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2,725,440

CO-AXIAL RELAY

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Fig. 1

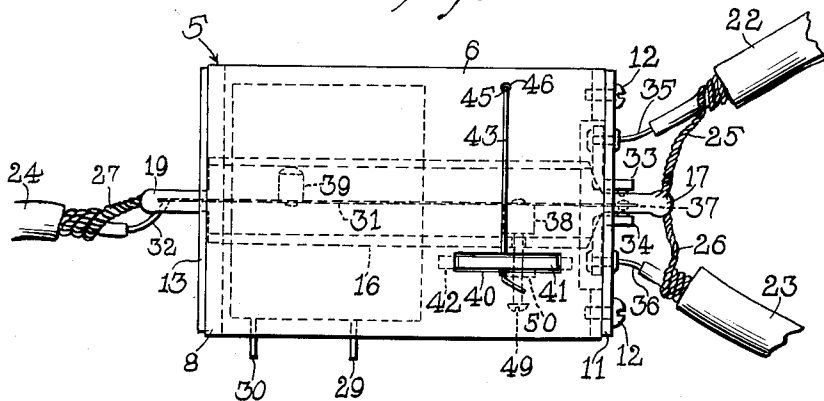


Fig. 2

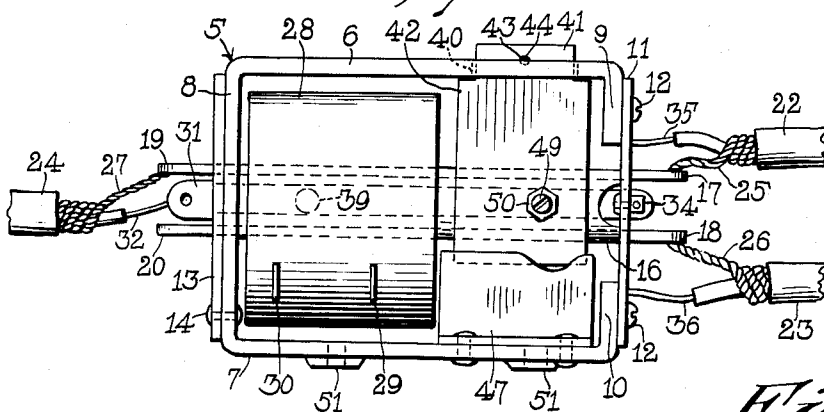


Fig. 3

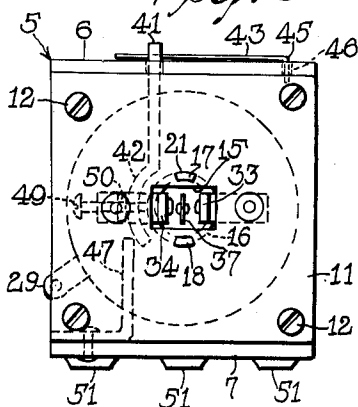
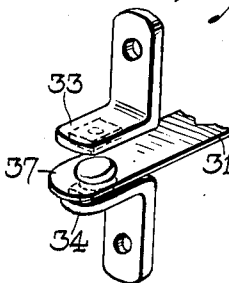


Fig. 4



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CO-AXIAL RELAY

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The present invention relates to electrical switches and relays and the like, and particularly to a co-axial relay.

The main object of my invention is to provide an electrical relay of the co-axial type that is compact and effective to alternately make and break two circuits in response to an electric current energizing a coil thereon.

Another object is to have a switching relay capable of selectively closing either one of two circuits of co-axial cables connected to the switch contacts thereof.

A further object is to have a hollow or tubular core for the relay upon which the actuating coil is wound and into which stationary contacts project at both ends into accessible positions.

It is also an object to have a relay of the character indicated provided with a movable contact member that extends into the hollow core with two corresponding stationary contacts which are disposed at both sides of the movable contact member in accessible position.

A practical object is, of course to produce a compact and effective relay that is so simple in theory and construction that it is reasonable in cost and also not likely to get out of order.

An object is likewise to have such a special relay wherein the construction is suitable for conducting radio frequency currents.

Other objects and advantages of my invention will appear in greater detail as the specification proceeds.

In order to facilitate ready comprehension of this invention for a proper appreciation of the salient features thereof, the invention is illustrated on the accompanying drawing forming part hereof, and in which:

Figure 1 is top or plan view of the co-axial relay made according to the present invention and embodying the same in a practical form;

Figure 2 is a front elevation of the relay as seen from below in Figure 1;

Figure 3 is an end elevation of the same relay as seen from the right in Figure 2; and

Figure 4 is an enlarged fragmentary perspective view of the contacts of the relay of Figures 1 to 3.

Throughout the views, the same reference numerals indicate the same or like parts.

In the electrical art, switches and circuit breakers of all varieties find much application for many purposes, and especially is this true of relays. Relays generally, however, are not suitable for connection to co-axial cables nor for carrying radio frequency currents in any form. Upon considering this problem, I have as a result succeeded in producing a special co-axial relay as already outlined which I shall now proceed to describe in detail in the following.

