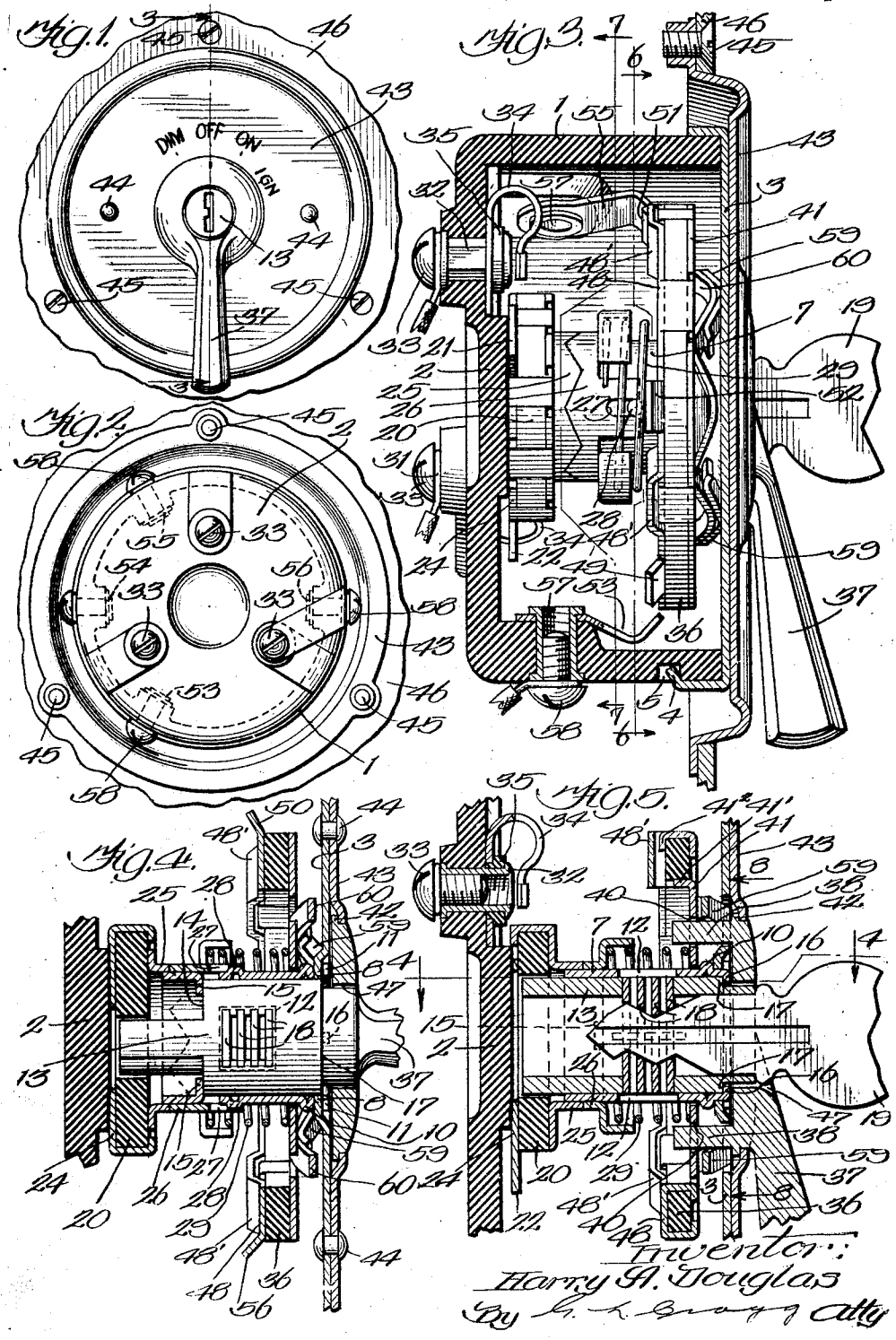
Nov. 30, 1926. 1,608,586

H. A. DOUGLAS

COMBINED LIGHTING AND IGNITION SWITCH

Filed Nov. 23, 1925 2 Sheets-Sheet 1



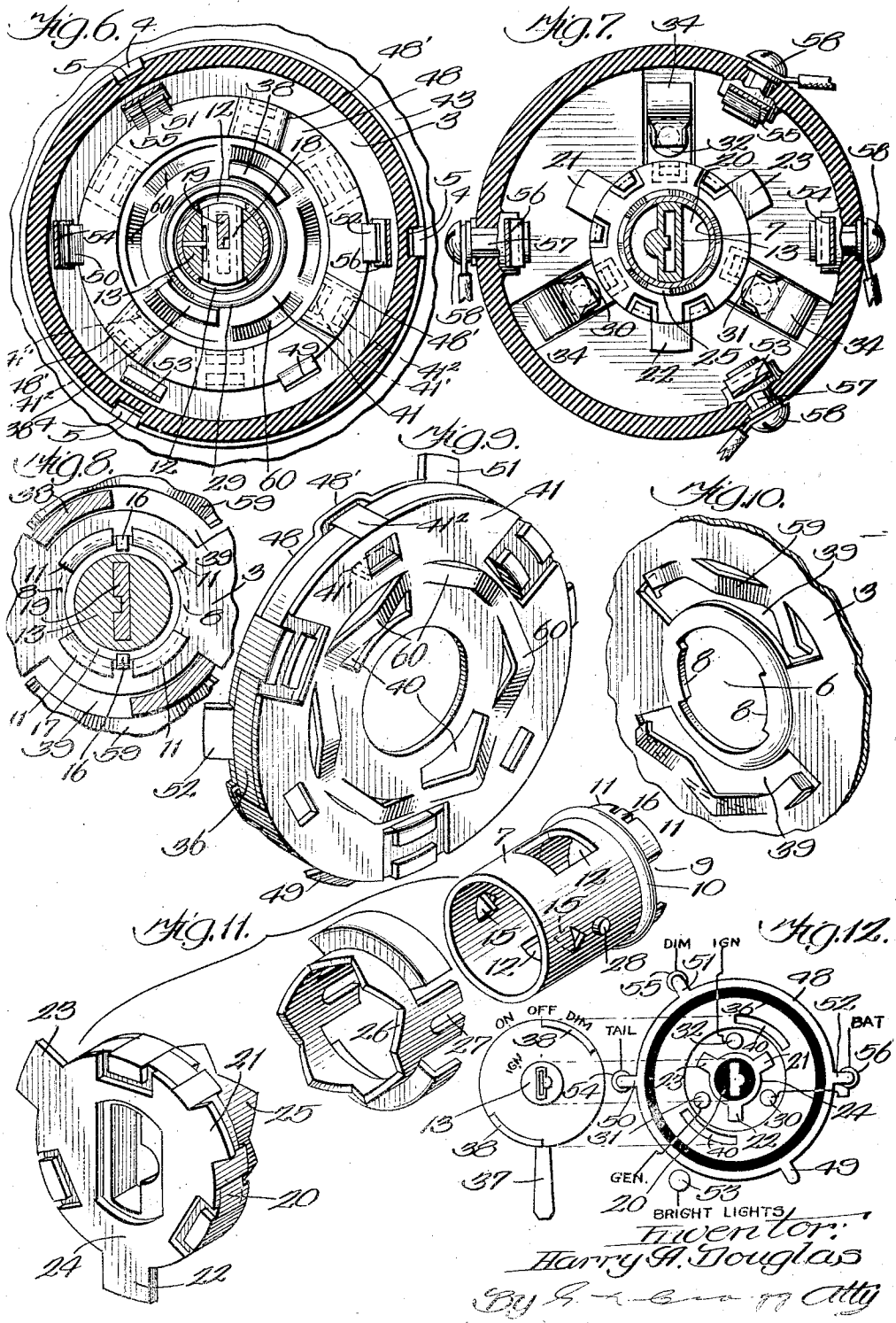
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Nov. 30, 1926. 1,608,586

H. A. DOUGLAS

COMBINED LIGHTING AND IGNITION SWITCH

Filed Nov. 23, 1925 2 Sheets-Sheet 2



Inventor:
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By
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Patented Nov. 30, 1926. 1,608,586

UNITED STATES PATENT OFFICE.

