

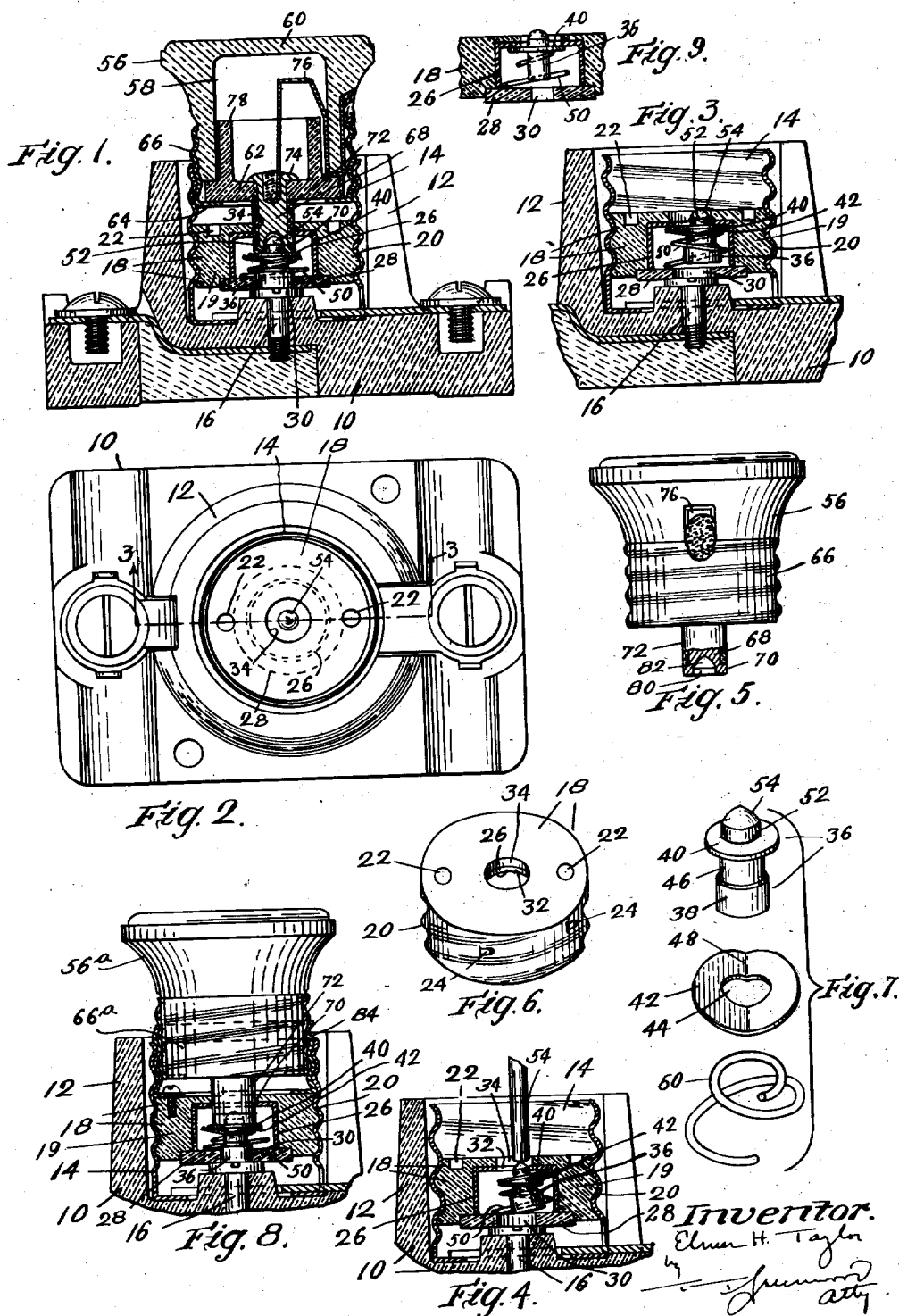
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ELECTRIC FUSE

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ELECTRIC FUSE

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This invention relates to electric fuses, and especially to fuses of the screw plug type wherein the fusible element is contained within a screw-threaded plug or casing that is adapted to be screw-threaded into a socket or receptacle.

