March 25, 1941. A. E. LAMEL ET AL 2,236,318

REMOTE CONTROL ELECTROMAGNETIC INTERLOCK SWITCH

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Fig. 1.

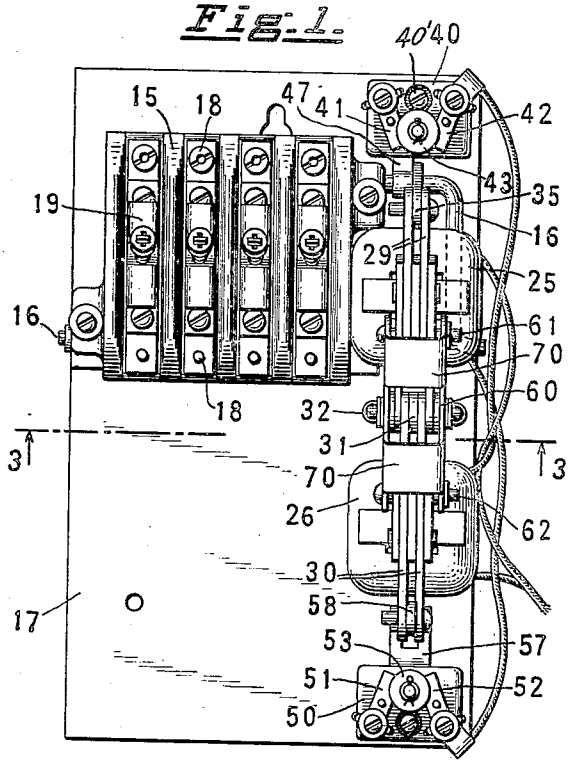


Fig. 2.

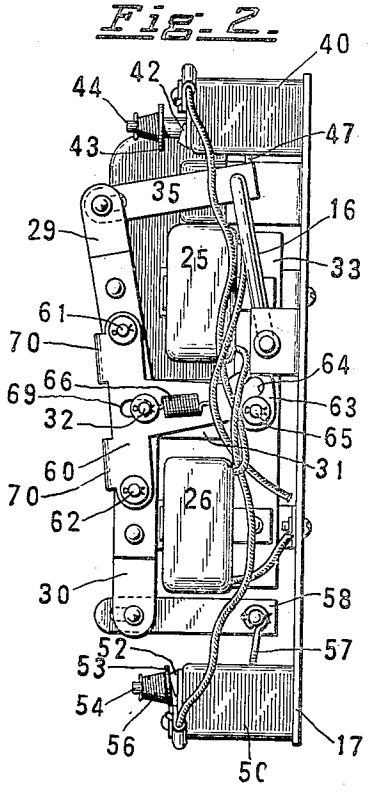
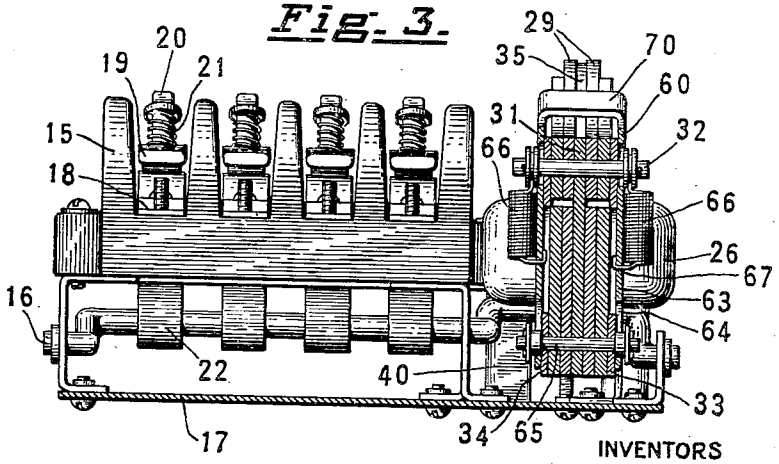


Fig. 3.



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Fig. 5.

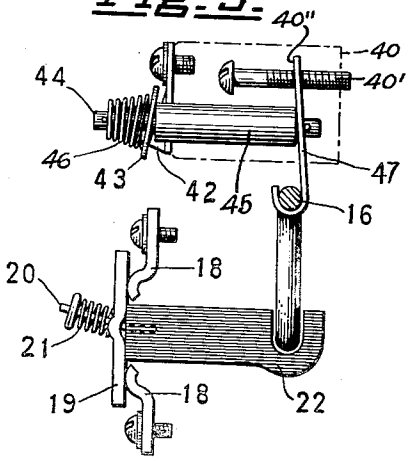


Fig. 4.

