

Aug. 8, 1939.

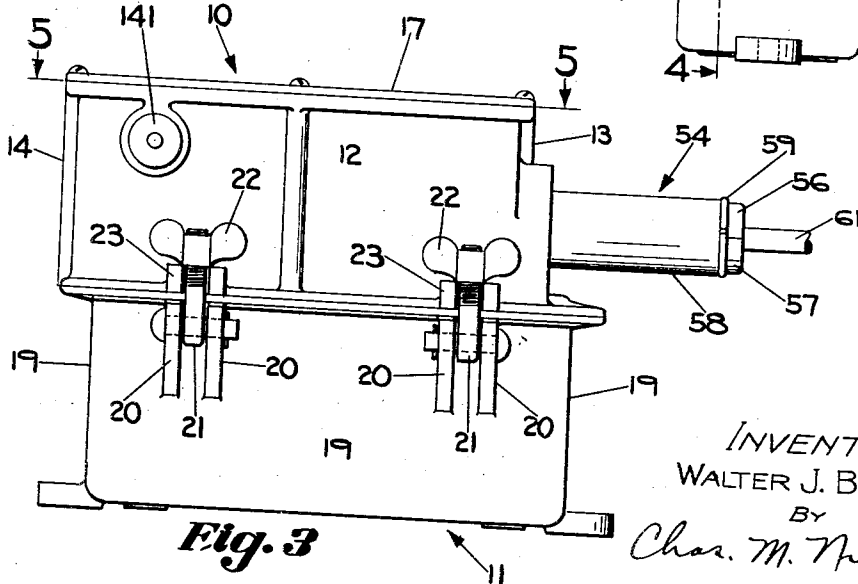
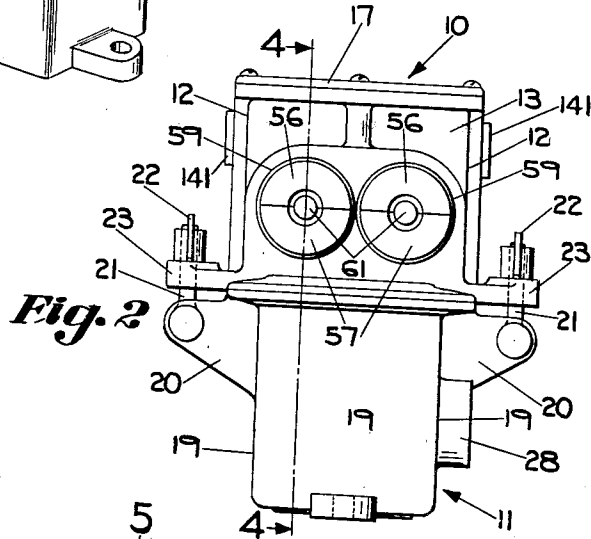
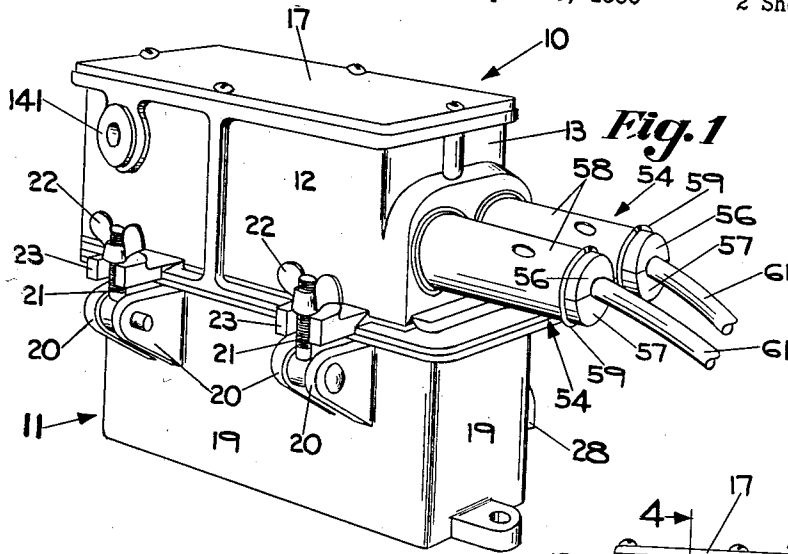
W. J. BAUROTH

2,168,663

PLUG TYPE SWITCH

Filed April 3, 1936

2 Sheets-Sheet 1



INVENTOR:
WALTER J. BAUROTH,
By

Chas. M. Nissen
ATTY.

