

March 24, 1953

P. V. YINGST

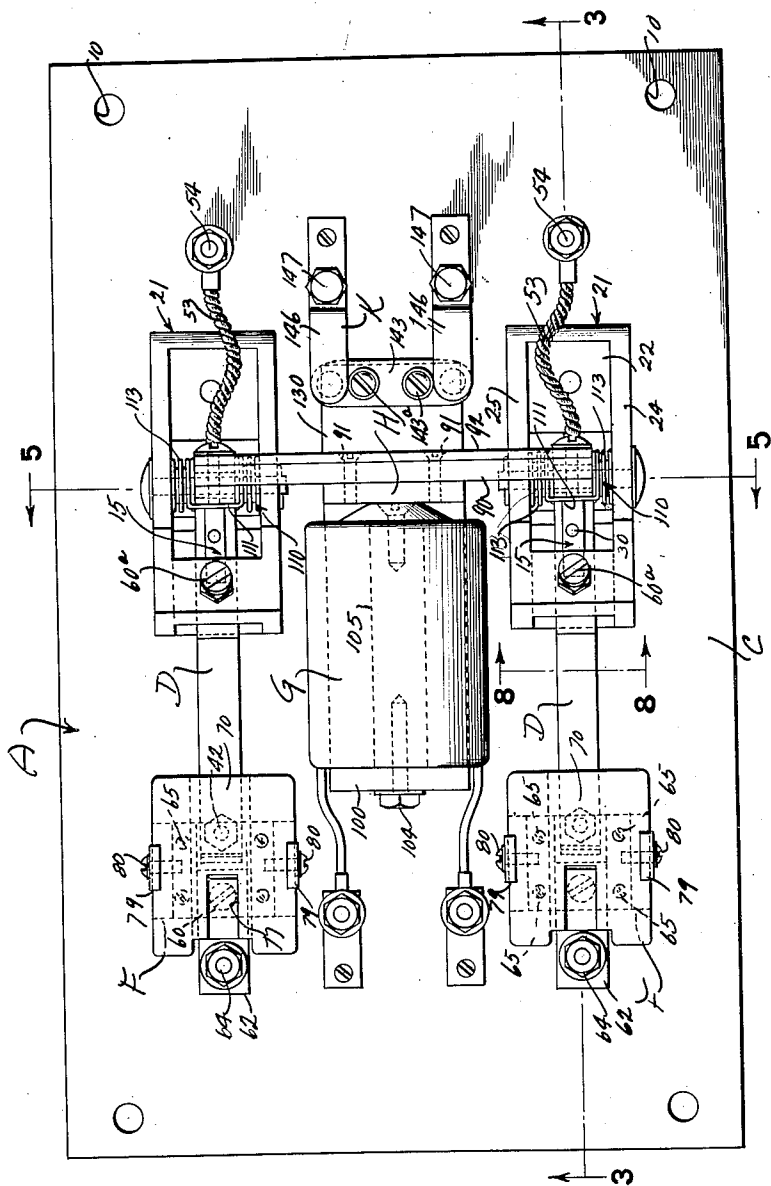
2,632,822

CONTACTOR

Filed Feb. 12, 1948

4 Sheets-Sheet 1

FIG. 1.



INVENTOR.

Paul V. Yingst

BY

Lancaster, Allen & Rommel

ATTORNEYS.

Filed Feb. 12, 1948

P. V. YINGST

4 Sheets-Sheet 2



Paul V Yingst

BY *Lancaster, Allen & Pennell*
ATTORNEYS.

ATTORNEYS.

March 24, 1953

P. V. YINGST

2,632,822

CONTACTOR

Filed Feb. 12, 1948

4 Sheets-Sheet 3

FIG. 4.

