Nov. 3, 1953 W. VON STOESER 2,658,123

HOLDING RELAY

Filed Sept. 14, 1950

Fig. 1

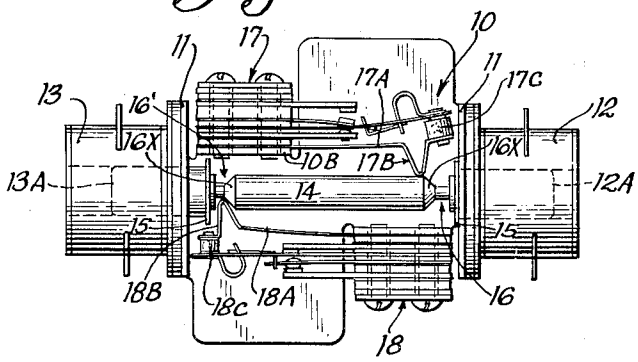


Fig. 2

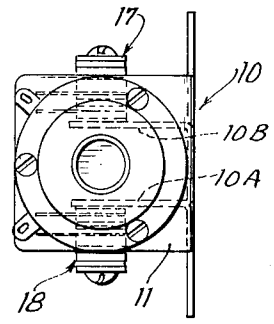


Fig. 3

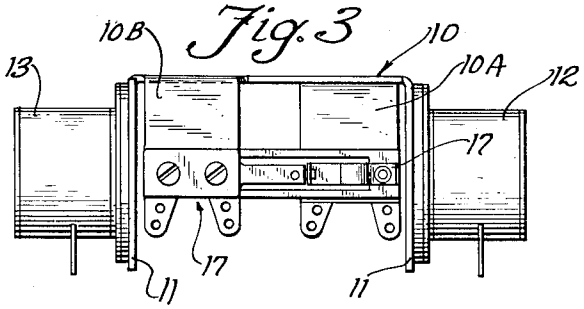
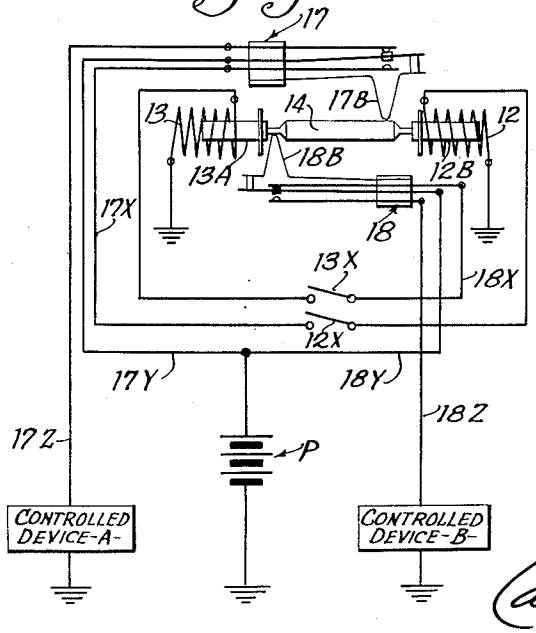


Fig. 4



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HOLDING RELAY

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3 Claims. (Cl. 200—100)

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The invention disclosed pertains to relays and like electromagnetically actuated switch devices, the particular improvements relating to the provision of a novel holding and releasing means by which the relay switches may be held in, and released from, their several operating conditions.

One of the more detailed features of the improvement resides in the provision of a holding type relay having a reciprocable plunger common to two solenoids for selective reciprocating by the same, and switches having spring blade parts adapted to operate as detents in notches in the plunger.

Additional objects and aspects of novelty and utility characterizing the improvements will appear as the following specification proceeds in view of the annexed drawing, in which:

Fig. 1 is a top plan view of the relay;

Fig. 2 is an end view of the relay;

Fig. 3 is a side elevation of the relay;

Fig. 4 is a diagram for a holding circuit for the relay.

