

United States Patent

[[[3,594,685

[72]	Inventor	Francis V. Cunningham Western Springs, Ill.
[21]	Appl. No.	841,265
[22]	Filed	July 14, 1969
[45]	Patented	July 20, 1971
[73]	Assignee	Joslyn Mfg. and Supply Co. Chicago, Ill.

Des 148,105 12/1947 Gossard 339/110 P
2,728,055 12/1955 Curtis 339/19
Primary Examiner—Robert K. Schaefer
Attorney—Mason, Kolehmainen, Rathburn & Wyss

[54] ELECTRICAL COUPLER
6 Claims, 4 Drawing Figs.

[52] U.S. Cl..... 339/19,

339/111

[51] Int. Cl. H01r 13/62,
H01r 31/08

H01 r 31/08

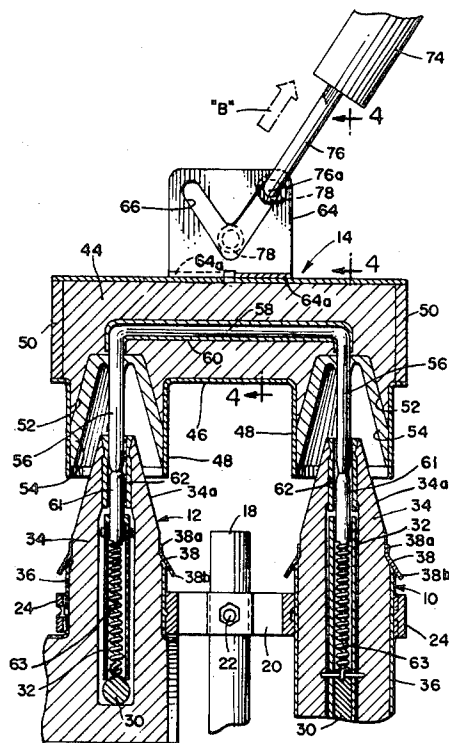
[50] **Field of Search**..... 339/19,
109, 110, 110 C, 110 C, 160 P; 200/19, 109, 110,
110 C, 160 P

