Feb. 24, 1931. A. F. LAKE 1,793,858

NONWELDING RELAY

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Fig. 1.

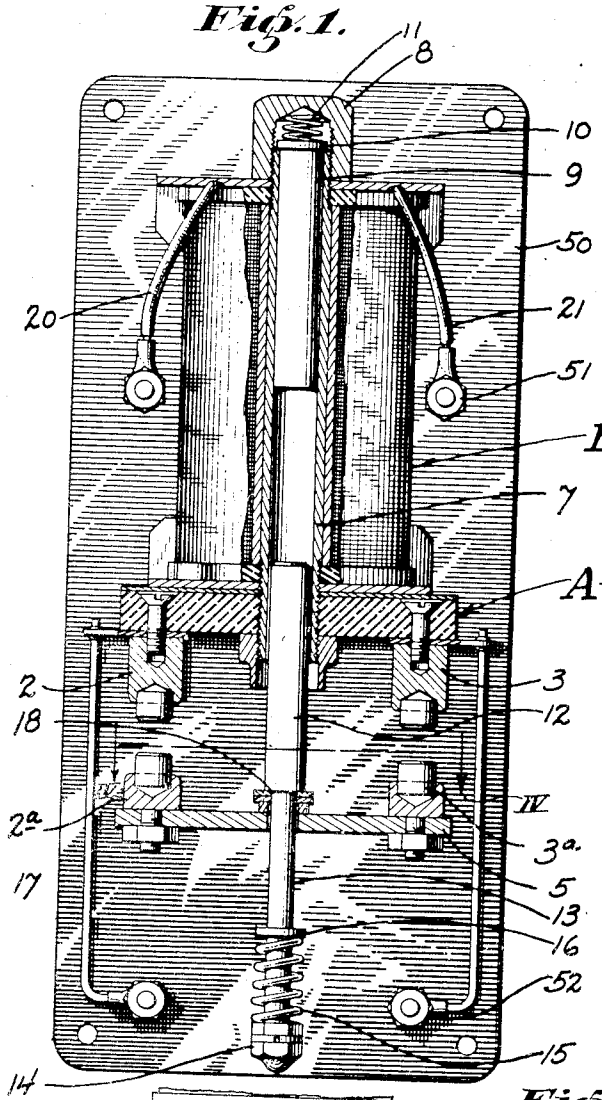


Fig. 2.

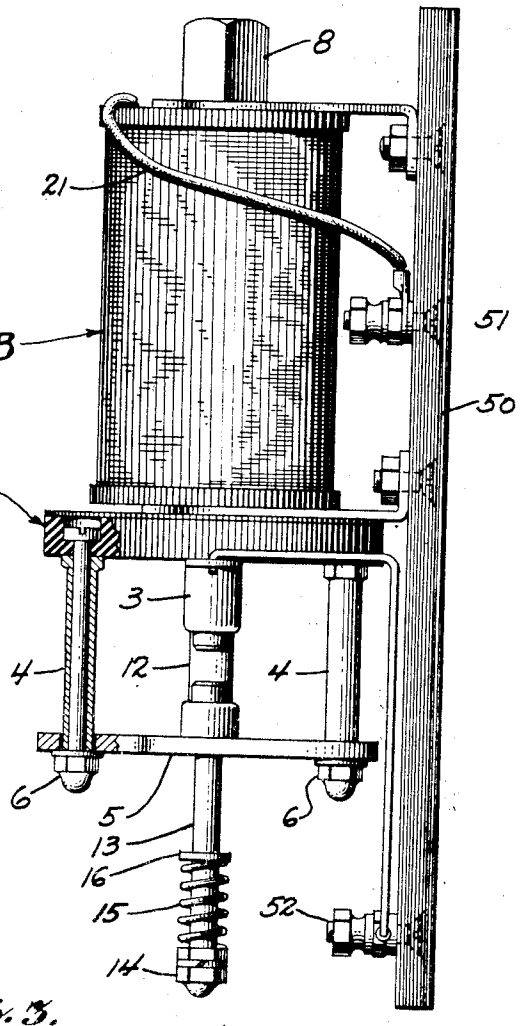


Fig. 3.