Aug. 8, 1939.

W. J. BAUROTH

2,168,663

PLUG TYPE SWITCH

Filed April 3, 1936

2 Sheets-Sheet 2

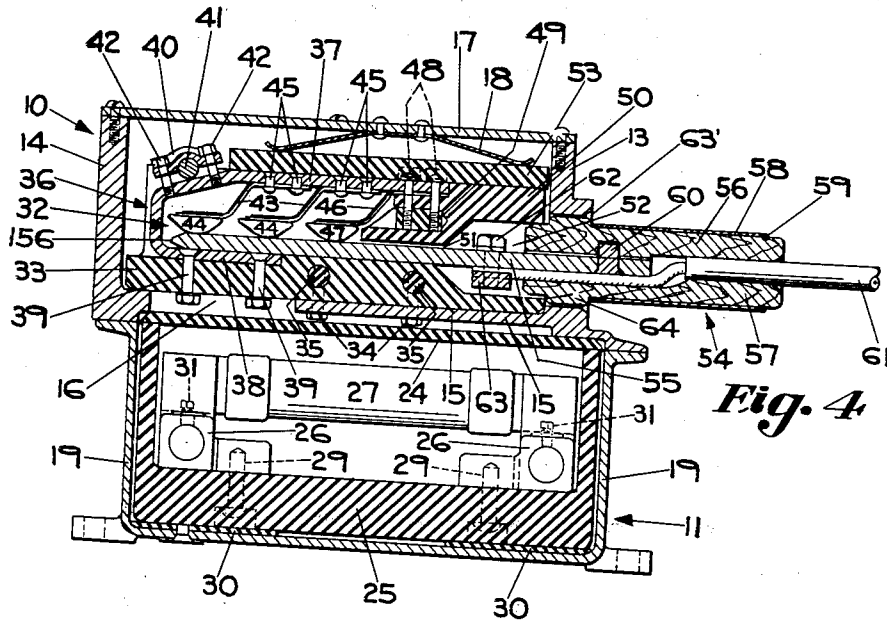


Fig. 4

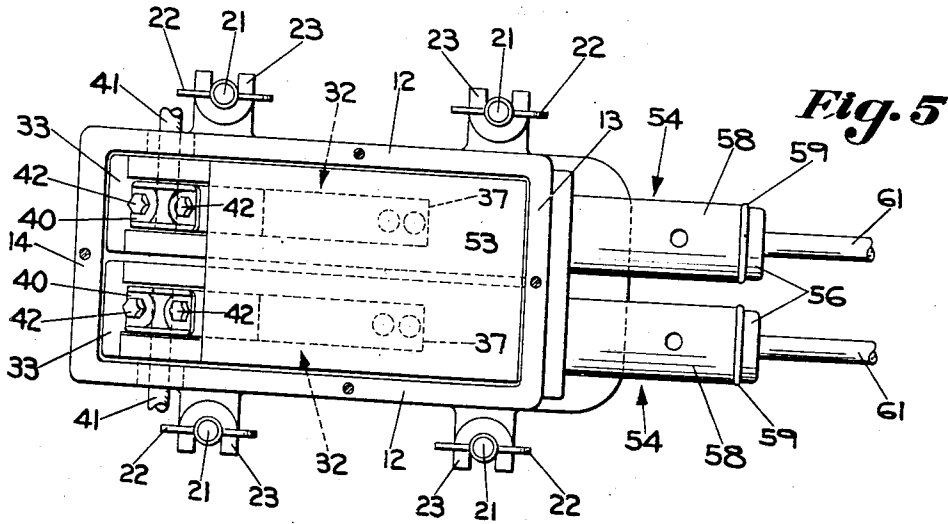


Fig. 5

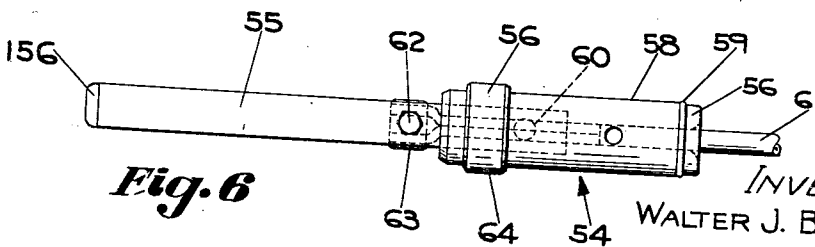


Fig. 6

INVENTOR:
WALTER J. BAUROTH,
By
Char. M. Nissen,
ATTY.

UNITED STATES PATENT OFFICE

2,168,663

PLUG TYPE SWITCH

Walter J. Bauroth, Columbus, Ohio, assignor to
The Jeffrey Manufacturing Company, a corporation of Ohio

Application April 3, 1936, Serial No. 72,638

10 Claims. (Cl. 173—332)

This invention relates to a new and improved plug type switch which is preferably constructed in combination with a combined switch and fuse box.

5 An object of the invention is to provide an improved plug type switch particularly adapted for use in connection with mining machines which will permit the plug or plugs to be removed under load in case of an emergency, without appreciable damage to the mechanism, while at the same time protecting the operator.

10 A more specific object of the invention is to provide a plug type switch with a plurality of fingers all of which make contact with a switch plate during the normal operation of the device and in which the circuit will be broken between a readily removable and readily renewable contact finger and the plug plate in case the plug is removed while the machine controlled thereby is operating under load.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

25 Fig. 1 is a perspective view of the casing of the device comprising my invention;

Fig. 2 is an end elevational view of the device of Fig. 1;

30 Fig. 3 is a side elevational view of the device of Fig. 1;

Fig. 4 is an elevational sectional view taken on the line 4—4 of Fig. 2, looking in the direction of the arrows;

35 Fig. 5 is a plan view of the device with the switch cover plate removed, and taken on the line 5—5 of Fig. 3 looking in the direction of the arrows; and