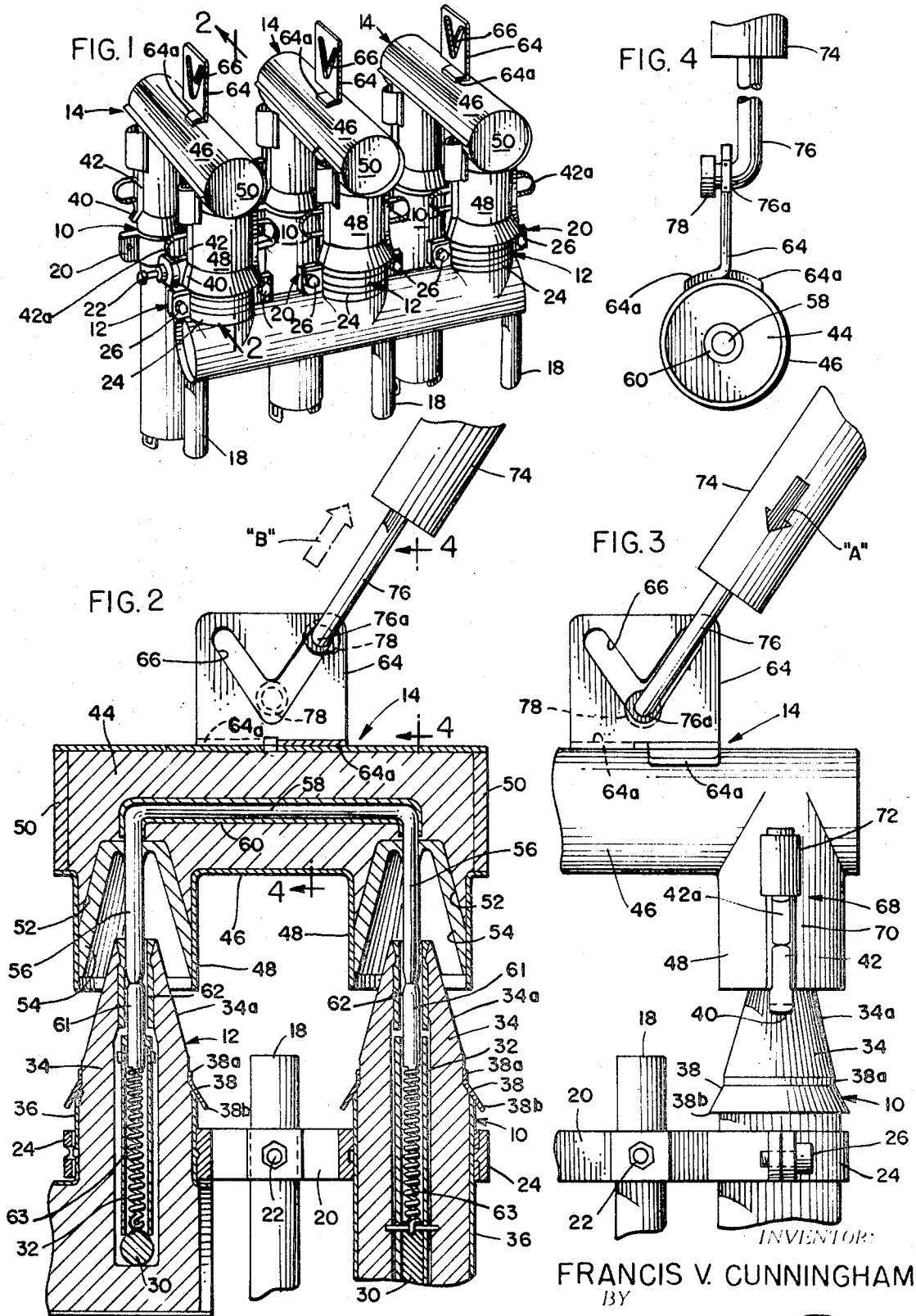
[56] **References Cited**

UNITED STATES PATENTS

1,747,069	2/1930	Gould.....	339/19 X
-----------	--------	------------	----------

ABSTRACT: A coupler for making or breaking contact with the end of a fixed terminal comprising a body having terminal means on one side adapted for contact with the fixed terminal and bracket means extending outwardly on an opposite side. An elongated slot is formed in the bracket means for slidably receiving the pin of a hot stick used for moving the coupler toward and away from the fixed terminal to make and break contact therewith, the slot extending in a general direction toward and away from the end of the fixed terminal and including stop surfaces at opposite ends. The hot stick pin is freely movable between the stop surfaces and is engageable therewith to exert force on the coupler to make or break contact with the fixed terminal.





INVENTOR:
FRANCIS V. CUNNINGHAM
BY
Magoy, Kolehmainen, Rathbun & Wyss
ATT'YS

ELECTRICAL COUPLER

The present invention relates to couplers for use in making and breaking contact with the end of a fixed terminal and more particularly relates to couplers of the type used in underground high voltage applications wherein a hot stick is used for manipulating the coupler to make or break contact.

The coupler of the present invention is especially adapted for use with terminal assemblies like that shown in FIGS. 1, 2 and 6 through 8 of the copending application for Letters Patent of The United States, Ser. No. 660,748 filed Aug. 15, 1967 assigned to the assignee of the present invention. However, the invention is useful with many other types of terminal assemblies which are worked hot by means of a hot stick.

It is an object of the present invention to provide a new and improved coupler of the character described adapted to be manipulated with a hot stick to make and break contact with one or more terminals.

Another object of the present invention is to provide a coupler of the character described employing new and improved bracket means for slideably receiving the pin of the hot stick in a manner permitting the hot stick to be moved freely within an elongated slot therein to gain momentum before engaging a stop surface at the end of the slot with sufficient force to easily make or break contact between the coupler and the fixed terminal. The present invention is especially adapted for use with terminal assemblies wherein considerable force is required to make or break contact between the terminal assembly and the coupler and hence the new and improved coupler provides a special means for utilizing the momentum available in a hot stick moving toward the end of a slot for providing the increased force as needed.

Another object of the present invention is to provide a new and improved coupler of the character described especially adapted for use with a terminal comprising an elongated member wherein the coupler terminal means is movable axially with respect to the elongated terminal to make or break contact therewith.

Yet another object of the present invention is to provide a new and improved coupler for use with a hot stick wherein the hot stick can be easily manipulated from either opposite end of the coupler for effecting a connection or a disconnect.