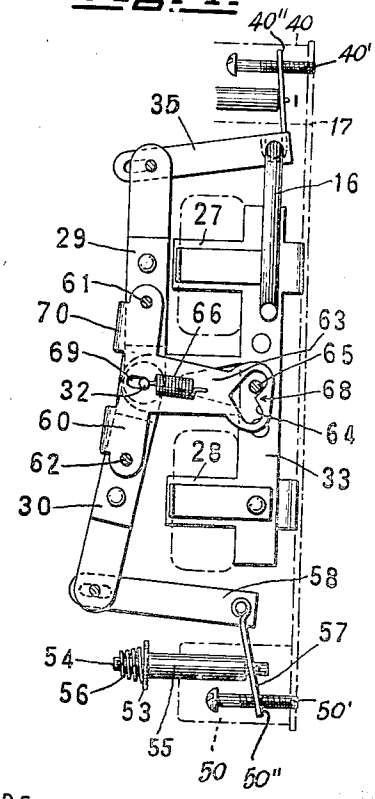
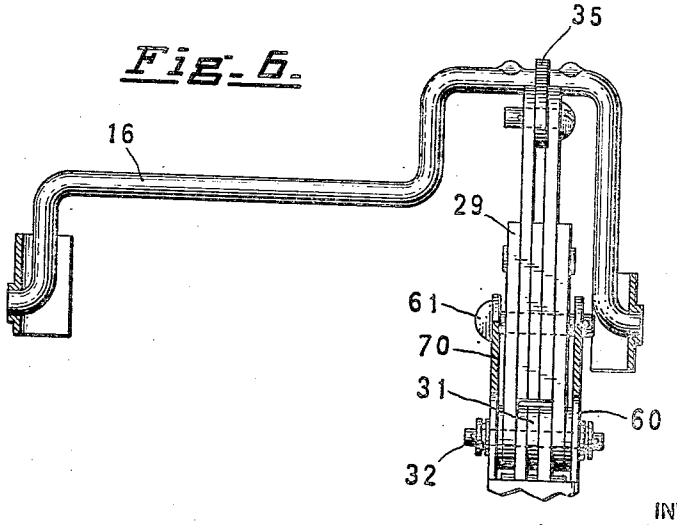


Fig. 6.



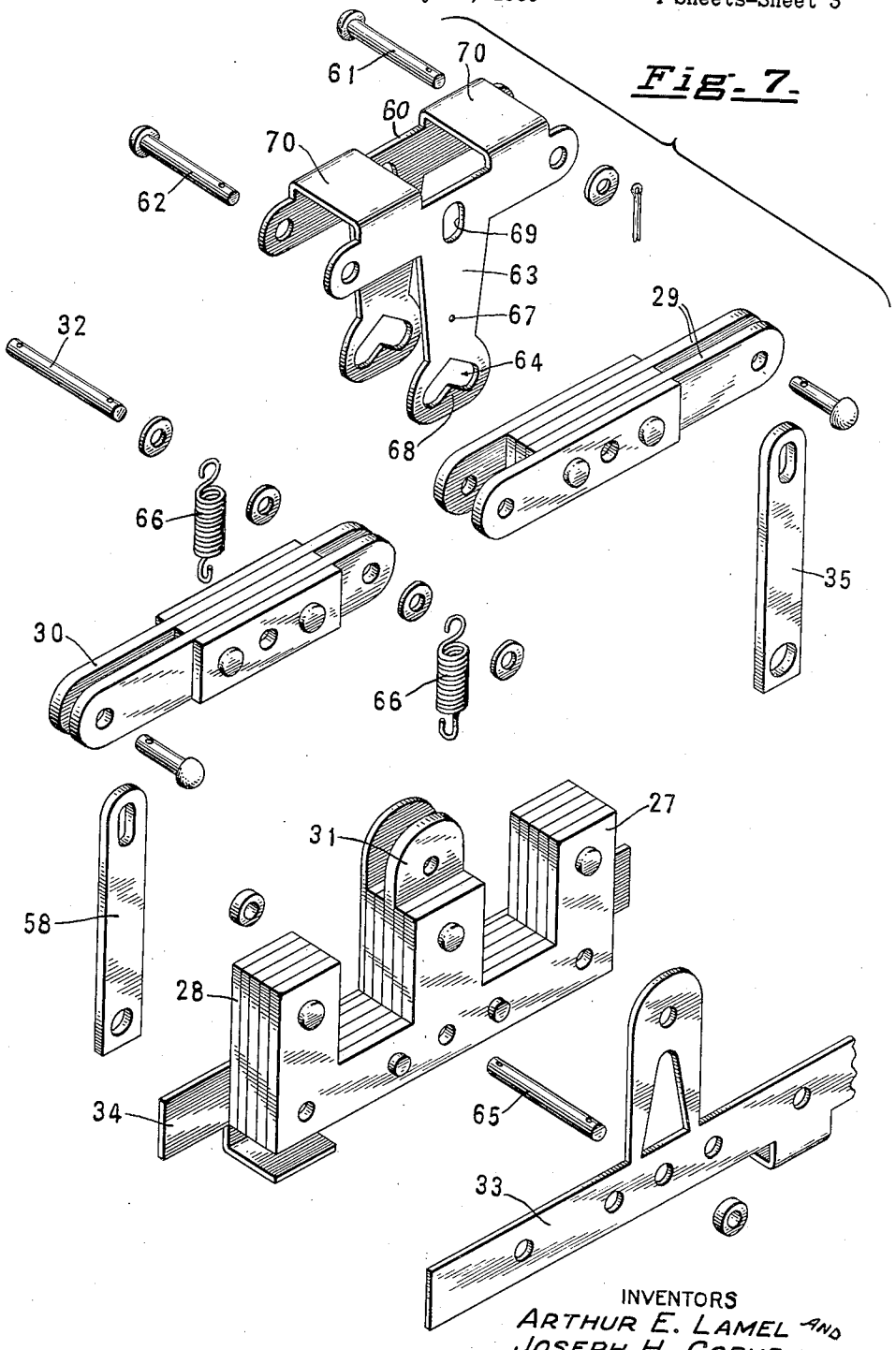
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Fig. 7.



