controlling means so that whenever a circuit to one of the magnets is tampered with in any form the signal controlled by that magnet will be set and cannot be changed until the circuit controlling same magnet is actuated in the manner described herein to change the signal set.

I am aware that modifications of such a device may be made and I contemplate all such modifications as are embraced within the scope of the appended claims.

I claim:—

1. An inter-locking relay including contacts normally held out of contacting position, magnets having armatures for controlling said contacts, arms connected to said armatures and movable therewith, means carried by each arm for cooperating with the other arm to prevent movement of one arm into circuit closing position when the other arm has been moved from normal position.

2. An interlocking relay, comprising circuit closing members, a stop, dogs carried by the respective circuit closing members and movable thereon into paths intersecting said stop, and means carried by each circuit closing member engaging the dog on the other circuit closing member to move it into its said path.

3. An interlock for relays including in combination, circuit closing members normally held out of contacting position, arms carried by each of said members, and means carried by each arm for cooperative engagement with the means on the other arm whereby to permit one of said members to close a circuit and to prevent the other member from closing its circuit, when said members are out of normal position.

4. In combination, means including contacts for closing either of two circuits, said contacts being normally out of closing position, an arm carried by each contact, and means on one arm cooperating with like means on the other arm to restrain one contact from moving into closing position when the other contact is in circuit closing position.

5. In combination, means to close circuits, means to prevent more than one circuit being closed at a time, said means including reciprocating arms, bell cranks, each bell crank being pivoted on one arm and having a support on the other arm, dogs pivotally supported on each of said arms in unbalanced position, the pivot of each forming a stop for the other, and a bar having notches for engagement by the shorter ends of said dogs, the bell cranks having upstanding portions to engage the shorter ends of said dogs and direct same into said notches when either of said arms is dropped.

6. In combination, a relay including two magnets adapted to be successively de-energized, a contact for closing a circuit carried by the armature of each magnet, an arm attached to each contact, similar members correspondingly arranged on each arm for cooperative engagement when said arms are moved, a stop in the path of movement of certain of said members adapted for engagement by either of the members, and means also supported on the arms for directing one of said members into engagement with said stop when either contact is moved into circuit closing position.

7. An interlock for a relay, in combination, contact members adapted to be attached to and movable with said contacts, arms extending from said members and having downwardly extending end portions, each of said ends having a bell crank pivoted at one end thereon, one leg of which crank is supported substantially horizotnally on a pivot with the other crank, the other leg of said crank extending upwardly, a dog pivotally connected on each of the downwardly extending ends of said arms in unbalanced position, the longer end of each dog arranged to fall against the pivot of the other dog, the short ends of said dogs adapted to be engaged by the upstanding legs of the bell crank pivoted on the other arm, a stop projecting between said arms and having notches therein disposed near the lower ends of said dogs, the latter being arranged whereby on de-energization of the coil, one arm drops causing contact between the dog and bell crank to direct the contacting end of the dog into the adjacent notch in said stop to prevent the dropping of the other arm and its attached contact.

Signed at Chicago, State of Illinois, this 13th day of May, A. D. 1918.

FRANK EDWARD LULL.