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ISOLATING PLUGGING-IN BOX FOR ELECTRIC POWER CABLES

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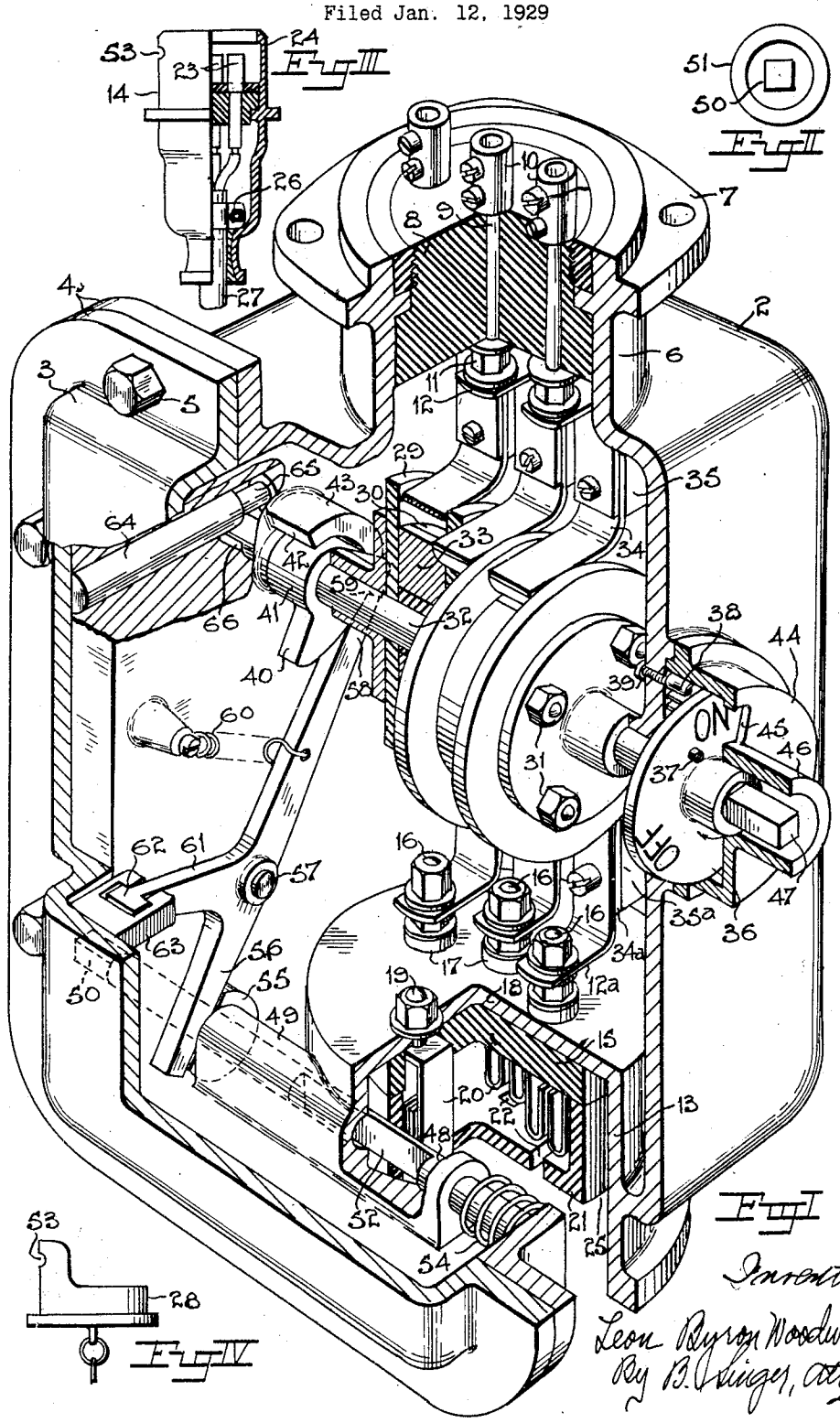


Fig I

Fig IV

Fig III

Fig II

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ISOLATING PLUGGING-IN BOX FOR ELECTRIC POWER CABLES

Application filed January 12, 1929, Serial No. 332,174, and in the Union of South Africa June 22, 1928.