An electric fuse is intended primarily to protect the conductors of the circuit with which the fuse is in series against overheating due to the excessive loading thereof. With the increasing use of electrical appliances, circuits are frequently overloaded and a fuse that is of a size or capacity adapted for the circuit conductors blows with the result that often it is replaced by a fuse of larger capacity. This permits the excessive current to be carried but also permits the circuit conductors to be overloaded. Hence the practice of inserting a fuse of a larger capacity than is warranted by the current carrying capacity of the conductors is an unsafe practice.

An object of the present invention is the provision of an improved device so arranged that a fusible element above a predetermined current carrying capacity can not be inserted conveniently in the circuit the fuse is designed to protect.

A further object of the invention is the provision of an improved form of fuse having as a component part thereof a circuit controlling device that is adapted to be screw-threaded into the fuse plug base or receptacle and is so constructed and arranged that it cooperates only with its associated type of fuse plug in permitting a circuit to be established through the fusible element between the terminals of the receptacle and prevents the establishment of the circuit when some other type of fuse plug is inserted in the receptacle.

Another object of the invention is the provision of a circuit controlling device that overlies the center contact or terminal of the fuse receptacle and has a movable contact member that is so unstably supported and otherwise so arranged that, when it is moved toward the center contact by some means that does not position and guide it properly, will assume some other than a closed-circuit position but, when operated by a fuse plug adapted for it, will readily assume a closed-circuit position in engagement with the center contact of the fuse receptacle.

When a fuse blows and a replacement fuse is not readily available it is quite common practice for the user of current to insert a cent or other conducting disc in the fuse receptacle to bridge the terminals thereof, or to stuff tinfoil or other flexible conducting material into the fuse recep-

tacle for the same purpose. This practice obviously is unsafe. It is a further object of the invention to provide an improved form of fuse that does not readily permit the terminals of the fuse receptacle to be conductively bridged in this manner.

A yet further object is generally to improve upon electric fuses.

Fig. 1 is a sectional elevation through a fuse plug receptacle and a fuse therein embodying the present invention.

Fig. 2 is a plan view of the fuse socket or receptacle with the fuse plug removed.

Fig. 3 is a sectional elevation through the fuse receptacle and the circuit-controlling device therein, taken along line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 but illustrating the manner in which the contact member tilts away from a circuit-closing position when not properly guided.

Fig. 5 is a side elevation of the fuse plug.

Fig. 6 is a perspective view of the insulating carrying member of the circuit-controlling member.

Fig. 7 is an exploded view of the contact member of the circuit-controlling device.

Fig. 8 is a sectional detail of a modified form of the invention.

Fig. 9 is a sectional detail of a modified form of wabbling support for the movable contact member.

The electric fuse embodying the present invention is intended to be screw-threaded into a fuse plug base or receptacle 10 having an upstanding annular neck 12 that surrounds an internally screw-threaded metal shell 14 that constitutes one of the terminals of the receptacle. A center contact 16 is located at the bottom part of the shell and constitutes the other terminal of the receptacle. The fuse embodying the present invention includes a circuit controlling device 18 herein shown as comprising a disc of insulating material 19 constituting a contact support and having external screw-threads 20 that engage the screw threads of the terminal shell 14. The disc is adapted to be screw-threaded into the bottom portion of the shell, for this purpose having spanner holes 22 in the upper face thereof, and to seat upon some part of the receptacle as the center contact 16. It will be understood that not all fuse receptacles are constructed as herein illustrated so that in some receptacles the disc may seat upon some other part of the receptacle than the center contact. In any event, however, the disc overlies the center contact. The circuit con-

