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ELECTRICAL CONNECTOR CLAMP

Filed Nov. 22, 1957

Fig. 1

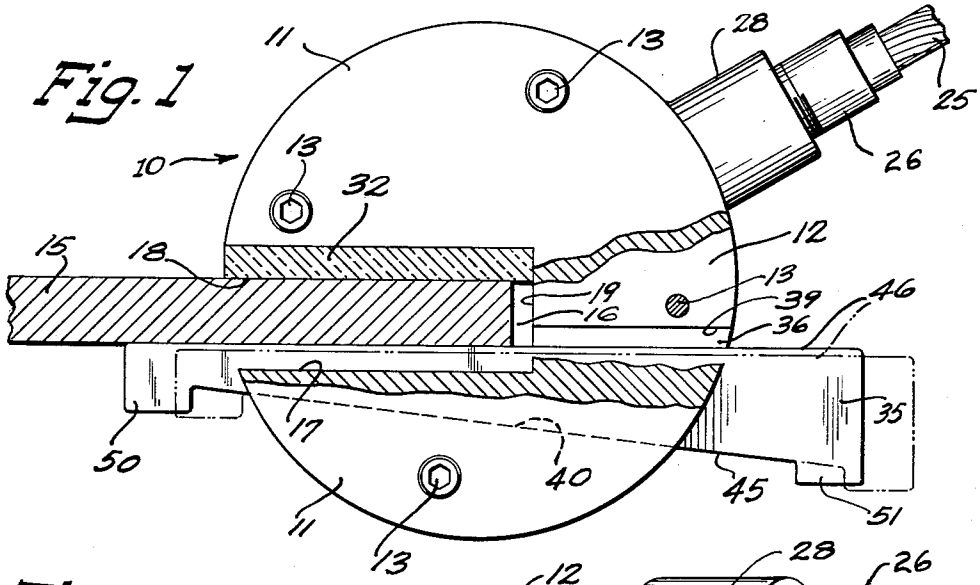


Fig. 2

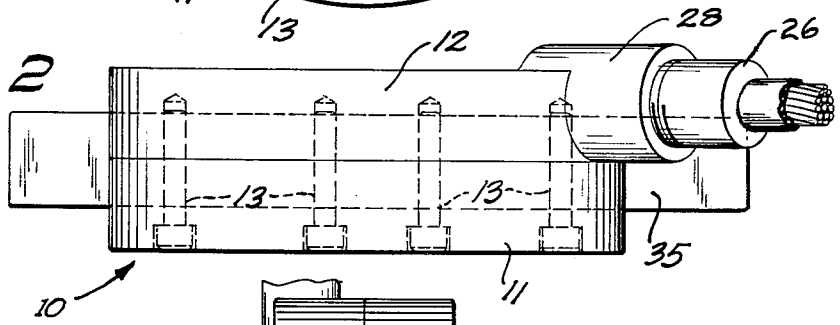
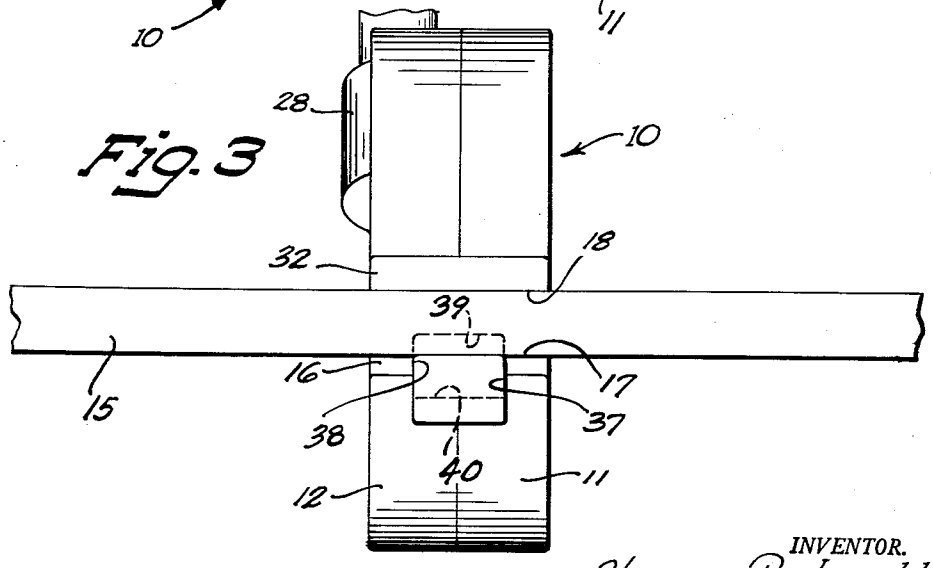