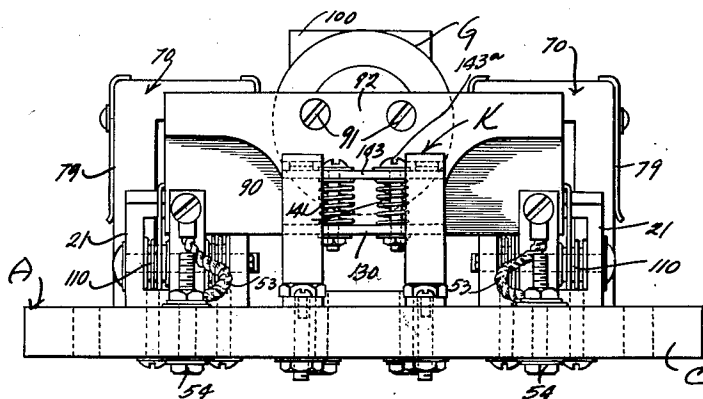


FIG. 5.

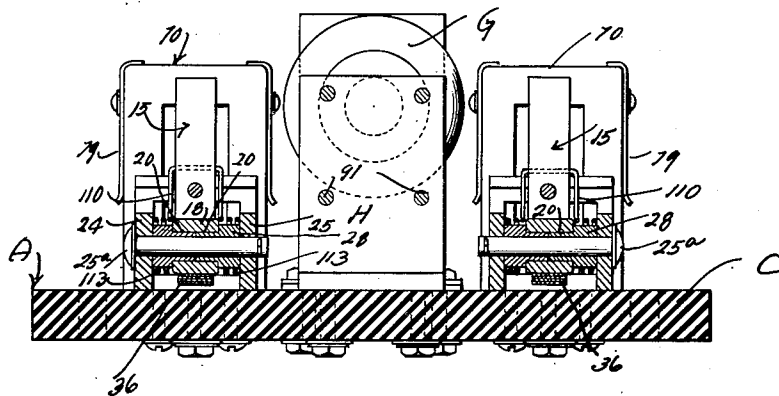
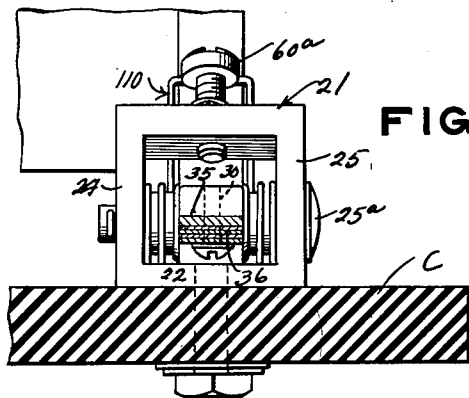


FIG. 8.

INVENTOR.

Paul V. Yingst

BY

Lawrence, Allen & Rommel
ATTORNEYS.