Fig. 6 is a plan view of one of the plugs of the device of my invention.

40 It sometimes occurs, particularly in the operation of mining machines, that a condition will arise during which a mining machine will be operating under load and become stalled but the circuit breakers which control the electric circuits therefor will fail to function properly and will thus require that an operator pull out a plug in order to prevent the destruction of the motor of the mining machine. While this is an unusual condition it does occur at times, and the invention herein disclosed is designed to cope with such a condition and to protect the plug type switch as well as the operator who is compelled to pull the plug under the mentioned conditions.

45 As is best seen in Figs. 1, 2 and 3 of the drawings, the device of my invention comprises a housing formed by a plug type switch compartment 10 which is removably attached to and positioned above a fuse housing 11. The switch compartment 10 is formed by integrally connected side 50 walls 12 and front and rear end walls 13 and 14,

respectively. An integral bottom wall 15 is also provided within which is an opening 16. A removable top cover plate 17 is provided and has on its bottom surface a pair of spring fingers 18 adapted to contact a switch mechanism within the compartment 10 which will be described more in detail hereinafter.

5 The fuse housing 11 is provided with integral side and end walls 19, said side walls each carrying a pair of laterally extending brackets 20, 20 with which co-operate swiveled bolts 21, 21 provided with wing nuts 22, 22 adapted to co-operate with bifurcated brackets 23, 23 carried by bottom flanges on plates 12, 12 of the switch compartment 10. It will be obvious that the wing nuts 22, 15 22 may be adjusted to clamp the switch compartment and fuse housing or compartment rigidly together, or may be released to permit their free separation.