Fig. 3



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ELECTRICAL CONNECTOR CLAMP

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This invention relates generally to an electrical connector clamp and more particularly to a quick acting clamp that may be rapidly attached to a member for making a good electrical connection to the member and that may be readily detached therefrom.

It often occurs that it is necessary to make frequent electrical connections and disconnections to a member. For example, in electrical arc welding, the workpiece that is being welded must be electrically connected to ground to carry out the welding operation. It is therefore the practice to provide an electrical cable that is permanently connected at one end to ground and is provided at its opposite end with a quick acting clamp that is secured to each succeeding workpiece to electrically connect the workpiece to ground while the welding operation is being performed.

The clamp most commonly employed for this purpose is provided with two jaws movable relative to each other to vary their spacing and actuated by a spring which urges them to their closed position. In operation, the operator must open the jaws against the force of the spring and then release them upon the workpiece to which the clamp is being applied. In order to make a good electrical connection the spring must be of substantial force so that the jaws will grip the workpiece tightly, but the strength of the spring is limited by the amount of force that the operator can manually apply to compress it in opening the jaws. The operator is therefore required to exert considerable effort to overcome the force of the spring every time the clamp is applied and removed from a workpiece, while the strength of the spring itself is limited to enable the operator to actuate the jaws so that extremely high clamping pressures cannot be obtained. Furthermore, such clamps are frequently damaged from the rough usage to which they are subjected, and the springs wear rapidly from being repeatedly flexed in actuating the clamp.

It is therefore a general object of the present invention to provide an improved clamp for making a temporary electrical connection to a member.

Another object of the present invention is to provide an improved electrical connector clamp with which maximum pressure may be applied at the will of the operator for making a good electrical connection with a minimum of effort on the part of the operator.

Another object is to provide an improved electrical connector clamp that may be very rapidly clamped to an object and released therefrom with very little effort.

Another object is to provide an improved electrical connector clamp that will assure an excellent electrical connection with the object to which it is clamped.

A further object is to provide an improved electrical connector clamp that is of simple and inexpensive but sturdy construction while being very efficient in operation.

According to this invention the improved electrical connector clamp comprises a body having a fitting for receiving one end of an electrical conductor to make electrical connection therewith. The body of the clamp is provided with a slot for receiving the object to be clamped. A clamping slide is slideably carried by the body and extends into the slot so that its top surface forms the bottom wall of the slot for cooperation with the top wall of the slot to clamp the object between them. The bottom surface of the slide is inclined with respect to its top surface and slides along a similarly inclined surface formed in the body so that when the slide is moved in one direction its top surface rises toward the top wall of the slot while remaining parallel thereto to progressively reduce the space between them.

To effect the clamping action, the operator may move the slide to one limit of movement to establish the maximum gap between the top surface of the slide and the top wall of the slot. The object to be clamped is then placed between these two surfaces and the slide is moved in the opposite direction to reduce the gap between the top surface of the slide and the top wall of the slot. Such movement of the slide will cause its top surface to engage the object that is being clamped and force it tightly against the top wall of the slot to effect firm engagement therewith. Since the electrical conductor is connected to the body of the clamp the top wall of the slot is likewise electrically connected to the electrical conductor so that the latter has good electrical connection with the object in the clamp. The clamping force may be very readily increased by the operator with a minimum of effort by simply tapping the slide sharply with a hammer or similar tool, and although an extremely tight clamping action is thus obtained, the clamp may be easily released by tapping the slide in the opposite direction.