Briefly, the foregoing and other objects and advantages of the present invention are accomplished in one illustrated embodiment thereof comprising a new and improved coupler adapted to make and break contact with the end of a fixed terminal. The coupler includes a body having terminal means on one side adapted for contact with the fixed terminal and bracket means is extended outwardly of the coupler body on the opposite side thereof for receiving the pin of a hot stick used for working the coupler. Elongated slot means is formed in the bracket means for slideably receiving the contact pin of the hot stick and the slot means extends in a direction generally toward and away from the end of the fixed terminal. Stop surfaces are formed at opposite ends of the slot means for engagement by the hot stick pin as it is moved from one end of the slot to the other to gain momentum to exert increased force for making or breaking contact between the coupler and the fixed terminal. The hot stick is moved along the slot in the desired direction gaining momentum before engagement with a stop surface at the end of the slot and accordingly increased force is then available for effecting a rapid connection or disconnection between the coupler and the fixed terminal.

For a better understanding of the present invention, reference should be had to the following detailed description taken in conjunction with the claims and drawings in which:

FIG. 1 is a perspective view illustrating several pairs of spaced-apart terminal assemblies connected together with couplers constructed in accordance with the features of the present invention;

FIG. 2 is a sectional view taken substantially along line 2-2 of FIG. 1 through one pair of spaced-apart terminals and a

coupler showing the coupler in a disconnected condition and engaged with the contact pin of a hot stick;

FIG. 3 is a fragmentary elevational view similar to FIG. 2 but showing the hot stick in a different operative position relative to the coupler; and

FIG. 4 is a fragmentary elevational view looking in the direction of the arrows 4-4 in FIG. 2.

Referring now more particularly to the drawings, in FIG. 1 therein is illustrated a plurality of pairs of spaced-apart, parallel terminal assemblies 10 and 12, respectively. Each pair of terminal assemblies 10 and 12 is adapted to be electrically interconnected by a new and improved coupler 14 constructed in accordance with the features of the present invention. The terminals 10 and 12 are described in greater detail in the aforementioned copending application for Letters Patent of The United States and each pair is supported in spaced-apart, axially parallel, alignment by an upstanding support rod 18 on which is mounted a generally figure eight shape clamping bracket 20, the opposite ends of which are adapted to abut and support one of the respective terminals 10 or 12. The clamping brackets 20 are connected to the supporting rods 18 with bolts 22 (best shown in FIGS. 2 and 3) and as shown best in FIG. 1, the outer ends of each bracket is closed with a semicircular clamping band 24 having diametrically disposed ears which are bolted to similar ears on the outer end portions of the bracket 20 with capscrews 26.

The terminals 10 and 12 in each spaced-apart, cooperating pair are preferably identical or similar and each includes a central conductor 30 connected with a hollow tubular, elongated, socket-type terminal 32 which is axially disposed within the central bore of an upstanding insulating member 34 having an upper frustoconical end surface 34a (FIG. 3). Preferably the insulators 34 are fabricated of high, rigid strength, dielectric material such as that sold under the trademark "Bakelite" or the like, and the insulators are encased within an outer, metallic grounding shield 36 which terminates below the frustoconical end portion 34a of the insulator. A locking ring or collar 38 formed of metal and grounded to the shield 36 is mounted on the insulators 34 and each collar includes a short cylindrical upper section 38a and a lower, downwardly and outwardly extending frustoconical skirt having a free outer edge 38b spaced outwardly of the sheath 36 in order to accommodate a pair of diametrically disposed clamping hooks 40 formed at the lower end of elongated clamping members 42 mounted on the coupler 14 and described more fully in the aforementioned copending patent application.

In accordance with the present invention, the new and improved coupler 14 includes a U-shaped body 44 (FIG. 2) having an elongated bight portion extending generally transversely to the longitudinal axes of the socket terminals 32 of the respective terminal assemblies 10 and 12. The body 44 includes a pair of downwardly extending legs 48 at opposite ends and each leg is coaxially aligned with the longitudinal axis of a socket terminal 32 in a respective terminal assembly 10 or 12. The body is formed of rigid insulating material and is covered with an outer metallic ground sheath 46 formed to fit over the elongated bight portion and the downwardly extending legs 48. Opposite ends of the bight portion of the coupler body are closed with plugs 50 and each of the legs 48 is provided with an upwardly extending frustoconical recess 52 for receiving the tapered upper end portion 34a of an insulator 34 of one of the terminals 10 or 12. The recesses 52 are lined with elastomeric insulating material 54 as more fully described in the aforementioned copending application so that when the coupler 14 is moved downwardly to make contact with the terminals 10 and 12, the frustoconical insulating surfaces 34a press upwardly against the elastomeric material which deforms to form an airfree interfacial contact between the insulators and results in a high dielectric strength coupling.

