April 13, 1965 C. E. GUTSHALL 3,178,675

DIAGONAL TEETER TERMINAL CLAMP

Filed Sept. 4, 1963

Fig. 1

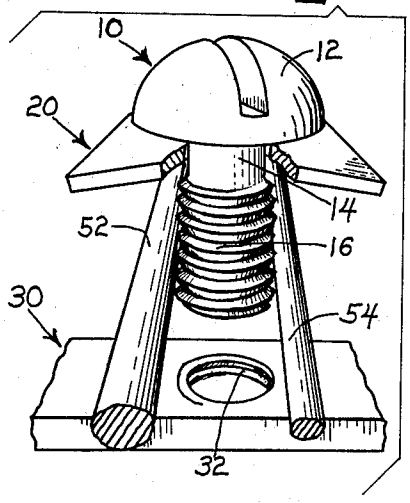


Fig. 2

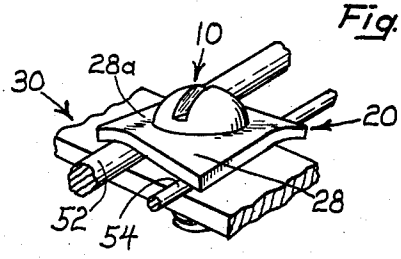


Fig. 3

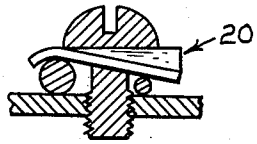


Fig. 4

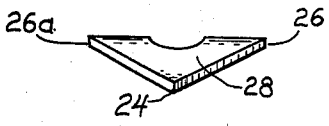


Fig. 5

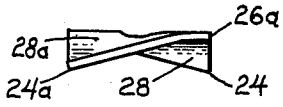


Fig. 6

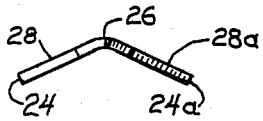


Fig. 7

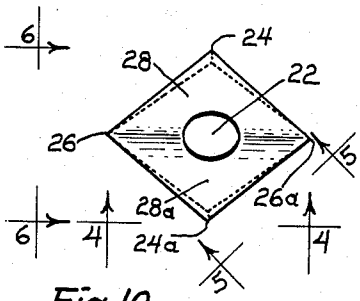


Fig. 8

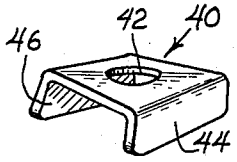


Fig. 9

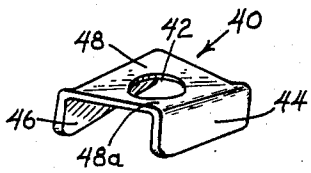


Fig. 10

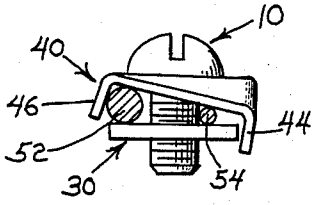
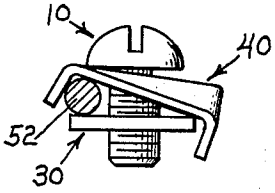


Fig. 11



INVENTOR.
Charles E. Gutshall
BY Robert W. Beart
His Att'y

United States Patent Office 3,178,675 Patented Apr. 13, 1965

3,178,675

DIAGONAL TEETER TERMINAL CLAMP

Charles E. Gutshall, Broadview, Ill., assignor to Illinois Tool Works Inc., Chicago, Ill., a corporation of Delaware

Filed Sept. 4, 1963, Ser. No. 306,488
3 Claims. (Cl. 339—246)

This invention relates to wire clamps or connectors, and more particularly to an electrical terminal clamp or connector to which one or more electrical conductors or wires may be detachably secured.