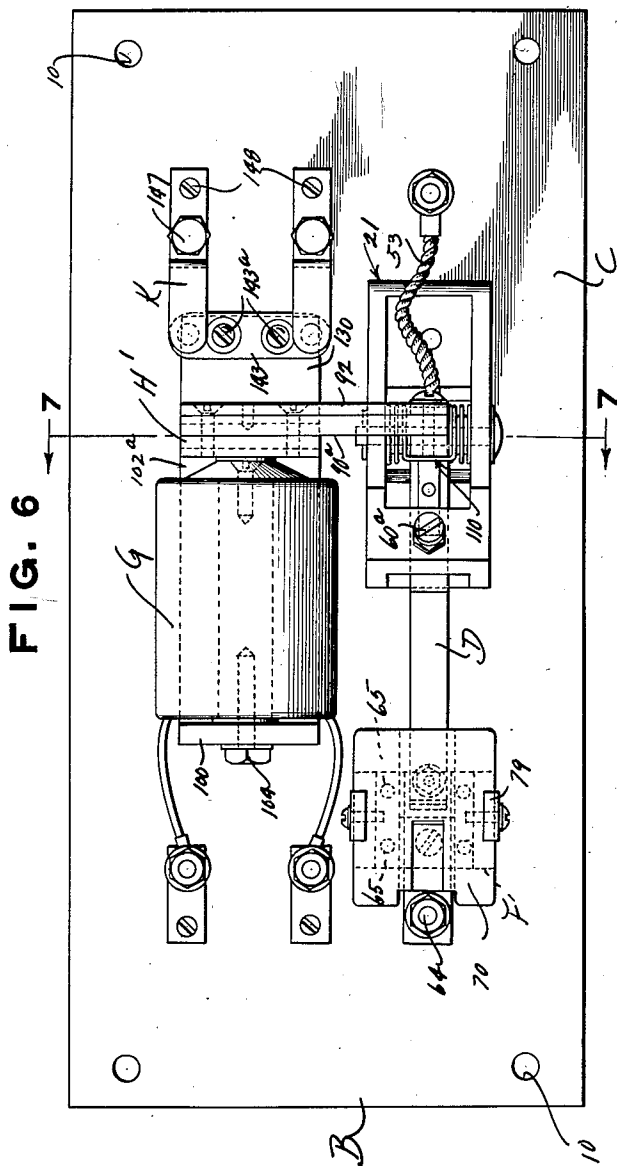
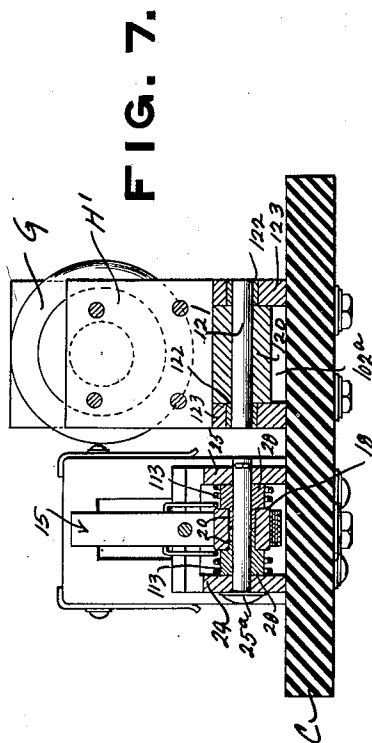
March 24, 1953

P. V. YINGST
CONTACTOR

2,632,822

Filed Feb. 12, 1948

4 Sheets-Sheet 4



INVENTOR.
Paul V. Yingst
BY *Lawrence Allen Rommel*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,632,822

CONTACTOR

Paul V. Yingst, Norwood, Ohio, assignor to The
Post-Glover Electric Company, Cincinnati,
Ohio, a corporation

Application February 12, 1948, Serial No. 7,893

6 Claims. (Cl. 200—104)

1

This invention relates to improvements in contactor constructions.

The primary object of this invention is the provision of an improved contactor for electrical circuits which is relatively simple in operation, compact and extremely durable.

In present day contactors the electromagnetic coil is conventionally disposed with its axis normal to the plane of the panel or base. In the present contactor the coil has its axis parallel to the plane of the base. With this construction the armature and contact arm can be pivoted close to the panel. Some of the advantages of the improved contactor over contactors of equal capacity are:

- (a) Strain upon the panel is decreased;
- (b) The weight of the mounted parts is more evenly distributed;
- (c) Overall-dimensions are decreased;
- (d) The center of gravity of pivoted parts is moved closer to the panel;
- (e) Wearing surfaces are reduced, and there is a reduction in the moment of inertia of the contact arm or arms, as the case may be.

A further object of this invention is the provision of an improved contact arm construction which embodies means to produce contact pressure without the necessity of providing extra springs, etc.

A further object of this invention is the provision of an improved contactor wherein the current capacity of the contactor is independent of the current carrying capacity of the contact arm.

A further object of this invention is the provision of oilless bearings for the pivoted parts of the contactor.