Referring to Figs. 1 and 3, the relay structure includes a stamped mounting having a base portion 10 with opposite upstanding end flanges 11, on each of which is mounted a solenoid winding 12 or 13, the solenoids having their respective bores in axial alignment to receive respectively the opposite magnetically attractable ends or core parts 12A and 13A of a plunger structure 14.

Means for limiting the reciprocatory movements of the plunger, and for maintaining the plunger in assembled condition, to include a pair of spring C washers 15 sprung into grooves closely adjacent switch detent notches 16 and 16' formed adjacent the aforesaid core parts 12A and 13A.

Struck-up from the base portion 10 on opposite sides thereof are brackets 10A and 10B (Fig. 3), upon each of which is mounted respectively a stack switch 17 or 18, preferably of the snap-action variety.

Each of said stack switches is provided with an actuator blade 17A, 18A, respectively, having corresponding plunger detents 17B and 18B, respectively engageable in the plunger notches 16 and 16' when the same are appropriately positioned by movements of the plunger means into the opposite positions.

Each notch formation 16 or 16' is preferably a circumferential or annular groove in the plunger body 14, and each groove has a circumferential cam face 16X for the associated switch detent or pawl.

Thus the plungers may be made as simple screw machine parts, and may rotate freely in the bores of the coils 12 and 13.

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Where magnetic heel pieces or plugs are used in the bores of the coils 12 and 13 to improve the magnetic circuit and efficiency, the C washers 15 may be omitted.

Each actuator blade 17A, or 18A, is associated, as at 17C or 18C, with the snap-action assembly of the corresponding switch, so that flexures of the actuator blades in movements of their respective detents into and out of the plunger notches, operate the associated snap-action switch means; and the latter may be calculated to operate only when the plunger 14 is displaced positively a certain distance.

The snap-action of the switches, plus the cam action of detents (as 17B) on the annular cam face 16X, assists in positive positioning of the plunger.

A snap stack-switch suitable for use in this relay is shown in my U. S. Patent No. 2,500,476.

Illustrative of one application of the holding relay, is the circuit shown in Fig. 4, wherein the solenoid coils 12 and 13 each have one terminal grounded, and their respective remaining terminals connected through some type of normally open control switch 12X and 13X to one of the snap-switch contact blades by conductors 17X or 18X.

In this example, each snap switch has its middle contact blade connected, as by conductors 17Y and 18Y, respectively, to a source of power P, such as the grounded battery shown.

The remaining snap-switch contact blades are respectively connected, as by conductors 17Z and 18Z, to grounded controlled devices A and B.

In operating the relay, energization of the appropriate solenoid 12 or 13 will cause the plunger to be attracted accordingly.

In the condition shown in Fig. 4, the core part 12A is already in attracted condition, and the snap switch 18 is actuated to condition an operating circuit for coil 13 via conductors 18X and 18Y provided the control switch 13X is closed (for instance, manually).

Under the conditions, closure of switch 13X will energize coil 13, attracting plunger core 13A until the detent 17B drops into notch 16, thereby actuating switch 18 to open the circuit via conductors 18X, 18Y and deenergize coil 13.

As a further result of operation of snap-switch 18, as aforesaid, an operating circuit for some desired "controlled device B" will now be closed via conductors 18Y and 18Z.

The aforesaid movement of the plunger 14 will also open a circuit theretofore completed by the snap-switch 17 via conductors 17Y, 17Z for another "controlled device A," and will also condi-

tion an operating circuit for energization of solenoid coil 12 via conductors 17X, 17Y, if the control switch 12X is closed.

In the illustrative circuit, the coil 12 is supervised by the relay switch 17, and coil 13 by the relay switch 18, in such manner that once either coil is energized, it cannot again be energized until the other coil is energized to restore its supervisory operating circuit.

Thus, if the master control switch 12X has been operated, relay or snap switch 17 will have opened the supervisory holding circuit via conductors 17X, 17Y, so that the relay cannot again be operated until master control switch 13X is first operated to actuate the other relay coil 13, to restore the condition of relay switch 17 and set up the circuit via conductors 17X and 17Y so that master switch 12X can once again be effective to energize the relay coil 12.