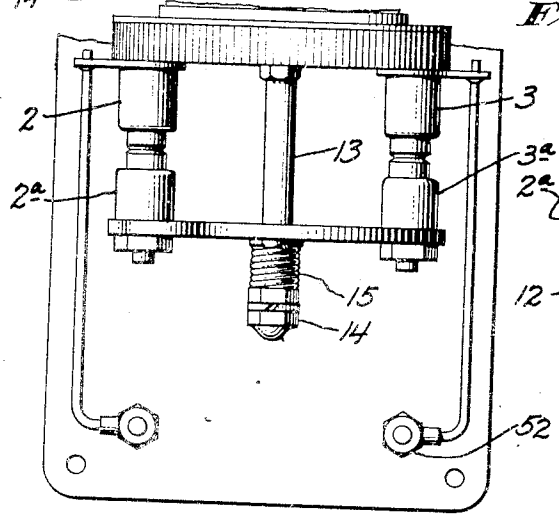
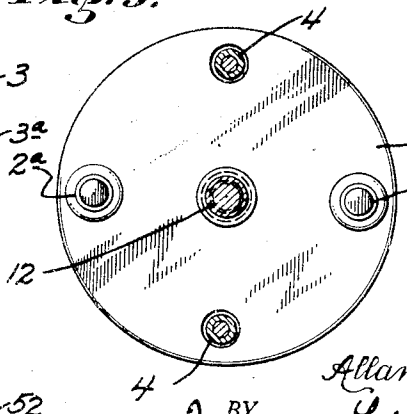


Fig. 4.



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Fig. 5.

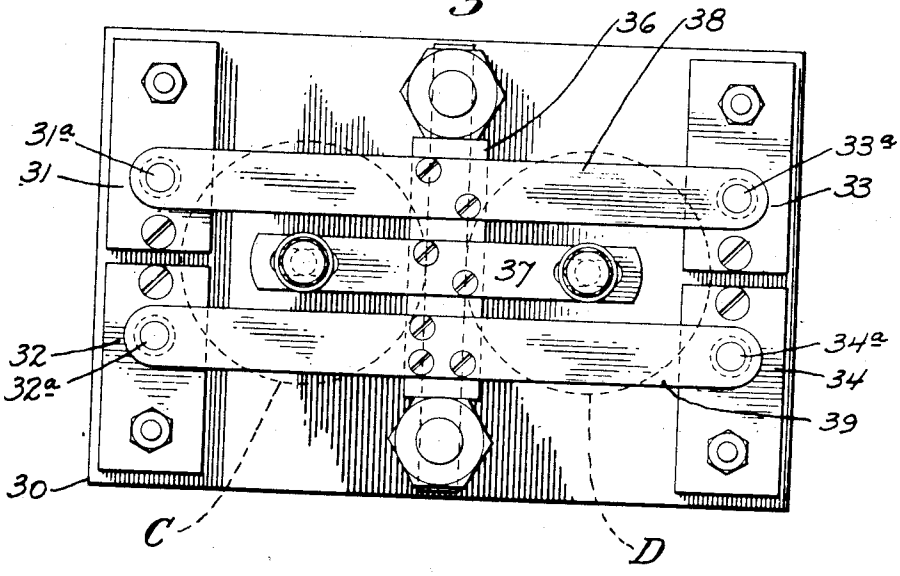
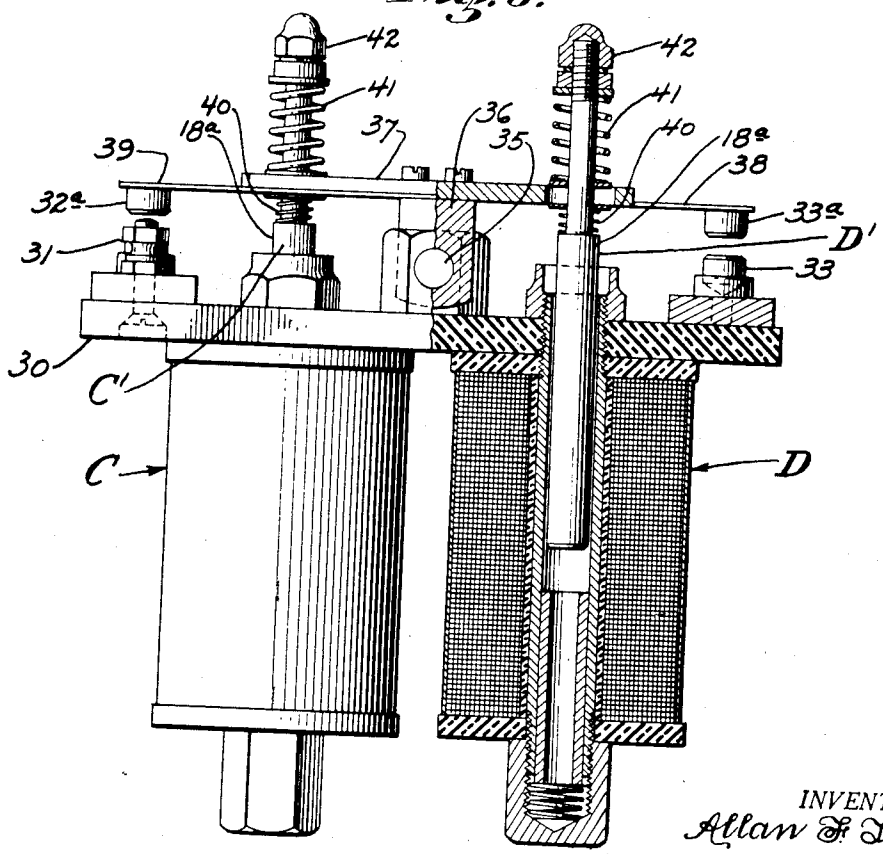


Fig. 6.