trolling device is adapted to be retained within the terminal shell 14 against unintentional removal therefrom by suitable locking means as the outstanding inserted spring fingers 24 which are sufficiently flexible to yield to permit the disc to be screwed into the shell but which bite into the shell and prevent the unscrewing movement thereof. The disc 19 is provided with an axially extended cylindrical recess that is open in the bottom face thereof; and a hardened steel cup 26 is seated in the recess and is retained therein by an insulating cover plate or disc 28 that overlies the bottom end of the cup and is frictionally retained in an enlargement of the recess. Said cover plate 28 is provided with an opening or passage 30 that overlies and provides access to the center contact 16. The bottom wall of the cup is provided with an axially directed circular passage 32 that registers with a corresponding passage 34 in the top face of the disc 19. A movable contact member 36 in the form of a short cylindrical rod or stud is loosely located or floats in said cup 26 and is capable of moving axially and also laterally in any direction. The contact member is provided with a cylindrical lower end 38 that is closely conformed to the diameter of the passage 30 over the center contact 16 so that when it is accurately aligned with said passage it can move therein and engage the center contact but when it is misaligned with said passage, it can not enter the passage. The contact stud at its upper end is provided with a radially outstanding annular flange 40 which, in the open-circuit position of the contact stud, bears against the end wall of the cup 26 and preferably overlies the aligned passages 32 and 34 in any laterally displaced position of the contact and thereby provides a constant closure for the passages except when the contact member is in closed-circuit condition. A washer 42 is located under and in contact with the flange 40 and has a hole 44 through which the portion 38 of the contact member can pass, the contact member above said portion 38 and under said flange 40 being of reduced diameter as at 46 so that said washer is free to move laterally of the flange when in contact therewith. The washer is bent along its diameter to form a ridge 48 and inclined portions on opposite portions of the ridge. A conically shaped spiral spring 50 encircles the contact member and has its large end bearing against the cover disc 28 and its small end against the ridge of the washer 42. The arrangement of the washer, spring and contact member is such as to provide a pivotal or wobbling support for the contact member when it is moved in a circuit-closing direction. While the flange of the contact member lies flat on the end wall of the cup 26 and in covering relation with the aperture therethrough, in any lateral position assumed by the contact member when it is in open-circuit position, it is caused to tilt or cant about the ridge 48 of the washer when pressure is applied to the top end of the contact member by some makeshift means, due to the shape of the top as will be described presently, and also due to the usually-assumed position of the ridge 48 eccentrically of the axis of the contact member. Due to the tilted position, the contact member is thrown out of alignment with and consequently will not enter the bottom aperture 30 and thus is prevented from moving into circuit-closing engagement with the center contact 16 of the fuse receptacle. The spring 50 here shown has but few convolutions, two being here shown, and with

such a spring the washer can be omitted and the same tilting action will take place since, by reason of the few convolutions, the upper convolution will bear against the flange 40 only on one side thereof so that the bearing portion of the convolution will then be the equivalent of the ridge 48 of the washer 42. In Fig. 9 a modification is illustrated, wherein the washer is omitted, the upper end of the spring 50 bearing against the flange 40 close to the body 46 of the contact member and at one side of the axis thereof. The flange 40 of the contact member, in its open-circuit position overlies the aligned passages 32 and 34 in any laterally displaced position thereof so that a wire or tinfoil can not be inserted readily through these passages and through the passage 30 to make contact with the center terminal 16. The positioning of a cent or other conducting disc on top of the circuit controlling device, even though the disc makes contact with the contact member 36, can not complete the circuit through the receptacle since it is also necessary for the movable contact member 36 to engage the center terminal 16. Hence the construction is practically non-tamperable.