As is best seen by reference to Fig. 4 of the drawings, the fuse housing 11 of metal is provided with an open top which is covered by a plate 24 of insulating material, which plate is held in place by the switch compartment 10. Mounted within the fuse housing 11 is a dish-shaped insulating block 25 upon which is mounted a pair of fuse clips 26, 26 which carry a fuse 27. Access to the fuse clips 26, 26 to make electrical contact therewith will be through apertured bosses, one of which is seen at 28 in Figs. 1 and 2. The fuse clips 26, 26 are rigidly attached to the block 25 as by screws 29, the heads of which are set in countersunk holes in block 25 and are insulated from the bottom of the metal housing 11, by means of insulating plates 30, 30, which may be riveted to the bottom of said fuse housing. A well known type of clamping means in the form of a set screw 31 is provided for each of the fuse clips 26, 26 to attach a conductor removably thereto.

35 Mounted within the switch compartment 10 is a pair of plug type switch mechanisms 32, 32 placed side by side as illustrated in Fig. 5. As these switch mechanisms are essentially duplicates, it will be understood that the following description will apply to each. In the bottom 45 of the switch compartment 10 I provide an insulating block 33, preferably molded asbestos fiber. There may be only one such block for the two switch mechanisms 32, 32. The block 33 is clamped rigid with the bottom wall 15 by screws 34, 34 which thread into transversely extending rods 35, 35 which may also be made of insulating material.

50 Mounted upon said insulating block 33 are the two switch mechanisms 32, 32 each of which comprises a U-shaped bracket 36 of material having high conductivity such as copper or bronze, said bracket 36 having an elongated top plate or arm 37 and a shorter bottom plate or arm 38, the latter of which fits in a recess in the rear end of 60

the insulating block 33 and is rigidly attached to said block 33 as by countersunk bolts 39 which are provided with appropriate nuts.

Adjacent the top rear end the U-shaped bracket 36 is provided with a conductor clamping and connecting yoke 40 adapted to provide good electrical connection between a conductor 41 and the U-shaped bracket 36, said conductor 41 extending through an apertured boss 141 on a side wall 12. Appropriate screws 42, 42 co-operate with said yoke 40 to effect a clamping action on said conductor 41. The top plate 37 also carries two downwardly extending spring fingers 43, 43 which are provided with contact tips 44, 44, said spring fingers 43, 43 and tips 44, 44 being of conducting material such as copper or bronze, and said spring fingers 43 being rigidly attached to said top plate 37 as by rivets 45. It will be evident that the spring fingers 43, 43 provide a conducting path from the top plate 37 to the contact tips 44, 44.

In addition to the spring fingers 43, 43 I provide a third spring finger 46 provided with a contact tip 47. The spring finger 46 and contact tip 47 are identical with fingers 43, 43 and contact tips 44, 44 except that instead of being rigidly attached to the top plate 37 they are removably attached thereto by a plurality of screws 48 which thread into a block 49, preferably of insulating material and which clamps an insulating block 50 against the spring finger 46. That is, the spring finger 46 will be held in position by being clamped between the insulating block 50 and the top plate 37.

It may also be pointed out that the insulating block 50 co-operates with the insulating block 33 to provide an elongated passageway 51 which opens into a chamber 52, the function of which will be described more in detail hereinafter.

Positioned above the switch mechanisms 32, 32 and in contact with the top plates 37, 37 thereof is an insulating plate 53 which is held down by the previously mentioned spring fingers 18 carried by the removable cover plate 17.

Co-operating with each of the switch mechanisms 32, 32 is a hand operated switch plug 54. There are two such plugs 54 which are of identical construction. Each of said switch plugs 54 comprises an elongated flat blade 55 of conducting material such as copper or bronze provided with a pointed nose 156 and carried by a handle formed by a pair of complementary wood semi-cylinders 56 and 57. Said semi-cylinders 56 and 57 are held in clamped relation by a cylinder 58 which may be slid thereover and held in place by a spring ring 59. A rivet 60 extends through the blade 55 and into a notch in the semi-cylinder 57 thus preventing longitudinal movement between the plug handle and the blade 55. The semi-cylinders 56 and 57 cooperate to provide a conduit for a conductor 61 which is electrically connected to the blade 55 by a screw 62 and a clamp plate 63.