HARRY A. DOUGLAS, OF BRONSON, MICHIGAN.

COMBINED LIGHTING AND IGNITION SWITCH.

Application filed November 23, 1925. Serial No. 70,352.

My invention relates to combined switches for governing the ignition or power controlling circuits and the lighting circuits of automotive vehicles and which combined switches employ rotatable switch handles for controlling the lighting circuits and locks having rotatable members for controlling the ignition or power controlling circuits.

In switches of the type shown in Patent 1,369,140, dated February 22, 1921, the handle supports an insulating contact carrying ring and a rotatable lock member accessible through the handle supports a contact carrying plate of insulation surrounded by the ring and these two contact carriers have contact springs mounted thereon. A casing surrounds these contacts and their carriers, the handle having connections extending through openings in the casing that join the handle with the contact carrying ring. A disc of insulation is surrounded by the casing and carries contacts that are complemental to the spring contacts. These spring contacts, in pressing either against the disc or against the contacts on the disc, serve to position their carriers, the spring contacts thus performing a mechanical function as well as an electrical function. It has been found in practice that the temper of the spring contacts becomes impaired by the current passing therethrough so that, in the course of time, they become unfit to properly perform their mechanical function. To avoid this difficulty, switches of the type disclosed in Patent 1,516,765, dated November 25, 1924, have been devised.

In such a switch of the type disclosed in this latter patent, the insulating ring coupled with the handle and the insulating element also in the form of a ring coupled with the rotatable lock member do not carry any contacts but are provided with springs devised for pressing added metallic contact carriers toward the contact carrying disc to engage the contacts upon these carriers with the contacts upon the disc or directly with the disc. These spring devices upon the added contact carriers, in addition to pressing the contact carriers in one direction toward the contact carrying disc, also press, in the other direction, upon the insulating rings that are coupled with the handle and with the rotatable lock member to maintain these rings respectively in proper assembly with said handle and lock member. The added metallic contact carriers serve, in conjunction with the contacts thereon, to effect desired control of the circuits as the contact carriers are adjusted by said insulating rings which operate the contact carriers through the spring devices that also couple these insulating rings with the contact carriers. The springs of these spring devices are excluded from circuit at all times and, consequently, do not have their temper affected by any passing current.

It is one of the objects of my invention to provide spring mechanism which will perform the mechanical function hitherto performed by the springs in such combined switches of the prior art but so arranged that they will not carry any portion of the current and as to dispense with the contact carriers supplied in addition to the insulating contact actuating rings coupled with the handle and rotatable lock member. In carrying out this object of my invention, the insulating rings that are coupled with the handle and rotatable lock member for controlling the circuits, directly carry the contacts instead of serving to operate contact carriers supplied in addition thereto, spring mechanism being added which is out of the path of any current flowing in the controlled circuits and which merely performs the mechanical function of maintaining the contact carrying insulating rings or supports in proper assembly with the parts that serve to turn the same.

The invention has for another object the provision of a handle controlled contact actuator carrying contacts engageable with contacts disposed upon the side or cylindrical wall of the casing, these latter contacts desirably having connecting portions extending through this casing side wall for connecting them in circuit. This handle controlled contact actuator is desirably in the form of an insulating ring that is pressed by the mechanically acting spring toward the front casing end wall, this ring and this casing wall being provided with complemental cam members whereby the ring may be held in various positions of rotary adjustment.

The lock controlled switch member desirably has contacts thereon which are engageable with contacts upon the sides thereof that are carried by the base of the casing and in order that this lock controlled switch

member may be positively positioned in its various adjustments, it also has cam portions thereon that are complemental to non-rotating cam portions that serve, in cooperation with the other cam portions, to hold the lock controlled switch member in various adjustments. The non-rotating cam portions are desirably pressed upon by the same spring that presses upon the handle controlled switch member whereby these spring pressed cam portions may yield to permit the lock controlled switch member to have one plane of movement. In carrying out my invention in the preferred way, the casing includes a body member of insulation and of cup form, the end wall of the casing upon which the handle is rotatably mounted constituting a closure upon the rim of the cup. The ignition circuit contacts are desirably upon the base or bottom end of the cup and the lighting circuit contacts are upon the side wall of the cup, an arrangement which readily distinguishes the ignition and lighting circuits and greatly facilitates access thereto for wiring.