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UNITED STATES PATENT OFFICE

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NONWELDING RELAY

Application filed July 6, 1927. Serial No. 203,693.

This invention relates to electric switches and especially relay switches of the quick break type, which are adapted to be actuated by an alternating current.

The object of the present invention is to generally improve and simplify the construction and operation of relay switches; to provide a switch of the character described in which alternating current vibrations may be entirely eliminated; to provide a switch in which the contacts are self-aligning; to provide a switch which is interlocking to prevent two circuits from being closed at the same time, and further to provide a switch in which the circuit contacts are operated by gravity, plus spring action, and in which a hammer action is obtained in the moment when separation of the contacts takes place.

The relay switch is shown by way of illustration in the accompanying drawings in which:

Fig. 1 is a front view of the relay switch, said view being broken away to show parts of the mechanism in section.

Fig. 2 is a side elevation of the relay switch.

Fig. 3 is a front view showing the lower portion of the relay switch.

Fig. 4 is a cross-section taken on line IV—IV, Fig. 1.

Fig. 5 is a plan view showing a modified form of the switch.

Fig. 6 is a side elevation of the modified switch, shown in Fig. 5, said side elevation being partially in section.

Referring to the drawings in detail, and particularly to Figs. 1 and 2, A indicates a base plate preferably constructed of insulating material upon which is supported a solenoid magnet B. Suitably secured to the lower face of the base plate A are a pair of circuit contact members 2 and 3. Also secured to the lower face of the base plate are a pair of guide rods, 4—4, and slidably mounted thereon is a plate, 5, on which is mounted a pair of circuit closing contacts, 2^a and 3^a. The lower ends of the guides 4, are provided with shoulders or nuts, as indicated at 6, and downward movement of the plate 5 upon the rods 4 is accordingly limited.

Mounted within the solenoid magnet is a guide tube 7 which is made of brass, or similar non-magnetic material. The upper end of the tube projects slightly above the upper end of the magnet and it is provided with a cap 8. Mounted in the upper end of the tube is a core member 9, which is shouldered, as indicated at 10, to engage the upper end of the tube 7 and interposed between the upper shouldered end and the nut 8 is a spring 11.

Projecting into the lower end of the tube 7 is a movable core member or armature rod 12. The lower end of the armature member is reduced in diameter, as indicated at 13, and it projects through the plate 5. A nut 14 is mounted on the lower reduced end of the armature and a spring 15 and washer 16 is supported thereby. One or more washers, such as indicated at 17, is interposed between a shoulder 18 on the armature and the upper face of the plate 5 and these washers merely serve the function of buffers, as will hereinafter be described.

The relay switch shown in the present instance may be used for a number of different purposes. For instance, for operating traffic signals and the like. Where the relay switch is employed in conjunction with a traffic signal, the circuit through the magnet B is controlled from some remote source. An alternating current is usually employed and the current enters the magnet through wires generally indicated at 20 and 21. The closing of a circuit through the wires 20 and 21 causes energization of the core 9 and the armature 12 and the armature is accordingly attracted or lifted upwardly into the magnet into engagement with the core member 9. During the upward movement of the armature washers 16 engages the lower face of the plate 5 and the plate, together with the contacts 2^a and 3^a are accordingly lifted upwardly into engagement with the contacts 2 and 3. Spring 15 is placed under a slight compression during this upward movement and so is the spring 11. This is important as the compression of the springs 11 and 15 serves two functions: first, that of smoothing out or substantially eliminating alternating current vibrations and secondly, that of

imparting a rapid or impelling movement to the armature 12 when the magnet is de-energized. Engagement on the contacts 2, 2a and 3 and 3a may serve the functions of closing a local circuit, for instance that required for the operation of a traffic signal. This circuit remains closed as long as the circuit through the magnet remains closed and it is automatically broken when the magnet circuit is broken, due to the fact that the magnet B becomes de-energized the moment the main actuating circuit through the wires 20 and 21 is broken. Breaking of the main actuating circuit releases the armature 12 and it accordingly drops by gravity. In addition thereto, its downward movement is accelerated, due to the sudden release of the compressed springs 11 and 15. The downward movement of the armature is accordingly rapid and shoulder 18 strikes the buffer washer 17 on the upper face of the plate 5 with what may be termed a hammer-like blow. This is also important, as it is found in actual practice that the contacts often have a tendency to weld. Any welding action which may have taken place while the contacts were in engagement with each other is of no consequence in the present instance, as the hammer-like blow imparted by the shoulder 18 is sufficient to break the weld and thus permit the plate 5, together with the contacts 2a and 3a, to drop by gravity against the stop shoulders or nuts 6. The breaking action of the contacts when separated is accordingly positive and rapid, and flashing or formation of arcs is also prevented.