The present invention is an isolated plugging-in box for connecting a portable cable such as the trailing cable of a coal cutter to the fixed power cable system.

A feature of the invention is the provision of safety arrangements for preventing accidents when the trailing cable is being connected or disconnected, and also when the box is being examined or repaired.

The invention comprises a locking member movable to a postion at which it permits the plug to be pushed into or withdrawn from its socket and another position at which it locks the plug in its socket and also preferably forms a barrier to the entrance of the plug if that is not already in the socket. There is also provided a switch in the circuit of a socket terminal which can be closed only when the locking member is in its locking position.

Said switch is conveniently of the rotary drum type and is preferably biassed by a weight or a spring to move to its off position. With such switch, the control device may be a spring trigger adapted to hold the switch on, but to be displaced from such position by the locking member and thereby release the switch when the locking member is positioned otherwise than for locking.

It is preferred to provide for the actuation of both the plug lock and the switch by a single detachable key. This is engaged with the plug lock to unlock the same and after being detached from the plug lock is engaged with the switch to move it to the on position and thereby enable the trigger to engage it. When not being thus used, the key may be kept in the custody of a responsible person, thus preventing unauthorized operation of the plugging-in box.

The means which retains the switch in the on position may be arranged to lock the door of the box at the same time; and means may also be provided whereby opening of the cover locks the switch in the off position so that the whole time either the door is locked on or the switch is locked off. The switch locking means thus controlled by the door may be such as to enable the switch deliberately to be closed for testing purposes.

The plug locking means is preferably biassed towards its locking position.

One form of the invention is illustrated in the accompanying drawings in which

Fig. I is a perspective view of a plugging-in box with parts broken away.

Fig. II is an end view of the plug locking pin.

Fig. III is a partly sectioned view of the plug drawn to a smaller scale.

Fig. IV shows a dummy plug.

The box 2 is provided with a front cover 3 which when removed exposes the whole of the interior of the box. The cover is secured to the box by means of the flanges 4 and screws 5; a moisture and flame proof joint being made as by means of a copper gasket.

The upper end of the box is shown with tubular extension 6 having a bolting flange 7 for coupling it to the standardized junction box described in our application for Letters Patent No. 332,173.

The extension 6 is closed by a block 8 of insulating material through which pass the electric leads, consisting of bolts 9 having heads 10 and secured by nuts 11. The switch brush leads 12 are secured to said bolts. The heads 10 of the bolts are formed as binding sockets for the leads coming from the terminal block in the junction box to which the apparatus is attached.

The lower end of the plugging-in box is formed as a re-entrant socket 13 for receiving the cable plug 14 Fig. III. An insulating block 15 is secured at the inner end of this socket 13 by the three power contact bolts 16 having insulating bushes 17 where they pass through the metal end 18 of the socket, and by an earthing contact bolt 19 which is secured directly to said metal end of the socket. The lower ends of the bolts carry spring contact jaws 20 surrounded by an insulating shield 21 apertured at 22 for the entrance of the plug contacts 23.

The plug 14 is constructed with a casing 24 adapted to pass up into the annular space 25 left between the wall of the socket 13 and the insulating block 15 and shield 21; and it has the cable terminal contacts 23 and an earthing contact to engage the respective

spring contact jaws 20 in the socket 13. The clamp 26 or equivalent means for mechanically securing the cable 27 in the plug is arranged within said casing 24. The plug is fixed in the socket by the locking means hereafter described.

When the plug is not in position the socket is covered by a dummy plug 28, Fig. IV which is locked in the same way as the plug and thus protects the socket terminals 20 in case the switch should be left on.

