Aug. 2, 1938. J. F. FRESE 2,125,436

HIGH FREQUENCY ELECTRICAL SWITCH AND ELECTROMAGNETIC ACTUATING MEANS THEREFOR

Original Filed Aug. 5, 1933 2 Sheets-Sheet 1

FIG. 3

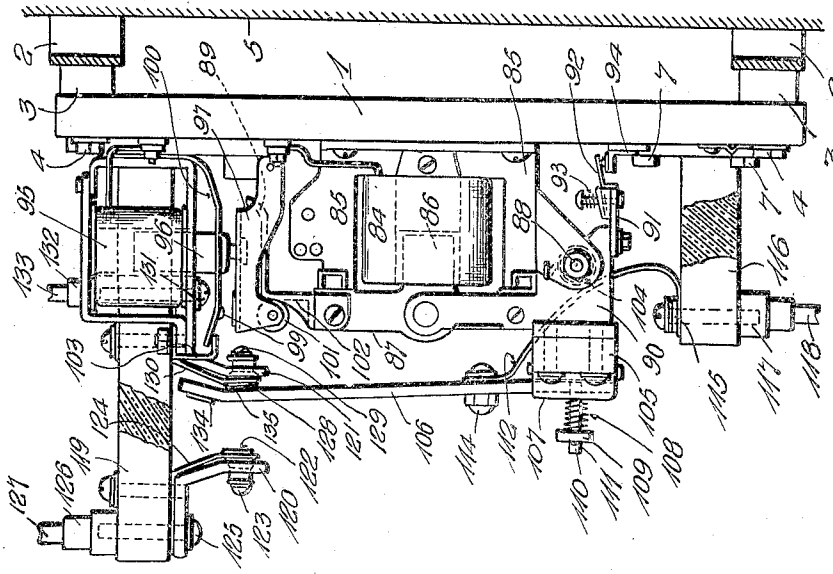


FIG. 2

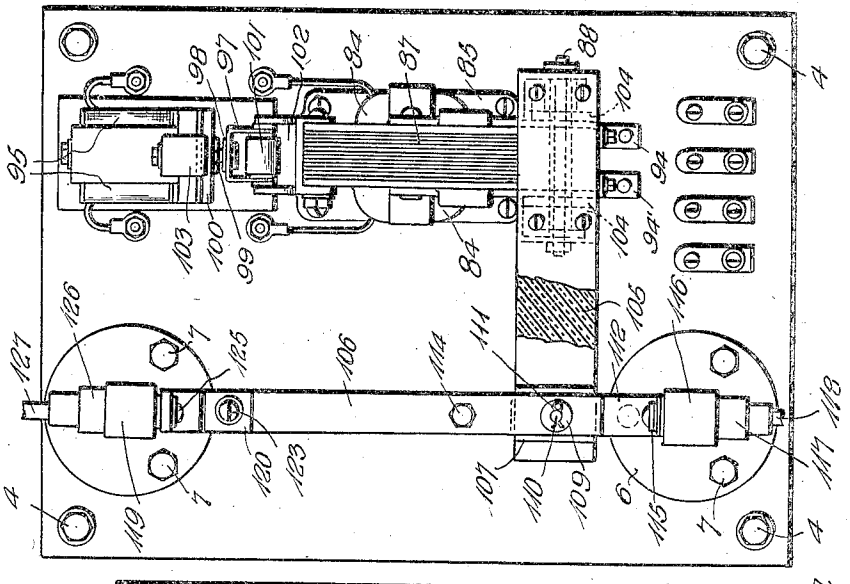
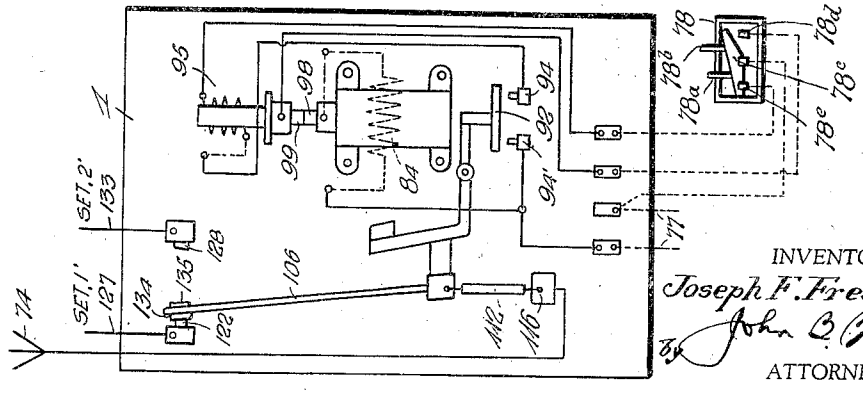