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Fig. 9.

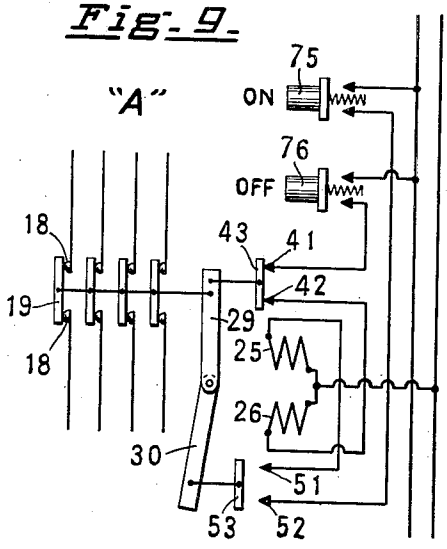


Fig. 10.

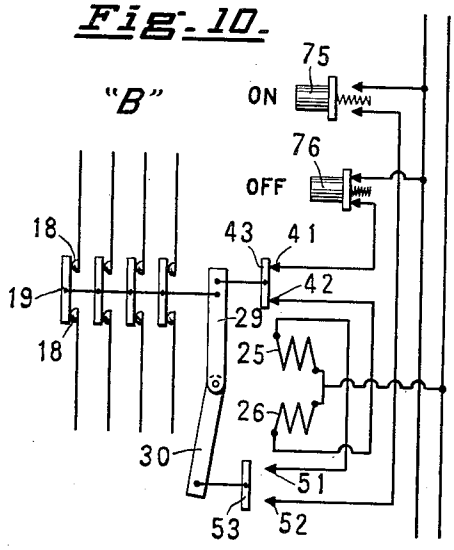


Fig. 11.

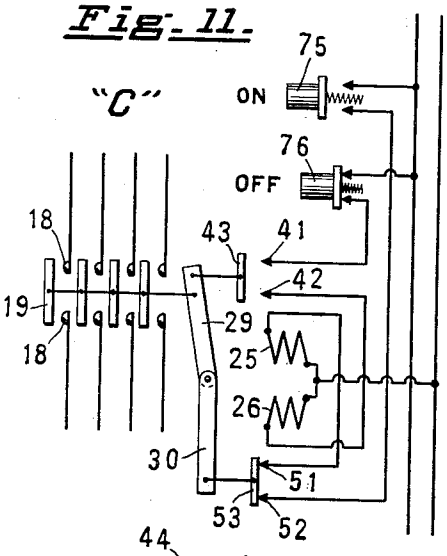


Fig. 12.