The contact member 36 is adapted to be held in alignment with the passage 30, and guided to enter said passage and engage the center terminal 16, only by a specifically designed cooperating fuse plug. For this purpose the contact member has a centering top portion that projects above the flange 40 and into the aligned passages 32 and 34. Said centering portion comprises a cylindrical base portion 52 disposed adjacent the flange 40 and a crowned head 54 both of which are adapted to enter a correspondingly formed recess in the center contact of a fuse plug. The fuse plug cooperating with the circuit controlling device herein described comprises a casing or body 56 of any suitable insulating material as glass having a chamber 58 therein open at the bottom and closed at the top by a transparent member or window 60 that as herein shown is integral with the body of the casing although the particular construction is not important for the present invention and can be anything suitable or usual. An insulating plate 62 is seated upon the end of the casing 56 and covers the open end of the chamber 58 and is secured in the aforesaid relation under the inturned flange 64 of an externally and internally screw-threaded shell 66 which is screw-threaded on external screw-threads of the casing 56. Said shell 66 constitutes a terminal of the fusible element within the casing and is adapted to be screw-threaded in the terminal shell 14 of the fuse receptacle. The plate 62 is provided with a center contact in the form of a rod or stud 68 that is co-axial with the axis of the casing 56 and its shell 66 and extends for a considerable distance below the end of the flange 64 of said shell 66 and thus considerably below the end of the fuse plug body. Said contact at its lower end is provided with an enlarged head 70 that is of small axial length. The contact rod under the head is surrounded by an insulating tube 72 which bears against the lower end face of the plate 62; and the inner end of the contact rod is flanged outwardly as at 74 to clamp the insulating tube 72 firmly between the plate 62 and the head 70. The particular construction of the center contact 68 as so far described is not important, with respect to the manner of securing the rod to the fuse body and of insulating the rod, except that the head 70 should be of small axial

length and should not be exposed above the circuit controlling device 18 when the circuit through the fuse terminals is complete, and the remaining exposed portion of the rod should have an insulating surface. A fusible element 76 has one end connected to the inner end of the contact rod 68 and its other end connected to the shell 66 of the fuse plug. The plate 62 is provided with an annular flange 78 which extends into the chamber 58 and between the bends of the fusible element, so as to provide a barrier that prevents the establishment of a short length gas path between the center contact and the shell 66 when the fuse blows under heavy load. The bottom or contact end of the center contact 68 is provided with a centering recess that is shaped to receive the head of the movable contact 36 of the circuit closing device. To this end the recess, see especially Fig. 5, is provided with a cylindrical lower portion 80 that receives the cylindrical portion 52 of the movable contact member 36 and an upper conically-shaped or crowned portion 82 that receives the crown or head 54 of the contact member 36. This arrangement provides for centering the movable contact member 36 or aligning it with the passage 30 to the center terminal 16 of the fuse receptacle and holding the contact member in such aligned position while the fuse plug is being screwed into the terminal shell 14 and thereby is moving the contact member 36 toward engagement with the center terminal 16. While the movable contact member 36 can be disposed laterally a considerable distance in any direction within its enclosing cup 26 the head of the contact member is always disposed in the aligned recesses 32 and 34 and the shape and dimensions of the head are such that in the furthestmost laterally displaced position of the contact member the head will always enter the recess in the end of the center contact of the fuse plug as the fuse plug is screwed into the receptacle. The end face of the center contact 70 of the fuse plug is flat and the spring 50 is designed to hold the flange 40 of the movable contact member seated upon said end face, whereby to hold the contact member from wobbling or canting during circuit-closing movement, the spring, for this purpose, exerting its pressure on said flange 40 within its area of engagement with the fuse contact. However, the centering head of the movable contact member can fit into the fuse contact long and close enough to be held co-axial therewith against the eccentric pressure of the spring and thus confined against wobbling or tilting and guided into closed-circuit position without the necessity for having the fuse contact seat on the flange, except that such is preferred for electrical purposes. With either arrangement the contact member is constrained against deflection from its circuit closing line of movement and is caused to pass into and along the aperture 30 and engage the center contact of the receptacle. If an ordinary fuse plug is attempted to be used, the center contact thereof usually is so broad that it can not enter the passage 34 and thus can not depress the movable contact member 36. If, however, it can enter the passage 34 and depress the movable contact member 36 the contact member will tilt and engage the cover disc 28 at one side of the aperture 30 and thus not pass through the aperture. Thus the movable contact member ordinarily can not be made to engage the center terminal of the receptacle ex-

cept by the use of a fuse plug having an end recess in its center contact as herein described.

The enlarged end 70 of the center contact of the fuse plug has a sharp-edged periphery and closely conforms to the diameter of the aligned passages 32 and 34 so as to shear off any strips of tinfoil that might be placed in the receptacle in an attempt to bridge the terminals thereof, the cup 26 being of some hard material as tempered steel to act as a die for this purpose. Thus a construction is provided wherein the terminals of the receptacle can not readily be bridged by make-shift devices. The receptacle is usually contained in a box that conceals and prevents access to the line terminals of the receptacle so that the only manner in which the terminals might be bridged is by placing some bridging device within the terminal shell 14.