A further object of this invention is the provision of a permanent magnet associated with the contact tips in such manner as to produce a high flux density in the air gap for the purpose of quickly extinguishing sparks caused by breaking of the contacts.

Other objects and advantages of this invention will be apparent from the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts thruout the several views—

2

Figure 1 is a plan view of the improved contactor showing a double pole main line type.

Figure 2 is a side elevation of the contactor of Figure 1.

Figure 3 is a longitudinal cross sectional view taken substantially on the line 3—3 of Figure 1.

Figure 4 is an end view of the armature end of the contactor.

Figure 5 is a transverse cross sectional view taken substantially on the line 5—5 of Figure 1.

Figure 6 is a plan view of a single pole type of contactor.

Figure 7 is a cross sectional view taken substantially on the line 7—7 of Figure 6.

Figure 8 is an enlarged sectional view taken substantially on the line 8—8 of Figure 1 and showing an improved contactor arm mounting.

In the drawings, wherein for the purpose of illustration are shown single pole and double pole types of contactors, the letter A may generally designate the double pole contactor and B the single pole contactor. They both embody similar constructions, with the exception of the coil armature mounting. In the single pole type contactor the armature has a separate pivot axis and in the double pole type the armature is carried by parts connected to the pivots of the two contact arm mountings.

Insofar as applicable, similar reference characters designate corresponding parts thruout the several views, and in the several forms of invention shown.

Referring to the forms of inventions A and B, each of the same includes a panel C having an improved contact arm structure D adapted for cooperation with a contact E with which is associated an arc extinguishing means F. A coil G is provided with which is associated, in the form of invention A, armature H, and in the form of invention B, an armature H'. With each of the forms of inventions A and B there may be provided an auxiliary contact assemblage K.

The panel C is of a size and nature to conform to the capacity of the contactor and it may be provided with suitable apertures 10 for receiving mounting bolts. The base may be mounted in vertical, horizontal or angular planes, as desired.

Referring to the contact arm construction D, the same preferably includes a cast aluminum rocker arm 15 of L-shaped formation. It com-

prises a lower contactor arm connecting portion 16 and a right-angled armature connecting portion 17. The arm 15 is provided with a barrel portion 18 adapted to receive from opposite sides thereof (Fig. 7) the reduced sleeve ends 20 of oil-less type of sleeve bearings.

A cast aluminum rocker arm support or bracket 21 is provided, having a base portion 22, bolted as at 23 to the panel C, as shown in Figure 3. This bracket 21 includes wall portions 24 and 25 extending normal to the plane of the panel C for supporting a mounting pin or shaft 25a, as shown in Figure 7. The mounting pin 25a has a head at one end and is secured by means of a cotter pin at its other end to the bracket structure, as shown. The flanged-type of oil-less bearings include, in addition to the sleeve portion 20, the outer enlarged flange portions 28 which abut the inner surface of the bracket supporting walls 24 and 25.

To the under surface of the rocker arm portion 16 is secured, by bolts 30, a beryllium-copper spring arm portion 35 of an inherent springy nature. With arm 35 is associated, as part of the contact arm, a laminated copper strip construction consisting of a plurality of copper strips 36. The parts 35 and 36 are connected to the rocker arm portion 16 by bolts or screws 30. At its end the contact arm is provided with a copper contact tip 40 which is silver inlaid. It covers the lower surface and the front edge of the arm and is provided with a screw threaded stud 41 which extends thru the end of the beryllium-copper spring arm portion 35 and is secured thereto by means of a nut 42. The laminations 36 are provided with kinks defining an expansion loop 50. The beryllium-copper portion 35 terminates at the mounting sleeve portion 18 of the rocker arm but the copper laminations continue around the portion 18 and extend upwardly for connection by means of a terminal bolt 52 to the rocker arm portion 17. This terminal bolt 52 also connects a conductor braid 53, the opposite end of which is connected to a binding post 54.

