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INTERLOCKING PLUG AND RECEPTACLE ELECTRICAL CONNECTOR

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Fig. 1

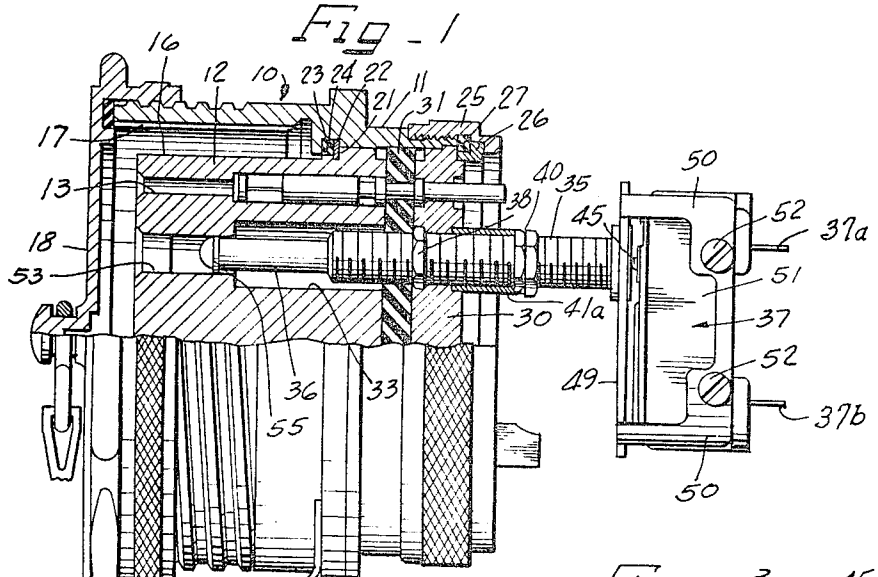
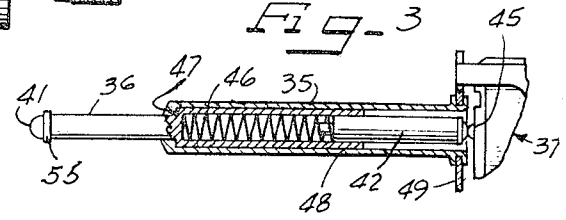


Fig. 3



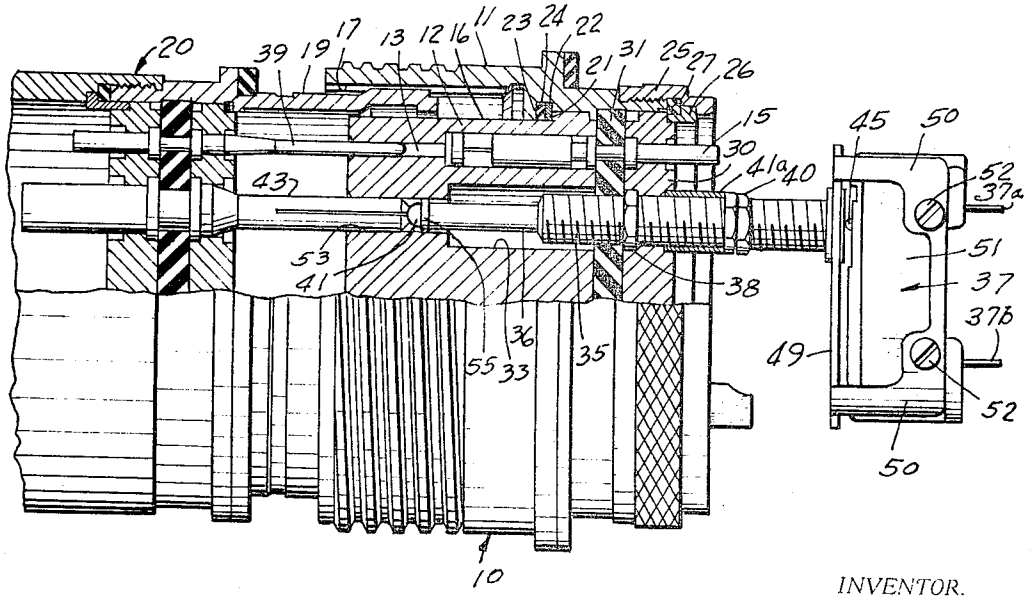


Fig. 2

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INTERLOCKING PLUG AND RECEPTACLE ELECTRICAL CONNECTOR

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1 Claim. (Cl. 200—51.09)

This invention relates to improvements in electrical receptacle connectors.

