Dec. 2, 1930. H. C. LAGERBLADE 1,783,802

WELDING STRIP FOR GOLF SHAFTS

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Fig. 1.

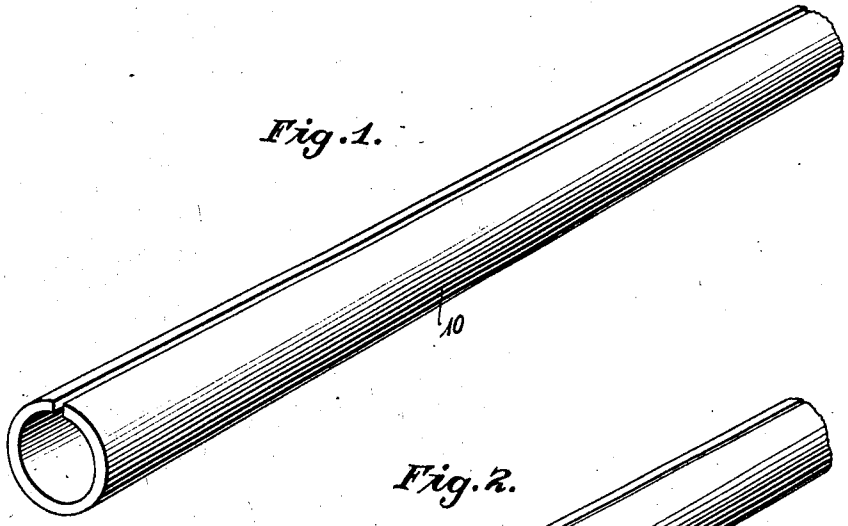


Fig. 2.

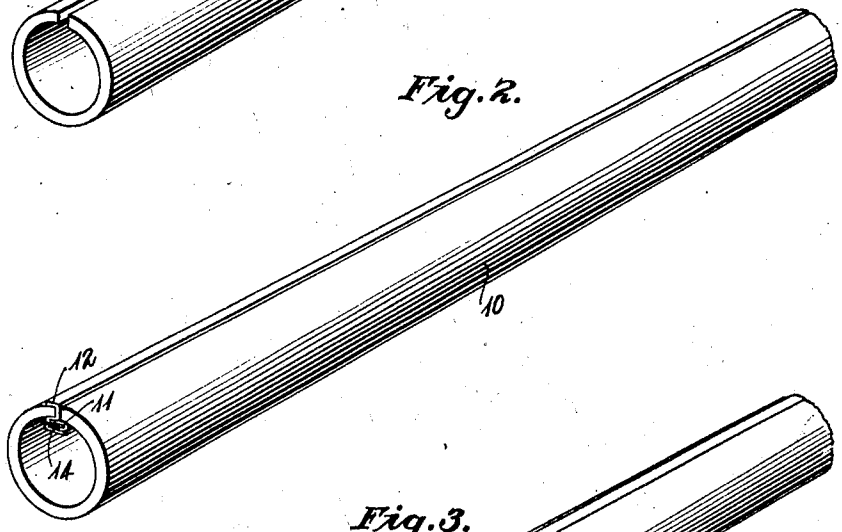


Fig. 3.

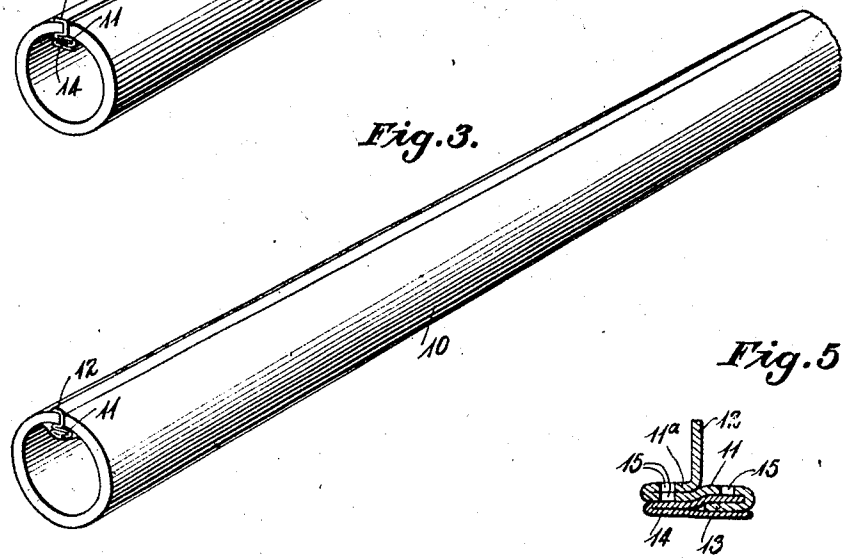


Fig. 5.