There are various conventional ways of attaching electrical conductors to a terminal. One of the more common ways is to wrap the conductors around the shank of a bolt which is threadably secured to a base plate, and then tighten the bolt so as to clamp the conductors between the bolt head and base plate. Another conventional way is to clamp the conductors between a pair of flat plates which are drawn into contact with the conductors by a clamping member, such as a bolt or the like. Both of these connections have the disadvantage that any slight force applied along the longitudinal extent of the conductor will loosen the connection with the terminal. To overcome this difficulty, several prior art devices have been constructed with relatively complicated structural arrangements for retaining and holding the conductors to increase the mechanical, and thereby the electrical connection of the conductors to a terminal. However, these arrangements may require the use of more parts or material than the above described conventional means, and they may even be unsuitable for attaching conductors of different sizes to the electrical terminal.

It is, therefore, an object of the present invention to provide a terminal clamp which is relatively simple in construction, and which uses a minimum number of parts and amount of material to mechanically restrain electrical conductors of the same or different size from movement in any direction, and thereby insure a good electrical conneciton.

Another object of the present invention is to provide a terminal clamp wherein a flat plate is provided with a diagonal twist or bend to permit longitudinal and transverse clamping of electrical conductors or elongated workparts of the same or different size to a flat base plate when the twisted plate is forced thereagainst.

Another object of the present invention is the provision of a terminal clamp having a flat square plate which is deformed on both sides of a diagonal extending between one pair of opposed corners of such plate to accommodate and permit clamping of conductors or elongated workparts of the same or different size to a flat base plate.

A further object of the present invention is to provide a deformed plate in a terminal clamp which will accommodate wires of different size and permit teetering or tilting of the plate when it is forced into contact with the largest wire or wires, and thus provide a torsional clamping force to the smaller wire or wires.

Still a further object of the present invention is the provision of a terminal clamp wherein the plate having the diagonal twist may also be provided with opposed downwardly projecting flanges to prevent transverse moving of the workparts which are clamped thereby.

Another object of the present invention is to provide a deformed plate in a terminal clamp having such a configuration that it will readily permit attachment to the clamping member or bolt which forces such deformed plate into contact with the conductors and against the flat base plate.

Still another object of the present invention is to provide a terminal clamp which is economical, simple and efficient in construction and use.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of a terminal clamp constructed in accordance with the present invention, and showing the relative position of the parts prior to assembly;

FIG. 2 is a perspective view showing the terminal clamp of the present invention in clamped position;

FIG. 3 is a side elevational view of the terminal clamp, partly in section, and showing the relative positioning of the parts in clamped position;

FIG. 4 is a side elevation view of the deformed plate taken along lines 4—4 of FIG. 7;

FIG. 5 is a side elevation view of another portion of the deformed plate taken along line 5—5 of FIG. 7;

FIG. 6 is a side elevation view of still another portion of the deformed plate taken along line 6—6 of FIG. 7;

FIG. 7 is a top plan view of the deformed plate of the present invention;

FIG. 8 is a perspective view of another embodiment of the present invention having opposed downwardly projecting flanges;

FIG. 9 is a perspective view similar to FIG. 8, but showing the plate deformed in an opposite direction to that shown in FIG. 8;

FIG. 10 is a side elevational view of the terminal clamp using the embodiment of the deformed plate shown in FIG. 9;

FIG. 11 is a side elevational view similar to FIG. 10 and showing the deformed plate of FIG. 9 engaging a single conductor.

Although the invention is shown and described herein with reference to an electrical terminal clamp for connecting electrical conductors or wires, it will be understood that it may be employed for connecting any type of elongated objects or workparts.

Referring now to the drawings wherein like numerals have been used to designate similar parts throughout the various figures, one embodiment of the terminal clamp constructed in accordance with the invention is shown in FIGS. 1–3. The terminal clamp generally comprises a pair of spaced-apart clamping plates 20, 30, and a clamping member or rotary fastener 10 such as a bolt or the like for forcing the plates into contact with a pair of electrical conductors, designated as 52 and 54 in the drawings. The plates 20 and 30 are preferably formed of an electrical conducting material, such as metal, and are constructed to accommodate the clamping member 10 therein for retaining and holding conductors positioned between the plates in a manner to be described.

The base plate 30 may take any general shape or configuration and may be made integral with a machine or other apparatus. As illustrated in FIG. 1 of the drawings, the base plate 30 is provided with a threaded aperture 32 for receiving the threaded shank 16 of the clamping member 10. The base plate 30 will be formed in such a manner that it will provide conductor or workpart receiving areas on opposite sides of the threaded aperture to accommodate and receive the conductors 52 and 54.