In the modification illustrated in Fig. 8, the construction is essentially the same as above described except that the insulating disc 19 of the circuit controlling device 18 is secured to the lower end of an internally and externally screw-threaded shell 84 that is screw-threaded in the terminal shell 14 of the receptacle. The fuse plug 56a is provided with a terminal shell 66a that is adapted to be screw-threaded in the shell 84 and hence is too small to engage the screw-threads of the terminal shell 14. Hence the fuse plug designed to enter the shell 84 can not be screw-threaded in the usual receptacle that is not provided with the circuit controlling device and the usual type of fuse plug can not be screw-threaded in the shell 84.

I claim:

1. The combination of a fuse receptacle and a movable contact member therein having means by which the contact member can be properly guided for successful movement into closed-circuit position and when not so properly guided will move into some position other than closed-circuit position, and a fuse plug insertable in said receptacle having means for properly guiding and moving said contact member into closed-circuit position.

2. The combination of a fuse receptacle, a movable contact member therein having means by which the contact member can be properly guided for successful movement into closed-circuit position, supporting means for said contact member which biases it for movement into other than closed-circuit position when it is not properly guided, and a fuse plug insertable in said receptacle having means for properly guiding and moving said contact member into closed-circuit position.

3. The combination of a fuse receptacle and a wobbling contact member therein having means which requires that the contact member be restrained from wobbling and properly guided for successful movement into closed-circuit position.

4. In combination with a fuse receptacle, a movable contact member therein for controlling the circuit therethrough, said contact member being movable along a predetermined path into circuit-closed condition and also being capable of assuming any one of various different positions laterally displaced from said path, and a fuse plug insertable in said receptacle having means which moves said contact member from any displaced position into and holds it in said path and moves it into circuit-closed condition.

5. In combination with a fuse receptacle, a movable and laterally displaceable contact member therein for controlling the circuit there-

through, a yielding support on which said contact member is tiltable, and a fuse plug insertable in said receptacle having means cooperating with said contact member for moving it laterally into and also holding it in a predetermined position and also for holding it against tilting and for moving it when so held into closed-circuit position.

6. The combination of a fuse receptacle, a contact member therein that has freedom for movement in many directions and is arranged to be moved into closed-circuit position only when its freedom of movement in all directions but one is restricted, and means for moving said contact member into open circuit position and for holding it for freedom of movement in many directions.

7. The combination of a fuse receptacle, a contact member therein movable in a circuit-closing direction and also in a direction laterally thereof, and means that requires the restraint of said contact member against lateral movement to insure the completion of its movement in a circuit-closing direction.

8. The combination of a fuse receptacle, a contact member therein movable between closed and open circuit positions, means which requires a predetermined angular positioning of said contact member for movement in a closed circuit position, and means which normally holds said contact member in a different angular position for movement toward circuit-closing position.

9. The combination of a fuse receptacle, a contact member therein movable between closed and open circuit positions, means providing a passage along which said contact member is movable into closed-circuit position, and means for normally holding said contact member in such position that it can not enter said passage.

10. The combination of a fuse receptacle, a contact member therein movable between open and closed circuit positions, means providing a passage within which said contact member is movable into closed-circuit position, and means normally holding said contact member in open-circuit position above and at one side of the entrance to said passage.

11. The combination of a fuse receptacle, a contact member therein movable between open and closed circuit positions, means providing a passage into which said contact member is movable into closed-circuit position, and means that at times holds said contact member yieldingly at an angle to the axis of said passage so that said contact member can not enter it except when aligned therewith.

12. The combination of a fuse receptacle, having a screw-threaded shell and a center contact, an insulating member located within said shell above said center contact and having means providing screw-threads that are engaged with the screw-threads of said shell, a contact member movable in said insulating member between open and closed circuit positions with respect to said center contact, means which requires the movement of said contact member in a predetermined circuit closing direction, and means which normally holds said contact member in open-circuit position out of said predetermined direction of movement.