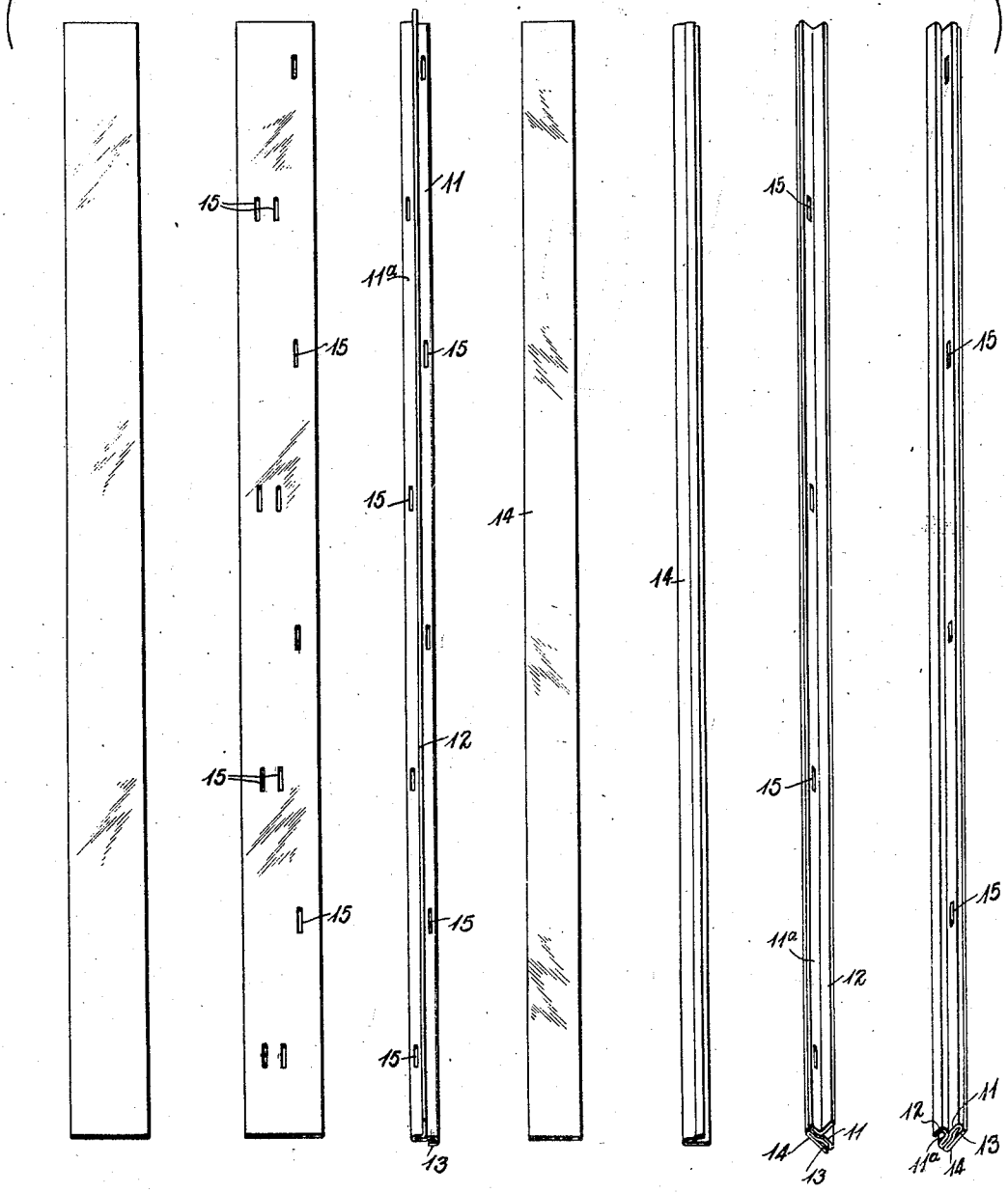
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Fig. 4.



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Patented Dec. 2, 1930

1,783,802

UNITED STATES PATENT OFFICE

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WELDING STRIP FOR GOLF SHAFTS

Application filed June 12, 1928. Serial No. 284,840.

This invention relates to seamed metal articles, and particularly to such articles as are designed to withstand severe bending and twisting strains, and which, when distorted, will return to their original form when the strain to which they are subjected is removed.