Hence, in the practice of my invention, and referring also again to the drawing, a generally rectangular soft iron or steel frame 5 includes two opposite sides 6 and 7 integral with the end 8, while at the other ends, the sides terminate in the inwardly directed aligned lugs 9 and 10 supporting end plate 11 of insulating material

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secured by screws 12, 12. At the opposite end, the frame has a similar insulating plate 13 secured upon end 8 by means of rivets 14 or the like. Each end plate 11 and 13 has holes 21 through which project terminal lugs 17, 18, 19 and 20 of tubular iron core 16. These lugs form stationary terminals for connection to co-axial cables 22, 23 and 24.

Thus, cable 22 has the outer conductor 25 connected to lug 17 of the core 16, the outer conductor 26 of cable 23 connected to the adjacent lug 18 of the same core, while outer conductor 27 of cable 24 is connected at the other end of the core to lug 19. About the core 16 within end 8 is mounted a magnetic coil 28 provided with electrical terminals 29, 30, to which conductors may be connected to operate the relay.

Through the core extends a thin resilient movable contact strip 31 of conductive metal that projects through end plate 13 and is there connected to the central conductor 32 of cable 24. The opposite insulating plate 11 is provided with two angle lugs 33 and 34 riveted or otherwise fastened in place upon the plate. The two central conductors 35 and 36 of cables 22 and 23, are soldered to these lugs. The movable contact member is disposed with its contact end 37 disposed between stationary contacts or lugs 33 and 34, while within the core 16, this contact member is provided with a pair of opposite insulating and supporting knobs 38 and 39 secured upon opposite sides of member 31 and spaced a distance apart. The knob 39 is relatively nearer the end of contact member 31 that is fixed in end plate 13, while the other knob upon the other side is spaced approximately the same distance from the other movable end 37, the two knobs generally determining an intermediate working position for the contact member and normally causing it to be biased toward stationary lug or contact 34. Of course, the contacts are insulated from the hollow or tubular core 16, which incidentally is plated in order to facilitate its use for conducting or guiding radio frequency currents along the same.

In frame portion 6 is a limited slot 40 through which projects a narrowed end 41 of a movable iron armature 42 extending in to overlap core 16 and being slightly curved at the inner end to partly conform to the external form of the core. The outer end 41 of the armature is provided with a retaining wire 43 extending through a transverse hole therein at 44, with one end 45 of the wire bent down and directed into a hole 46 in side 6 of the frame 5. This retains the wire in place and thereby also retains the yoke or armature loosely suspended in the slot 40. A stop plate 47 is fixed in place within the frame to side 7 by rivets 48, 48 to prevent armature 42 from swinging too far away from core 16 but allowing a limited movement of the armature or yoke 42. The latter has an adjustable screw 49 secured therein and extending through the curved portion thereof, and extending through the wall of the core 16 with the inner end in contact with knob 38 on contact member 31. By virtue of the bias of this contact member toward stationary contact lug 34, through knob 38 it also biases the yoke or armature 42 away from hollow core 16 in normal operative position of the armature. A clinching nut is engaged upon the screw against the armature to fix this screw in attained position of adjustment. If the armature is caused to approach the core, it will through screw 49 and knob 38 push the movable contact transversely a sufficient distance to force contact end 37 thereof away from contact lug 34 to contact lug 33.

Frame 5, core 16, armature 42, and coil 28, constitute an electromagnet. When coil 28 is energized, core 16 attracts the curved end of the armature and screw 49 pushes knob or button 38 and thereby moves contact member 31 from normal position in which its contact

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end engages against stationary lug or contact 34 to a correspondingly opposite position in which it engages against stationary contact lug 33 as long as the coil remains energized. Thus, a current energizing the magnet causes switching of connections from one stationary contact to the other.

The iron frame 5 may be provided upon side member 7 with a group of internally threaded bosses 51, 51, etc., into which securing screws may be inserted when fastening the relay to a support. Any means of support may naturally be used, as found expedient.

Manifestly, variations may be resorted to, and parts and features may be modified or used without others within the scope of the appended claims.

Having now fully described my invention, I claim:

1. A co-axial relay of the character described, including an iron frame having an end portion with a side portion extending substantially at right angles therefrom and terminating in an inwardly directed end lug substantially parallel to the end portion, an elongated hollow iron core secured at one end to said end portion and projecting therethrough with a terminal thereon for connection to one conductor of a cable and having terminals on the opposite end for connection to one conductor each of two other cables, a non-magnetic insulating plate secured to said end lug and to said opposite end of the hollow core to retain said core substantially parallel to the side portion of said frame with the last mentioned terminals of said core accessible upon the exterior of said insulating plate, a movable contact member supported in isolated condition in said core and having a contact end movably located in the vicinity of said end lug, the insulating plate having an opening for said contact end through which it extends freely, means for connecting the contact member to the central conductor of the first mentioned one cable, a pair of contact members fixed upon said insulating plate at opposite sides of the opening therein and spaced apart with the contact end of said contact member located therebetween, means for biasing the contact end against one of the pair of contact members normally, a movable iron yoke or armature disposed in magnetic contact with the side portion of said frame at one end and having its other end disposed in the immediate vicinity of said hollow core, a projection on said yoke extending transversely through the wall of said core toward the contact member therein, and insulating means transmitting the mechanical contact of said projection to said contact member, and an electric magnet coil mounted upon said core having electric terminals for connection to a current source.