The frustoconical recesses in the legs of the coupler body are in coaxial alignment with a pair of downwardly depending terminal pins 56 interconnected together at their upper ends by a conductor 58 and sheath 60. The conductor 58 and

sheath 60 are extended through a central bore formed in the main bight portion 44 of the coupler body. The spaced apart, parallel terminal pins 56 in the coupler 14 are electrically connected through the conductor 58 so that when contact is made between pins 56 and the terminals 32, the respective spaced pairs of terminal assemblies 10 and 12 are electrically connected.

As more fully described in the aforementioned patent application, each socket terminal 32 in a respective terminal assembly 10 or 12 is provided with a follower 61 of insulating, arc-extinguishing material and the follower is positioned in the upper end or mouth of the socket and is biased to normally extend upwardly above the upper end of the terminal 32. The follower 61 of arc-extinguishing material is biased upwardly in its respective terminal 32 by means of a compression spring 60 seated in coaxial alignment in the bore of its terminal member. At the upper end portion or mouth of the central bore each terminal insulator 34 is provided a sleeve 62 of arc-extinguishing insulating material for aiding in extinguishing arcs caused by a disconnect under load when the coupler 14 is moved upwardly away from the terminals 10 and 12. The follower 61 and the sleeve 62 at the upper end of the insulator 34 both aid in rapidly extinguishing arcs when a disconnect is made under load. The arc-extinguishing followers 61 biased upwardly by the springs 63 serve to support the coupler 14 in disconnected or rest portion (FIG. 2) with the lower ends of the terminal pins 56 resting in contact with the upper ends of the followers 61 as shown in FIG. 2. In this position no electrical connection is established between the terminal pins 56 and the respective socket-type terminal members 32 of the terminal assemblies 10 and 12.

In accordance with the invention, the coupler 14 is provided with an upwardly extending bracket 64 formed of sheet metal or the like having a V-shaped slot 66 defined therein. The bracket 64 extends upwardly of and in line with the longitudinal axis of the bight portion of the disconnect body 44 and in a direction directly and diametrically opposite to the legs 48. The bracket includes a pair of integrally formed feet 64a bent outwardly in opposite directions at the base thereof and spot welded or otherwise attached to the outer metallic grounding sheath 46. Each leg 48 of the coupler 14 is provided with a pair of manually operated clamping assemblies 68 (FIG. 3) disposed on opposite sides thereof and each includes an elongated downwardly extending vertically slideable clamping member 42 having a hooked lower end 40 adapted for engagement with the lower edge 38b of the collar or skirt 38. Each clamping member 42 is slideable vertically and each includes a loop 42a to facilitate pulling the hooked ends 40 downwardly to hook over the lower edge 38b of the collar 38 after the coupler 14 has been forced downwardly into a contact making, seated position on a pair of spaced terminal assemblies 10 and 12. Normally the clamping members 42 are biased upwardly into a retracted position by a spring (not shown) which is seated and enclosed in a housing portion 72 formed at the upper end of the track 70. Complete details of the clamping assemblies 68 and the operation thereof are more fully described in the aforementioned copending patent application. Briefly once electrical contact is made or established between the lower end portions of the pins 56 of the coupler 14 and the socket terminals 32 of a pair of terminal assemblies 10 and 12, the coupler 14 is then locked in place by pushing the individual clamping assembly 68 downwardly with a hot stick through the loops 42a and engaging the hooked ends 40 over the lower edge 38b of the skirts 38. Before breaking the contact between the coupler 14 and terminals 10 and 12 it is necessary to unhook the clamping assemblies 68 with a hot stick so that rapid upward movement of the coupler 14 away from the terminals is possible.

In accordance with the present invention, the bracket 64 is especially adapted for use with a conventional hot stick 74 of the type having a contact pin 76 on the lower end. The pin is formed with a short right angle portion 76a provided at the lower end and an enlarged cap or head 78 is provided at the

outer end of the right angle portion. The V-shaped slot 66 is wide enough at the lower apex portion (FIG. 2) to permit lateral insertion of the head portion 78 of the hot stick pin, but the upper portions of the divergent legs of the slot are narrower than the head to prevent inadvertent disengagement of the hot stick once engaged. The legs of the V-shaped slot are slightly wider than the pin diameter to permit free sliding movement of the pin portion 76a up and down in the bracket. Because relatively large forces are required for making or breaking contact between the connector 14 and the associated pair of terminal assemblies 10 and 12 and because it is desirable to make or break contact rapidly, the V-shaped slot 66 is especially designed to permit limited and guided movement of the pin portion 76a of the hot stick in a direction generally toward and away from the terminals 10 and 12. The upper ends of the legs of the V-slot are closed to provide an upper limit or stop surface and the apex of the V-slot provides a lower stop surface.