The foregoing and other objects of the invention, which will become apparent from the following detailed specification setting forth an illustrative embodiment, may be achieved by the particular construction depicted in and described in connection with the accompanying drawings, in which:

FIGURE 1 is a view in side elevation with a part of the body broken away to show its interior construction and illustrating an electrical connector clamp constructed in accordance with the teachings of the present invention with a plate being shown engaged by the clamp for making electrical connection therewith;

FIGURE 2 is a plan view of the electrical connector clamp depicted in FIGURE 1; and

FIGURE 3 is a front elevational view of the electrical connector clamp illustrated in FIGURE 1.

Reference is now made more particularly to the drawings which illustrate an electrical connector clamp incorporating the features of the present invention. The unit comprises a body generally identified by the reference numeral **10** and which is formed of two mating plates **11** and **12** with each of the plates comprising one half of the body **10**. The plates **11** and **12** are of uniform size and shape and are symmetrically attached together by four screws **13** to form a unitary structure that comprises the body **10**. The body **10** is illustrated as being of circular configuration as an exemplary embodiment, the circular form being of convenient construction and pleasing in appearance although it is to be understood that it may be of other configurations without detracting from the operation of the clamp.

In the illustrated embodiment it may be assumed that a workpiece **15** is being subjected to an electric arc welding operation requiring that the workpiece **15** be electrically connected to ground to enable the electric arc welding process to be performed. To this end, the workpiece **15** is inserted into a slot **16** formed in the body **10** wherein the workpiece is securely clamped in a manner to be described, and the clamp unit will serve to electrically connect the workpiece **15** to a suitable ground (not shown).

The slot **16** extends through the entire thickness of the body **10**, being formed in both plates **11** and **12** and is defined by a bottom wall **17**, a top wall **18** and a back wall **19**. The electrical connection to ground is made through an electrical conductor **25** that is connected to ground (not shown) at one end and is provided with

a fitting 26 at its opposite end, the fitting being of standard commercially available construction. The fitting 26 is placed in threaded engagement with a threaded bore formed in a boss 28 that protrudes from the periphery of the plate 12. The fitting 26 is constructed so that the electrical conductor 25 is electrically connected to the boss 28 for completing an electrical circuit therethrough.

In the illustrated embodiment the plates 11 and 12 are fabricated of aluminum or other good electrical conducting material so that the electric current is carried by the plates 11 and 12 from the workpiece 15 to the boss 28 and through the fitting 26 to the conductor 25 to complete the circuit to ground. However, the plates 11 and 12 may be fabricated of wood, plastic or other non-electrical conducting material, in which case special provision would have to be made for completing an electrical circuit from the workpiece 15 to the conductor 25. In such case an electrical connection must be made to a plate 32 of copper or other good electrical conducting material which is attached to the body 10 adjacent to the slot 16 so that the bottom surface of the plate 32 forms the top wall 18 of the slot 16. An electrical conductor (not shown) would therefore be attached at one end to the plate 32 and its opposite end would be fixed to the boss 28 to make electrical connection therewith. With this alternate arrangement, the electrical circuit would be completed from the workpiece 15 through the plate 32, the electrical conductor (not shown) and the boss 28 through the fitting 26 to the conductor 25 which carries the current to ground.

Although the electrical current is carried by the body 10 in the illustrated embodiment, the plate 32 is included to provide a removable plate which is attached to the body 10 by screws (not shown) or other suitable means. A selection of plates 32 of different thicknesses may be furnished for the purpose of varying the height of the slot 16 to accommodate workpieces of a wide range of thicknesses. Thus, by inserting a plate 32 of increased thickness, the height of the slot 16 will be reduced to accommodate a workpiece of less thickness. Conversely a reduction in the thickness of the plate 32 will increase the height of the slot 16 to provide the space for a workpiece of greater thickness.