The co-acting top clamping plate 20 is mounted on the clamping member 10 near the undersurface of the clamping member head 12 and may be a sheet metal stamping if desired. Because of the unique configuration of clamping plate 20, wires 52, 54 will be restrained against longitudinal and transverse movement when the clamping member 10 forces the plate 20 into contact with

the conductors and against the base clamping plate **30**. The clamping plate **20** is preferably made in a square shape and is deformed in the vicinity of an imaginary diagonal extending between opposed corners of the plate to provide a downwardly facing concave surface. From an inspection of FIGS. 4–7, it will be evident that the clamping plate **20** is provided with corners **24**, **24***a* and **26**, **26***a*, and that the clamping plate is deformed in the vicinity of an imaginary diagonal extending between corners **26**, **26***a*. While the plate **20** will normally be deformed on opposite sides of the diagonal extending between a pair of opposed corners, the plate may be deformed on opposite sides of a diagonal which is adjacent to, but not intersecting one or both of the opposed corner portions.

When the clamping plate is twisted or formed in this manner, it will provide a pair of opposed axially inclined converging portions or turned down corners **28**, **28***a*. These converging portions will contact and grip the conductors to mechanically restrain them from any longitudinal or transverse movement as will be evident from an inspection of FIGS. 2–3 where the clamping plate **20** holds the wires into contact with the base clamping plate. While the shape of the clamping plate **20** will permit the accommodation of wires of the same size or diameter, it is preferably used in conjunction with wires having varying sizes. In such a case, the clamping plate **20** will perform a unique function of teetering or tilting around the axis of its aperture when the clamping plate is forced into contact with the wire or wires having the largest size. Such a movement will be permitted because of the elliptical opening **22** formed in the clamping plate when it is diagonally twisted or bent, although a slight movement can take place if the opening was thereafter shaped to substantially its original form by compressing the plate between corners **26**, **26***a*.

In application, the wires **52**, **54** will be located on opposite sides of the threaded aperture **32** of base plate **30**. The clamping plate **20** is applied to clamping member **10** along the reduced shank portion **14**, and the head **12** of the clamping member is rotated by a suitable tool to permit the threaded shank **16** of the clamping member to engage within the threaded aperture **32**. In this position, the plates will define parallel workpart or conductor receiving areas therebetween on opposite sides of the clamping member. As the clamping plate **20** is forced towards the base clamping plate **30**, it will engage the wire **52** and will preliminarily clamp it in a predetermined position. At this point, the clamping plate **20** will teeter about the axis of its elliptical aperture **22** while remaining forced against the undersurface of the head **12** of the clamping member substantially along its entire extent. Upon further tightening, the clamping plate **20** will maintain the conductor **52** in clamped position and will exert a torsional clamping force on the smaller conductor **54** to force it toward the clamping member. When fully tightened, the clamping plate **20** will not only hold the conductors **52**, **54** from moving longitudinally, by the force applied normal to the axes of the conductors but it will also prevent any transverse movement of such conductors since the particular corner portion of the plate **20** resting atop the largest conductor **52** will grip it from moving in a transverse direction, and the undersurface of one of the converging portions will provide a wedging action against the smaller conductor **54** to fix it in a specific position.

The clamping plate **20** is preferably initially formed in a square shape since it need not then be oriented in any particular manner when it is used for restraining the conductors. When the clamping plate **20** is deformed in the manner shown by FIGS. 4–7, the marginal portions of the same, which include corners **24**, **24***a* and **26**, **26***a*, will define a periphery when extended to lie within a common plane which will conform substantially to the initial undeformed shape of the clamping plate. The particular

shape of the clamping plate **20** is not limited to a square configuration since it will be understood that the same longitudinal and transverse gripping concept of the present invention may be achieved by any suitable configured clamping plate.

