S. D. FIELD.

RELAY.

APPLICATION FILED JUNE 17, 1909.

942,815.

Patented Dec. 7, 1909.

2 SHEETS—SHEET 1.

Fig: 1.

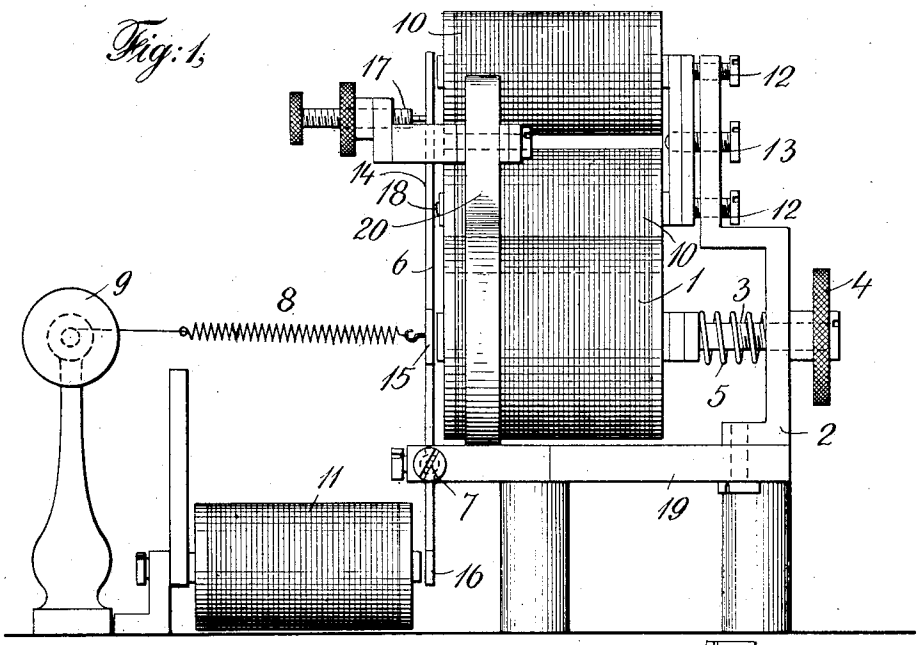


Fig: 2.

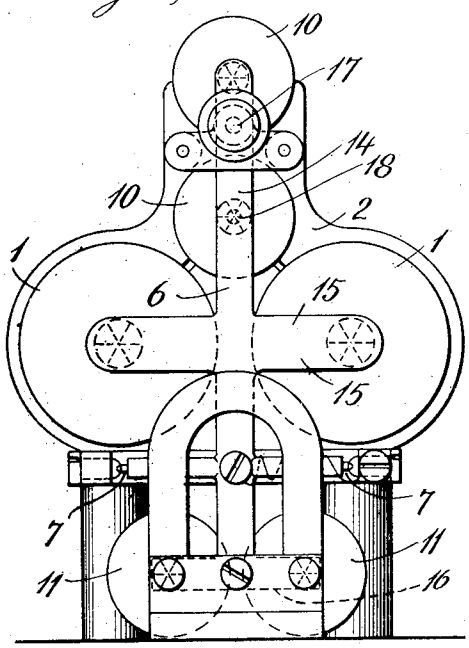
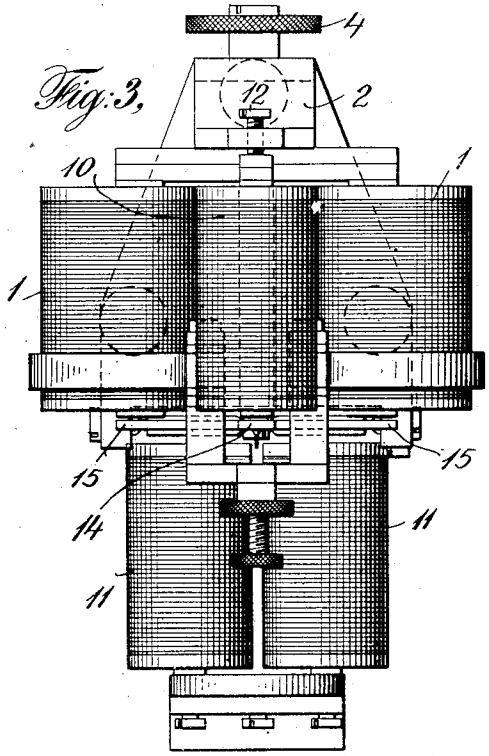


Fig: 3.