The switch plug 54 is insertable through an appropriate aperture 63' provided in an enlargement of the front end wall 13 of the switch compartment 10. The switch plug is provided with an enlarged circumferential flange 64 on the handle thereof which is adapted to abut the insulating block 33 to limit the inward movement of the plug 54. When the plug is inserted, as illustrated in Fig. 4 of the drawings, the spring fingers 43, 43 and 46 will urge the blade 55 into contact with the bottom plate 38 of the U-shaped bracket 36. This will provide a conducting path between said

bottom plate 38 and said blade 55. An additional conducting path will be provided between the contact tips 44, 44 and 47 through the spring fingers 43, 43 and 46 to the top plate 37. This will insure a good contact to close the circuit between the conductor 41 and the conductor 61.

Should it be found necessary to pull the plug 54 while current is passing through the conductors 41 and 61 under conditions previously mentioned, it is to be noted that the contact tips 44, 44 will break their electrical contact with the blade 55, and said blade 55 will break its electrical contact with the bottom plate 38, while the contact tip 47 still makes electrical contact with said blade 55. Thus when the plug 54 is pulled out with the device under load, the circuit is finally broken only between the blade 55 and the contact tip 47 carried by spring finger 46. As a consequence the arc which will be produced will only be produced between said contact tip 47 and the blade 55. Any resulting damage will be confined principally to the contact tip 47 and possibly to a slight extent to the blade 55. As was previously pointed out the spring finger 46 which carries the contact tip 47 is readily removable and thus may be readily renewed.

It is also to be noted that as this circuit is being broken with the consequent arcing, the blade 55 will be traveling with its tip end or nose 156 adjacent the elongated passageway 51 which is only of sufficient cross-sectional area to receive the blade 55 with ease. The withdrawal movement of the blade 55 from this passageway will produce such suction as to produce an outward rush of gases tending to cool the arc and extinguish it and prevent its doing any harm to the operator who pulls out the plug 54. The expansion chamber 52 which follows the passageway 51 not only provides room for the screws 62 and clamp plate 63 but also allows for expansion of any gas which comes through the passageway 51 before it issues from the aperture 63', thus further protecting the operator. There will, of course, be two of the switch plugs 54 and either or both of them may be pulled out to cut off the circuit under conditions previously mentioned.

It is thus evident that I have provided a device which provides adequate contacting area between the switch blade 55 and the contact tips 44, 44 and 47 so that arcing will not cause the blade 55 to blister and stick, thus insuring that it may be readily removed at any time. Furthermore, when the blade 55 is pulled out under load, the arc will be drawn into the passageway 51, as previously described, and the insulating block 50 is so formed that the arc will occur between tip 47 and blade 55 and will be directed so as not to occur between spring finger 46 and blade 55. If this latter condition were permitted the spring finger 46 would soon lose its elasticity.

The passageway 51 and expansion chamber 52 cooperate to extinguish the flame so that when the device is operated under load the flame of the arc will not issue from the casing 10 and therefore the switch has flame-proof features adapting it for use in a gaseous mine.

It may be mentioned that all of the exposed insulating material is preferably of asbestos fiber which will withstand the arcing without deterioration.

It may also be mentioned that while the finger 46 and contact tip 47 are renewable, said tip 47 is preferably made of such size and hard material, such as hard drawn copper, or bronze, that

it has a very long life and thus need not be often renewed though subjected to severe use.

It should be particularly noted that only the contact tip 47 is subject to arcing. The contact tips 44, 44 are never subjected to arcing and are therefore always each in excellent condition for making very good conducting wiping engagement with the blade 55. Consequently no blistering by arcing at the contact tip 47 can ever cause the switch blade 55 to stick in its position shown in Fig. 4. The operator can therefore rest assured that in any case of emergency the blade 55 can readily be withdrawn to break the motor circuit.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a switch, the combination with a U-shaped contact having arms one of which is longer than the other, of a plurality of spring contact fingers carried by the longer arm and extending toward the shorter arm, a removable plug having a blade adapted to extend between the plates of said U-shaped contact and to contact all of said fingers and said shorter arm, one of said fingers being so positioned that when said blade is withdrawn it will make contact therewith until after the blade breaks its contact with said shorter arm.

