

Oct. 3, 1933.

E. RIEMENSCHNEIDER

1,928,910

METHOD OF FORMING FLANGED ARTICLES

Filed Dec. 31, 1930

3 Sheets-Sheet 1

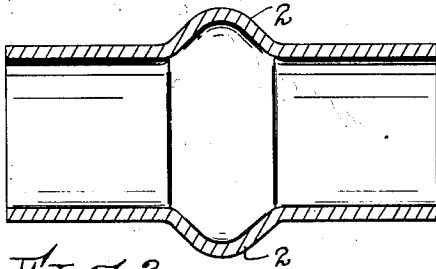


FIG. 2

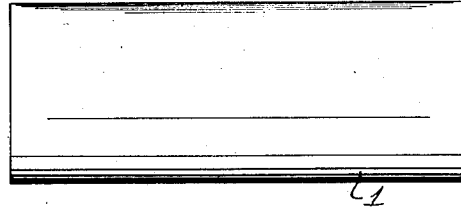


FIG. 1

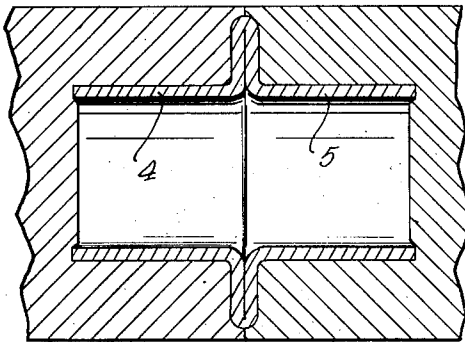


FIG. 3

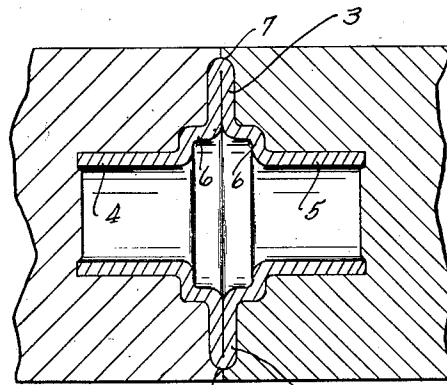


FIG. 4

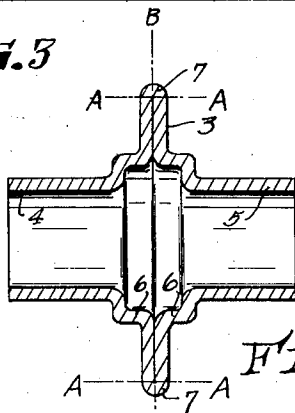


FIG. 5

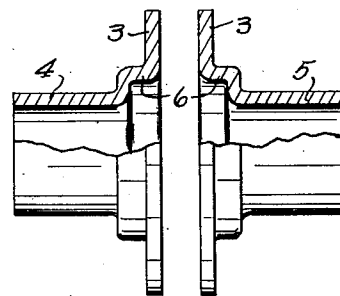


FIG. 6

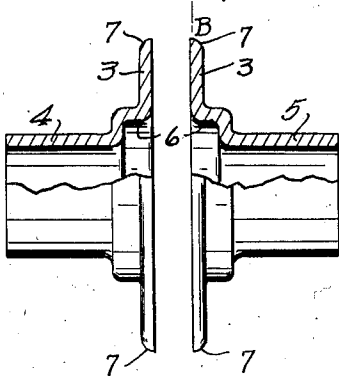


FIG. 7

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3 Sheets-Sheet 2

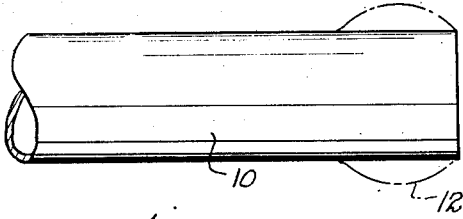


FIG. 8

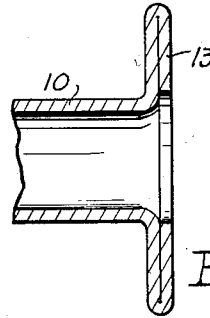


FIG. 9

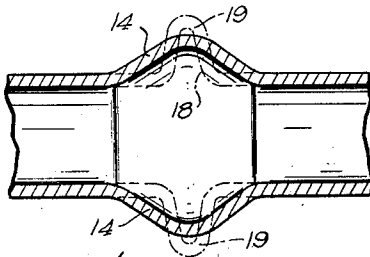


FIG. 10

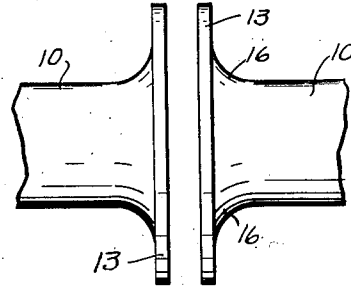


FIG. 11

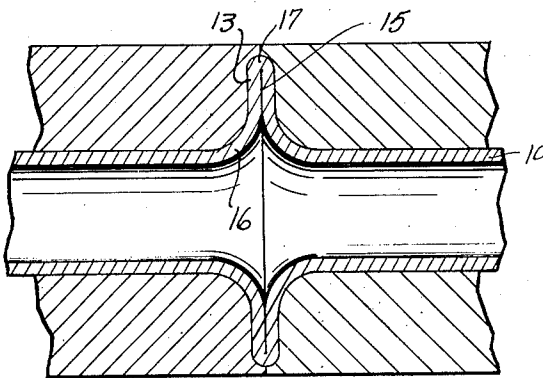


FIG. 12

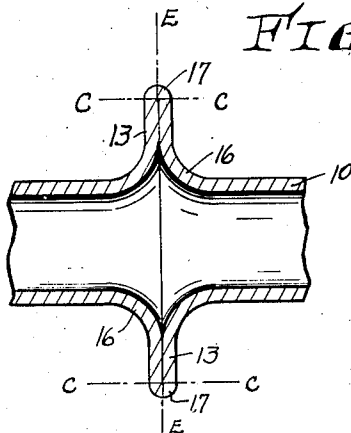


FIG. 13

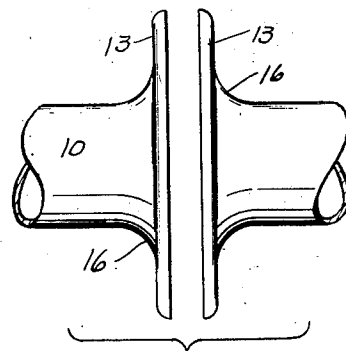


FIG. 14

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3 Sheets-Sheet 3

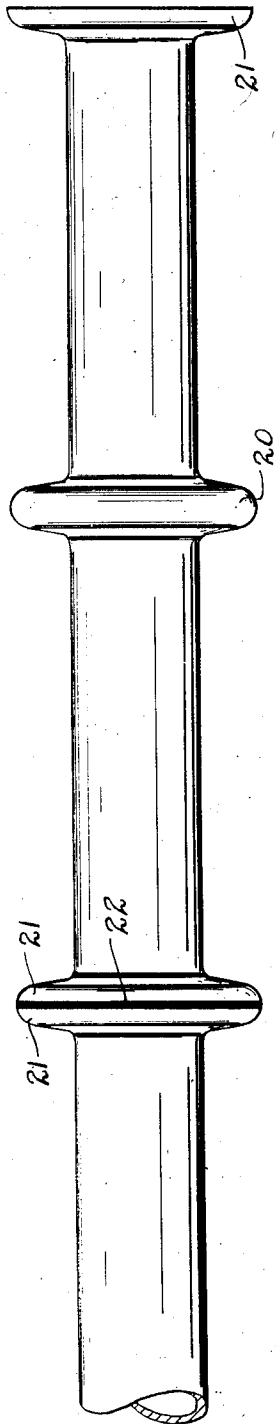


FIG. 15

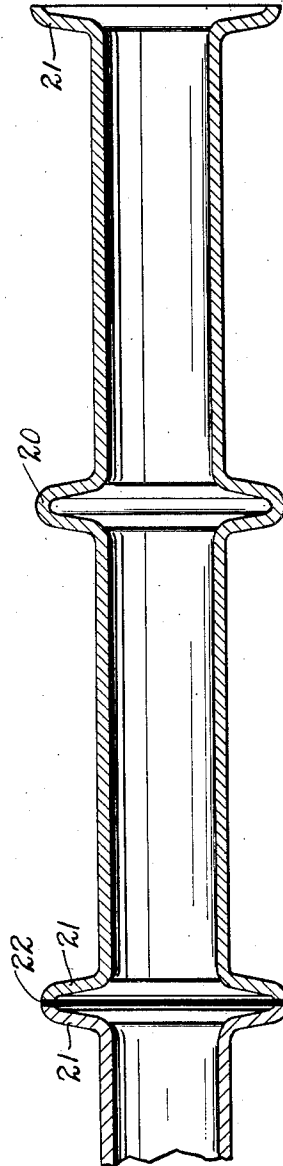


FIG. 16

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1,928,910

METHOD OF FORMING FLANGED ARTICLES

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Application December 31, 1930
Serial No. 505,878

4 Claims. (Cl. 29—159.3)

This invention relates to flanged articles and particularly to flanged pipe and tubing, wheel hubs and the like, and the method of forming the same from cylindrical blank stock.

5 In the manufacture of such articles the general practice has been to upset and thicken a portion of the walls of the blank at the ends and to turn the thickened wall portions outwardly and stamp them into flanges.

10 Hubs and the like are quite often formed from flat blanks of irregular outline stamped from sheet stock, the blanks being formed into the hubs by operating the blanks with dies to bring the blanks to the desired shape and then welding them along a longitudinal seam to form the finished product.

15 In the case of tubing quite often a separate cast flange is secured onto the pipe. These methods are comparatively expensive due to the amount of stock wasted and the amount of labor and expensive steps required.

20 The method with which my invention is concerned is very economical and well adapted to be carried out with generally used apparatus and in quantity production.