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2 SHEETS—SHEET 2.

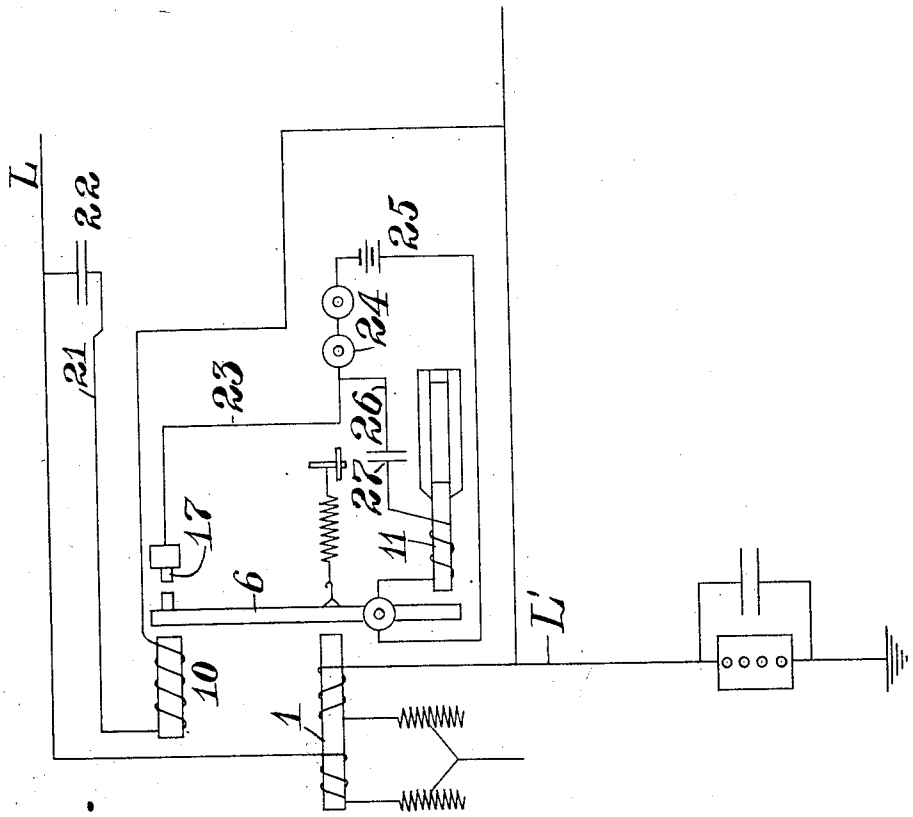

Fig. 4.

Attest:

May J. Swindell

Paul H. Frank

by

Inventor:

Stephen D. Field

H. M. Knable

Atty

UNITED STATES PATENT OFFICE

STEPHEN D. FIELD, OF STOCKBRIDGE, MASSACHUSETTS, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

RELAY.

942,815. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed June 17, 1909. Serial No. 502,688.

To all whom it may concern:

Be it known that I, STEPHEN D. FIELD, a citizen of the United States, and residing at Stockbridge, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to improvements in relays and embodies an improved relay particularly intended for use in quadruplex and other multiplex telegraph systems, and is illustrated and described, in connection with the quadruplex telegraph system, of my companion application filed June 17, 1909, Sr. No. 502,687.

My invention consists in means whereby mutilation of the signals and false movements of the armature of such relay are avoided.

The objects of my invention are to avoid mutilation of signals, and false signals, of telegraph relays, to produce a relay which shall be sensitive, rapid in action, and free from precise and difficult adjustments, and to make the relay simple, compact, and structurally suitable for use in telegraph service.

I will now proceed to describe my invention with reference to the accompanying drawings, in which one form of relay embodying my invention is illustrated.