I will explain my invention more fully by reference to the accompanying drawings in which Fig. 1 is a front view of the preferred embodiment of the invention; Fig. 2 is a rear view of the switch shown in Fig. 1; Fig. 3 is a sectional view, on a larger scale, on line 3—3 of Fig. 1; Fig. 4 is a sectional view on line 4—4 of Fig. 5; Fig. 5 is a sectional view of the central portion of the structure taken on the common axis of the casing handle and locking device; Fig. 6 is a sectional view on line 6—6 of Fig. 3, on a smaller scale; Fig. 7 is a sectional view on line 7—7 of Fig. 3, also on a smaller scale; Fig. 8 is a sectional view on line 8—8 of Fig. 5; Fig. 9 is a perspective view of the handle controlled insulating contact carrying ring; Fig. 10 is a perspective view of the front end wall of the casing showing the cams upon the interior face thereof which cooperate with the ring of Fig. 9 to hold this ring in various adjustments; Fig. 11 is a perspective view, illustrating the ignition circuit controlling insulating contact carrying ring, the cam member complemental to the cam member carried by this ring, and the inwardly projecting tubular extension in fixed relation with the casing and upon which said complemental cam member may move longitudinally of the axis of the casing but with respect to which this complemental cam member does not turn; and Fig. 12 is a diagram, illustrating the inter-relation of the handle and lock with the circuits controlled thereby.

The casing employed is preferably inclusive of a body of insulation in the form of a cup having a side wall 1 and a rear or bottom wall 2 in integral formation. The front metallic end wall 3 of the casing constitutes a closure that is placed upon the rim of the cup and is held in assembly with the cup by means of the prongs 4 extending rearwardly from said end wall and projecting into the recesses 5 formed upon the exterior of the side wall 1 of the casing. The cup shaped body of the casing is desirably cylindrical and the front end wall 3 of the casing has a lock opening 6, generally circular and coaxial with the casing. The cylindrical hollow lock member 7 is carried by and constitutes a continuation of the front end wall 3 of the casing and projects into the casing interior. In the preferred embodiment of the invention, the wings 8, located upon the end wall 3 at the opening 6 through this end wall, project into spaces 9 formed in opposite sides of the lock member 7 in front of the bead 10 on this lock member whereby said lock member is held from rotation. The bead 10 engages the inner face of the casing end wall 3 and the ears 11 upon the front end of said lock member are clinched outwardly and backwardly against the front face of the casing wall 3, whereby said lock member is held from movement along the axis of the casing. The lock member 7, thus stationary or in fixed relation with the front casing end wall 3, is formed with openings 12 in opposite sides thereof. A rotatable lock member 13 is journalled by and within the hollow lock member 7, the lock member 13 having shoulders 14 which engage the ears 15 upon and projecting inwardly from the hollow lock member 7 to prevent inward movement of the rotatable lock member. Outward movement of the rotatable lock member 13 is prevented by means of the ears 16 upon and projecting inwardly from the front end of the lock member 7 and which engage the shoulder 17 upon the front end of the lock member 13. Tumblers 18 are radially movable in openings formed in the rotatable lock member 13, this member being thus a tumbler barrel. These tumblers are controlled by a suitable key 19. When this key is inserted, the tumblers are withdrawn sufficiently into the member 13 to clear the lock member 7 so that the tumblers may be bodily turned to turn the lock member 13 and close the ignition circuit, as will hereinafter more fully appear. When the lock member 13 is turned back by its key to a position in which the tumblers are in register with the openings 12, the ignition circuit is opened, and is locked open by the tumblers when the key is withdrawn. The floating contact carrier 20 is preferably in the form of a ring of insulation having an oblong bore in which the oblong inner end of the lock member 13 is received so that this contact carrier is turned when the lock member 13 is turned by the key. This contact carrier has contacts 21, 22, and 23 thereon that are formed integrally with the metallic ring

24, said contacts being preferably of sheet metal as is the ring. A cam member 25, in the nature of a serrated crown, surrounds the lock member 7 and turns with the carrier 20. A floating cam member 26 also surrounds the lock member 7 and has a crown shaped inner end complemental to the crown portion of the cam member 25. Slots 27 are formed in opposite sides of the cam member 26 and receive pins 28 projecting outwardly from opposite sides of the stationary lock member 7. The slots permit longitudinal movement of the floating cam member 26 and the pins 28 prevent turning movement of this cam member, as the lock member 13 is turned. A spring 29, abutting at its outer end, as will later appear, presses inwardly at its inner end against the floating cam member 26 to press this cam member against the cam member 25.

