

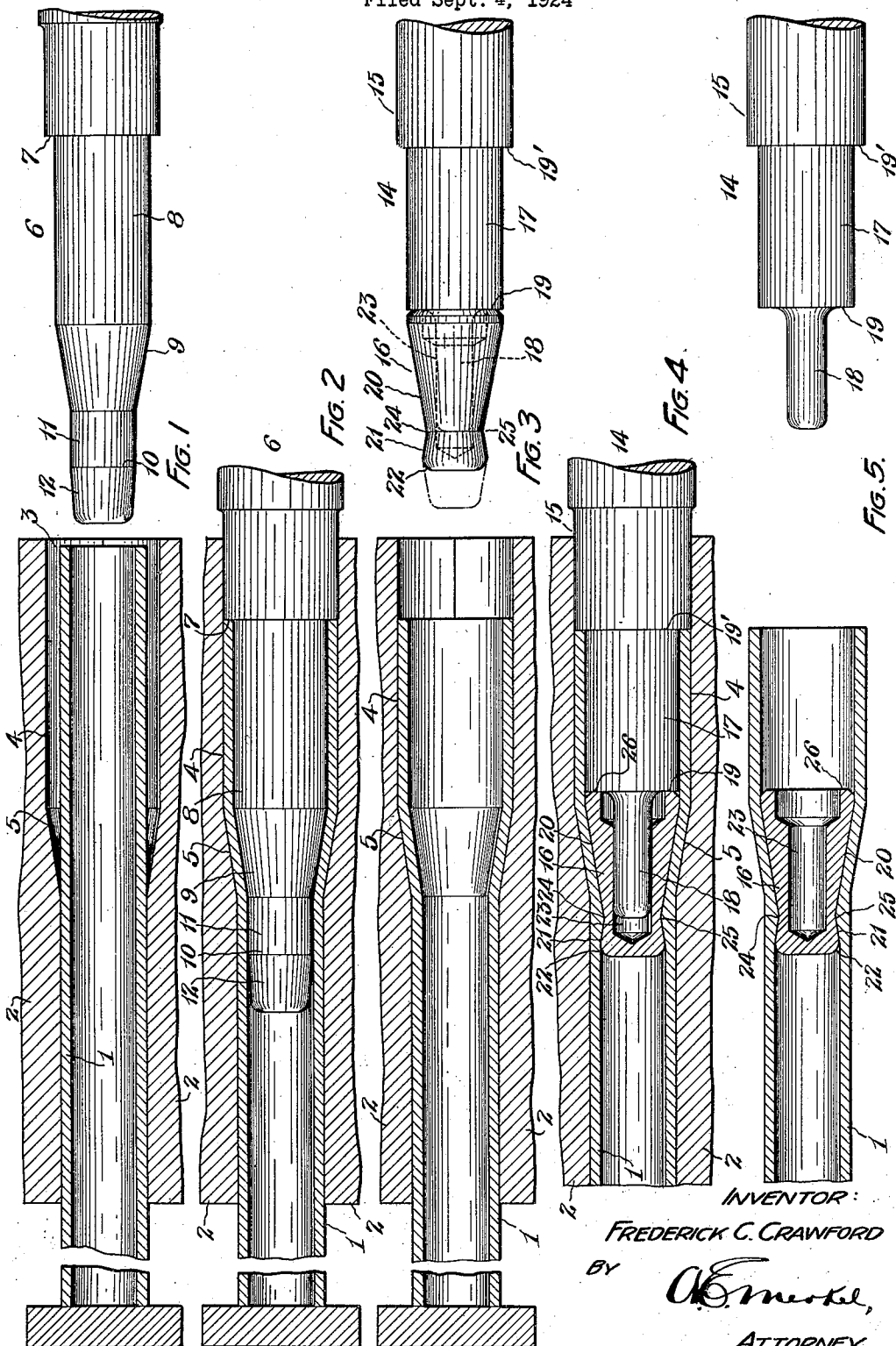
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METHOD OF MAKING TUBULAR END SOCKETS

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METHOD OF MAKING TUBULAR END SOCKETS.

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My invention relates to drag links or tie rods of automotive vehicles and particularly to the main or tubular member of such drag links or tie rods.

As is well known to those skilled in the art, certain types of drag links and tie-rods are provided with expanded end sockets which receive bearing blocks, springs, and abutment members for connection to another part of the steering gear of the vehicle.

The object of this invention is to provide such a drag link or tie rod with an interior abutment member forming a shoulder at right angles to the axis of the socket adapted to receive the thrust of the parts mounted in the socket, and furthermore to provide the tubular member with such abutment member in an efficient and economical manner.

In the annexed drawing:

Figure 1 represents an axial section of a tubular element whose end portion it is required to form with an internally shouldered socket, showing the forming dies also in section, and adjacent thereto the forming punch which is first used, in elevation.

Fig. 2 represents a view similar to that of Fig. 1, showing the form of the socket after the first operation resulting from the insertion of the first forming punch.

Fig. 3 represents a similar section after the first forming punch has been withdrawn, and showing the second forming punch in elevation, ready for insertion.