A principal object of the present invention is to provide an improved form of receptacle connector arranged to complete an electrical circuit when the contacts thereof are engaged with complementary contact members, and maintaining the contacts of the receptacle deenergized except upon the purposely making of a circuit.

Another object of the invention is to provide an improved form of electrical connector receptacle having a contact carrier with parallel passageways leading through the carrier and current conducting circuit making line contact members in certain of the passageways, with switch means in association with another of the passageways and an actuator movable along the other passageway and actuated to operate the switch means to complete an electrical circuit through the line contact members upon circuit making engagement of the line contact members by corresponding complementary contact members, movable within the passageways.

A still further object of the invention is to provide an improved form of electrical connector receptacle including a contact carrier having a plurality of passageways leading through the carrier with current conducting circuit making contact members in certain of the passageways and a switch in association with another of the passageways, with an actuator in the other of the passageways, spring biased to engage the switch and actuated by the movement of complementary contact members along the passageways to effect energization of the circuit making line contact members only upon movement of the complementary contact members along the passageways to engage the current conducting circuit making line contact members.

A still further object of the invention is to provide an improved form of interlocking plug and receptacle assembly including contact carrier means having a plurality of passageways leading therethrough with circuit making line contact members in certain of said passageways, and a snap acting switch and actuator stem in association with another of the passageways and actuated by a pin on the plug assembly, to effect energization of the circuit making line contact members only when the plug is in the receptacle, and to deenergize the line contact members as the plug is moving out of the receptacle.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawing wherein:

FIGURE 1 is a partial fragmentary longitudinal sectional view taken through an electrical receptacle connector constructed in accordance with the principles of the present invention with certain parts of the connector housing shown in side elevation;

FIGURE 2 is a partial fragmentary longitudinal sectional view of the receptacle shown in FIGURE 1 showing a plug moving into the receptacle in position to complete an electrical circuit; and

FIGURE 3 is a sectional view taken through the switch actuator guide and support shown in FIGURES 1 and 2, and showing certain details of the switch actuator not shown in FIGURES 1 and 2.

In the embodiment of the invention illustrated in the drawings, I have shown in FIGURE 1 a receptacle 10 including a generally cylindrical housing 11 having a contact carrier member 12 mounted therein and having a plurality of parallel contact containing passageways 13 leading therethrough. Contacts 15 are mounted in and extend partially along the passageways 13 to the back of said housing and are adapted to have circuit conducting leads (not shown) soldered or otherwise connected to the outer ends thereof.

As shown in FIGURES 1 and 2 the contact carrier 12 has an outer peripheral wall portion 16 spaced inwardly of an interior wall 17 of the housing 11. The space between the walls 16 and 17 forms an annular recess to receive an open annular end portion 19 of a plug assembly 20. The casing 11 is shown as being threaded from its open end and as having an end cap 18 threaded thereon. The end cap 18 may be removed when it is desired to establish an electrical connection between the contacts 15.

The contact carrier 12 may be made from a suitable insulating material and is shown in FIGURES 1 and 2 as having a shoulder 21 extending outwardly of the wall 16 and abutting a washer 22 spaced from an inwardly extended shouldered portion 23 of the housing by a resilient ring 24. The contact carrier 12 is retained in position against the shoulder 23 by an annular gland nut 25 threaded on the rear end of the housing. The annular nut 25 abuts a retaining ring 26 having an outwardly facing shouldered portion engaging a resilient ring 27 abutting the end of the housing. The retaining ring 26 also engages a connector retainer 30 abutting at its inner end a resilient plate 31 engaging the inner end of the contact carrier 12. The contact carrier 12, resilient plate 31 and connector retainer 30 form in effect a contact carrier assembly for carrying the contacts 15.

The contact carrier also has an enlarged diameter passageway 33 leading therethrough parallel to the passageways 13 and having an actuator guide 35 extending therein for a portion of the length thereof. The actuator guide forms a guide for an actuator pin 36 for operating a switch 37, to make or break electrical circuits connected to contact members 37*a* and 37*b* to operate a control device regulating the current flow through the main line contacts 15, for example, by regulating the main power contactors. The switch 37 may be of any well known form of make and break switch and preferably is a quick make and break switch of the snap acting type.