13. The combination of a fuse terminal having a screw-threaded shell and a center contact, an insulating member located within and having a screw-threaded connection with said shell and overlying said center contact, a contact member

carried by said insulating member and movable into and away from closed-circuit engagement with said center contact, means providing an aperture through which said movable contact member is constrained to pass in its movement in a circuit-closing direction, and means which normally holds said movable contact member out of register with said aperture.

14. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within said receptacle and having an aperture in one end thereof, a contact member carried by said insulating member and movable in a circuit-closing direction in said aperture, and means which normally positions said contact member out of alignment with said aperture.

15. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having apertures in its top and bottom faces, a contact member located within said insulating member between said apertures and movable in a circuit-closing direction within said bottom aperture, and means which supports said contact member in a circuit open position free for movement in a circuit-closing position and also free for movement in various lateral directions.

16. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having apertures in its top and bottom faces, a contact member located within said insulating member between said apertures and movable in a circuit-closing direction within said bottom aperture, and means which supports said contact member in a circuit-open position free for movement in a circuit-closing position and also free for movement in various lateral directions, said contact member having an outstanding flange which underlies and constitutes a closure for said top aperture in its circuit-open position.

17. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having a passage in its bottom face, a contact member carried by said insulating member and adapted to be moved within said passage in a circuit-closing direction, and means for normally effecting movement of said contact member in a circuit-closing direction with its axis misaligned with said passage.

18. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having a passage in its bottom face, a contact member carried by said insulating member and adapted to be moved within said passage in a circuit-closing direction, means for normally effecting movement of said contact member in a circuit-closing direction with its axis misaligned with said passage including a spring which exerts its pressure on said contact member eccentrically thereof as the contact member is moved in a circuit-closing direction.

19. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having apertures in its top and bottom faces, a contact member carried by said insulating member movable in a circuit-closing direction into and along said bottom aperture, means including a spring normally holding said contact member in elevated position above and out of said bottom aperture, said contact member having an outstanding flange that bears against said insulating member

and overlies and constitutes a closure for said top aperture, said contact member being free to assume various laterally displaced positions in said insulating member and said spring holding said contact member in elevated position above said bottom aperture and bearing on said flange eccentrically of said contact member.

20. A circuit controlling device for fuse receptacles comprising an insulating member adapted to be disposed within the receptacle and having a chamber therein that is open at the bottom face of said insulating member and an aperture in its top face that opens into said chamber, a cover plate for said chamber having an aperture therein, a contact member located within said chamber and movable into and along said cover plate aperture in a circuit-controlling direction, said contact member being free to assume various laterally displaced positions within said chamber and having an outstanding flange that overlies said top aperture, a bent fulcrum disc that bears against said flange, and a compression spring that bears against the fulcrum of said disc.

25 21. The combination of a fuse receptacle, a contact member therein controlling the circuit through said receptacle and being free for movement in different directions, and a fuse plug insertable in said receptacle having means engageable with said contact member which restricts its freedom of movement to that which effects its movement into closed-circuit position.

22. The combination of a fuse receptacle, a movable contact member therein adapted to control the circuit through said receptacle, said contact member being free for movement into various laterally and angularly displaced positions, and a fuse plug insertable in said receptacle having means which engages said movable contact member and moves it from any laterally and angularly displaced position in which it may be located and holds it in a condition where it can be moved into closed-circuit position.

23. The combination of a fuse receptacle, a wabbling contact member therein which controls the circuit through said receptacle, and a fuse plug insertable in said receptacle having means which engages said contact member and restrains it from wabbling and guides it for movement in a circuit-controlling position.

24. The combination of a fuse receptacle, a contact member therein which controls the circuit through said receptacle, means which yieldingly supports the contact member in open-circuit condition in any one of a plurality of off-center circuit-closing positions, said contact member having a centering head, and a fuse plug insertable in said receptacle having means providing a centering recess in which said head is insertable in any displaced position of the contact member and is caused to be centered thereby and held from movement other than in a circuit-closing direction.

