DETACHABLE COUPLING FOR ELECTRICAL CONDUCTORS

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This invention relates to detachable couplings for electrical conductors particularly for conductor cables such as are employed to conduct current to portable, electrically operated machines such as welding machines.

This invention has for its object to provide a coupling by means of which successive lengths of conductor cable may be quickly and easily joined. A further object is to provide a coupling for conducting elements of low resistance capable of carrying heavy currents without excessive heating, the conducting elements of the coupling members being firmly locked in contact with each other when the coupling members are joined together.

A further object is to provide a detachable coupling provided with conducting elements which are adapted to interlock and which have relatively large contacting areas which are kept clean by wiping action incident to the locking and unlocking of the coupling.

A further object is to provide a detachable coupling in which the interlocking connecting members of the coupling are of identical construction so that no selection is necessary in attaching to conductors or in joining conductors together, and the manufacture of a single article only is required.

A further object is to provide a conductor coupling of the bayonet joint type in which contact is maintained by spring pressure and in which the elements are positively locked together and in which the elements may be quickly and easily attached or disconnected.

With the above and other objects in view, the invention may be said to comprise the coupling s shown in the accompanying drawing hereafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will appear to one skilled in the art to which the invention applies.

Reference should be had to the accompanying drawings forming a part of this specification, in which:

Figure 1 is a side elevation showing two detached coupling elements positioned for engagement by a relative axial movement;

Fig. 2 is an axial section through a pair of lined coupling members;

Fig. 3 is a fragmentary perspective view of the closing end of one of the coupling members;

Fig. 4 is a fragmentary detail view showing the interlocking lugs in side elevation;

Fig. 5 is a section taken on the line indicated at 5—5 in Fig. 4.

In the accompanying drawing a coupling embodying the invention is illustrated which is composed of two identical coupling members indicated by the reference character A. While the identity of the two coupling members is very desirable and convenient, it is to be understood that this feature is only one of several herein disclosed and claimed, and, while preferred, is not essential to the invention.

As illustrated in the accompanying drawing, the body of each coupling member A consists of a cylindrical block 1 which has an axial bore 2 opening to the end thereof which engages the mating coupling member. Within the bore 2 is mounted a pin 3 which has an enlarged head 4 slidable in a counterbore 5 which extends to the opposite end of the coupling member. The pin 3 is normally held in its outermost position by a compression coil spring 6 which is mounted between the head 4 of the pin and a plug 7 secured within the counterbore 5. The plug 7 is secured in the counterbore 5 inwardly of the end of the block 1 to provide a suitable socket to receive a conductor cable 8 which is secured by suitable means to the block 1, preferably by sweating or soldering. The end of the block 1 in which the bore 2 is provided is cut away on an axial plane to provide a semi-cylindrical projection 9. The inner face of the cylindrical projection 9 lies in a plane diametrically intersecting the bore 2 leaving a half bearing 10 in said face for guiding the pins 3 of the coupling members when joined. The projection 9 has a flat end face 11 and a flat 35 shoulder 12 is provided on the block 1 at the base of the cutaway portion. The projection 9 has a recess 13 cut in one side thereof adjacent the shoulder 12 to provide an overhanging locking lug 14 outwardly of the recess. The axial depth of the recess is greater than that of the lug so that the recess 13 of one coupling member is adapted to receive the lug 14 of a mating coupling member when the members are fitted together and one of the members is turned with respect to the other. At its outer end the lug 14 is provided with an inclined cam face 15 and adjacent the inner end thereof is provided on its inner face with a notch 16 providing a locking tooth 17 at the outer end of the lug.

The block 1 is mounted within an insulating sleeve 18 which covers the block 1 from the end thereof to which the cable 8 is attached to a point substantially midway between the inner and outer ends of the projection 9. The portion of the
sleeve extending beyond the shoulder 12 provides a semi-cylindrical socket to receive the semi-cylindrical projection 9 of a mating coupling member. A disk 19 of insulating material surrounds the cable 8 and covers the end of the block 1 around the cable, the cable 8 being provided with an insulating covering 28 up to the outer face of the disk 19.

The pins 3 of each coupling member is normally held by the spring 8 in a position in which its outer end projects slightly more than half way to the end of the projection 9 so that when two of the coupling members are engaged one with the other and pressed together axially, the pins 3 are guided between the half bearings 10 of the complementary projections 9 and are forced inwardly against the springs 8. When the couplings are joined the flat end faces of the pin are pressed axially one against the other by the springs 8.

