H. JUNKERS.

METHOD OF MAKING HOLLOW CONSTRUCTION MEMBERS.

APPLICATION FILED JUNE 28, 1920.

1,427,904. Patented Sept. 5, 1922.

2 SHEETS—SHEET 1.

Fig. 1

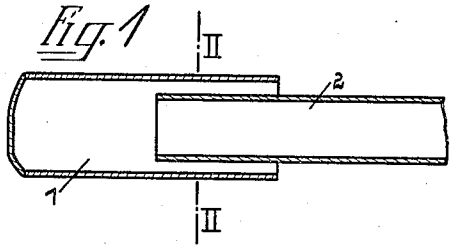


Fig. 2

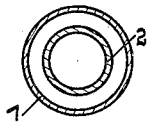


Fig. 3

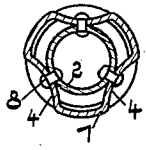


Fig. 4

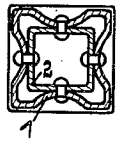


Fig. 5

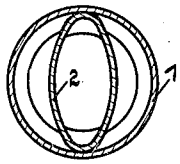


Fig. 5a

Fig. 6

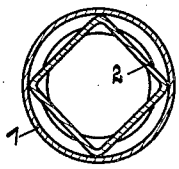


Fig. 6a

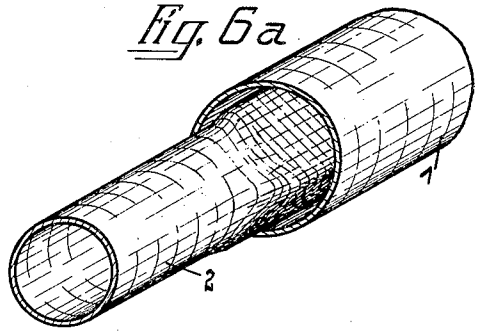


Fig. 7



Fig. 8

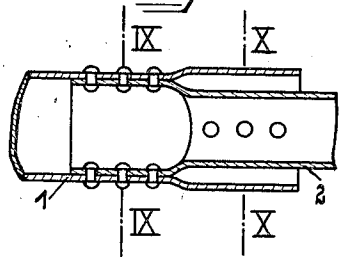


Fig. 9

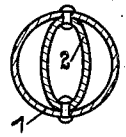
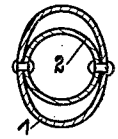


Fig. 10



Inventor:

Hugo Junkers

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2 SHEETS—SHEET 2.