In actual practice it is usually found that one set of contacts will burn away at a more rapid rate than another set of contacts and difficulty is often encountered in properly aligning the contacts. In the present instance, this is taken care of by providing a loose fit between the plate 5 and the guide rods 4 and similarly by providing a loose fit between the armature rod extension 13 and the plate 5. That is the plate 5 may tilt, as indicated by dotted lines in Fig. 1, to a considerable degree, thus permitting automatic alignment, if one set of contacts should burn away more rapidly than the opposite set of contacts.

In Figs. 5 and 6 a slight modification of the relay switch is shown. In this instance it is desired to control two different sets of traffic signals. For instance, one signal to show green or right-of-way and the second signal to show red or stop. Two solenoid magnets are required in that instance, these being indicated at C and D; supported by the magnets is a plate 30 and mounted at opposite ends thereof are contacts such as indicated at 31 and 32 and 33 and 34. Pivotally mounted, as at 35, centrally of the plate 30 is a rocker member 36 and supported thereby is a plate 37 and a pair of contact arms 38 and 39. The contact arm 38 carries cooperating contacts 31a and 33a and the arm 39 carries cooperating contacts 32a and 34a. A rocking movement is imparted to the rocker member 36 the plate 37 and the arms 38 and 39 through means of the magnets C and D and armature members C′ and D′ co-operating therewith. These armature members are shouldered, as indicated in 18a. Small coil springs 40 are interposed between the shoulder 18a and the lower face of the plate 37 and larger coil springs 41 are interposed between the upper face of the plate 37 and nuts 42 mounted on the upper ends of the armature members.

In actual operation the magnets C and D will be controlled from a main actuating circuit, just as the magnet illustrated in Fig. 1. After the magnet D is energized its armature D′ will be attracted or pulled downwardly into the magnet. This downward movement of the armature imparts a rocking movement to the rocker 36, the plate 37 and the arms 38 and 39 thereby bringing the contacts 33, 33a and 34a into engagement with each other. It will at the same time cause the cooperating spring 41 to be placed under compression, this being important, as the compression of this spring is relied upon to obtain a quick break and also to produce a hammer action similar to that described in connection with the relay shown in Fig. 1. That is the de-energization of the magnet D′ releases the cooperating armature D′. The compression of the springs 41 imparts an impelling movement to the armature D′ in an upward direction. The shoulder 18a will during this rapid upward movement, impart a hammer-like action to the spring 40 and if any welding has taken place between the contacts it will be broken and the rocker 36, together with the plate 37 and the arms 38 and 39, will return to normal position. Another important feature of the structure shown in Figs. 5 and 6 is what may be termed an interlocking feature. That is, two different circuits cannot be closed at the same time. If the magnet C is energized, contacts 31 and 31a and contacts 32 and 32a will be closed, while energization of the magnet D will cause the opposite contacts to be closed. The two separate circuits controlled by the several contacts can accordingly not be closed at the same time.

The type of switch shown in Figs. 5 and 6 may be supported entirely by the plate indicated at 30, while the type of switch shown in Figs. 1 and 2 may be supported by a plate, such as indicated at 50, this plate in turn forming a support for the base plate A and the several terminal posts indicated at 51, 52 etc.

While certain features of the present invention are more or less specifically described and illustrated, I wish it understood that varying changes in design and construction may be resorted to within the scope of the

appended claim. I similarly wish it understood that the material and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

In a device of the character described the combination with a solenoid magnet and a base plate by which it is supported, of a pair of stationary contacts secured to the base plate, a pair of guide rods secured to the base plate, a contact plate slidably mounted thereon and having a pair of contacts aligning with the stationary contacts, stop members on the lower ends of the guide rods and supporting the contact plate in a position where the contact members are out of contact with each other, a guide tube in the magnet, a rod shaped armature member extending through the contact plate and into the guide tube of the magnet and guided solely by said members, a shoulder on the armature rod whereby the armature is supported by the contact plate, said armature having an extension rod of considerable length extending below the contact plate, and a spring supported on the lower end of the rod and disposed at considerable distance below the contact plate, said spring adapted to engage the contact plate and lift it into engagement with the stationary contacts when the magnet is energized and the armature is lifted thereby, said spring also adapted to be compressed during the lifting movement of the armature so as to impart a rapid downward movement to the armature rod in the opposite direction upon de-energization of the magnet and to cause the shoulder on the armature rod to strike the contact plate with a hammer-like blow to insure separation of the contacts if welded.

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