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METHOD OF AND MACHINE FOR MAKING CRAB JOINTS

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My invention relates to twisted tube crab joints for electric cables in net-work mains and the like, and has for its object the production of a new method of and machine for forming the twisted assembly, commonly known to the trade as twisted multiple connectors.

Crab joints have been made by twisting together a plurality of lengths of annealed seamless copper tubing so that the projecting ends may be used for connecting any number of cables together, such as two-way-two-way or four-way-four-way connector as shown. Heretofore when the tubes have been twisted in the manner common to the trade, it has been difficult to produce a neat central portion because of the difficulty of maintaining uniform compression resulting in the collapse of the tubes in the twisting and the convolutions would be not uniformly laid. It has also been difficult to make a rigid structure and when twisted too much, failure is apt to occur, causing a large percentage of spoilage due to fracture.

The manner of use of these crabs makes it necessary that the protruding end of the tubes be flexible so that they may be bent out from the center line of the structure and back to the original position many times without fracture of the tube's wall. In order to accomplish this it is desirable to specially form and shape the curved portion of the tube ends as they emerge from the twisted mass. One of the objects of this invention is to produce a method of making the crab that produces an exceptionally long curved portion joining the straight tubular ends with the twisted center portion and to so form it that an indefinite number of bends of this section outward and back can be made without fracture of the metal.

In making the crabs it is necessary to twist the assembled tubes under compression to form even convolutions and the twist movement must be synchronized with the compression movement. If the compression movement is not properly synchronized with the twist movement, the convolutions will be irregular and will not be properly closed. If the compression is too heavy, convolutions are also irregular and will be closed tightly before the twisting is completed, thereby causing a rupture of the metal. Another one of the objects of this invention therefore, is to produce a machine that will synchronize the twist and compression to form a perfect crab.

To keep the weight of the completed piece known as a crab, to a minimum, the twists must have the smallest possible number of rotating twists. I have discovered that with 1½ or 1¾ twists or substantially a twist of from 450° to 540° the convoluted or twisted portion may be compacted solid and no expansion and contraction of the cable connection under heat cycles will open or loosen the compacted mass of the crab connector.

My method and machine overcomes all these defects and produces a crab joint with uniform convolutions compacted into a solid mass, with the legs in perfect alignment, and provided with especially formed connecting portions rising out of the twisted center with a long unbroken curve that will permit the bending of the legs many times without rupture of the copper tubes.

This specially formed connecting portion between the tubular ends and the twisted portion is obtained by flattening the tube section in a plane which is at right angles to the diagonal line passing through the center lines of the diagonally opposite tubes, said plane being set at substantially 45° to the longitudinal axis of the tubes.

The foregoing and other features of my invention will now be described in connection with the accompanying drawings forming part of this specification in which I have illustrated my machine in its preferred form after which I shall point out in the claims those features which I believe to be new and of my own invention. In the drawings:

Figure 1 is an isometric view of a typical crab joint, a four-way-four-way, shown with eight legs made from four lengths of tubing.

Figure 2 is a side elevation of my machine with the parts in loading position; the tubes are in the twisting head, reverse air pressure in all cylinders. The leg forming device and the air piping is removed to simplify this view.

Figure 3 is a top view of same.

Figure 4 is an end view in part section along line 4—4, Figure 2.

Figure 5 is a side elevation similar to that shown in Figure 2 with the twisting head ¾ revolution, pressure on horizontal cylinder only. Toggle arm pressure not applied.

Figure 6 is a side elevation similar to that shown in Figure 2 with parts in final position. Full air pressure on both toggle press arms and carriage pull lever giving full twist and squeeze pressure.

Figure 7 is a diagrammatic sketch of the air control system, showing how the various air cylinders may be operated.

Figure 8 is an enlarged detail (side view) show-