When the key is turned throughout its range from one alternative position to another, the contact carrier 20 is turned with the lock member 13, the cam member 25 turning with the contact carrier. In this turning movement, the floating cam member 26 is moved outwardly along the axis of the lock member 13 by the cam member 25 and against the force of the spring 29 until the point of the engaging cams pass each other, whereupon the spring expands until finally the two cam members are brought into full engagement, a condition which obtains when the carrier 20 is turned from one circuit controlling position to another. The contacts 21, 22, and 23 either ride upon the contacts 30, 31, 32, complemental thereto or ride off of these contacts, the contact carrier 20 preferably moving slightly inwardly when the contacts thereon are engaged with the contacts complemental thereto, the spring 29, however, maintaining the contacts upon the carrier in firm engagement with their complemental contacts. When the contacts are engaged, the contact carrier 20 is very slightly removed from the inner end wall 2 of the casing due to the preferred positions of the engaging ends of the contacts 30, 31 and 32. When the contacts are separated, the contacts upon the carrier 20 are directly engaged with the insulating end wall 2 of the casing. The ignition circuit is thus opened or closed according to the adjustment of the rotatable lock member 13 as will be fully understood by reference to Fig. 12. The contacts 30, 31 and 32 are desirably in the nature of sleeves whose bores are threaded. These sleeves pass through the rear end wall of the casing and receive binding screws 33 whereby the sleeves are electrically connected with the ignition circuit wires. The contacts upon the carrier 20 are desirably substantially rigid, engagement thereof with their complemental contacts being effected by the spring 29 and furthered by the leaf springs 34 which supplement the action of the spring 29 in this respect. These leaf springs lap the inner ends of the contacts 30, 31 and 32, the contacts upon the carrier 20 being receivable between the springs 34 and the contacts upon the casing wall 2. The spring 29 is out of the circuit or circuits established when the contacts upon the carrier 20 are engaged with their complemental contacts. The springs 34 are desirably also out of circuit, being assembled with the contacts 30, 31 and 32 by means of insulating washers 35 that are inserted between the flanged inner ends of these contacts and the base ends of the springs 34 which also surround said washers. The contacts upon the carrier 20 and their complemental contacts are thus preferably substantially rigid, the spring means 29, 34 being supplied in addition thereto to make the engagement therebetween effective and carrying no current, for the purpose stated.

Another contact carrier 36 is provided, this contact carrier being desirably also in the form of a ring of insulation which surrounds the outer ends of the lock members 7 and 13. The outer end of the spring 29 presses the contact carrier 36 toward the front casing end wall 3. A handle 37 is coupled with the contact carrier 36 by means of prongs 38 projecting inwardly from the handle and passing through openings 39 in the end wall 3 and through openings 40 in the metallic plate 41 secured to the contact carrying ring 36. The handle is confined to a substantially fixed plane of rotation by means of the flanges 42 that are snugly received in a space between the front casing end wall 3 and the plate 43 which is riveted upon the end wall 3 by means of the rivets 44 and which desirably serves as a mounting plate for the switch casing and its contents. To the latter end, the mounting plate is extended radially beyond the casing and is formed to receive mounting screws 45 at its peripheral portion, these mounting screws serving to assemble the plate 43 with the dash board or other mounting panel 46. The hub portion of the handle is coaxial with the lock member 13 and with a circular opening formed in the plate 43, the edge of this opening confining the handle to an axis of rotation coincident with the axis of the rotatable lock member 13. The hub portion of the handle has a lock opening 47 freely receiving the outer end of the lock member 13. The insulating ring 36 carries a sheet metal ring 48 having contacting portions 49, 50, 51 and 52 integrally formed therewith and which are desirably substantially rigid. Said contacting portions are engageable with and separable from complemental contacts 53, 54, 55 and 56 which are desirably also substantially rigid, being preferably formed of somewhat thick metal.