The copper contact E, which has a silver inlay tip, is mounted by means of a bolt 60 to the bight or base portion 61 of a U-shaped permanent magnet comprising part of the arc blowout F. The copper-silver contact E is provided with a face which slopes slightly towards the plane of the panel C, as will be noted from Figure 3, for efficient contact engagement with the contact tip 40 of the contact arm. A connecting link 62 is clamped between the contact E and the base 60 for conductor attachment with the binding post 64.

The U-shaped permanent magnet may be attached to the panel by means of screws, shown in dotted lines at 65 in Figure 1 of the drawings. It is to be noted that the surface engagement of contacts 40 and E lies within the permanent magnet.

An insulation and heat dissipating shield 70 is detachably connected with the upstanding walls or flanges 71 of the permanent magnet. It straddles the compartment wherein lie the contacts 40 and E and consists of a top wall 72, depending side walls 73 and a rear wall connecting lower portion 74. The walls are arranged to define a compartment, shown at 76, which opens forwardly. The shield 70 has a passageway 77 for heat dissipation. The outer surfaces of the wall portions 77 are recessed for receiving the flanges 71 of the permanent magnet and the shield is provided with spring clip attaching arms

79 secured at 80 thereto, the lower ends of which are stud-notched to frictionally engage in recesses (not shown) located on the outer surfaces of the flanged portions 71 of the permanent magnet. It is obvious that the shield may be readily pulled upward and detached from the permanent magnet to expose the contacts.

For the double pole type of contactor, the above contact arm and complementary arc blowout are duplicated as shown in Figures 1, 4 and 5 of the drawings. They are located in complementary relation and the rocker arm portions 17 thereof support an insulation plate or panel 90, secured as by screws 91 thereto. The terminal braid connecting bolt 52 also aids in securing the insulation plate 90 in position and the insulation panel is reinforced by a metal strip or plate 92 to which the screws or bolts 52 are also connected, as shown.

The electromagnet includes a coil G mounted upon an axis which is parallel with the plane of the panel C and as close as possible to the panel. Mounting is made upon the outstanding wall portion 100 of a yoke or bracket, the bottom or base 102 of which is attached by means of bolts 103 to the panel C. As is more clearly shown in Figure 6 of the drawings, the wall 100 of the yoke has attached thereto bolt 104 which extends into the core structure 105 of the coil. This efficiently mounts the coil in stable position upon the panel.

The armature H, of the double pole type of connector, is connected by the bolts 91, shown in Figures 1 and 4 to the reinforcing strip 92 and the insulation plate 90.

Each of the contact arms for the single and double pole-types of contactors includes an improved spring arrangement, best shown in Figures 2, 5, 7 and 8 of the drawings which may be appropriately referred to as a double torsion type spring for the purpose of holding the contactor arm or arms open. These springs are centered on the pivot shafts of the respective contact arms. Each spring, designated at 110 in the drawings, includes a U-shaped portion the bight 111 of which engages the exposed face of the rocker arm portion 17 and thence extends downwardly at an acute angle to the plane of the contact arm and terminates in coil spring portions 113 wrapped around the flanged parts 28 of the rocker arm bearing structures. The normal effect of the springs 110 is to hold the contact arms open with respect to the contacts E, and of course to move the armature away from the core.

The armature structure H' for the single pole type of contactor switch shown in Figures 6 and 7, is provided with a sleeve portion 120 provided with a fixed pin 121, the ends of which seat in sleeve type oil-less bearings 122 mounted in ears or bearing lugs 123 which are integral with the coil mounting yoke base 102a, shown in Figure 7.

The contactors A and B are each provided with an auxiliary contact assembly which consists of a base piece 130 integral with the reinforcing plate 92. This supporting portion 130 is provided with a pair of fixed upstanding studs which may be bolted in fixed relation as at 142. The upper ends thereof are provided with heads shown at 143a. The slidable contact supporting strip 143 is mounted upon the studs and urged upwardly by means of compressed springs 141. At its ends the strip 143 is provided with a pair of contacts 144 adapted to engage with complementary con-

tacts 145 mounted upon suitable bracket structures 146 which may be attached as at 147 upon the panel C. Terminals 148 may be provided for the contacts 145.