Other control circuits for coils 12 and 13 may be used. For example, coils 12 and 13 may be energized directly without any supervisory connections whatever through relay switches 17 and 18; and the latter may be utilized for any desired control purposes.

The relay structure disclosed is very stable in operation. There is little load on the armature or plunger means 14, 16; the plunger is in effect locked in its operated positions by the switches 17, 18; and the latter do not operate unless there has been a predetermined minimum displacement of the plunger.

The number of snap switches is not limited to two, since the plunger means 14 may be elongated to accommodate additional switches.

While the operation of the relay with snap-action stack-switches is highly satisfactory, ordinary stack-switches, having no snap-action mechanism, may be successfully employed where desired, or both types may be used on one relay.

By enlarging the length (axially) of the grooves 16 and appropriately pitching the cam faces 16X, the starting load on the plunger may be adjusted; and the depth of grooves 16 may be selected to minimize the loading effect of the spring blades 17A, 18A, and their detents while giving good indexing effect to hold the plunger units opposite positions. Good switch action may be had from relatively slight plunger displacements for either the snap-action or ordinary type of stack switch.

I claim:

1. A holding relay including a base, oppositely facing integral end plates on said base, a pair of axially aligned and spaced solenoids mounted on said base, each on one of said plates, a plunger reciprocable in said solenoids responsive to alternate energization thereof, integral flange means on said base on opposite lateral sides of said plunger, at least two stack switches one of each being carried on one of said flanges to extend in approximate parallelism alongside said plunger, at least two detent notches in said plunger one of the same being situated adjacent each solenoid, and each said switch having an actuator blade with a free end opposite one of said notches with a lateral offset movable into and out of the corresponding notch and adapted to ride on said plunger when not in the notch, said notches being situated such that reciprocatory movements of the plunger responsive to energizations of the solenoids as aforesaid will cause said detents to ride into and out of their respective notches to actuate the corresponding switches.

2. In a relay, a base having a pair of upstanding oppositely-facing end flanges integral therewith, and a pair of upstanding side flanges each of which closely adjoins one of said end flanges but on opposite sides of the base; a pair of axially aligned solenoids each of which is mounted on one of said end flanges; a reciprocable solenoid plunger having opposite end portions each movable in the bore of one of said solenoids, a stack-type spring-blade switch mounted on each side flange with its blades extending in parallelism with said plunger with their respective free ends situated closely adjacent the solenoid at the opposite end of the base, said plunger having two circumferential cam grooves therein one closely adjacent each solenoid, each said switch including an actuator blade with a laterally offset cam rider near a free end thereof and riding said plunger and movable into and out of the cam groove remote therefrom to operate the switch in alternation as a result of displacements of said grooves responsive to reciprocatory movements of the plunger, said grooves and cam riders being respectively spaced such that said switches are actuated substantially simultaneously but in reverse senses responsive to opposite movements of the plunger effected by alternate energization of said solenoids.

3. In a relay, a base stamping including a bottom portion having a pair of integral, upset, confronting coil flanges on opposite sides thereof, and a pair of integral switch flanges upset on opposite sides of the bottom respectively adjoining the two opposite sides on which said coil flanges are located, each said switch flange being contiguous to one of said coil flanges but offset from each other so as not to be in confronting alignment; a solenoid coil mounted on each coil flange with its bore aligned with the bore of the opposite solenoid coil; a common solenoid plunger reciprocable in the bores of the solenoid coils, a stack-type spring-blade switch mounted on each said switch flange and each having an operating blade with a cam and detent part riding on said plunger adjacent one of said coils, said plunger having a cam and detent formation near each said coil for cooperation with an adjacent cam and detent part of one of said switches, said plunger being adapted to be oppositely attracted and reciprocated by alternate energization of said coils to actuate said switches by camming cooperation of the cam and detent parts thereof with corresponding cam and detent formations on said plunger, said plunger being adapted to be releasably held in both of its attracted positions by engagement of the cam and detent means of either of said switches with the corresponding cam and detent means on the plunger.

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