The base ends of these contacts are anchored in place by means of the metallic sleeves 57 passing radially through the side wall 1 of the body of the casing. The metallic sleeves 57 are interiorly threaded to receive binding screws 58 by which the various lighting circuit wires are connected with said sleeves and thereby with the stationary lighting circuit contacts 53, 54, 55 and 56 that are thus disposed at the side of the casing. The lock desirably has no influence upon the handle and the handle no influence upon the lock so that the contact carriers 20 and 36 are independently adjustable to enable the independent adjustment of the ignition and lighting circuits. When the lighting circuits are opened, the outer end of the spring 29 not only presses the metallic plate 41 upon the contact carrier 36 toward the casing end wall 3 but actually against this end wall. When the handle is turned to close the lighting circuits, the substantially rigid contacts 49, 50, 51 and 52 upon the carrier 36 engage the inward sloping surfaces of the free ends of the contacts 53, 54, 55 and 56. The contact carrier 36 is then positioned slightly inwardly from the outer end wall 3 in order that the spring 29 may freely function to maintain good contact between these engaging contacts. The portions 59 of the end wall 3 that are engaged by the plate 41 and the portions 60 of the plate 41 that engage the plate 43 are desirably in the nature of cams that serve positively to hold the carrier 36 from accidental rotation. When the handle is turned to open, or close, or to change the lighting circuits, the cams 60 ride upon the cams 59 to press the carrier 36 inwardly against the force of the spring 29 so that the contacts upon the ring 36 are moved inwardly. When the crowns upon the cams have passed each other, the spring 29 expands until finally the contacts upon the ring 36 are in full line with their complemental contacts 53, 54, 55 and 56 and are ultimately outwardly pressed into firm engagement therewith by the spring 29, the contacts 53, 54, 55 and 56 then pressing upon the contacts 49, 50, 51 and 52 by the force of said spring, the plate 41 upon the carrier 36 being, incidentally, held inwardly removed from its outward position by the contacts 53, 54, 55 and 56. Any suitable construction may be provided for assembling the metallic plate 41 with the insulating ring 36. As illustrated, said plate is formed with ears $41'$ that are received within grooves on the interior of the ring 36 and said plate is further provided with ears 41^2 that embrace the periphery of the ring. The metallic ring 48 is bulged at $48'$ where it covers the inner ends of the ears 41^2.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:—

1. In a switch the combination with a body of insulation in the form of a cup; of a closure upon the rim of the cup forming with the cup a closed casing; contacts within the casing and mounted upon the side of the cup, these contacts having circuit connecting portions passing through the side of the cup; a contact carrier within the casing, mounted to turn upon said closure; an operating handle upon the exterior of the casing and assembled with the closure to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said closure whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement therewith by turning the handle and the contact carrier; a lock having one member fixed with relation to the closure, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts upon the base of the cup and complemental to the contacts upon the second carrier and having circuit connecting portions passing through the base of the cup.

2. In a switch, the combination with a body in the form of a cup; of a closure upon the rim of the cup forming with the cup a closed casing; contacts within the casing and disposed at the side of the cup, these contacts having circuit connecting portions passing through the side of the cup; a contact carrier within the casing, mounted to turn upon said closure; an operating handle upon the exterior of the casing and assembled with the closure to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said closure whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement therewith by turning the handle and the contact carrier; a lock having one member fixed with relation to the closure, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a sec-

ond contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts disposed at the base of the cup and complemental to the contacts upon the second carrier.