More particularly, the invention relates to means for facilitating brazing the abutting edges of a metal tube formed from a thin sheet of metal such as steel.

Tubes of this character, such as are adapted for use as golf club shafts, are illustrated in the Emmett and Thorpe Patents, No. 1,543,497, dated June 23d, 1925, and No. 1,550,153, dated August 18th, 1925. In these prior patents, a metal strip is introduced into the interior of the metal tube, the body portion of said strip lying against the inner surface of the tube along the abutting edges and the offset portion of said strip lying between said abutting edges. To braze the abutting edges of the tubes in these prior patents, it is proposed to introduce into the interior of the tube, along the metal strip, a binding material, preferably in the form of a plurality of strands of copper wire, which, when subjected to heat, will flow into the interstices between the abutting edges of the sheet metal tube and braze those edges together.

In the present instance, a strip of metal is inserted between the abutting edges of the tube similar to the disclosure in the prior patents just mentioned, but the present invention contemplates a novel form of strip which is considerably lighter than the materials used for the brazing operation in said prior patents. This reduction in weight tends to make a better feeling golf club shaft, inasmuch as it reduces the binding material or copper to a minimum, and consequently does away with the possibility of a surplus of copper.

This is important, as there is no elasticity or spring in the copper, so that by reducing the amount of copper used to a minimum, there is less likelihood of deadening the shaft, and, in addition, the heat treatment of the shaft itself will be benefited by the reduction in the quantity of copper used.

Another object of the present invention is to provide a composite brazing strip, i. e., a strip composed of an elongated piece of metal of at least the elasticity of the metal of which the tube is formed, and a binding material, preferably in the form of a copper strip, carried by said elongated piece of metal, whereby the copper will be held securely in the proper place within the tubular member while the abutting edges of the latter are being welded. With the composite strip of the present invention, the two metals are put together before being placed in the seam formed by the abutting edges of the metal tube. This simplifies the operation considerably, and, by having the copper securely held in place, or anchored to the elongated strip of metal, there is little, if any, possibility of the copper flowing anywhere but into the seam formed by said abutting edges.

Another object is to provide means for facilitating entry of the copper or binding material into the interstices between the abutting edges of the metal tube. Preferably, the present brazing strip consists of a strip of steel substantially T-shaped in cross section, with a bent-over portion at the side of the cross member of the T opposite from the upright portion of the T, this bent-over portion of the steel strip being utilized for clamping to said strip a strip of the binding material or copper.

The cross member of this T-shaped strip may be provided with a series of perforations, preferably located at opposite sides of the upright portion of said strip, so that, when the copper, which is attached to said strip by the bent-over portion, is melted, it will have ready access, through said perforations, to the interstices between the abutting edges of the tube being formed. In other words, the provision of these perforations in the cross member of the T-shaped steel strip permits a considerable quantity of the molten copper to flow directly into the seam being formed instead of necessitating the molten copper flowing over the side edges of the steel

strip and then between said steel strip and the inner surface of the tube into the interstices between the abutting edges of said tube.

In the accompanying drawings, which illustrate the preferred embodiment of the present invention,

Figure 1 is a perspective view of the blank from which a tapered steel tube is made, formed into shape preparatory to joining the edges of the blank together;

Fig. 2 is a perspective view of the tube with the composite brazing strip inserted in place;

Fig. 3 is a perspective view of the finished tubular shaft;

Fig. 4 is a series of views illustrating the several steps pursued in producing the composite brazing strip; and

Fig. 5 is a perspective view of a golf club, the shaft of which has been formed of a tube similar to that shown in Fig. 3.

While the present invention is susceptible of use in the production of various tubular metallic seamed bodies, it is illustrated, in the present instance, in connection with the production of tubular metal golf shafts. The shaft of a golf club is subjected to repeated bending and twisting strains, often rather severe, and, to be successful, a golf club shaft must be so made that it will withstand such strains without failing at any point or losing its resilient and flexible characteristics. In manufacturing tubular metallic shafts from sheet metal, considerable difficulty has been encountered in forming the seam by which the edges of the metal blank are united. This seam must be so formed as to not destroy the resilience or flexibility of the finished shaft, and it must be made in such fashion as to not interfere with the weight or balance of the shaft. For this reason, it is quite essential that in forming the seam, the binding material should be used in as small a quantity as possible, and should be uniformly distributed throughout the seam so as not to affect the balance of the shaft or the heat treatment of the material of which said shaft is formed.