The clamping action is produced by the longitudinal movement of a slide wedge element 35 that is slidably disposed within a channel 36 formed in the body 10 in alignment with the slot 16. The slot 36 is centrally located with respect to the thickness of the body 10, being defined, as shown in FIGURE 3, by a side wall 37 formed in the plate 11 and a side wall 38 formed in the plate 12 as well as a top wall 39 and an inclined bottom wall 40 which serves as a guideway for the slide 35 as will be presently described. It will be observed in FIGURE 1 that the top wall 39 extends from the periphery of the body 10 to the back wall 19 of the slot 16 where it terminates. On the other hand, the inclined bottom wall 40 is in effect a chordal line that intersects the periphery of the body 10 and is located at a distance from its center, so that the inclined bottom wall 40 extends through the entire section of the body 10. As a result, as clearly seen in FIGURE 1, a portion of the channel 36 opens into the slot 16 and is terminated by the slot 16 while the lower portion of the channel 36 extends through the entire section of the body 10. Furthermore, the top wall 39 of the channel 36 is substantially parallel to the bottom wall 17 and the top wall 18 of the slot 16. The bottom wall 40 of the channel 36 on the other hand, is disposed at an angle to the top wall 39 and to the top wall 18 of the slot 16 being inclined upwardly toward the slot 16.

The slide 35 includes a bottom side 45 which is in sliding engagement with the bottom wall of guideway 40 of the channel 36 and is inclined with respect to its top side 46 at the same angle and in the same direction as the bottom wall 40 is inclined with respect to the top wall 18 of the slot 16. The top side 46 of the slide 35 is therefore parallel to the bottom and top walls 17 and 18 respectively of the slot 16.

Since the bottom wall 40 is disposed at an angle to the top wall 18 of the slot 16 and the bottom side 45 of the slide 35 is disposed at the same angle in the same direction with respect to its top side 46, movement of the slide 35 to the left as viewed in FIGURE 1, will cause an upward movement of the top side 46 of the slide 35 toward the top wall 18 of the slot 16. Furthermore, since both the bottom wall 40 and bottom side 45 are inclined to the same degree, the top side 46 of the slide 35 will remain parallel to the top wall 18 of the slot 16 during any movement toward and away from the top wall 18.

Such movement of the top side 46 of the slide 35 toward and away from the top wall 18 of the slot 16 can be clearly seen in FIGURE 1. In this view, the slide 35 is shown in broken lines in its extreme rightward position while the solid lines illustrate the position of the slide 35 after it has been moved slightly to the left of its extreme rightward position. It will be observed that the broken line representing the top side 46 is further away from the top wall 18 than the solid line representing the top side 46 is from the same top wall 18. Further movement of the slide 35 to the left as viewed in FIGURE 1 will progressively cause a movement of the top side 46 toward the top wall 18 to reduce the gap between the top side 46 of the slide 35 and the top wall 18 in the slot 16.

This movement of the top side 46 toward the top wall 18 in the slot 16 is taken advantage of to clamp the workpiece 15 therebetween for the purpose of making a good electrical connection with the workpiece 15 to connect it to ground. In operation, the slide 35 is moved to its extreme rightward position as viewed in FIGURE 1 to enlarge the gap between the top side 46 and the top wall 18 a maximum amount. The clamp unit is then moved to place the workpiece 15 within the slot 16 as shown in FIGURES 1 and 3. With the workpiece 15 inserted into the slot 16, the slide 35 is moved to the left as viewed in FIGURE 1 until its leftward movement is interfered with by engagement of its top side 46 with the bottom surface of the workpiece 15. A tapping of the right end of the slide 35 with a hammer or other suitable tool will force the top side 46 of the slide 35 into tight engagement with the workpiece 15 to, in turn, force the latter into tight engagement with the top wall 18 of the slot 16. In this manner, the workpiece 15 is firmly gripped in the slot 16 by the clamping unit and a good electrical connection is made from the workpiece 15 to ground through the clamping unit and the electrical conductor 25.