The guide 35 is shown in FIGURES 1 and 2 as being an exteriorly threaded tube extending through the members 30 and 31 and retained to the member 30 by a nut 38 threaded on said guide and engaging the inner side of the member 30 and a pair of lock nuts 40 engaging a sleeve 41*a* on the tube 35 and maintaining said sleeve in engagement with the member 30 and said tube in position on the member 30.

The actuator pin 36 is shown as having a guide ring 55 slidably guided along a passageway 53 terminating at its inner end in the passageway 33. The pin 36 has a rounded outer end portion 41 adapted to be engaged by an actuating pin 43 mounted in and extending inwardly from the contact carrier 44 of the plug assembly 20 as the contacts 39 of the plug assembly are moved inwardly along the passageways 13 to engage the contacts 15. The actuator pin 36 is shown in FIGURE 3 as being a hollow pin having a spring 46 seated therein and engaging a movable actuator plug 42 engageable with an actuator button 45 of the switch 37, to operate said switch to effect the completion of an electrical circuit through the line contact members 15, when the contact pins 39 are moved inwardly along the passageways 13 to complete a circuit between said contact pins and said contact members.

The spring **46**, seated between the pin **36** and plug **42**, is compressed as the contacts **39** are moved to engage the contacts **15**. Compression of the spring **46** will cause movement of the actuator plug **42** to exert sufficient pressure on the actuator button **45** to actuate the switch **37**. The spring **45** thus accommodates overtravel of the pin **36** to enable said pin to continue travel after engagement of the contact pins **39** with the contacts **15** until the plug is fully mated in the receptacle **10**. The free or outer end of the tube **35** forms a support for a mounting plate **49** for the switch **37**, and is suitably secured to said mounting plate. The mounting plate **49** is shown in FIGURE 2 as being mounted on the outer end of the tube **35** and as being the base of a generally U-shaped mounting bracket for the switch **37**. Legs **50** of the mounting bracket extend away from the guide tube **35** along opposite sides of a casing **51** for the switch **37** and are secured to said switch as by machine screws **52**.

When the plug assembly is disconnected from the receptacle **10**, the actuator pin **36** will be moved by the spring **46** into the extended position with respect to its guide tube **35** shown in FIGURE 1. This will release pressure on the plug **42** and switch button **45**. The switch **37** will then operate to effect the deenergization of the line contacts **15**.

As the plug assembly **20** is inserted into the receptacle **10**, the actuating pin **43** will slidably fit through the entering end **53** of the passageway **33**. As the plug and contact pins **39** are moved inwardly along their respective passageways, the actuating pin **43** will first engage the end **41** of the actuator pin **36** and move said pin against its spring **46** and thereby compress the spring **46** an amount sufficient to exert sufficient pressure on the plug **42** and actuator button **45**, and to actuate said switch to electrically connect the contacts **15** in a line energizing circuit.

Upon disconnection of the plug assembly **20** from the receptacle **10**, the pin **36** will follow the pin **43** as it moves out of the receptacle. The spring **46** will then release pressure from the actuator plug **42** and accommodate movement of the switch button by the bias of the switch arm into position to deenergize the contacts **15** and accommodate the movement of the contact pins **39** out of circuit completing contact with the contacts **15**, with the circuit through said contacts deenergized, to thereby avoid arcing and burning of the contact pins **39** and contacts **15** as said contact pins are disengaged from the contacts **15**.

It should be understood that the plug and receptacle assembly just described is particularly adapted to be used as an explosion proof connector and when so used is usually mounted in an explosion proof housing with the switch arm **37** enclosed in the housing. With such an assembly the receptacle will be a dead front and circuit

opening and closing will be inside of the housing protected from hazardous areas.

While I have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modfications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

An electrical connector receptacle comprising,

a housing,

a contact carrier in said housing,

a plurality of parallel passageways leading through said contact carrier,

current conducting circuit making contact members mounted in certain of said passageways for effecting a mechanical and electrical connection with corresponding complementary contact members by rectilinear movement of the corresponding complemental contact members to engage said current conducting circuit making contact members,

a guide sleeve extending along one of said passageways,

a snap acting switch mounted on the outer end of said guide sleeve and having a switch button in registry with said guide sleeve,

an actuator pin movable along said guide sleeve,

an actuator plug movable with respect to said actuator pin for engaging said switch button,

spring means interposed between said plug and actuator pin and biasing said actuator pin outwardly with respect to said sleeve,

said plug being engaged with said switch button with sufficient pressure to actuate said snap acting switch upon the rectilinear movement of complementary mating contact members along said passageways to engage said contact members, to thereby provide an electrical circuit interlock with respect to said contact members.

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