In production of the golf club shaft illustrated in the present instance, a sheet metal blank formed up, preferably of steel, is trimmed to the desired shape, depending upon the taper of the tube which is to be formed from it. Of course, if the tube to be formed is to be cylindrical, the blank will be rectangular.

This blank is preferably formed of steel of the desired gauge and chemical analysis, depending upon the weight of the shaft which is to be formed and the degree of flexibility or resilience desired in the finished shaft. The blank is then formed roughly into the shape of the tubular shaft, thus bringing the longitudinal edges of the blank adjacent each other, the blank 10 taking substantially the form shown in Figure 1. The blank may well be formed to the shape shown by clamping it about a mandrel of the desired shape.

As proposed in the Emmett and Thorpe patents before referred to, the seam at the meeting edges of the tube is formed by means of a steel connecting strip inserted between the adjacent edges of the body of the tube and lapping and secured to the adjacent portions of the body of the tube by a suitable binder of the character hereinafter described. This connecting strip is preferably made of steel, it being desirable that the steel from which this strip is formed be of substantially the same carbon content as the steel of the blank forming the body of the tube. The binding material is preferably copper in a highly purified state, that is, copper which is free from occluded gases and from which all oxide has been eliminated. This binding material melts at a temperature below that at which any substantial decarbonization of the steel takes place, and, therefore, the fusion of this binding material in forming the seam does not have any detrimental effect upon the metal forming the tube insofar as the elasticity of that metal is concerned.

In accordance with the present invention, this steel strip is substantially T-shaped in cross section, the face of the cross member 11 of said T opposite that face from which upright 12 of the T projects having a bent-over portion 13 for securing to said strip the copper or other binding material 14. It has been found desirable to produce this steel strip by folding the portion 11*a* which constitutes a part of the cross member of the T over upon the body portion 11 which primarily forms the cross member of the T. One side edge of the strip is then bent to form the upright portion 12 of the T, and the other side edge portion of the strip is bent back upon the cross member or body portion 11 so as to clamp between it and said body portion the strip of copper or other binding material 14.

The strip thus formed is inserted between the adjacent edges of the tube formed by the body of the blank. In doing this, the operator takes a suitable tool and draws the strip into position, the body portion 11 lying within the tube with the upright portion 13 disposed between the adjacent edges of said tube. The copper or other binding material secured to the strip by the portion 13 is at the inner side of the strip, but in order to facilitate entry of the copper, when fused into the interstices of the seam to be formed, the cross member or body portion of the steel strip has a multiplicity of perforations 15 therein, these perforations having been initially spaced in the blank from which the steel is formed. The several steps pursued in producing this composite strip are illustrated in Fig. 4.

As shown in this figure, the first step con-

sists in placing a multiplicity of longitudinally spaced perforations 15 in said strip, after which one side edge of the strip is bent over as at 13, and a portion 11*a* is bent over in the reverse direction, so that the opposite side edge of the strip may be turned at right angles to the body portion 11 to form the upright portion 12. Next, a flat strip of copper is bent upon itself, as shown in the third view of Fig. 4, and one fold of this piece of copper is then inserted between the bent-over portion 13 of the steel strip and the body portion 11 of said strip. Suitable pressure is then applied to the opposite strip so as to secure the copper strip to the steel strip.

When this composite connecting strip has been inserted between the edges of the tube, as described, the next step in the manufacture of the shaft is to wrap the tube with an asbestos tape so as to hold the edges in proper contact with the connecting strip. The wrapped tube is then inserted in a furnace in an atmosphere of hydrogen, the furnace being maintained at or about the melting point of the copper. The fused copper runs into the interstices between the adjacent portions of the body of the tube, and the steel strip, and forms a very secure union between these parts. This entry of the fused copper into said interstices is greatly facilitated by the provision of the perforations 15 in the steel strip, as the presence of these perforations gives ready access to said interstices instead of requiring all the copper to flow around the side edges of the cross member or body portion 11 of the steel strip.

After this union of the abutting edges of the tube has been made, the tube is finished in accordance with the disclosures of the Emmett and Thorpe patents above mentioned, and as this portion of the method of production of the finished shaft forms no part of the present invention, further detailed description thereof is deemed unnecessary.