In its preferred form the switch for isolating the socket terminals is a barrel composed of flash-over preventing discs 29 and contact discs 30 all secured together by bolts 31 and mounted on a shaft 32. The contact discs 30 are of insulating material, each with metal contacts 33 let in at diametrically opposite points and metallically connected to one another so that when the switch is in the correct angular position they connect the pairs of spring brushes 34, 34*a*. Said brushes are mounted upon insulating blocks 35 and 35*a*, screwed to the back of the box and are provided with the strip contacts 12, 12*a* connecting them to their respective bolts 9 and 16.

36 is a disc fixed on the switch shaft 32 and having a pin 37 connected to one end of a spiral spring 38, the other end of which is secured to the box at 39. Said spring tends constantly to rotate the switch barrel, in the direction indicated by the arrow to the off position. The barrel is held in this position by the stop face 40 of the collar 41 (which is fixed to the shaft 32) striking the edge 42 of the stop block 43 extending from the side of the box. A cover 44 over the disc 36 is apertured at 45 to expose the words "On" and "Off" marked on the face of the disc, thus indicating the position of the switch barrel. Said cover 44 is extended to form a socket 46 covering the end 47 of the shaft 32, which is squared or other wise formed to receive a key inserted into the socket.

The plug locking means consists of a pin 48 rotatably mounted in a barrel 49 integral with the box and intersecting the plug socket 13. The outer end 50 (Fig. II) of the pin 48 is shaped identically with the outer end 47 of the switch shaft 32 and it is enclosed within a socket 51 similar to the switch shaft socket 46 so that it can be rotated by the same key as the switch barrel.

The middle section of this pin 48 is half cut away so that when the remaining half 52 is in the angular position shown it enters the corresponding notch 53 in the cable plug 14 and so locks said plug in the socket 13; whilst in its opposite angular position said half 52 lies wholly out of the socket 13, when the plug 14 can be withdrawn or inserted. One end of the pin 48 has attached to it a coil spring 54 which tends constantly to rotate the pin into its plug locking position.

A cam 58 is secured on the locking pin 48 to rotate therewith, and actuates a trigger 56 pivoted at 57 and having an end 58 adapted to engage a tooth 59 on the collar 41 for holding the switch on. The trigger is fitted with a spring 60 tending to engage it with the tooth 59.

Said trigger 56 has an arm 61 with a T head 62 which engages in a slotted lug 63 on the inside of the cover 3 and prevents the removal of the cover when the switch is on.

The means for locking the switch when the cover 3 is open consists of a bolt 64 sliding endwise in a socket formed in the box wall and intersecting the adjacent bearing of the switch shaft 32. A spring compressed in the bottom of the recess and not shown, tends to project the bolt partly out of its recess; but when the cover 3 is in position it presses the bolt back into its recess to the position shown in the drawing. In this position a peripheral groove 65 on the bolt comes opposite the switch shaft 32 so that the latter is free to rotate in the normal manner.

When the switch has been released by the displacement of the trigger 56—and when accordingly the cover 3 has been unlocked by the rising of the T head 62—, a flat 66 on the switch shaft comes uppermost. Upon removal of the cover, the bolt 64 is pushed out by its spring so that its full diameter at the rear of the groove 65 comes over said flat 66 so locking the switch shaft against rotation from its off position. It will be noted that when the bolt 64 has become projected by the removal of the cover 3, it can still be manually depressed to release the switch. This is to enable the switch to be rotated for testing purposes; but as it would be deliberately done by the authorized electrician who is working at the box, it should not be dangerous.

The operation necessary to insert the cable plug 14 in the socket 13 involves first the fitting of the key in the socket 51 and its engagement with the end 50 of the locking pin 48; then rotation of said pin 48 by the key sufficiently to bring the halved portion 52 of said pin out of the socket 13. It is arranged that this movement requires a large angular movement, such as one of 180 degrees. In the initial and preferably small portion of this movement, say 20 degrees, the cam 55 on the locking pin 48 forces over the trigger 56 and releases the end 58 of the same from switch shaft tooth 59, whereupon the switch spring 38 rotates the switch to the "off" position, at which it is held by the stop face 40 contacting with the stop block 43.