In FIGS. 8–11, the clamping plate **40** conforms substantially to the clamping plate **20** previously described in construction and operation except that it has a pair of opposed downwardly projecting flanges **44**, **46** which may be used in the following manner. The flanges may be used either as a conductor restraining means for preventing movement of the conductors in a direction transverse to the axes of the conductors, or because the dimension between the flanges may be made slightly larger than the base plate **30**, they may cooperate with the same and limit or restrict the movement of the clamping plate **40**. This will be evident from an inspection of FIGS. 10–11 where the clamping plate **40** is substantially similar to the clamping plate **20** as shown in FIGS. 1–3 except that the flanges may be used to engage one or both of the conductors, or may cooperate with the base clamping plate **30** to restrict the movement of clamping plate **40**.

Although the present terminal clamp has generally been shown and described as receiving a plurality of conductors of different sizes, it will be understood that the terminal clamp may receive a single wire or a plurality of wires of the same diameter. It will also be evident that the conductors are not limited to the cylindrical shape shown in the drawings, but may be square, polygonal, etc.

To increase the gripping power of clamping plates **20** and **40**, locking serrations may be formed on their undersurface for grippingly engaging the conductors. Also, the particular shape of clamping plates **20** and **40** will permit a permanent attachment to clamping member **10** around a reduced shank designated in the drawings by numeral **14** if such is desired.

From the foregoing, it will now be evident that the present invention contemplates a unique, but relatively simple structural arrangement wherein the top clamping plate **20** or **40** may perform the functions of longitudinally and transversely gripping the conductors against the base clamping plate **30**, and permit the clamping plates to teeter about the axis of its aperture should conductors of different size be used, all without having to orient the clamping plate shown in FIGS. 1–7 in any particular position.

The specific details and embodiments disclosed and claimed herein are for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art and such changes are to be considered a part of the invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A resilient clamping device for elongated workparts, and comprising a sheet metal stamping of substantially square-shaped configuration having a substantially centrally located aperture, and fastening means extending through the aperture, said stamping having a diagonal apex substantially coincident with one pair of opposed corners of the stamping and extending therebetween to form a dihedral, with the other pair of diagonally opposed corners extending downwardly from the apex and providing a downwardly facing concave-like surface adapted when positioned to face a complementary clamping surface to provide passageways for the elongated workparts on opposite sides of said aperture and traversing beneath said apex and an opposed pair of edges of the stamping, the portions of the stamping on opposite sides of the apex presenting the said opposed pair of edges thereof to resiliently and aggressively impinge on associated workparts as an incident to compression of the stamping by tightening the fastening means in said aperture toward the workparts.

2. A resilient clamping device as claimed in claim 1, wherein the margins of the stamping between said opposed

pair of edges are each provided with a flange extending in the direction of the concave-like surface to provide opposed surfaces to facilitate trapping of the elongated workparts by the stamping when in association with a complementary clamping surface of a width substantially no greater than that of the stamping.

3. In combination with elongated workparts and a clamping plate with a surface against which the workparts are to be clamped, the provision of a sheet metal stamping of substantially square-shaped configuration having a substantially centrally located aperture, and fastening means extending through the aperture and engageable with the clamping plate, said stamping having a diagonal apex substantially coincident with one pair of opposed corners of the stamping and extending therebetween to form a dihedral, with the other pair of diagonally opposed corners extending downwardly from the apex and providing a downwardly facing concave-like surface facing the said clamping surface to provide passageways for the elongated workparts on opposite sides of said aperture and traversing beneath said apex and an opposed pair of edges of the stamping, the portions of the stamping on opposite sides of the apex presenting the said opposed pair of edges thereof to resiliently and aggressively impinge on the associated workparts as an incident to compression of the stamping by tightening the fastening means into said clamping plate.

References Cited by the Examiner

UNITED STATES PATENTS

1,807,462	5/31	Zehnder	339—246 X
2,216,740	10/40	Hubbell	339—246 X
2,507,242	5/50	Bost	339—122 X
2,712,123	6/55	Wibell et al.	339—246
2,794,476	6/57	Hanneman	151—35
3,016,510	1/62	Blonder	339—263 X
3,065,442	11/62	Hubbell et al.	339—263 X
3,081,507	3/63	Gribble	339—246 X

FOREIGN PATENTS

828,865	1/52	Germany.
924,460	3/55	Germany.
284,976	4/31	Italy.
220,315	11/42	Switzerland.

JOSEPH D. SEERS, *Primary Examiner.*

THOMAS J. HICKEY, *Examiner.*