In said drawings: Figure 1 shows a side elevation of my improved relay; Fig. 2 shows a front view thereof; Fig. 3 shows a top view thereof; Fig. 4 is a diagram illustrating one method of using said relay.

Referring first to Figs. 1, 2 and 3, numerals 1 designate the main or line magnet of the relay mounted as usual upon a frame 2 and arranged to be moved forward and backward, for purposes of adjustment, by means of a screw 3, nut 4, and spring 5; such adjusting means being a common feature of telegraph relays.

6 designates the armature of the relay, which armature is pivoted at 7, 7 in the usual trunnion screws, and is provided with the usual retractile spring 8 and spring-adjusting means 9.

This relay comprises, in addition to the main magnet 1, other magnets 10 and 11, all arranged to act upon the same armature; magnet 10 being supported by the same frame 2 which supports magnet 1, and being arranged to be moved toward and from the armature, for purposes of adjustment, by means of screws 12, 12 and 13.

For structural simplicity, and in order to reduce the mass of the armature 6 to as low an amount as possible, the two spools of magnet 10 are placed one above the other, their poles being, therefore, in line vertically. The armature 6 is, therefore, of double cruciform shape, comprising an upper longitudinal portion 14 coacting with the poles of magnet 10, a transverse portion 15 coacting with the poles of magnet 1, and a lower transverse portion 16, below the pivotal point, coacting with the poles of magnet 11.

The cores of magnets 1 and 10 are preferably of soft iron, and are preferably highly laminated, so as to be capable of extremely rapid magnetic changes. The cores of magnet 11 may or may not be permanently magnetized, but may also be laminated, as it is desirable at times that these cores, if permanently magnetized, shall be over-powered by contrary magnetism induced by current discharges passing through the coils of this magnet.

The particular relay shown has a rear contact stop 17, but has no corresponding front contact, as, for the particular purpose for which this relay is intended, it requires no such front contact. It has, however, a front stop, 18, so placed as to prevent actual contact of the armature with the cores of the magnets. This front stop is a small piece of non-magnetic metal, such as brass, located upon the face of the lower core of magnet 10. Any other construction of front stop would be equally suitable.

The rear frame 2 of the relay, the base plate 19, and the bracket 20 supporting the rear contact stop, are, of course, of some non-magnetic material, such as brass.

In Fig. 4 I illustrate diagrammatically one arrangement of circuits, embodying this relay. The arrangement I have shown is that used in a quadruplex system of my previously mentioned companion application, though I do not here illustrate the polar relay and connections employed in that system, as these form no part of the neutral relay itself. In this drawing L designates a line conductor, and L′ an artificial line con-

ductor, such as are commonly employed in duplex and quadruplex telegraph systems. The magnets 1 of the relay are differentially wound, one winding being in the line circuit and the other in the artificial line circuit. The magnet 10, which is commonly termed a holding magnet, is in a bridge circuit 21 extending from the line conductor L to the artificial line conductor L', and in this circuit there is a condenser 22. The armature 6 of the relay, and the rear contact stop 17, are in a local circuit 23 including a sounder or other suitable instrument, 24, to be controlled by the relay, and including also a local battery or source of electrical energy 25; and the windings of magnet 11 are in a bridge conductor 26, extending from one side to the other of this local circuit, and including a condenser 27.

The operation of the relay, as thus connected, is as follows: Supposing current to be flowing in the line L, and this current to be reversed at the distant station, at the instant of "no current" during such reversal, there is a discharge of current in the local circuit including magnet 10, due to the change in condenser 22, the effect of which is to energize magnet 10 momentarily and so hold the armature 6 away from its rear stop 17, at the instant when magnet 1 is deënergized. By the time this discharge has passed the opposite current has been established in the line and in the coils of magnet 1, so that the armature 6 will be retained against its front stop. In case of reduction of line current strength, such as is intended to operate this relay, there is a similar but lesser discharge through the coils of magnet 10, which, however, is not sufficient to prevent or appreciably retard retraction of the armature 6, since such reduction in current strength of necessity continues for an appreciable time. When, while the armature 6 is in its retracted position, the strength of the current from the distant end is increased, condenser 22 charges, producing a flow of current in the local circuit of magnet 10, the result of which is to assist, slightly, the forward movement of the armature 6.