The pins 3 are of electrically conductive material such as copper or brass to provide a low resistance connection between the coupling members.

The block 1 is also preferably composed of electrically conductive material particularly when the coupling is used in lines through which current of high amperage is passed. The block 1 may be readily formed from copper or brass bar stock by simple machining operations.

In joining two of the coupling members, the members are moved axially into engagement with the semi-cylindrical projections 9 thereof fitting over the pins 3 and projecting into the sockets formed within the sleeves 18. The pins 3 and sleeves 18 provide concentric bearing surfaces and, since the locking lugs 14 of the two coupling members are opposite the recesses 13, the coupling members may be turned, one relative to the other, to cause the lugs 14 to enter the recesses 13. The inclined cam faces 15 of the locking lugs 14 are opposed one to the other so that by grasping the sleeve 18 of the two coupling members and turning them in opposite directions one cam face 15 will ride over the other as the lugs 14 enter the recesses 13 pulling the coupling members together, forcing the pins 3 inwardly and compressing the springs 8. The teeth 17 of one lug is thus caused to ride over the teeth 17 of the other, whereupon the springs 8, which tend to force the coupling members apart, will cause the teeth 17 to snap into the notches 16 thus locking the two coupling members against relative turning movement. The lugs 14 positively hold the coupling members against separation by relative axial movement.

The locking teeth 17 prevent accidental relative rotation of the coupling elements which would free the lugs. As shown in Fig. 1 of the drawings, the inclined cam faces 15 of the locking lugs have inclinations such that when brought into engagement by a turning movement the cams engage first adjacent their inner edges so that when turning one of the coupling members upon the other there is a greater leverage on the engagement between the cam faces being near the axis and at a greater distance from the surfaces of the sleeves 18 where the force is applied.

To disconnect two of the coupling elements, the two coupling elements are gripped firmly and one is pressed axially toward the other compressing the springs 8 until the locking teeth 17 are retracted from the notches 16 whereupon the locking members may be turned in a direction to release the locking lugs 14. After the point 77 of one of the locking teeth 17 has passed out-wardly past the point of the other, the coupling members may be released and the cam faces 15 pressed together by the actions of the springs 8 will rotate the projections 9 to the position in which the two lugs 14 are clear of each other and the coupling members may be freely separated.

The insulating sleeve 16 may be any suitable insulating material secured in any suitable way to the blocks 1. It has been found that an excellent union may be made between a metal block 1 and an insulating sleeve of the metal block by knurling the surface of the metal block as shown in Fig. 4 and forcing the block into the sleeve after cutting away the interior of the sleeve slightly at one end to permit the block to be partially inserted.

When the coupling members are joined together there is a slight gap between the ends of the sleeves 18 of the two coupling members to permit the relative movement necessary to permit the teeth 17 to be engaged or disengaged. If it be desired to close this gap the sleeves may be made of a length such that the ends thereof will be in engagement when the coupling members are locked together if the edge portions of the sleeves are sufficiently elastic to permit the relative axial movement necessary for the locking operation. Such elasticity may be provided by making the edge portions of the sleeves of elastic rubber.

When the coupling members are joined together, a conductive connection between the cables 8 is made through the pins 3 and pins 14. When the blocks 1 are made of electrically conductive material, the locking lugs 14 which are held together under pressure provide contact members for the passage of current. Current passes from the block 1 of one coupling member to the block 1 of the other through the end faces of the pins 3 and through the bearing surfaces engaging the pins 3, and through the interengaging surfaces of the locking lugs. During the operation of making and breaking the coupling, the pins 3 are caused to slide upon the bearing faces. The end faces of the pins are caused to turn upon each other while under pressure and the surfaces of the teeth 17 are caused to slide upon each other so that these contacting surfaces are kept clean and current passes freely from one coupling member to the other.

By reason of the fact that the locking element of the two members are of identical construction any coupling member may be joined with any other coupling member and no problem of selection is involved in attaching the coupling members to the cable ends by joining lengths of cable together. Also, the manufacture of the coupling is simplified because there is only one article of manufacture and a saving in replacement cost is effected because of the fact that any coupling member will replace any other coupling member.

Furthermore, it is to be understood that the particular form of apparatus shown and described, and the particular procedure set forth are presented for purposes of explanation and illustration and that various modifications of the said apparatus and procedure can be made with out departing from my invention as defined in the appended claims.