FIG. 1



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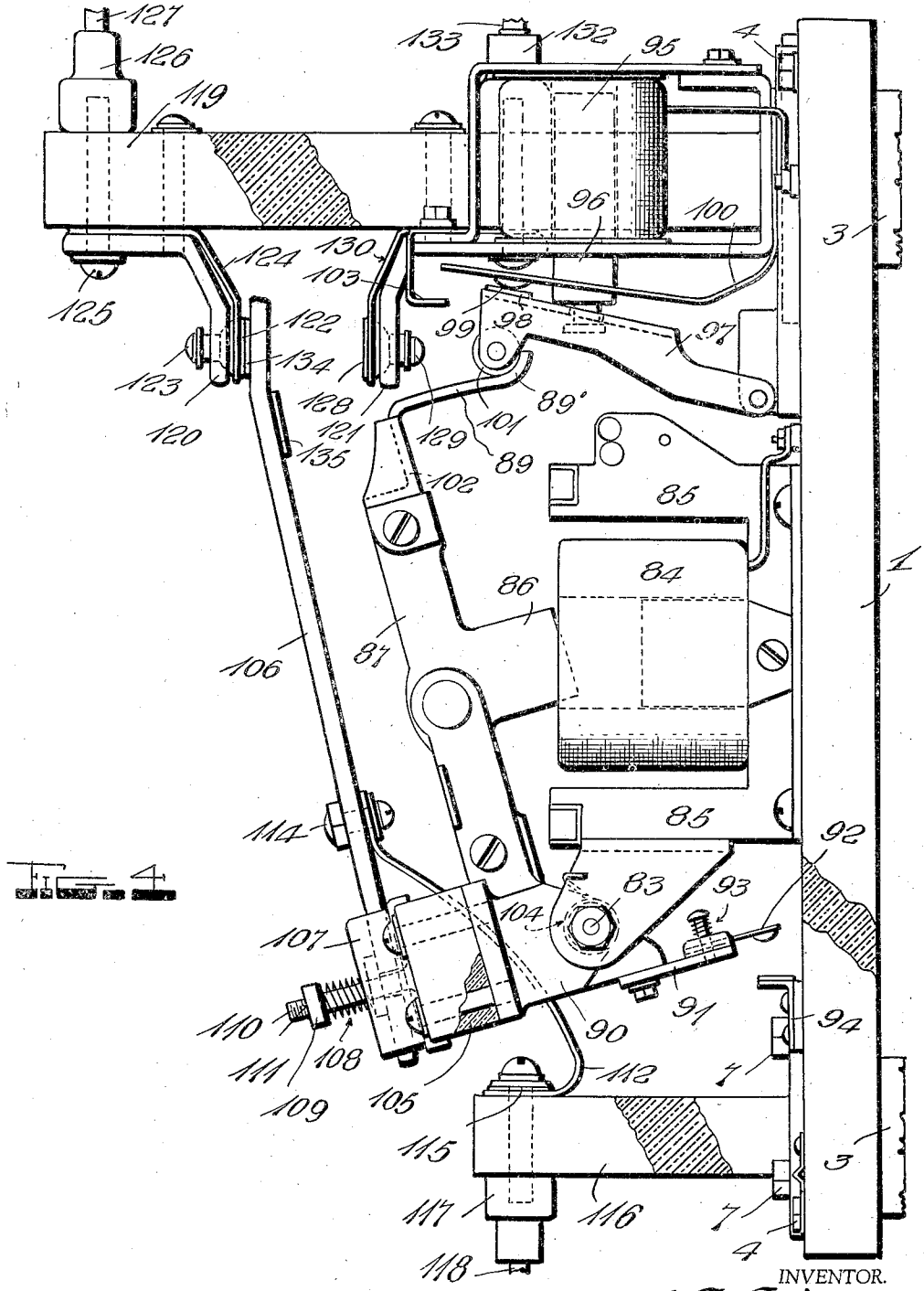

Fig. 4

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UNITED STATES PATENT OFFICE

2,125,436

HIGH FREQUENCY ELECTRICAL SWITCH AND ELECTROMAGNETIC ACTUATING MEANS THEREFOR

Joseph F. Frese, Baltimore, Md., assignor to Monitor Controller Company, Baltimore, Md., a corporation of Maryland

Original application August 5, 1933, Serial No. 683,861, now Patent No. 2,080,861, dated May 18, 1937. Divided and this application August 1, 1936, Serial No. 93,812

4 Claims. (Cl. 200—98)

My invention relates broadly to electrical switches, and more particularly to electrical switch and contactor systems for use in high frequency electrical circuits and to means for controlling electromagnetically actuated switches.