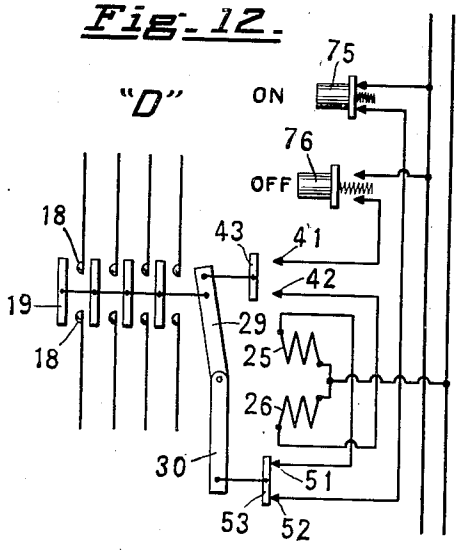
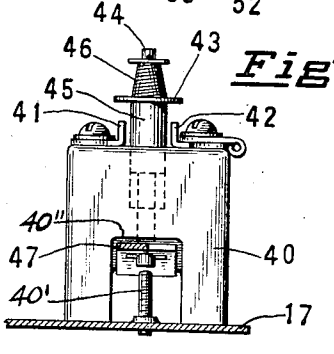


Fig. 8



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UNITED STATES PATENT OFFICE

2,236,318

REMOTE CONTROL ELECTROMAGNETIC INTERLOCK SWITCH

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Application July 22, 1939, Serial No. 285,978

11 Claims. (Cl. 200—98)

Our invention relates to electric circuit controlling switches such as are sometimes used as motor starters, remote controlled disconnect switches or the like.

Such switches make and break power consuming circuits and are actuated electromagnetically through circuits controlled by remote or local push button switches, time switches, or the like.

One object is to provide a switch of this character which is simple, rugged and reliable.

Another object is to provide a switch which will operate properly in any position in which the switch may be mounted.

Another object is to provide such a switch which is mechanically locked against accidental action when the consuming circuit is open as well as when closed.

Another object is to provide for convenient connection of auxiliary disconnect switches.

Another object is to provide a push button or similarly operated switch which does not require a continuous flow of current to hold it in either the "on" or "off" position and is therefore entirely silent between operations when the control current is alternating.

In the form shown the main contact mechanism is of a suitable type. The movable switch member is actuated by an electromagnetic device to close the circuit and mechanically lock the parts in the "on" position. Another electromagnetic device serves to unlock the parts and permits spring means to open the circuit. These two electromagnetic devices are provided with armatures which are connected by a rocker which is mechanically locked or latched in either the "on" position or in the "off" position and biased to move from one position to the other when movement is started by the closing of the circuit of the previously unenergized magnet. Any suitable form of remote control station switch may be used and any suitable form of holding-in contact devices.

Since the control current flows only momentarily, while the switch is operating, there can be no persistent undesirable hum when alternating current is used on the control circuits. This switch is held locked by mechanical means, in the position to which its has been thrown by the control current, so that persistent flow of control current is unnecessary.

Fig. 1 is a front view of one form of switch with electromagnetic devices embodying our invention and with suitable circuit transfer contacts.

Fig. 2 is a side view of the same parts—the parts being in the open circuit or "off" position.

Fig. 3 is a horizontal section on the plane of the line 3—3 of Fig. 1.

Fig. 4 is a skeleton side view of the magnets and armature structures with the parts in the closed circuit or "on" position.

Fig. 5 is a detail side view showing the contacts of one switch unit and one of the auxiliary contact devices.

Fig. 6 is a front view showing the crank shaft and parts of the circuit-closing magnet.

Fig. 7 is an exploded perspective view showing the various parts of the core, armature and rocker of the electromagnetic devices.

Fig. 8 is a detail view of one of the circuit transfer or auxiliary switches.

Figs. 9, 10, 11 and 12 are diagrams showing the parts respectively in (A) the normal closed power circuit or running position, (B) a remote control "off" switch closed for the purpose of energizing one magnet and causing the power circuit to be opened, (C) the power circuit opened, and (D) a remote control "on" switch closed for the purpose of energizing the circuit of the other magnet and closing the power circuit.

The switch proper may be of any suitable type and have any number of units. We have shown four units mounted on an insulating base 15 and having a common crank shaft 16 supported by a base plate 17 which carries all of the parts. Each switch unit has two stationary contacts 18 provided with suitable circuit terminals. The movable switch contact member 19 is loosely mounted on a stud 20 under pressure of a spring 21 and carried by the insulating member 22 which slides in the base 15 and is connected to the crank shaft.