The gentle incline of the bottom wall 40 of the channel 36 and its cooperating bottom side 45 of the slide 35 limits the amount of vailable movement of the top side 46 toward the top wall 18 of the slot 16. However, the capacity of the unit is not affected by this limitation inasmuch as the plate 32 may be varied in thickness as previously described to thereby vary the gap of the slot 16 to accommodate a wide range of thicknesses of workpieces despite the limited movement of the top side 46 toward the top wall 18 of the slot 16.

The gentle slope of the bottom wall 40 of the channel 36 and the bottom side 45 of the slide 35 furnishes the advantage of producing a wedging effect when the slide 35 is in clamping position to prevent its inadvertent displacement. Because of its inclined side 45 in engagement with the inclined bottom wall 40, the tapping of the slide 35 toward the left as viewed in FIGURE 1 will cause the slide to firmly wedge itself between the bottom surface of the workpiece 15 and the bottom wall 40 of the channel 36 so that the slide 35 itself is tightly held in the locking position and will not accidentally slip to release the workpiece 15.

However, although the slide **35** is thus tightly wedged in its operating position to prevent inadvertent release of the workpiece **15**, a slight tapping with a hammer or the like on the left side of the slide **35** as viewed in FIGURE 1 to move it rightwardly, will immediately release the slide **35** from the tight wedging engagement with the bottom wall **40** and the bottom surface of the workpiece **15** so that the slide **35** is then free to move toward its rightward limit of movement to release the workpiece **15**. The tapping of the left end of the slide **35** with a hammer need only function to move the slide **35** a small fraction of an inch to release the wedging action so that the slide **35** will move freely in the channel **36**.

In order to avoid movement of the slide **35** beyond the limits of the channel **36** and thereby separate it from the body **10**, two stops **50** and **51** are provided with the stop **50** extending downwardly from the left end of the slide **35** as viewed in FIGURE 1 and the stop **51** protruding downwardly from the right end of the slide **35**. Therefore, movement of the slide **35** can continue until the stop **50** abuts the periphery of the body **10** at the left end of the bottom wall **40**, and in like manner, leftward movement of the slide **35** is limited by the abutment of the stop **51** with the periphery of the body **10** at the right end of the bottom wall **40**.

From the foregoing detailed description of the structure and operation of the illustrative embodiment of the present invention, it will be apparent that a new and improved electrical connector clamp has been provided which may be rapidly applied and released to make a good electrical connection with a member with a minimum of effort required on the part of the operator.

Although the illustrative embodiment of the present invention has been described in considerable detail for the purpose of making a full disclosure of a practical operative arrangement by means of which the invention may be practiced, it is to be understood that various novel features of the invention may be incorporated in other arrangements without departing from the spirit and scope of the invention as defined in the subjoined claims.

The principles of the invention having now been fully explained in connection with the foregoing description of embodying structure, I hereby claim as my invention:

1. In an electrical connector clamp for making an electrical connection to a member; a body having a peripheral edge and a slot which has a width that extends through the entire thickness of said body with the length of the slot extending inwardly from the peripheral edge of the body to an interior portion of the body so that one end of the slot opens at the peripheral edge of said body for receiving the member; a first wall defining one side of the slot; a second wall defining the opposite side of the slot, said body also having a channel extending therethrough so that both ends of the channel open into the peripheral edge of said body, a portion of the length of said channel opening into said first wall of the slot with the remaining portion of the length of the channel being closed on all four sides by said body to form four walls defining the channel, one of said last-named walls facing said second wall of the slot and being inclined thereto; an elongated slide of greater length than the channel and having two longitudinal oppositely disposed sides with one of said sides being inclined relative to the opposite side in the same direction and in the same degree that said wall of the channel is inclined with respect to said second wall of the slot, said inclined side of said slide being in sliding engagement with said inclined wall of said channel so that said slide may be moved longitudinally in said channel along said inclined wall of the channel to move its side opposite its inclined side toward said second wall of the slot to engage a member in the slot and clamp it against said second wall of the slot; means on said body operative to electrically connect an electrical conductor to said second wall of the slot; a first stop secured to an end of said slide that extends from one end of said channel; and a second stop secured to the opposite end of said slide which extends from the opposite end of said channel, said stops being of sufficient size to prevent their entrance into said channel to prevent the removal of said slide from the channel to thereby prevent the displacement of said slide from said body.

2. In an electrical connector clamp for making an electrical connection to a member; a C shaped body having a peripheral edge with the C shape being formed by a slot which has a width that extends through the entire thickness of said body with the length of the slot extending inwardly from the peripheral edge of the body to an interior portion of the body so that one end of the slot opens at the peripheral edge of said body for receiving the member; a first wall defining one side of the slot; a second wall defining the opposite side of the slot, said body also having a channel extending therethrough so that both ends of the channel open into the peripheral edge of said body, a portion of the length of said channel opening into said first wall of the slot with the remaining portion of the length of the channel being closed on all four sides by said body; an elongated wedge element of greater length than said channel and contained in said channel so that it may be moved longitudinally into wedging engagement with a member located in the slot to force the member into tight engagement with said second wall of the slot; means on said body operative to electrically connect an electrical conductor to said second wall of the slot; a first stop secured to an end of said wedge element that extends from one end of said channel; and a second stop secured to the opposite end of said wedge element which extends from the opposite end of said channel, said stops being of sufficient size to prevent their entrance into said channel to thereby prevent said wedge element from being removed from said channel.

3. In an electrical connector clamp for making an electrical connection to a member; a body having a peripheral edge and a slot which has a width that extends through the entire thickness of said body with the length of the slot extending inwardly from the peripheral edge of the body to an interior portion of the body so that one end of the slot opens at the peripheral edge of said body for receiving the member; a first wall defining one side of the slot; a second wall defining the opposite side of the slot, said body also having a channel extending therethrough so that both ends of the channel open into the peripheral edge of said body, a portion of the length of said channel opening into said first wall of the slot with the remaining portion of the length of the channel being closed on all four sides by said body; an elongated wedge element slidably contained in said channel for longitudinal sliding movement into wedging engagement with a member located in the slot to force the member into tight engagement with said second wall of the slot; means on said body operative to electrically connect an electrical conductor to said second wall of the slot; and means secured to said elongated wedge element to prevent the removal of said wedge element from the channel to thereby prevent the displacement of said wedge element from said body.

4. In ad electrical connector clamp for making an electrical connection to a member; a body having a peripheral edge and a slot which has a width that extends through the entire thickness of said body with the length of the slot extending inwardly from the peripheral edge of the body to an interior portion of the body so that one end of the slot opens at the peripheral edge of said body for receiving the member; a first wall defining one side of the slot; a second wall defining the opposite side of the slot, said body also having a channel extending therethrough in a path parallel to the length of the slot with one end opening into the peripheral edge of said body and the opposite end opening into the slot; an elongated wedge element slidably contained in said channel and

extending into the slot, said wedge element being slidable into wedging engagement with a member located between the two walls of the slot to force the member into tight engagement with said second wall of the slot; means on said body operative to electrically connect an electrical conductor to said second wall of the slot; means secured to said elongated wedge element to prevent the removal of said wedge element from the channel to thereby prevent the displacement of said wedge element from said body; and a surface formed at each end of said wedge element and adapted to receive the blows of a hammer for tapping said wedge element in one direction into wedging engagement with a member in the slot and for tapping said wedge element in the opposite direction to release it from such wedging engagement.

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