March 20, 1928. 1,663,254

G. H. HUFFERD

PROCESS OF MAKING TIE ROD ENDS

Filed Feb. 26, 1926

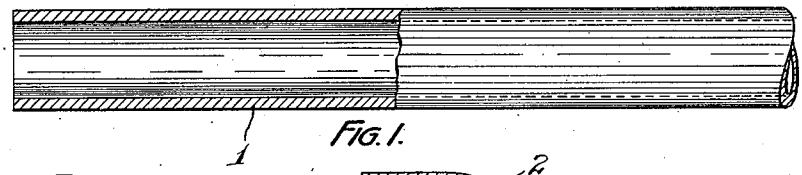

FIG. 1.

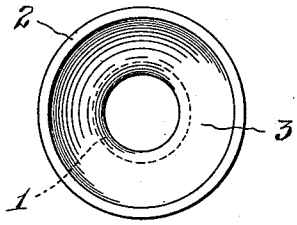

FIG. 3.

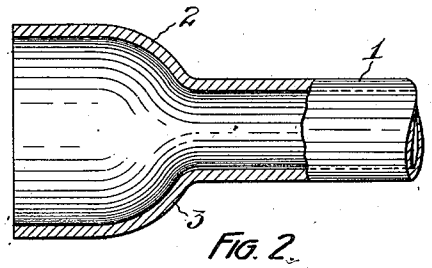

FIG. 2.

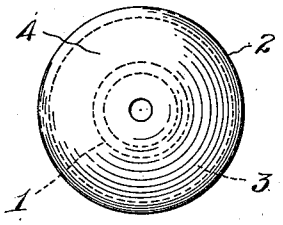

FIG. 5.

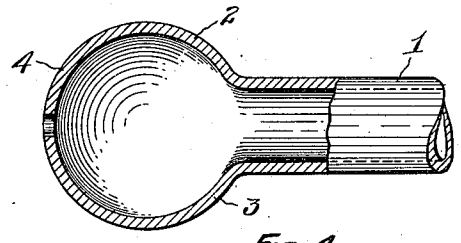

FIG. 4.

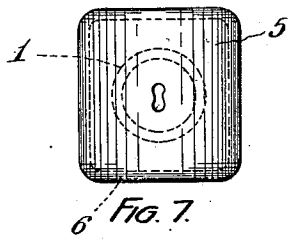

FIG. 7.

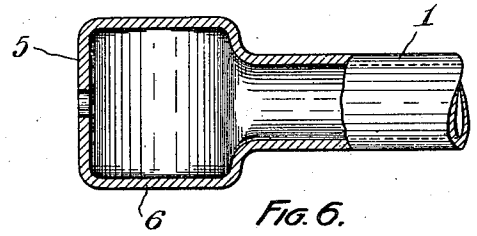

FIG. 6.

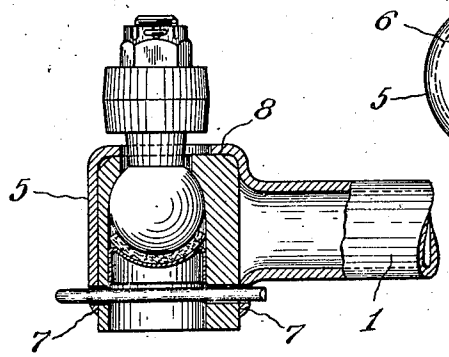

FIG. 9.

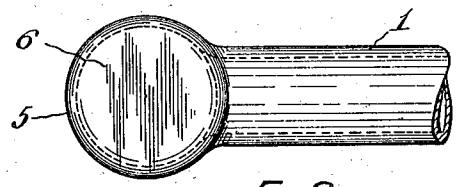

FIG. 8.

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Patented Mar. 20, 1928. 1,663,254

UNITED STATES PATENT OFFICE.

GEORGE H. HUFFERD, OF DETROIT, MICHIGAN, ASSIGNOR TO THOMPSON PRODUCTS INC., OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PROCESS OF MAKING TIE-ROD ENDS.

Application filed February 26, 1926. Serial No. 90,841.

The invention relates to a process for producing a connecting rod formed out of a light, seamless, metal tube, with an integral ball-joint housing, such as is disclosed and claimed in an application filed by me jointly with Frederick C. Crawford on February 26, 1926, Serial No. 90,899. While I contemplate the employment of the process especially for the formation of the ends of tie rods and drag links of automobiles, the purpose to which the rod is to be put is not material.