The plug 14 being now inserted into the socket 13, the locking pin 48 is turned back or allowed to spring back to its original position so that its halved portion 52 locks the plug in the socket. The current is however still switched off, and to switch it on the key is

detached from the locking pin and applied to the end 47 of the switch shaft 32. Said shaft can then be rotated against its spring 38 to bring the switch to the "on" position, at which the trigger end 58 once more falls under the tooth 59 and maintains the switch in position.

To remove the plug 14 the locking pin 48 has again to be rotated as before, so that before the plug is released the cam 55 again throws out the trigger end 58 and so causes the current to be switched off.

Owing to the initial small angular movement of the locking pin 48 which effects the release of the switch and the remaining large angular movement which has thereafter to be effected before the plug 14 is released, there can be no danger of sparking if the plug is allowed to fall out of its socket, when released, instead of being withdrawn by hand.

For the same reason the switch can if desired be released and thereby put into its off position by giving the locking pin 48 a partial turn, while still leaving the plug 14 in place.

Claims:

1. In a plugging-in box, the combination of a plug socket, a switch controlling the current supply to said socket, energy storing means tending constantly to open said switch, a plug locking member movable to a locking position where it debars insertion or withdrawal of the relevant plug into or from the socket, means to hold the switch in its closed position and displaceable to release the switch by movement of the plug locking member from its locking position, so that the energy storing means is free to open the switch.

2. In a plugging-in box, the combination of a plug socket, an electric switch controlling the current supply to said socket, and comprising a rotatable member biassed towards its off position, a trigger for holding said rotatable member in its on position, and a plug locking member movable to a locking position where it debars entrance or withdrawal of the relevant plug into or from the socket and comprising a part which engages and trips the trigger when the plug locking member is moved from its locking position.

3. In a plugging-in box, the combination of a plug socket, an electric switch controlling the current supply to said socket and comprising a rotatable member biassed towards its off position, a trigger biassed to move into position to hold said rotatable member in its on position, and a rotatable plug locking member movable to a plug locking-position in the plug socket and provided with a projection adapted to trip the trigger when the locking member is moved from said position.

4. In a plugging-in box, the combination of a plug socket, a switch controlling the current supply to said socket, a plug locking member movable to and from a locking position where it debars insertion or withdrawal of the relevant plug into or from the socket, and means actuated by a relatively small initial movement of the plug locking member from its plug locking position for opening the switch, the plug locking member having thereafter a relatively large movement before it ceases to function as a plug lock.

5. In a plugging-in box, the combination of plug engaging terminals, a switch controlling the current supply to said terminals and comprising a rotary member enclosed within the box and having an exposed part shaped for turning engagement by a detachable key, a rotary plug locking member also enclosed within the box and having an exposed part similar to the exposed part of the rotary switch member shaped for turning engagement by the same detachable key, and means actuated by rotation of the plug locking member from its plug locking position for opening the switch.

6. In a plugging-in box, the combination of plug engaging terminals, a switch controlling the current supply to said terminals and comprising a member biassed to move to its open position, said member having an exposed key engaging part, a movable plug locking member biassed to move to a plug locking position and having an exposed key engaging part similar to that of the switch member, and means operating to hold the switch member in its closed position and moved to release said member by movement of the plug-locking member from its plug-locking position.

7. In a plugging-in box, the combination of plug engaging terminals, a rotary switch member controlling the supply of current to said terminals and biassed to move to its open position, said member being enclosed within the box and having a spindle end exposed and shaped for engagement by a detachable key, a rotary plug locking member biassed to move towards its plug locking position and having a spindle end exposed and shaped similarly to that of the switch member, and means operating to hold the switch member closed, and moved to release the switch by movement of the plug-locking member from its plug-locking position.

In testimony whereof I affix my signature.

LEON BYRON WOODWORTH.