With the composite steel and copper strip disclosed in the present instance, the weight of the combined metals used in the strip is considerably lighter than where a multiplicity of copper strands are used in conjunction with a steel strip. This tends to make a better feeling golf shaft, inasmuch as it reduces the amount of copper used in the brazing to a minimum and it eliminates the possibility of surplus copper which would tend to deaden the shaft. Furthermore, as there is no spring in copper, the less copper that is used in making the seam the better the heat treatment will be in the shaft itself. The present composite steel and copper strip also insures the copper or other binding material being held securely in place during the welding or uniting of the abutting edges of the tube. Again, by placing the copper and steel together in a single strip before the strip is drawn into the seam to be formed, the operation is greatly simplified. The composite strip is also superior to the use of individual strands of copper, as the latter gave no insurance that the copper would fall directly into the seam, whereas by having the copper anchored into the strip, there is no possibility of the copper flowing anywhere but into the seam.

Another feature of this composite type of strip is that it is not necessary for the operator to turn and shake each individual shaft, in order to insure the copper flowing into the seam along the entire length of the strip, as is the case when individual copper strips are used for the binding material. In addition, the provision of the perforations in the steel strip not only facilitates the flow of the molten copper into the seam being formed, but the presence of these perforations also insures a brazing of the seam throughout the length of the shaft. The possibility of skips in the brazing is practically eliminated with the use of this punched steel strip, inasmuch as the copper, when it melts, will flow directly through the strip and into the seam. Due to the fact that it is unnecessary for the operator to turn and shake each individual shaft in order to insure the copper flowing along the entire seam being formed, it is possible to automatically handle the shafts being welded by having them passed through furnaces in quantities.

What is claimed is:

1. A connecting member for brazing the abutting edges of a tube formed from a thin sheet steel blank, said connecting member comprising a steel strip having substantially plane portions adapted to lie between said abutting edges and against the inner surface of the tube adjacent said abutting edges, respectively, and a strip of copper attached to said steel strip adapted to fill the interstices between and unite said abutting edges and said steel strip throughout their approximate surfaces when brought to a brazing temperature, said steel strip being interposed between said strip of copper and the inner surface of the tube, and means for facilitating entry of the copper when fused into said interstices.

2. A connecting member for brazing the abutting edges of a tube formed from a thin sheet steel blank, said connecting member comprising a steel strip having substantially portions adapted to lie between said abutting edges and against the inner surface of the tube adjacent said abutting edges, respectively, and a strip of copper attached to said steel strip adapted to fill the interstices between and unite said abutting edges and said steel strip throughout their approximate surfaces when brought to a brazing temperature, said steel strip being originally interposed between said strip of copper and the inner sur-

face of the tube and having longitudinally spaced perforations therein through which the molten copper may flow into said interstices.

3. A connecting member for brazing the abutting edges of a metal tube formed from a thin sheet steel blank, said member comprising a steel strip substantially T-shaped in cross section, the upright portion of said strip being substantially plane and adapted to lie between said abutting edges and one face of the cross portion of said strip being substantially plane adapted to extend along the inner surface of the tube adjacent said abutting edges, and a binding material secured to the other face of said cross portion of the steel strip, adapted to fill the interstices between and unite said abutting edges, said cross portion of the steel strip having perforations therein through which the binding material can enter said interstices.

4. A connecting member for brazing the abutting edges of a metal tube formed from a thin sheet steel blank, said member comprising a steel strip having a body portion, one face of which is adapted to be positioned against the inner surface of the tube along said abutting edges, an angularly disposed section projecting from one face of said body portion adapted to lie between said abutting edges and a bent-over portion on the opposite face of said body portion, and a binding material clamped between said body portion and a bent-over portion adapted to fill the interstices between and unite said abutting edges.

5. A connecting member for brazing the abutting edges of a metal tube formed from a thin sheet steel blank, said member comprising a steel strip having a body portion, one face of which is adapted to be positioned against the inner surface of the tube along said abutting edges, an annularly disposed section projecting from one face of said body portion adapted to lie between said abutting edges and a bent-over portion on the opposite face of said body portion, and a copper strip secured between the body portion and the bent-over portion of the steel strip adapted to fill the interstices between and unite said abutting edges, the body portion of said steel strip having perforations therein through which the copper, when fused, may flow to enter the interstices between said abutting edges.

6. A connecting member for brazing the abutting edges of a metal tube formed from a thin sheet metal blank, said member comprising an elongated strip of steel having one side edge reversely bent upon the medial portion of the strip, said reversely bent portion terminating in a rib angularly disposed with respect to said medial portion, whereby said rib may be positioned between said abutting edges with said reversely bent portion and said medial portion positioned within the tube, and the other side edge of said strip being also reversely bent upon said medial portion, and an elongated strip of copper clipped to said member between said medial portion and the last mentioned reversely bent edge portion of said strip.

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