This application is a division of my copending application Serial Number 683,861, filed August 5, 1933, for "High frequency electrical switch and contactor system", which became Patent No. 2,080,861, dated May 18, 1937.

One of the objects of my invention is to provide a construction of electrical switch and contactor system offering minimum electrical capacity and subject to minimum dielectric losses when employed for the control of high frequency currents.

Another object of my invention is to provide a construction of high frequency electrical switch and contactor system in which maximum surface area is provided on the switch arm and electrical contactors for affording the maximum conductivity for high frequency currents.

A further object of my invention is to provide a construction of high frequency electrical switch and contactor system wherein a switch arm is pivotally mounted and shiftable under control of an automatic actuator for establishing connection with either of two electrical contactors carried by a standard formed of dielectric material, and wherein the contactors are so positioned with respect to the standard that all mechanical stresses and strains occur longitudinally of the standard thereby relieving the standard of undesired sheer forces.

A still further object of my invention is to provide means for automatically controlling the shifting of a pivotally mounted high frequency switch arm from one contactor to another through operation of a remote control device.

A further object of my invention is to provide a circuit arrangement for the control of a high frequency switch, wherein two sets of series connected switches, the switches of each set including a manually operated contactor and an automatically operated contactor, are connected with a power supply source and separate switch control mechanisms, and wherein the automatic contactors precondition each other for effectively controlling the switch control mechanisms.

Other and further objects of my invention reside in the construction of a high frequency switching system, as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

Figure 1 is a schematic view showing the wiring employed in connection with my improved high frequency switch; Fig. 2 is a front elevation of a preferred form of my invention of which Fig. 1 is a wiring diagram; and Figs. 3 and 4 are side elevations of the switch structure shown in Fig. 2, with the movable arm and associated control elements in alternative positions.

The switch control system of my invention employs a two-way manually operated remote control switch, as shown in Fig. 1, selectively operable in accordance with the position desired for the switch arm of the high frequency switch. The switch mechanism is mounted in a convenient location on a panel 1, and is compact in arrangement and highly efficient in operation. The operation of the control system shown in Fig. 1 will be more clearly understood after considering the structure of my invention illustrated in Figs. 2, 3, and 4.

Referring to the drawings in more detail, reference character 1 designates the base on which the parts of the high frequency switching system are mounted. Reference character 2 designates a bracket structure arranged at each end of the base in spaced relation thereto and secured by means of bolts 4 extending through spacer members 3 and secured to the brackets 2. Brackets 2 are secured to a ceiling, wall or panel structure indicated at 5. The base 1 is apertured in predetermined positions to receive socket members 6 which serve as supports for the dielectric standards. I employ a dielectric standard consisting of "Micalex" in which minimum dielectric losses occur by reason of the arrangement of the contact and pivot fittings with respect to the standards. As will be hereinafter pointed out, all mechanical stresses on the dielectric standards are produced longitudinally of the standards so that mechanical sheer stresses are reduced to a minimum. The sockets 6 are maintained in position with respect to base 1 by bolt members 7.

In the form of my invention illustrated, I employ an electromagnetic actuator having control solenoid 84 mounted on core structure 85. The solenoid 84 is of hollow construction and attracts the pole piece 86 carried by the armature 87. Armature 87 is pivoted at 88 with respect to the frame of the core structure 85. The armature 87 carries a fitting 90 on the end thereof on which insulated plate 91 is mounted. Insulated plate 91 carries the contactor 92 which is spring pressed as represented at 93. The contactor 92 coacts with stationary contacts represented at 94 and 94′ as mounted on base 1 which are sepa-

rately connected to the solenoid 95 and solenoid 84, respectively, as shown more clearly in Fig. 1.

The solenoid 95 controls the movement of armature 96 connected to the pivotally mounted arm 97. The pivotally mounted arm 97 carries a pilot contact 98 adapted to establish connection with contact 99 carried on the resilient strip member 100 when solenoid 95 is actuated. The circuit diagram of the solenoids 95 and 84 can be traced in Fig. 1. The pivoted arm 97 carries a roller member 101 which is adapted to latch over the end 102 of the armature 87 when armature 87 is moved to closed position by energization of solenoid winding 84, as shown in Fig. 3. The resilient strip member 100 bridges the armature 96 and is restrained from movement in one direction by hook bracket 103.