It is the object of this invention to produce such an article by novel and effective procedure and of which the cost of production will be comparatively small.

In the annexed drawings illustrating the steps of the process:

Figure 1 is a view of a seamless metal tube, partly in section from which the connecting rod is made according to my process;

Fig. 2 illustrates the tube after the end has been expanded and upset to proper diameter;

Fig. 3 is an end view thereof;

Fig. 4 illustrates the result of the next step in the process, which consists in forming or spinning the expanded end shown in Fig. 2 into substantially spherical form;

Fig. 5 is an end view of Fig. 4;

Fig. 6 illustrates the result of the succeeding operation, which consists in shaping the substantially spherical end illustrated in Fig. 4 into the form of a cylinder whose axis is at right angles to the axis of the tube;

Fig. 7 is an end view of Fig. 6.

Fig. 8 is a bottom plan view of Fig. 6.

Fig. 9 is a view of the connecting rod end as completed according to my process and assembled with a ball joint.

Referring to the drawings in detail in which the same reference character is used throughout to indicate the same part, the process is begun with a light, seamless metal tube 1, the end of which is enlarged or expanded, as illustrated at 2, the extent of the enlargement depending upon the size of the ball-joint housing or similar part which it is desired to form upon the end of the tube. In the process of enlargement it is obvious that the same metal which forms the wall of the tube must also constitute the wall of the enlargement, from which it follows that, if the end of the tube is subjected to the process of expansion alone, the resulting wall will be much thinner than the untreated wall of the tube. If it is desired to retain, in the enlargement, the original thickness of the tube wall, it is necessary to subject the treated part of the tube to the process of upsetting or thickening, which is a well-known operation, and which may take place simultaneously with the operation of expansion in a manner known to the art. The expanding operation is preferably so effected as to leave a segmental spherical surface 3 next to the body of the tube 1, as indicated in Fig. 2. After the step of expansion the end of the expanded portion is formed by spinning or otherwise, into a substantial sphere 4, as illustrated in Fig. 4. This spherical end 4 is then die-formed, preferably by a hot-forging method, into a cylinder 5 whose axis is at right angles to the axis of the tube. Thereafter one end 6 of the cylinder is completely removed, as indicated at 7 (Fig. 9) and a concentric part of the opposite end is removed, so as to leave a ball-seat retaining and bearing surface 8, thus forming a ball-joint housing. The housing so made is adapted to receive and retain a ball joint described in a co-pending application and which is not my sole invention. This ball joint is fully illustrated in Fig. 9 and requires no further description, except the explanation that it comprises a ball seat having a bore eccentric to its axis, adapted to rotate in the housing for purposes of adjustment of the ball stud with relation to the rod and to be fixed in any adjusted position.

While I have illustrated the bearing surface 8 as being formed of two surfaces at substantially right angles to each other, the shape thereof is dependent merely upon the shape of the dies employed in forging the spherical end 4 into the cylinder. By selecting dies of other shapes this bearing surface might be the segment of a sphere or cone.

In the description above it is indicated that the end of the tube to be formed for receiving a ball joint may be expanded without upsetting, or expanded and also upset, depending upon the characteristics of the resulting article desired; but as it is ordinarily desirable to have the greatest strength of such a part with the least weight, it will be found best to upset the expanded or enlarged portion of the tube so that the hous-

ing will have a strength equal to that of the body of the tube. In the following claims which specify the step of expanding the end of a metal tube the expression is to be understood as also covering the step of upsetting the metal whenever such is deemed to be desirable.

It is apparent that by the method described the article disclosed may be effectively constructed and at a low cost. The method is capable of variation in detail and it is therefore to be understood that it is not limited to the details described but includes all processes comprehended within the terms of the appended claims.

What I calim is:

1. The process of making a one-piece, seamless, tubular connecting rod, consisting in expanding the open end of a seamless metal tube, forming it into substantially spherical form, shaping the substantially spherical end into cylindrical form, and finally removing the end walls of the cylinder.

2. The process of making a one-piece, seamless, tubular connecting rod, consisting in expanding the open end of a seamless metal tube, forming it into substantially spherical form, shaping the substantially spherical end into cylindrical form, and finally completely removing one end wall of the cylinder and an inner concentric part of the other end wall so as to leave a ball-seat retaining shoulder.

Signed by me this 22nd day of January, 1926.

GEO. H. HUFFERD.