The electromagnetic system includes two coils 25 and 26 mounted on the upper and lower parts 27 and 28 of a core preferably formed of a number of plates of E-shape. The armatures 29 and 30 are hinged to the center post 31 by a common pin 32. The magnet core is supported by side plates 33 and 34 which may form parts of the magnet core.

The upper armature 29 is connected to the crank shaft by a link 35 which is preferably slotted at one end to permit some freedom of movement of the armature with respect to the crank shaft. One auxiliary switch near the upper coil consists of an insulating base 40 (see Fig. 8) with two stationary contacts 41 and 42 and a movable connecting contact or switch member 43 carried by a post 44 slidable in the base. An insulating sleeve 45 on the post supports the switch member

43 and spring 46. The base 40 is secured to the plate 17 by a screw 40'.

An arm 47 connects the crank shaft 16 and the post 44 so that when the crank shaft is moved to close the circuit through the switch member 19 the auxiliary switch contact 43 will be moved to close the circuit across the contacts 41—42 and when the crank shaft moves to open the main switch the auxiliary switch will open its circuit. The arm 47 is in effect pivoted about the abutment 40'' formed by the rear face of the base 40.

A second circuit transfer device is mounted near the lower coil and consists of an insulating base 50 with stationary contacts 51 and 52 and a movable contact 53 caried by post 54 with a sleeve 55 and spring 56. This post 54 is connected by arm 57 to the rear end of a link 58 which has a lost motion connection with the lower end of armature 30 so that when the armature 30 is drawn toward the coil 26 the post 54 will be moved so as to close the circuit across the contacts 51 and 52 and when armature 30 is released and retracted the circuit through 51 and 52 will be opened. The base 50 is secured to plate 17 by screw 50' and the arm 57 is in effect hinged or pivoted against the abutment 50'' formed by the rear face of the base 50.

The two armatures are connected by a T-shaped rocker 60 loosely hinged at 61 and 62 to the respective armatures 29 and 30. This rocker has a control arm 63 with a forked slot 64 into which the stationary pin 65 carried by the magnet core projects. Pin 65 may carry a friction roller at the point where it engages the wall of the forked slot. The pins 32 and 65 are in a plane perpendicular to the faces of the magnet cores 27 and 28 and midway between them. A spring 66 connects pin 32 and a point 67 in the rocker arm 63 between the pin 32 and the slot 64. The two branches of the slot 64 are separated by a dart shaped projection 68. The rocker has a slot 69 to allow for its movement relative to the stationary pin 32. Preferably the rocker has two sides as above described connected by cross pieces 70 and there is a spring 66 on each side.

The diagram of Fig. 12 shows the parts in the position of Figs. 1 and 2 and connected in a control circuit with "on" and "off" switches 75 and 76 which are spring pressed toward open circuit. When switch 75 is "closed" current passes through the lower auxiliary switch (which is then closed) and thence through coil 25 which is thus energized to attract armature 29. This actuates the crank shaft 16 and closes the circuit through the main switch and through the upper auxiliary switch. At the same time when the armature 29 turns on its hinge pin 32, the rocker 60 turns on hinge pin 62 so that the arm 63 tilts. The slot 64 is so shaped that this tilting can take place and the dart-like projection 68 passes behind the pin 65. As soon as the points 67 where the spring 66 is attached to the arm 63 passes across the center line between pins 32 and 65, the spring 66 will exert tension on the rocker 60 to rotate and tilt it from the position of Fig. 2 to that of Fig. 4. The movement across the center line is effected by the inertia of the parts when the magnet attracts the armature 29 and also by the pressure of the spring 56 on the lower auxiliary switch.

When the main switch is closed and the parts are in the position of Fig. 9, the action is just the reverse upon pressing the "off" button switch 76 to close the control switch as shown in Fig. 10. This energizes the lower coil attracting its armature 30 and tilts the rocker back to the position of Fig. 2, thus closing the circuit of the lower auxiliary switch and opening the circuit of the main switch.

When the rocker is in either the position of Fig. 2 or Fig. 4, the parts are latched in position and held there mechanically by the action of the springs 66, 66 and the dart-like latching projection 68. The circuit through the magnet will be opened as soon as the switch throws to the position corresponding to the control circuit which has been energized, due to the circuit transfer action of the respective auxiliary switch.

It will be seen that the duplex electromagnetic devices together with the latching device may be assembled as a unit, only one point of connection being required with the crank shaft of the main switch and the auxiliary switch being independently mounted.