What I claim is:

1. A detachable coupling for electrical conductors comprising two coupling members adapted to be connected to electrical conductors each having electrically conductive portion
adapted to contact when said members are joined, each coupling member having an outer sleeve of insulating material and a locking member fitting within the sleeve and attached there- 

5 to, said locking member having a shoulder at one side thereof spaced inwardly from an end of the sleeve and an axially extending projection, at the opposite side thereof which projects past the end of the sleeve, whereby the coupling members may be assembled in axial alignment with the projection of each extending into the sleeve of the other, said projections each having a laterally extending locking lug spaced axially from its shoulder, said locking lugs being movable into axially overlapping relation by a relative turning movement of the coupling members when assembled in axial alignment, the opposed inner faces of said locking lugs each provided with a projecting tooth, and resilient means tending to force said coupling members apart and serving to maintain axial pressure between the lugs to yieldingly hold the teeth thereof in engagement to lock the coupling members against relative turning movement.

2. A detachable coupling for electrical conductors comprising two coupling members each having a cylindrical contact member of conductive material, cut away at one end to provide each contact member with a shoulder and a substantially semi-cylindrical projection outwardly from the shoulder, each contact member having a sleeve of insulating material attached thereto and extending past its shoulder, whereby each coupling member is provided with a socket to receive the semi-cylindrical projection of the other, each projection having a recess in one side thereof adjacent the shoulder providing a locking lug overhanging the recess, the recesses being of sufficient axial width to receive said lugs when said coupling members are interfitting and one is turned with respect to the other, each locking lug having an inwardly projecting tooth adjacent its outer end, and a spring pressed member resisting axial movement of one coupling member into the other and acting to press one of the locking lugs against the other to retain the tooth of one behind the tooth of the other to lock the coupling members together.

3. A coupling member which is adapted to interlock with an identical coupling member to provide a detachable electrical connection comprising a cylindrical insulating sleeve and a cylindrical electrically conductive block within said sleeve, said block having an axial bore opening to one end and a counterbore opening to the other, a pin slidably mounted in said bore, the end of the block being cut away along an axial plane to provide a semi-cylindrical projection extending past the end of the insulating sleeve and providing a half bearing for said pin, said projection being undercut at one side to provide a projecting lug and a recess to receive the corresponding lug of an identical coupling member, a pin slidably mounted in said counterbore and spaced from the end thereof to provide a conductor receiving socket, and a spring interposed between said plug and said pin.

4. A coupling member which is adapted to interlock with an identical coupling member to provide a detachable electrical connection comprising a cylindrical insulating sleeve and a cylindrical electrically conductive block within said sleeve, said block having an axial bore opening to one end and a counterbore opening to the other, a pin slidably mounted in said bore, the end of the block being cut away along an axial plane to provide a semi-cylindrical projection extending past the end of the insulating sleeve and providing a half bearing for said pin, said projection being undercut at one side to provide a projecting lug and a recess to receive the corresponding lug of an identical coupling member, a pin slidably mounted in said counterbore and spaced from the end thereof to provide a conductor receiving socket, and a spring interposed between said plug and said pin.

5. A coupling member which is adapted to interlock with an identical coupling member to provide a detachable electrical connection comprising a block of conductive material having a cylindrical portion which is cut away at one side to provide a shoulder and a projection having an arcuate outer face and an inner face substantially in an axial plane, said projection having a recess in its axial face at one side thereof adjacent said shoulder, said recess having an axial depth of more than one-half the height of said projection so that the said recess provides a lug adapted to enter the corresponding recess of an identical coupling member, a spring sleeve member mounted in said coupling member and projecting past said shoulder for engagement with a mating coupling element, and a sleeve of insulating material mounted upon the cylindrical portion of said block and extending past the shoulder thereof to provide a socket to receive the projection of a mating coupling member.

6. A coupling member which is adapted to interlock with a coupling member of identical construction to provide a detachable connection comprising a block having a bore opening to one end thereof, said block being formed at said end with a shoulder and a projection disposed wholly to one side of a plane axial with respect to the bore, said projection being undercut to provide a recess adjacent the shoulder of an axial width at least one-half the axial length of the projection and a locking lug outwardly from the recess adapted to enter the recess of an identical coupling member, said lug having a locking tooth on the side thereof toward said shoulder, a pin slidably mounted in said bore, and a spring acting upon said pin and normally projecting the pin past said shoulder a distance greater than one-half the length of said projection, whereby the pin of said coupling member may be engaged with the pin of an identical coupling member, and the members interlocked by pressing one axially toward the other to aline the lug of each with the recess of the other and turning one relative to the other about the axis of the pins to engage the lugs.

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