The cast aluminum bracket structure for mounting of the rocker arm is provided with an air gap adjusting screw 50a mounted thereon, the purpose of which is obvious.

Briefly referring to the operation of the invention, the contactor is designated to cooperate on 80% to 100% rated voltage. When operating voltage is applied to the coil G a pull is exerted upon the armature H or H', as the case may be. Since the armature is secured to the rocker arm, the latter will be rocked in a direction which will close the contacts 40 and E. The beryllium-copper contact arm acts as a single plate cantilever spring and applies pressure to the contacts, since it will necessarily flex into such position upon coil attraction of the armature. With a contactor having a maximum capacity of 100 amperes per pole, 250 volts, a pressure of approximately 3.5 lbs., is produced by the beryllium-copper contact spring.

When voltage is removed from the coil, the force exerted by the contact arm spring or springs will break the magnetic seal and the armature return springs 110 return the contactor arm to open position. When the contactor opens under load, the arc caused by the breaking of the contact is extinguished by the permanent magnet blowout and the shield, of course, assists in dissipating the heat.

It is quite apparent that the upper laminated shunt carries the major portion of the current since the beryllium-copper contact arm has a low conductivity in order that it may possess the required physical characteristics. The beryllium-copper spring portion 35 is so constructed as to constituents and heat treating that the elongation produced incident to operation very nearly is equivalent to that of copper. However, to provide for any difference in elongation, the expansion loop 56 is provided. This loop also permits expansion of the copper laminations in relation to the beryllium-copper spring arm 35 when the contactor closes.

Various changes in the shape, size and arrangement of parts may be made to the form of the invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a contactor the combination of a supporting panel of insulation material, an electromagnet including a coil, means mounting the coil upon an axis parallel with the plane of the panel, a bell crank type rocker arm construction including a pair of arms pivoted at their juncture upon a fixed pivot axis located immediately adjacent to the panel, an armature mounted upon one of the arms for said coil, a fixed contact upon the panel, a spring contact arm construction mounted upon the other rocker arm including a contact portion for the fixed contact first mentioned, and an independent unitary auxiliary contact assembly including a stationary contact carried by said panel and a movable contact carried by and connected with that arm of the rocker arm construction which has the armature mounted thereon for movement therewith.

2. In a circuit controlling contactor the combination of an insulation base, an electromagnet including a coil, an armature for said coil, means mounting the armature on an oil-less bearing

with a pivot axis close to said base, and a pair of main line contacts one of which is mounted upon the base in stationary relation and the other of which includes a contact arm and an oil-less bearing pivotally mounting the contact arm upon the base with a pivot axis close to the base and in alignment with the pivot axis of said armature.

3. In an electrical contactor the combination of an insulation panel, an electromagnetic coil mounted upon said panel with its axis parallel to the plane of the panel and close thereto, a main line switch arm pivotally mounted on a definite axis upon said panel, with the axis thereof parallel to and close to the panel and including oilless bearings therefor, and an armature for the electromagnet pivotally mounted upon the panel on an axis close to the panel in other oilless bearings and with the axis in line with the axis of the switch arm.

4. In an electrical contactor the combination of an insulation mounting panel, an electromagnet, means mounting the electromagnet upon the mounting panel with its axis close to the adjacent surface of the panel and parallel to the plane of the panel, a bracket construction mounted upon the panel, an L-shaped rocker arm construction including a pair of connected arm portions, oilless bearing means mounting the rocker arm construction at the juncture of the arm portions upon said bracket on an axis parallel to the plane of the panel and close to the adjacent surface of the panel, a fixed main line contact mounted upon the panel close to the panel, a spring contact arm construction mounted upon one of the arm portions of said rocker arm including a contact for engagement with the fixed contact upon the panel, an armature mounted upon the other arm portion of the L-shaped rocker arm in position to be attracted by the electromagnet, the armature bearing such relation to the electromagnet that when the same is attracted by the electromagnet the spring arm will flex under tension to force the contact thereof into close forceful engagement with the fixed contact, a blowout construction mounted upon the panel for said contacts, and means carried by said bracket to adjustably limit the movement of the switch arm contact away from the fixed contact.