Fig. 11

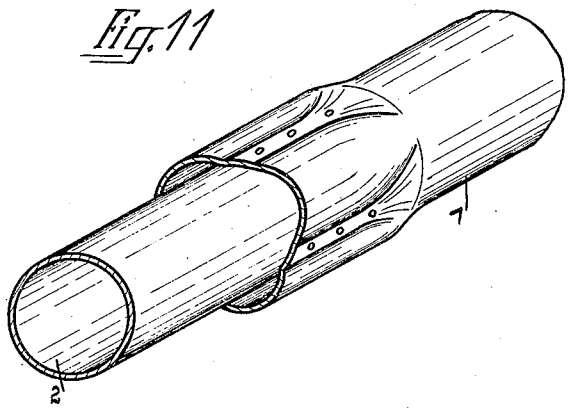


Fig. 12

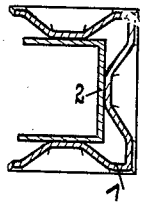


Fig. 13

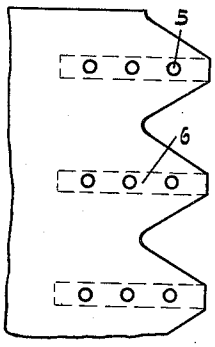


Fig. 13a

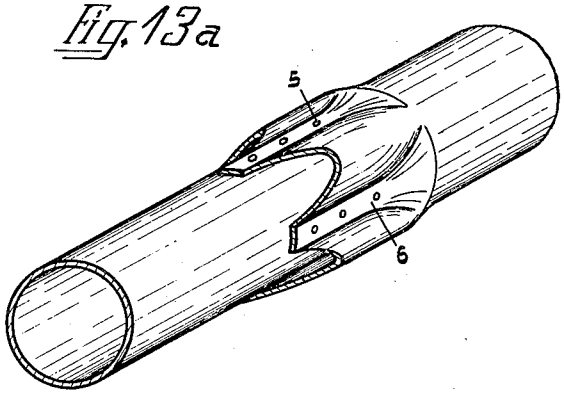


Fig. 14a

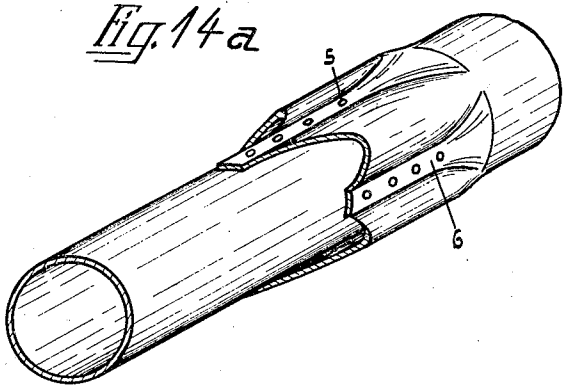
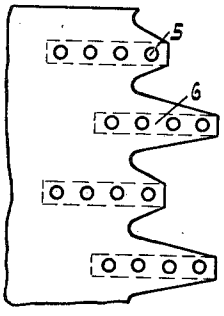


Fig. 14



Inventor:

Hugo Junkers

Patented Sept. 5, 1922. 1,427,904

UNITED STATES PATENT OFFICE.

HUGO JUNKERS, OF DESSAU, GERMANY.

METHOD OF MAKING HOLLOW CONSTRUCTION MEMBERS.

Application filed June 28, 1920. Serial No. 392,586.

To all whom it may concern:

Be it known that I, HUGO JUNKERS, a citizen of the German Empire, residing at Dessau, Germany, have invented certain new and useful Improvements in Methods of Making Hollow Construction Members (Germany, March 12, 1917), of which the following is a specification.

This invention relates to a method of connecting hollow construction members and more especially tubular or other comparatively long members or bearers, which do not serve for conducting liquids, but for transmitting forces (traction, pressure, flexure) and whose difference of circumferences is so great that the inner periphery of one member is considerably longer than the outer periphery of the other member, so that the members on being inserted concentrically one in the other, do not contact with each other.

Until now, when connecting tubes or the like for the sole purpose of producing a rigid connection, the same connecting methods were employed which are usual in pipe or tube systems serving to conduct liquids. For instance the circumferences of said tubes were changed by enlarging or upsetting these tubes in such a manner that they could be slipped into each other without leaving any free space between them. In other cases special connecting members such as the so-called reducing joints have been employed for connecting such tubes.

The first named method of changing the circumferences can be applied only to certain materials well suited for expanding or upsetting without cracking or breaking and moreover requires expensive manual labour or special contrivances. The method of employing special connecting members results in a very undesirable accumulation of constructive parts at the connections and increases the weight of the structure as a whole.

It is further known to connect two tubes, the inner diameter of the one tube being about equal to the outer diameter of the other one, so that the adjoining peripheral faces of the tube ends contact with each other, by forming indentations at the joint, whereby the material is stretched in this place.

In contradistinction thereto the purpose of my present invention is to connect tubes whose diameters differ so widely that an annular space is left between their ends. This is effected by deforming either one or both tubes at the point of connection, without changing their circumferences, in such a manner, that a plurality of flat portions of their surfaces, preferably uniformly distributed over their periphery, are brought in close contact, whereupon the connection of the two tubes can be effected in any desired manner, for instance, by riveting, electric point welding or the like.

In the drawings affixed to this specification and forming part thereof different connections of tubes produced in accordance with my invention are illustrated by way of examples.

In the drawings

Fig. 1 is a longitudinal section and

Fig. 2 is a cross-section on line II—II (Fig. 1) of two tubes of different diameters designed to be joined together.