To move the coupler 14 into a contact making position from the position of FIG. 2, the hot stick 74 is pulled slowly upwardly (arrow B) until the pin portions 76a engage a stop surface at the upper end of one leg of the V-slot 66 in the bracket. The hot stick is then thrust downwardly (arrow A, FIG. 3) with considerable force and momentum is built up thereby so that when the pin portion 76a reaches the apex at the bottom of the V-slot sufficient downward momentum is available to rapidly thrust the coupler 14 home to make contact between the terminals 10 and 12. The clamping assemblies 68 are then manually activated to lock the coupler in position. The V-shaped slot 66 is especially suitable because it allows the coupler to be worked from opposite ends with equal facility.

In order to break or disconnect the circuit between coupler 14 and terminals 10 and 12 after the clamping assemblies 68 have been released, the hot stick pin is inserted laterally into the apex portion of V-shaped slot 66 in the bracket 64. The hot stick is moved upwardly with considerable force in the direction of arrow B (FIG. 2) until the pin portion 76a reaches the stop surface or upper end of the leg of the slot. By this time, sufficient momentum and force is available to rapidly lift the coupler 14 upwardly away from the terminals 10 and 12 and effect a rapid disconnect of the circuit. If the disconnect is made under load the arc drawn between the coupler terminal pins 56 and the socket terminals 32 is extinguished rapidly by the arc extinguishing cartridge 61 and bore liner material 62.

The bracket 64 is especially well suited for accommodating hot stick 74 and the V-slot 66 is effective to guide the hot stick in the proper direction when making and breaking contact between the coupler 14 and the terminals 10 and 12. The V-shaped slot permits the coupler to be worked from either side with equal facility for making and breaking contact.

While there has been illustrated and described a single embodiment of the present invention, it will be apparent that many variations may be made therein, all within the scope and spirit of the invention.

I claim:

1. A coupler for making and breaking contact with the end of a fixed terminal, said coupler including a body having terminal means on one side adapted for contact with said fixed terminal and bracket means extending outwardly on opposite side, and elongated slot means formed in said bracket means for slideably receiving the pin of a hot stick used for moving said coupler toward and away from said fixed terminal to make and break contact therewith, said slot means extending in a direction generally toward and away from the end of said fixed terminal and including stop surfaces at opposite ends whereby said hot stick pin can freely move from one end to the other of said slot means to gain momentum before exerting impact force on said coupler to make or break contact with said fixed terminal.

2. The coupler of claim 1 wherein said terminal means comprises an elongated member movable axially to make and break contact with said fixed terminal, said slot means extending in a direction generally the same as the direction of elongation of said terminal means.

5

6

3. A coupler for making and breaking contact with the end of a fixed terminal, said coupler including a body having terminal means on one side adapted for contact with said fixed terminal and bracket means extending outwardly on an opposite side, and elongated V-shaped slot means formed in said bracket means for slideably receiving the pin of a hot stick used for moving said coupler toward and away from said fixed terminal to make and break contact therewith, said slot means extending in a direction generally toward and away from the end of said fixed terminal and including stop surfaces at the ends of both legs and the apex thereof whereby said hot stick pin can freely move from one end to the other of said slot means before exerting force on said coupler to make or break contact with said fixed terminal.

4. A coupler for selectively making and breaking contact between the ends of a pair of spaced-apart, fixed terminals, said coupler including an elongated body adapted to extend transversely between said fixed terminals and having a pair of spaced-apart electrically interconnected terminal means on

one side thereof adapted for engagement with said fixed terminals, upstanding bracket means on an opposite side of said body intermediate said spaced terminal means, and elongated slot means formed in said bracket means for slideably receiving the pin of a hot stick used for moving said coupler to make and break contact with said fixed terminals, said slot means extending in a direction generally transverse of said body and having stop surfaces at opposite ends whereby said hot stick pin can freely move from one end to the other of said slot means before exerting force on said coupler to make or break contact with said fixed terminals.

5. The coupler of claim 4 wherein said slot means is V-shaped and includes stop surfaces at the ends of both legs and the apex thereof.

6. The coupler of claim 4 wherein said terminal means each includes an elongated conductor extending generally transversely of said body and movable axially to make and break contact with a respective fixed terminal.

20

25

30

35

40

45

50

55

60

65

70

75