In the operation of quadruplex systems there frequently comes a time when, just as the current strength in the line increases sufficiently to start the armature of the neutral relay moving forward, the line current is reversed. When an ordinary neutral relay is used in such a system, this generally causes the armature of such relay to fall back to its rear contact stop, so making a false signal. The magnet 11 obviates this; because the instant the armature 6, in its forward movement, breaks contact with the rear contact stop 17, so interrupting the local circuit in which is a sounder 24, the magnet of this sounder is deënergized, and the resulting current in the bridge conductor including the condenser 27, such current being due not only to the charging of said condenser, but also to self-induction in the magnet of the sounder, energizing magnet 11 and causing said magnet to hold the armature away from its rear stop until magnet 1 is again energized. Magnet 11 does not impede backward motion of the armature, upon decrease of line current strength, because the discharge from condenser 27, momentarily demagnetizes the cores of magnet 11, so contributing, momentarily, to firmness of contact between armature 6 and rear contact stop 17.

What I claim is:—

1. A relay comprising in combination a movably mounted armature, a main electro-magnet therefor, a holding electro-magnet likewise coacting with the armature, and an auxiliary electro-magnet also coacting with said armature and acting thereupon in the same direction as the holding magnet.

2. A relay comprising in combination a movably mounted armature, a main electro-magnet therefor, a holding electro-magnet likewise coacting with the armature, and an auxiliary electro-magnet also coacting with said armature and acting thereupon in the same direction as the holding magnet, the core of such auxiliary magnet having normal material magnetic value in addition to any magnetism due to current flowing through its coils.

3. A relay comprising in combination a movably mounted armature, a main electro-magnet therefor, a holding electro-magnet likewise coacting with the armature, and an auxiliary electro-magnet also coacting with said armature and acting thereupon in the same direction as the holding magnet, a condenser in circuit with said holding magnet and a condenser in circuit with said auxiliary magnet.

4. A relay comprising in combination a movably mounted armature, a main electro-magnet therefor, a holding electro-magnet likewise coacting with the armature, and an auxiliary electro-magnet also coacting with said armature and acting thereupon in the same direction as the holding magnet, the core of such auxiliary magnet having normal material magnetic value in addition to any magnetism due to current flowing through its coils, a condenser in circuit with said holding magnet and a condenser in circuit with said auxiliary magnet.

5. A relay comprising a pivotally mounted armature, a main electro-magnet therefor, upon one side of the pivot, a holding electro-magnet for said armature, upon the same side of the pivot as said main magnet, and an auxiliary electro-magnet for said armature upon the opposite side of the pivot, but acting upon said armature in the same direction as said main and auxiliary magnets.

6. A relay comprising a pivotally mounted armature, a main electro-magnet therefor, upon one side of the pivot, a holding electro-magnet for said armature, upon the same side of the pivot as said main magnet, and an auxiliary electro-magnet for said armature upon the opposite side of the pivot, but acting upon said armature in the same direction as said main and auxiliary magnets, the core of said auxiliary magnet having normal material magnetic value in addition to any magnetization due to current passing through its coils.

7. A relay comprising a pivotally mounted armature comprising a longitudinal portion having two transverse extensions, located on opposite sides of the pivotal axis, a main electro-magnet located opposite one of such transverse extensions, another electro-magnet located opposite a longitudinally extending portion of such armature, and a third electro-magnet located opposite the other transverse extension of such armature.

8. A relay comprising in combination a pivoted armature having a longitudinally extending portion and two transverse extensions, a main electro-magnet located opposite one of said transverse extensions, another horse shoe electro-magnet having its poles both located opposite a longitudinally extending portion of said armature, said poles located one beyond the other in the direction of longitudinal extension of such armature, and a third electro-magnet having its poles located opposite the other transverse extension of said armature.

In testimony whereof I affix my signature, in the presence of two witnesses.

STEPHEN D. FIELD.

Witnesses:

H. M. MARBLE,

FRANK E. RAFFMAN.