5. In an electrical contactor the combination of an insulation mounting panel, an electromagnet, means mounting the electromagnet upon the mounting panel with its axis close to the adjacent surface of the panel and parallel to the plane of the panel, a bracket construction mounted upon the panel, and L-shaped rocker arm construction including a pair of connected armed portions, oilless bearing means mounting the rocker arm construction at the juncture of the arm portions upon said bracket on an axis parallel to the plane of the panel and close to the adjacent surface of the panel, a fixed main line contact mounted upon the panel close to the panel, a spring contact arm construction mounted upon one of the arm portions of said rocker arm including a contact for engagement with the fixed contact upon the panel, an armature mounted upon the other arm portion of the L-shaped rocker arm in position to be attracted by the electromagnet, the armature bearing such relation to the electromagnet that when the same is attracted by the electromagnet the spring arm will flex under tension to force the contact thereof into close forceful engagement with the fixed

7

contact, a blowout construction mounted upon the panel for said contacts, and means carried by said bracket to adjustably limit the movement of the switch arm contact away from the fixed contact, and an auxiliary contact construction including a contact carried by said panel, and a yieldably urged contact carried by said armature in position to force the auxiliary spring urged contact into engagement with the panel connected auxiliary contact upon attraction of the armature by said electromagnet.

6. In a circuit closing contactor the combination of a supporting insulation panel, an electromagnet having a coil, means supporting the electromagnet upon the panel with the coil axis parallel and close to the panel, an armature pivotally mounted upon the panel for said coil, a line contact fixedly carried by the panel, a resilient arm connected to the armature for movement therewith having a contact for engagement with the panel contact upon attraction of the armature by said coil, and an auxiliary contact assembly including a rigid arm connected with said armature and movable therewith and extending transverse thereto and in a direction opposite from the contact arm first mentioned with respect to the pivot axis of said armature, an auxiliary stationary contact mounted upon the panel, a movable contact carried by said rigid auxiliary contact arm, and spring means normally urging the movable contact last mentioned into engagement with the auxiliary panel

8

mounted fixed contact when the armature is attracted by said coil.

PAUL V. YINGST.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

	Number	Name	Date
10	894,645	Hill	July 28, 1908
	1,026,003	Stecker	May 14, 1912
	1,165,192	McMillion	Dec. 21, 1915
	1,309,822	Steen	July 15, 1919
15	1,327,951	Haas	Jan. 13, 1920
	1,501,708	Proberger	July 15, 1924
	1,680,701	Stancliff	Aug. 14, 1928
	1,732,750	Hodgkins	Oct. 22, 1929
	1,753,726	Sosinski	Apr. 8, 1930
20	1,892,045	Ellis	Dec. 27, 1932
	1,925,997	Barkham	Sept. 5, 1933
	1,935,512	Massey	Nov. 14, 1933
	1,955,961	Jackson	Apr. 24, 1934
	1,975,115	Masing	Oct. 2, 1934
25	2,037,662	Kurz	Apr. 14, 1936
	2,187,307	Friend	Jan. 16, 1940
	2,253,483	Menzel	Aug. 10, 1941
	2,332,446	Heinrich	Oct. 19, 1943
	2,393,203	Tarbell et al.	Jan. 15, 1946
30	2,393,784	Leavitt	Jan. 29, 1946
	2,416,358	Stilwell, Jr.	Feb. 25, 1947
	2,421,998	Cypser	June 10, 1947