2. In a switch, the combination with a casing, of a base of insulating material therein, a bottom contact plate, a top plate electrically connected thereto, a plurality of resilient contact fingers carried by said top plate and extending to positions adjacent said bottom plate, a removable plug comprising a conducting blade adapted to be inserted in said casing and to be contacted by said fingers and thereby pressed against said bottom plate, one of said fingers being positioned so that as the plug is removed it will break contact therewith after said blade has broken contact with said bottom plate.

3. In a switch, the combination with a base of insulating material, of a contact plate thereon, means including a plurality of contact fingers spaced from said plate, a removable plug including a conducting blade, said fingers cooperating with said blade to press it into contact with said contact plate when the plug is in operating position, at least one of said fingers being of conducting material and being so positioned that when said plug is removed it will break its contact with said blade after said blade has broken contact with said plate.

4. In a switch, the combination with a casing, of an insulating block in the bottom thereof, a U-shaped conducting bracket mounted on said bottom, said bracket having a top leg which is longer than its bottom leg, and spring contact fingers carried by said top leg and extending toward said bottom leg, one of said fingers being positioned longitudinally beyond the end of said bottom leg.

5. In a switch, the combination with a base of insulating material, a contact plate carried thereby, a top plate of conducting material positioned above said contact plate and extending longitudinally therebeyond at one end, means electrically

connecting said plates, spring finger means carried by said top plate and extending toward said bottom plate and positioned adjacent thereto, and a readily removable spring finger carried by said top plate and extending to a position above said base and spaced longitudinally from said contact plate.

6. In a switch, the combination with an insulating base, of a pair of conducting plates of unequal length supported thereby, means electrically connecting said plates, contact means carried by the longer plate and extending toward the shorter plate and adjacent thereto, and readily removable contact means carried by said longer plate and extending toward said shorter plate but positioned at a point removed from said shorter plate.

7. In a switch, the combination with a U-shaped contact having arms one of which is longer than the other, of a plurality of spring contact fingers carried by the longer arm and extending toward the shorter arm, a removable plug having a blade adapted to extend between the plates of said U-shaped contact and to contact all of said fingers and said shorter arm, one of said fingers being so positioned that when said blade is withdrawn it will make contact therewith until after the blade breaks its contact with said shorter arm, said one finger being readily removable.

8. In a switch, the combination with a casing, of a base of insulating material therein, a bottom contact plate, a top plate electrically connected thereto, a plurality of resilient contact fingers carried by said top plate and extending to positions adjacent said bottom plate, a removable plug comprising a conducting blade adapted to be inserted in said casing and to be contacted by said fingers and thereby pressed against said bottom plate, one of said fingers being positioned so that as the plug is removed it will break contact therewith after said blade has broken contact with said bottom plate, said one finger being readily removable.

9. In a switch, the combination with a base of insulating material, of a contact plate thereon, means including a plurality of contact fingers spaced from said plate, a removable plug including a conducting blade insertable between said plate and fingers and in contact therewith, said means including said fingers cooperating with said blade to press it into contact with said contact plate when the plug is in operating position, at least one of said fingers being of conducting material and electrically connected with said contact plate independently of said blade and being so positioned that when said plug is removed it will break its contact with said blade after said blade has broken contact with said plate, said one finger being readily removable.

10. In a switch, the combination with a casing, of a base of insulating material therein, a U-shaped member forming a bottom contact plate and a top plate, a plurality of resilient contact fingers carried by said top plate and extending to positions adjacent said bottom plate, a removable plug comprising a conducting blade adapted to be inserted in said casing and to be contacted by said fingers and thereby pressed against said bottom plate, one of said fingers being positioned so that as the plug is removed it will break contact therewith after the blade has broken contact with said bottom plate, said one finger being readily removable.

WALTER J. BAUROTH.