3. In a switch, the combination with a casing having a front end wall; contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

4. In a switch, the combination with a casing having a front end wall; contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; engaging cam formations upon said carrier and end wall for holding the contact carrier in different positions to which it is turned; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

5. In a switch, the combination with a casing having a front end wall; sheet metal contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; sheet metal circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

6. In a switch, the combination with a casing having a front end wall; sheet metal contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; engaging cam formations upon said carrier and front end wall for holding the contact carrier in different positions to which it is turned; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; sheet metal circuit controlling con-

tacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

7. In a switch, the combination with a casing having a front end wall; contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and slidable along said rotatable lock member and pressed toward the end of the casing opposite said end wall by said spring means; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

8. In a switch, the combination with a casing having a front end wall; contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; engaging cam formations upon said carrier and front end wall for holding the contact carrier in different positions to which it is turned; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and slidable along said rotatable lock member and pressed toward the end of the casing opposite said end wall by said spring means; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

9. In a switch, the combination with a casing having a front end wall; sheet metal contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; sheet metal circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and slidable along said rotatable lock member and pressed toward the end of the casing opposite said end wall by said

spring means; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

10. In a switch, the combination with a casing having a front end wall; sheet metal contacts within the casing and disposed at the side thereof; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; engaging cam formations upon said carrier and front end wall for holding the contact carrier in different positions to which it is turned; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; sheet metal circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and slidable along said rotatable lock member and pressed toward the end of the casing opposite said end wall by said spring means; and contacts disposed at the end of the casing opposite said end wall and complemental to the contacts upon the second carrier.

11. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by the force of said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; and other contacts within the casing and complemental to the contacts upon the second carrier.

12. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a contact carrier within the casing, mounted to turn upon said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of said rotatable lock member; other contacts within the casing and complemental to the contacts upon the second carrier; and spring means pressing the second contact carrier toward the rear end wall of the casing.

13. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement

with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of the lock member; other contacts within the casing and complemental to the contacts upon the second carrier; and spring means pressing the first contact carrier toward the front end wall of the casing and the second contact carrier toward the rear of the casing.

14. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of this lock member; other contacts within the casing and complemental to the contacts upon the second carrier; and spring means pressing the first contact carrier toward the front end wall of the casing and the second contact carrier toward the rear of the casing, the contacts complemental to the contacts upon the first contact carrier being pressed upon these contacts by said spring means.

15. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and pressed thereon by said spring means and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby; other contacts within the casing and complemental to the contacts upon the second carrier; and complemental cam members upon the first contact carrier and the front casing end wall serving to hold this carrier in its different adjustments.

16. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of said rotatable lock member; other contacts within the casing and complemental to the contacts upon the second carrier; springs means pressing the second contact carrier toward the rear end wall of the casing; a cam member upon the second contact carrier; and a floating non-rotating cam member complemental to the aforesaid cam member and pressed into engagement there-

with by said spring means whereby this second contact carrier is held in its different adjustments.

17. In a switch, the combination with a casing having a front end wall; contacts within the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; spring means pressing this contact carrier toward said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of this lock member; other contacts within the casing and complemental to the contacts upon the second carrier; spring means pressing the first contact carrier toward the front end wall of the casing and the second contact carrier toward the rear of the casing, the contacts complemental to the contacts upon the first contact carrier being pressed upon these contacts by said spring means; and complemental cam members upon the front casing end wall and the first contact carrier whereby this carrier is held in different adjustments.

18. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a contact carrier within the casing, mounted to turn upon and movable toward and from said end wall; an operating handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening through its hub portion and having a connection with said contact carrier that passes through an opening formed through said end wall whereby the contact carrier is turned by turning the handle; circuit controlling contacts upon said carrier complemental to the aforesaid contacts and brought into and out of engagement with the aforesaid contacts by turning the handle and the contact carrier; a lock having one member fixed with relation to said end wall, and a second and key-controlled member mounted to turn, the second member of the lock having a key-operated element placed into and out of engagement with the first lock member by the key, whereby the second lock member may be locked from turning; a second contact carrier within the casing and joined with the rotatable member of the lock to be turned thereby and movable along the axis of this lock member; other contacts within the casing and complemental to the contacts upon the second carrier; spring means pressing the first contact carrier toward the front end wall of the casing and the second contact carrier toward the rear of the casing, the contacts complemental to the contacts upon the first contact carrier being pressed upon these contacts by said spring means; complemental cam members upon the front casing end wall and the first contact carrier whereby this carrier is held in different adjustments; a cam member upon the second contact carrier; and a floating non-rotating cam member complemental to the latter cam member and pressed into engagement therewith by said spring means whereby this second contact carrier is held in its different adjustments.

19. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a floating contact carrier within the casing in the form of an insulating ring; contacts on said carrier complemental to the aforesaid contacts; other contacts within the casing; a second contact carrier within the casing; contacts on the second contact carrier complemental to the latter contacts; a handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier; and spring means out of circuit with and pressing together the contacts upon the first contact carrier and the contacts complemental to these contacts.

20. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a contact carrier within the casing; contacts on said carrier complemental to the aforesaid contacts; other contacts within the casing; a second and floating contact carrier of insulation within the casing; contacts on the second carrier complemental to the latter contacts; a handle

upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier; and spring means out of circuit with and pressing together the contacts upon the second contact carrier and the contacts complemental to these contacts.

21. In a switch, the combination with a casing having a front end wall; contacts within the casing; a floating contact carrier within the casing in the form of an insulating ring; contacts on said carrier complemental to the aforesaid contacts; other contacts with the casing; a second and floating contact carrier of insulation within the casing; contacts on the second carrier complemental to the latter contacts; a handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier; and spring means out of circuit with and pressing together the contacts upon both contact carriers and the contacts complemental to these contacts.

22. In a switch, the combination with a casing; of a rotatable handle upon the exterior of the casing and formed with a lock opening through its hub portion; a lock having a rotatable member; two floating contact carriers within the casing, one operable by the handle and the other by said lock member; contacts upon said carriers; contacts complemental to the aforesaid contacts; cam members coupled with the contact carriers; cam members complemental to the aforesaid cam members and cooperating therewith to position the contact carriers; and spring mechanism yieldingly maintaining said cam members and the cam members respectively complemental thereto in normal engagement.

23. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a floating contact carrier within the casing in the form of an insulating ring; contacts on said carrier complemental to the aforesaid contacts; other contacts within the casing; a second contact carrier within the casing; contacts on the second contact carrier complemental to the latter contacts; a handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier; and spring means pressing together the contacts upon the first contact carrier and the contacts complemental to these contacts.

24. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a contact carrier within the casing; contacts on said carrier complemental to the aforesaid contacts; other contacts within the casing; a second and floating contact carrier of insulation within the casing; contacts on the second carrier complemental to the latter contacts; a handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier; and spring means pressing together the contacts upon the second contact carrier and the contacts complemental to these contacts.

25. In a switch, the combination with a casing; of a rotatable handle upon the exterior of the casing and formed with a lock opening through its hub portion; a lock having a rotatable member; two contact carriers within the casing, one operable by the handle and the other by said lock member; contacts upon said carriers; contacts complemental to the aforesaid contacts; a cam member coupled with the handle operated contact carrier; a cam member complemental to the aforesaid cam member and cooperating therewith to position the handle operated contact carrier; and spring mechanism yieldingly maintaining said cam members in normal engagement.

26. In a switch, the combination with a casing; of a rotatable handle upon the exterior of the casing and formed with a lock opening through its hub portion; a lock having a rotatable member; two contact carriers within the casing, one operable by the handle and the other by said lock member; contacts upon said carriers; contacts complemental to the aforesaid contacts; a cam member coupled with the lock member operated contact carrier; a cam member complemental to the aforesaid cam member and

cooperating therewith to position the lock member operated contact carrier; and spring mechanism yieldingly maintaining said cam members in normal engagement.

27. In a switch, the combination with a casing having a front end wall; contacts within the casing, these contacts having circuit connecting portions passing through the side of the casing; a contact carrier within the casing in the form of an insulating ring; contacts on said carrier complemental to the aforesaid contacts; other contacts within the casing; a second contact carrier within the casing; contacts on the second contact carrier complemental to the latter contacts; a handle upon the exterior of the casing and assembled with said end wall to turn, said handle having a lock opening formed through its hub portion and having a connection with the first contact carrier that passes through an opening formed in said front casing end wall; and a lock having one member fixed with relation to the front casing end wall and a rotatable member joined with the second contact carrier.

In witness whereof, I hereunto subscribe my name.

HARRY A. DOUGLAS.