Figs. 3 and 4 are cross-sections disclosing different modes of interconnection of such tubes.

Fig. 5 is a cross-section and

Fig. 5ª a perspective view of a third,

Figs. 6 and 6ª similar views of a fourth modification.

Fig. 7 is a cross-section of a fifth mode of connecting the tubes.

Fig. 8 is a longitudinal section and

Figs. 9 and 10 are cross-sections on lines IX—IX and X—X, respectively, of a sixth form of tubular joint.

Figs. 11 and 12 are a perspective view and a cross-section, respectively, disclosing a seventh mode of connection.

Fig. 13 shows part of the outer tube in flattened condition.

Fig. 13ª is a perspective view of a pair of tubes jointed in another way, and

Figs. 14 and 14ª are similar views of a ninth modification.

As shown in Fig. 3 they are connected with each other by forming at the end of the outer tube 1 a number of longitudinal indentations 4 of such depth, that they contact with the inner tube 2. Along the lines of contact the two tubes are then rigidly connected by rivets 8.

Fig. 4 shows a connection of square tubes produced in a like manner.

In the connection shown in Figs. 5 5ª and 6 6ª the larger tube retains its shape, whereas the end of the narrower tube is deformed in such a manner that it contacts with the

inner surface of the outer tube along several lines or longitudinal stretches, along which the tubes can be rigidly connected.

Fig. 7 shows both tubes deformed at the ends, so as to contact with each other.

Figs. 8 to 10 illustrate a double connection of the tubes, the end of the narrower tube 2 being flattened to touch the inner surface of the wider one (Fig. 9) whose end is in its turn flattened so as to touch the narrow tube from without (Fig. 10).

Fig. 11 discloses a tube connection corresponding to Fig. 3, clearly illustrating the deformation of the outer tube. It will be understood that the tubes may also be connected in such a manner that their axes do not coincide. In a like manner tubes of different cross-section can be connected with each other.

The novel method may also be applied with advantage to open profiles, such as crescent or U-shaped bars or channels.

Fig. 12 shows an example of the connection of two channel-irons. Here the wall of the larger channel is depressed in three places, without altering its peripheral length, in such a manner that it contacts with the smaller channel, the rigid connection by riveting or the like being effected at these points of contact.

In order to effect a saving of weight and a more favorable distribution of forces the ends of the tube are preferably toothed or serrated between the lines of contact, as shown for instance in Figs. 13 and 13a.

According to Figs. 14 and 14a the teeth or serrations may differ in length. The rivet holes 5 can then be disposed on the lines of contact 6, indicated by dotted lines, so that the weakening of the cross-section, caused by said rivet holes decreases from the center of the point of connection towards both sides.

Mainly on account of the small weight of the connections produced according to this invention they are of special advantage in the construction of flying machines, quite especially at the wing ribs, the frame and other parts.

I claim:—

1. The method of connecting two hollow construction members of different diameters, which consists in deforming one of said members at the point of connection in such a manner that it contacts with the other in plurality of flattened portions and rigidly connecting the members at the said portions.

2. The method of connecting two hollow construction members of different diameters, which consists in deforming both said members at the point of connection in such a manner that they contact with each other in a plurality of flattened portions and rigidly connecting the members at the said portions.

3. The method of connecting two hollow construction members of different diameters which consists in deforming one member at the point of connection in such a manner, that it contacts with the other in a plurality of flattened portions longitudinally displaced relatively to each other, and rigidly connecting said members at the said portions.

4. The method of connecting hollow construction members of different diameters, which consists in deforming the end of one member in such a manner, that it contacts with the other in a plurality of flattened portions, cutting away part of the material between said portions and rigidly connecting said members at said portions.

5. The method of connecting hollow construction members of different diameters, which consists in deforming part of each member in such a manner, that the deformed part of each member contacts with a non-deformed part of the other member and rigidly connecting the said members at the said parts.

In testimony whereof I affix my signature.

HUGO JUNKERS.