25. The combination of a fuse receptacle, an insulating member therein having an aperture, a contact member which controls the circuit through said receptacle carried by said insulating member and movable into and along said aperture in a circuit-closing direction, means providing a support on which said contact member can tilt and thus be misaligned with said aperture, said contact member having a centering head, and a fuse plug insertable in said receptacle and having means including a centering recess that receives said head and holds said contact

member against tilting so that movement of said plug into said receptacle effects the movement of said contact member into and along said aperture in a circuit-closing direction.

26. The combination of a fuse receptacle having a screw-threaded terminal shell and a center contact, an insulating member located within said shell above said center contact and having an aperture therein that is open to said contact, a tiltable contact member carried by said insulating member and having a centering head, means normally holding said contact member in circuit-open condition above and misaligned with said aperture, and a fuse plug having a screw-threaded connection with said terminal shell and a center contact having means including a centering recess therein that can be entered by said centering head in any misaligned position of said contact member and that is constructed and arranged to move and hold said contact member into aligned position with said aperture and also to hold it against tilting, whereby movement of said screw plug into said shell causes the movement of said contact member into and along said aperture into engagement with said center contact of said receptacle.

27. A circuit controlling device for fuse receptacles comprising an insulating member adapted for insertion in the fuse receptacle and having a recess therein that is open at the bottom face thereof and an aperture in its top face that is open into said recess, a cover plate which overlies the open end of the recess and is engaged with said insulating member and has an aperture therein, a metal cup received within said aperture and having an aperture in its bottom wall that is aligned with said top aperture, a contact member disposed within said cup having a flange that overlies said cup aperture and a head that projects into said cup aperture and a body portion that is movable into and along the aperture of said cover plate, and a compression spring surrounding said contact member and exerting pressure upon said flange eccentrically of said contact member.

28. The combination of a fuse receptacle having a screw-threaded terminal shell and a center contact, an insulating member in and having a screw-threaded connection with and carried by said shell over said center contact, a contact member carried by said insulating member and movable therein axially only of said shell into and out of circuit-controlling relation with said center contact, spring means for normally maintaining said contact member in a raised position out of engagement with said center contact, and a fuse plug having a screw-threaded connection with said shell and a center contact engageable with said contact member to move it into engagement with said center contact of said receptacle by the advancing movement only of said plug, and locking means irremovably securing said insulating member in engagement with said shell.

29. The combination of a fuse receptacle having a screw-threaded terminal shell and a center contact, an insulating member in and having a screw-threaded connection with and carried by said shell over said center contact having a recess therein and passages leading to the top and bottom of said member, a movable contact member in said recesses and passages, spring means in said recess bearing on said contact member for moving it directly axially and normally holding it in elevated position out of en-

gagement with said center contact, and a fuse plug having a screw-threaded connection with said shell and a center contact insertable in one of said passages and engageable with said contact member for moving it directly axially into engagement with the center contact of said receptacle.

30. A circuit controlling device for fuse receptacles comprising an insulating member adapted for insertion in the fuse receptacle, means providing screw threads engageable with the screw-threaded shell of the fuse receptacle for holding said insulating member in said receptacle, said insulating member having a recess therein that is open at the bottom face thereof and an aperture in its top face that is open into said recess, a cover plate which overlies the open end of said recess and has an aperture therein, a movable contact member disposed in said recess having parts movable axially in said apertures in circuit-controlling direction, and spring means in said recess bearing on said

contact member and holding it yieldingly against movement in circuit controlling engagement.

31. A circuit controlling device for fuse receptacles comprising an insulating member adapted for insertion in the fuse receptacle, means providing screw threads engageable with the screw-threaded shell of the fuse receptacle for holding said insulating member in said receptacle, said insulating member having a recess therein that is open at the bottom face thereof and an aperture in its top face that is open into said recess, a cover plate which overlies the open end of said recess and has an aperture therein, a movable contact member disposed in said recess having parts movable axially in said apertures in circuit-controlling direction, said contact member having an outstanding flange located in said recess, and a spring bearing against said flange and normally holding said contact member in elevated position with said flange at one end of said recess.

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