We claim:

1. An electrical switch including a pair of electromagnets, armatures for said electromagnets hinged to each other and latching mechanism for preventing accidental movement of said armatures to or from the electromagnets including a rocker member having portions connected to said armatures and having an offset arm with a slotted portion, a stud on a fixed portion of the electromagnet extending through said slotted portion and a spring for urging the wall of said slotted portion against the stud.

2. An electromagnetically operated switch including two coils, a rocker pivotally mounted between said coils and an armature for each of said coils hinged respectively to one of the ends of said rocker and a spring pressed connecting device between the armatures and means coacting with said device to selectively lock either one of the armatures in its closed circuit position.

3. In combination with a main switch and auxiliary switches, a pair of electromagnets, a movable armature for each of said electromagnets, a pivoted rocker mounted between said electromagnets and having a hinged connection with each of said armatures, operative connections between said armatures and said main switch and auxiliary switches and latching mechanism for holding either of said armatures in either open or closed circuit position.

4. An electrical contactor including a pair of electromagnets, armatures for said electromagnets hinged to each other and latching mechanism for preventing accidental movement of said armatures to or from the electromagnets including a rocker member having portions connected to said armatures and having an offset arm with a slotted portion, a stud on a fixed portion of the electromagnet extending through said slotted portion and a spring having one end fixed to the hinge point for the armature and its other end fixed to the offset arm at a point in alignment with said hinge point, a projection on the wall of said slotted portion in alignment with said fixed points of said spring and adapted to engage said stud and hold the armature in closed or open circuit position.

5. An electrical contactor including a plate support, a pair of electromagnets on said support, a post on the plate between the electromagnets, armatures for said electromagnets hinged to one end of said post, a rocker member having its ends connected to said armatures at points on either side of said hinge point and having an offset arm loosely connected to said hinge point and provided with a slotted portion, a stud on the plate

support and extending through said slotted portion, a projection on the slotted portion and a spring for urging said sloted portion against said stud to hold either armature in "on" or "off" circuit position.

6. An electrical contactor including a plate support, a pair of electromagnets on said support, a post on the plate between the electromagnets, armatures for said electromagnets hinged to one end of said post, a rocker member having its ends connected to said armatures at points on either side of said hinge point and having an offset arm with an elongated slot for receiving the hinge pin and with a transverse slot with a projection at its central portion, a stud on the plate support in alignment with the hinge point and extending through said transverse slot and a spring having one end fixed to the hinge point for the armature and its other end fixed to the offset arm at a point in alignment with the hinge point whereby said rocker member is held in moved position.

7. In combination with a main switch and auxiliary switches, an electrical contactor including a pair of electromagnets, a post between said electromagnets, armatures for said electromagnets each having one of its ends hinged to said post, a connecting link having one of its ends hinged to the other end of each armature, a loose connection between the other end of each link and the movable contact of one of said auxiliary switches, and a loose connection between the latter end of one of said links and the movable contact of said main switch and latching mechanism for yieldingly holding either of said armatures and connected link in either open or closed circuit position.

8. An electrical contactor including a pair of electromagnets, a pivoted rocker mounted between said magnets and an armature for each of said electromagnets hinged to each of the opposite ends of said rocker and a spring pressed latch operably connected with said rocker for mechanically and positively holding a circuit open or closed, preventing accidental opening or closing of the circuit and eliminating magnetic hum.

9. An electrical contactor including two separate electromagnets, two discrete hinged armatures, one armature coacting with each electromagnet, a T-shaped rocker having arms hinged to the respective armatures and having a central upright with a latching projector, an abutment member coacting with said projector, a circuit making and breaking device connected to one of said armatures and a spring for biasing said rocker so that the latching projector is held in engagement with said abutment member.

10. In combination with a main switch having a movable contact member and two auxiliary switches each having a movable contact, a pair of electromagnets, a hinged armature for each magnet, a link connecting each armature to one of the movable contacts, the connection of one end of each link with its adjacent member being of the pin and slot type to permit relative free motion between the parts, and latching mechanism for yieldingly holding either one of said armatures and its connected link in either open or closed circuit position, said mechanism including a rocker hinged to each armature and having an intermediate spring pressed portion coacting with an abutment.

11. In an electromagnetically actuated switch, two spaced magnets, an armature for each magnet hinged at one end adjacent the space between the magnets, a rocker hinged to each armature and having a central arm with a projection having oppositely inclined edges, an abutment for said projection, a spring urging the projection against the abutment and an auxiliary switch actuated by each armature.

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