The armature 87 is spring tensioned by means of a coil spring indicated at 104 producing a continuous force on armature 87 which tends to move armature 87 to an open position. The fitting 90 provides a support for the "Micalex" strip 105 which projects normal to the axis of the armature 87 and carries on the end thereof the switch arm 106. The switch arm 106 is not rigidly connected to the end of the "Micalex" strip 105 but is secured thereto in a trough shaped guide 107 by means of a coil spring 108 confined in position by a washer member 109 connected to the pin 110 as represented at 111. A flexible electrical conductor 112 extends from a binding post 114 on switch arm 106 and connects to a binding post 115 carried by the extremity of the "Micalex" dielectric standard 116 mounted on base 1, as shown. A lug 117 is secured to the standard 116 by means of binding post 115 as shown and provides a connection for the conductor 118 thereby establishing a circuit to the moving switch arm in a manner which affords maximum conductivity to high frequency currents.

I provide a standard 119 formed from dielectric material such as "Micalex" and mounted on base 1, as shown. The standard 119 provides a support for the contactor bracket 120 and the contactor bracket 121, spaced longitudinally thereon and in alignment, as shown. The contactor bracket 120 provides mounting means for the contact member 122 which is angularly rockable with respect to the contactor bracket 120 under control of the screw device 123. The contact member 122 is connected through flexible lead 124 to the binding screw 125 which also serves to support the contact bracket 120 with respect to the standard 119. The lug 126 which is secured by the binding screw 125 to the standard 119 provides a connection means for the conductor 127 secured therein. The bracket 121 provides a mounting means for the contact member 128 which is angularly rockable in bracket 121 under control of the screw device 129. A flexible strip 130 provides a connection between contact member 128 and binding screw 131 which also serves to mount the bracket 121 in position on the standard 119 and provide a mounting means for the lug 132 into which the conductor 133 is arranged to extend.

The switch arm 106 bends at a slight angle adjacent the extremity thereof and carries a contact 134 thereon adapted to establish electrical connection with the contact member 122 in one extreme position of the switch arm 106, as illustrated in Fig. 4. A contact member 135 is mounted on the opposite side of the switch arm 106 in alignment with the contact member 128 for establishing connection therewith in the other extreme position of the switch arm 106, as has been illustrated in Fig. 3. It will thus be seen that contact is effected in planes substantially normal to the axis of the dielectric standard 119, and that strains in the standard, transmitted thereto through contact brackets 120 and 121, are maintained substantially longitudinal in the standard.

In the released position of the armature as shown in Fig. 4, I provide a tongue 89 extending from the end 102 of the armature 87 and having a curved end 89' which assures the connection of contacts 98 and 99 by further urging the arm 97 carrying the contact 98 towards the contact 99. The tongue 89 provides a surface over which the roller 101 passes as the armature is moved, the roller constituting an antifriction bearing on the tongue 89. The curved end of the tongue 89 also acts as a limiting abutment to prevent the further movement of the armature 87 under action of the springs 104. The abutment of contacts 122 and 134 limits the movement of the arm 106 but as the arm 106 is yieldably mounted with respect to the armature 87, the armature might be further displaced were it not for the limiting action of the curved end 89' of the tongue 89.

With reference now particularly to Figs. 1, 3 and 4, the operation of the switch and switch control system of my invention is as follows. The position of the switch arm 106 in Fig. 1 is the same as shown in Fig. 4; in other words, the armature 87 is disengaged from the solenoid 84, contacts 92 and 94, 94', are open, and contacts 98 and 99 are closed, as shown clearly in Fig. 1. The manual selector switch 78 comprises finger actuated members 78a and 78b, connected with the shiftable connector 78c, which is engageable with either of the contacts 78d or 78e. In the position shown the power supply 77 is connected through connector 78c to contact 78e, solenoid 95 and contact 94, but the circuit is incomplete through contactor 92, and contact 94' back to the power supply 77. The solenoid 95 is therefore inoperative. Closing of the switch 78 to contact 78d however, places contacts 99, 98, and solenoid 84 in circuit with the power supply 77, and the armature 87 is attracted by the action of the solenoid 84. Contacts 128 and 135 engage as shown in Fig. 3, the roller 101 on arm 97 latches over the end 102 of the armature to retain it in that position, and contacts 98, 99, are opened as the arm 97 becomes a latching means for the armature. Thus, the armature is retained in position though the circuit through the solenoid 84 is opened at the contacts 98, 99.