Fig. 4 represents a section showing the form of the socket after the second punch has been inserted.

Fig. 5 represents a section showing the finished socket formation and the second punch withdrawn.

In carrying out my invention, I take a piece of tubing 1 and clamp it between a two part die 2 which is provided with a cavity 3 having an interior contour corresponding with the required exterior contour of the desired socket forming a cylindrical portion 4 and a conical portion 5.

A punch 6 is then inserted into the end of the tube as shown in Fig. 2 so as to expand same to assume the contour of the die-cavity. This punch is provided with a shoulder 7, a cylindrical portion 8, a conical portion 9 and an end or pilot portion 10. The cylindrical portion 8 is made of less

length than that of the cylindrical portion 4 of the die-cavity and of a diameter substantially equal to that of said portion 4 less twice the gauge of the tube. The conical portion 9 is of same inclination as conical portion 5 of the die-cavity, and of a diameter throughout same as that of said portion 5 less twice the gauge of the tubing. The pilot portion 10 is made of slightly less diameter than the interior diameter of the tube and is provided with a cylindrical surface 11 and an end slightly tapered portion 12.

This punch is forced into the tube so as to, as previously stated, expand its end portion to assume the dimensions of the die-cavity and also as a result of the engagement of the shoulder 7, to upset the tubing and completely fill the space between the parts 8 and 9 of the punch and die thereby restoring the original gauge of the tube, as will be understood.

After the above described preliminary operation, the punch is withdrawn.

A second punch 14 is then inserted to complete the operation and this punch is provided with a cylindrical surface 17 of slightly less diameter than that of the interior of the cylindrical portion of the previously formed socket, and of somewhat less length than such socket portion. This punch is also formed with a cylindrical part 15 of substantially the same diameter as the interior diameter of the cylindrical part 4 of the die, but making a sliding fit therewith.

The second punch is furthermore formed with an end axially located cylindrical extension 18, Fig. 5, of reduced diameter, and forming a shoulder 19.

The punch 15 carries the abutment member 16 which is formed with an exterior conical surface 20 having a major diameter substantially equal to the major diameter of the surface 9 of the punch 6 and a minor diameter slightly less than the minor diameter of said surface 9. The length of conical surface 20 is somewhat greater than that of surface 9 as shown in Fig. 3. It is further formed with an end extension 21 having a conical surface converging toward the conical surface 20 and having its minor diameter equal to that of the latter as shown. The outer end of the extension is preferably rounded as at 22, Fig. 3.

Intersecting that end surface of the abut-

ment member 16 which is of major diameter, is an axial cylindrical bore 23, Fig. 4, which receives the extension 18 of the punch 15, and is of a length such that end of the abutment member 16 may abut the shoulder 19. The diameter of the bore is such as to allow a sliding fit between it and extension 18.

It will thus be noted that the removable part 16 is provided with a portion 24 having a cross-section of reduced area forming a circumferential depression 25 intermediate of the said part's ends.

The punch 14 with the abutment member 16 mounted thereon is then inserted into the previously described partially finished socket and pushed therein until the extension 21 passes into that portion of the tube of original diameter and the conical surface 20 intimately engages the interior conical surface of the socket. At the same time the shoulder 19' forces the metal ahead of it so as to completely fill the space between the cylindrical portion 17 of the punch 14 and the die and between the intermediate depression 25 and the die as shown in Fig. 4, thereby locking the abutment member 16 in place. The punch 14 is then withdrawn and the said member 16 remains in the tube and provides the required shoulder 26.

A multiplicity of abutment members 16 are provided so that there will be one for each operation, as will be understood.

It will be understood, of course, by those skilled in the art, that the above operations are performed while the metal operated upon is heated to a temperature suitable for an upsetting process.

What I claim is:

1. The method of forming a tubular element for tie rods or the like provided with an interior shoulder, which consists in expanding the end portion of a tube to form an

enlarged socket having a cylindrical portion joined to the tube-portion of normal diameter by a conical portion; then forcing a conical abutment member against and into intimate contact with the interior of said conical portion while the socket is confined in a die, and simultaneously upsetting the metal of the tube so as to lock said abutment member in place therein.

2. The method of forming a tubular element for tie rods or the like provided with an interior shoulder, which consists in expanding the end portion of a tube to form an enlarged socket having a cylindrical portion joined to the tube-portion of normal diameter by a conical portion; then forcing into the tube-portion of normal diameter and against and into intimate contact with the interior of the conical portion and while the socket is confined in a die, a conical abutment member having a circumferential depression, and simultaneously upsetting the metal of the tube so as to fill said depression and lock the abutment member in place.

3. The method of forming a tubular element for tie rods or the like provided with an interior shoulder, which consists in expanding the end portion of a tube to form an enlarged socket having a cylindrical portion joined to the tube-portion of normal diameter by a conical portion; then while the socket is confined and held in a die, inserting a conical abutment member in said socket and into intimate contact with the conical portion thereof; and then securing such member in such position by causing the metal of the tube to fill a depression in said abutment member intermediate of its ends.

Signed by me this 4th day of November, 1925.

FREDERICK C. CRAWFORD.