2. A relay according to claim 1, wherein the movable contact member extends through the hollow core and is fixed at the far end.

3. A relay according to claim 1, wherein the movable contact member extends throughout the length of the hollow core and is fixed at one end.

4. A relay according to claim 2, wherein the end portion of the frame carries a second insulating plate through which the far end of the contact member extends and to which it is secured while having a terminal externally of the second insulating plate for connection to the central conductor of the first mentioned cable.

5. A relay according to claim 4, wherein the projection on the yoke is an adjustable screw with a nut thereon to fix the screw in attained position of adjustment.

6. A relay according to the claim 2, wherein the side portion of the frame has a slot therein through which the one end of the yoke extends loosely and has a retaining member preventing loss of said yoke from association with said frame and its side portion.

7. A relay according to claim 6, wherein the inner end of the yoke adjacent to the core is arcuate in form to conform partially to the form of the core.

8. A relay according to claim 7, wherein the movable contact member is a strip of metal having an insulating

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knob or button disposed upon an intermediate portion registering with the inner end of the adjustable screw and biased against said button normally so as to bias the yoke away from the core until the coil on the latter is energized to cause the core to magnetically attract said yoke and by means of said screw push the contact end of the movable contact member from one contact lug to the other.

9. A relay according to claim 7, wherein the movable contact member is an elongated strip of metal and has two insulating knobs or buttons fixed upon spaced apart portions thereof within the hollow core and upon opposite sides thereof with one button registering with the inner end of the adjustable screw of the yoke so as to be engaged thereby and the other button located within the far end of the core and biasing the contact member and the said one button against said screw.

10. A relay according to claim 7, wherein the frame has a second side portion integral with the end portion and disposed parallel with the first mentioned side portion and secured to the first mentioned insulating plate at the opposite side from that to which the first mentioned side portion is secured.

11. A relay according to claim 10, wherein the first mentioned side portion has a rigid stop plate fixed thereon externally of a portion of the yoke to limit movement thereof to and from the core.

12. A coaxial relay including a unitary iron frame with two end portions spaced apart, a magnetically permeable iron core secured at one end thereof to said frame, and having a terminal thereon extending; externally of said frame adapted for connection to an outer conductor of a coaxial cable, said core at the other end having a further pair of terminals adapted for individual connection to the outer conductors of two additional coaxial cables, said core being hollow and serving as an outer co-axial electrical conducting member, a movable contact member supported in insulated relation inside said core and terminating in a contact movable in the vicinity of one of said end portions of the frame, means for connecting the contact member to the central conductor of the first mentioned cable, an insulating support fixed upon said frame, a pair of contact members secured upon said insulating support and spaced upon both sides of said movable contact member, means for biasing the latter against one of the pair of contact members, a magnetically permeable iron armature connected movably in contact with a side portion of said frame and having one end disposed adjacent to said core, said armature and core together forming a magnetic circuit with the frame, means for transmitting the mechanical contact of said armature to said movable contact member, and means for magnetically energizing said core.

13. A co-axial relay switch including a pair of stationary contact means spaced apart and adapted to be connected to the central conductors of two co-axial cables, a movable contact means having a contact portion thereon disposed between the stationary contact means so as to be movable from contact with one to contact with the other and having another portion adapted to be connected to the central conductor of another co-axial cable, unitary magnetic means forming an elongated hollow magnetic core and simultaneously the outer conductor of the co-axial switch, said movable contact means extending through said hollow core, integral unitary magnetic means forming terminal means for the outer conductors of said co-axial cables, and operable electro-magnetic means including an armature member having means co-operating with said core to complete a magnetic circuit for shifting the contact portion on said movable contact means from one stationary contact means to the other.

14. In a co-axial relay, an actuating electromagnet comprising a coil and a magnetic circuit, an electrical switch comprising at least one fixed contact and at least one movable contact, an outer co-axial conductor en-

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closing said movable contact, said outer co-axial conductor being a hollow magnetic iron member forming a part of said magnetic circuit, said magnetic circuit including a movable armature disposed to be displaced when said coil is energized, and coupling means between said armature and said movable contact so disposed that displacement of said armature produces motion of said movable contact.

15. A co-axial relay comprising co-axial conductors, a coil, a magnetic armature, a magnetic hollow core extending thru said coil, said armature being mounted adjacent and overlying said core, to attract said armature when said coil is energized, said core being hollow, a movable contact member insulated and supported for movement inside said hollow core, insulating means mechanically coupling said movable contact to said armature, said core and said contact member being said co-

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axial conductors, and at least one fixed electrical contact disposed to open and close an electrical circuit thru said movable contact member when said armature is moved.

16. A relay as set forth in claim 15, wherein distinct electrical terminals integral with said magnetic core are included.

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