It will now be seen that contacts 94, 94' have been bridged by the contactor 92, connecting the solenoid 95 to the power supply 77. The circuit through the solenoid, however, is now open at the switch 78. Closing of this circuit by moving the connector 78c to contact 78e will energize the solenoid 95 which will attract the armature 96, and the arm 97 attached thereto, the roller 101 releasing the armature 87 which will be displaced by the action of the springs 104 to the position shown in Fig. 4, the circuit then again being as shown in Fig. 1, with the circuits to both solenoids open, but with the circuit to the solenoid 84 adapted to be closed at the switch 78.

It will be observed that the high frequency contact system is well isolated from the electromagnetic actuator. The portions of the switch subjected to the passage of high frequency currents are so formed that minimum capacity is encountered and maximum conductivity of the

high frequency currents with minimum losses is assured.

The high frequency switch of my invention is capable of extension to employ a plurality of switch arms 106 on the dielectric strip 105 and corresponding contacts mounted on additional dielectric standards, with all the switch arms simultaneously controlled by a single electromagnetic actuator in accordance with my invention as herein set forth.

I may provide the stationary contacts 122, 128, with corona shields of the type shown in my copending application Serial Number 683,861, now Patent No. 2,080,861, of which this application is a division; and I may employ a tubular switch arm of the general characteristics disclosed in my copending application Serial Number 92,261, filed July 23, 1936, for "High frequency electrical switch detail", which application is also a division of my copending application Serial Number 683,861, supra. The corona shields and the tubular switch arm may be employed in the switch structure hereinbefore set forth in order further to increase the efficiency of the switch at high frequencies.

I have found the high frequency switch and contactor system of my invention highly practical in its construction and efficient in its operation, and while I have described my invention in certain preferred embodiments, I desire that it be understood that modifications may be made and that no limitations upon my invention are intended other than are imposed by the scope of the appended claims.

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

1. Auxiliary switch structure for a self-locking electromagnetic switch, comprising pivotally mounted latching means for the self-locking switch, a contact carried by said latching means, a resilient strip member disposed substantially parallel to said latching means, a coacting contact carried by the strip member and adapted to engage the contact on said latching means, an actuating member connected with said latching means and extending normal thereto, said resilient strip member being apertured to pass said actuating member, and a stop engaged by said resilient strip member with the latching means in operative position for separating said contacts.

2. Auxiliary switch structure for a self-locking switch, comprising in combination with an armature and pivotally mounted latching means therefor in said self-locking switch, actuating means connected with said latching means, a resilient strip member disposed substantially parallel with said latching means intermediate said actuating means and said latching means, a stop engaged by said strip member with the latching means in operative position, and coacting contacts on said latching means and said resilient strip member engageable upon the operation of said actuating means, said armature having means engageable with said latching means for maintaining said contacts engaged with said armature in unlatched position.

3. In a high frequency switch, a dielectric standard, a pair of contacts carried by said standard in alignment and spaced longitudinally thereon, a switch arm mounted for movement about an axis unequally distant from said contacts, and coacting contacts disposed on said switch arm in selected displaced positions adapted to engage said pair of contacts, said switch arm being bent in order that coacting contacts on said arm and said standard engage in planes substantially normal to said standard, whereby strains in said standard are maintained substantially longitudinal thereof.

4. A high frequency switch comprising a fixed contact mounted on a dielectric standard, a pivotally mounted dielectric support extending parallel with its axis of support, a switch arm mounted on said support and extending normal thereto and adapted to coact with said fixed contact, self-locking electromagnetic actuating means for said switch including an armature connected with said dielectric support at a substantial distance from said switch arm, a fixed extension on said armature disposed normal thereto and having a shoulder portion in the plane of said armature, pivotally mounted latching means engageable with said shoulder portion, auxiliary actuating means connected with said latching means and operable to release the latching means from engagement with said shoulder portion, a resilient strip member disposed intermediate said auxiliary actuating means and said latching means, coacting contacts on said strip member and said latching means, a stop engageable by said strip member with the latching means in operative position, and means on said extension engageable with said latching means for maintaining said contacts engaged and for limiting the movement of the armature in unlatched position.

JOSEPH F. FRESE.