25 For the purpose of illustration I shall describe my method as applied to the manufacture of flanged tubing, expansion tubing and wheel hubs, as these applications are typical of a large number of uses to which the method is applicable and at the same time are illustrative modifications which may easily be made without departing from the general principles of my invention.

30 Another advantage of my method is that it makes possible rapid economical production of thick wall flanged articles.

35 Other objects and advantages of my invention will become apparent from the following specification in which reference is made to the drawings by the use of numerals.

40 In the drawings—

Fig. 1 is an elevation of a cylindrical blank for making wheel hubs and the like in accordance with the principles of my invention.

45 Figs. 2, 3 and 4 are longitudinal sectional views of the blank illustrating the first three successive steps of my method.

Fig. 5 is a longitudinal sectional view of the blank after the forming operation.

50 Figs. 6 and 7 are elevations partly in section illustrating two different types of hubs obtained by separating the halves of the blank of Fig. 5.

Fig. 8 is an elevation of a section of tubing to be flanged according to the method of my invention.

Fig. 9 is a longitudinal sectional view of the tubing after the forming of the flange.

Figs. 10 and 11 illustrate the successive steps in the formation of a flange at an intermediate portion of the tube blank.

Fig. 12 is a longitudinal sectional view of the blank after the last forming operation.

Figs. 13 and 14 are elevations illustrating the different types of flanges that may be formed from the flange member illustrated in Fig. 12.

Fig. 15 is an elevation of a length of expansion tubing made in accordance with my method.

Fig. 16 is a longitudinal sectional view of a length of expansion tubing such as illustrated in Fig. 1.

First, I shall describe the manner in which I produce wheel hubs, the production of other somewhat similar articles by my method being apparent from this illustration. For this purpose I prefer to use a length of welded or seamless tubing. Instead, however, I may use a cylindrical blank formed by bending a flat strip normal to its width and welding the ends together along a longitudinal seam so as to form an open cylinder, which in effect would be a very short length of tubing. The length of tubing or cylindrical blank 1 is engaged by suitable dies or otherwise operated to cause a predetermined portion of the walls to bow outwardly to form an annulus 2, as illustrated in Fig. 2. The blank may be heated at the portion to be so formed to facilitate bending and to make possible a partial upset of the walls of the blank when the walls are bowed outwardly by axial pressure exerted by the dies as explained in my co-pending application, Serial No. 495,805, filed November 15, 1930, or in any other suitable manner. The amount of upset is dependent largely upon the amount of heating and length of tube so heated and pressed together.

I have found that the normal tendency of the walls of a tube or cylindrical blank when thus heated and subjected to axial pressure is to bow outwardly rather than inwardly, consequently I prefer to form the annulus by subjecting the tube or blank to axial pressure.

Having formed the annulus 2, the annulus is collapsed axially by a continued application of the endwise or axial pressure, or otherwise, to form a blank hub such, for example, as illustrated in Fig. 3, having a central flange with extended ends 4 and 5. The usual form of hub is smaller at the outer end away from the flange and consequently the ends 4 and 5 of the blank, extending outwardly from the flange, may be reduced in a

ring die or by swaging and formed to the proper contour. The last forming dies may be shaped to form the shoulders 6. In Fig. 4 the blank has been formed with shoulders closely adjacent to the flange 3 by means of dies. Mandrels may be used to support the inner walls of the stock when desired or necessary.

The blank thus formed is in effect two congruent hubs having the faces of their flanges in contact and joined by a peripheral or circumferential band of metal 7, the band 7 being approximately the thickness of the wall of the cylindrical blank. The dies may be properly shaped to impart a smooth accurate finish to the blanks both inside and out, to bring the blank exactly to the contour and finish desired. The ends 4 and 5 are shown as congruent with each other but each end may be differently formed, dependent upon the use or requirements to be met.

Referring to Fig. 5, the two hubs may be separated by grinding, shearing off or otherwise removing the peripheral band 7 of the flange. In removing the band portion 7 by shearing, for instance, it may be sheared across or normal to the flanges, as indicated by the lines A—A of Fig. 5, the cut being deep enough to extend through the inner wall of the circumferential wall portion 7. Another but more difficult manner of cutting is in a plane defined by the adjacent faces of the flanges and indicated in Fig. 5 by the line B—B.

In Figs. 6 and 7 respectively, are illustrated the different types of flanges formed by the above described manners of disconnecting the flanges. The intermediate portion of the flanges do not tend to adhere or stick together and consequently drop apart freely when the annular band portion 7 has been removed.

Another application of my method is the formation of flanges on pipe or tubing. In Fig. 8 is illustrated the end of a length of tubing 10 having comparatively thick walls so as to be suitable for water, steam or fluid pressure conduits or strong enough to form load bearing columns. The length of tubing is clamped and subjected to axial pressure, the end portion or portion to be flanged first being heated by electrical resistance or otherwise to a sufficient degree to facilitate bending and eliminate stresses or tearing of the metal. The application of axial pressure causes the walls of the heated tubing to bow outwardly, forming an annulus 12 as indicated by the dotted line in Fig. 8.

Continued application of axial pressure causes the annulus to collapse axially to form a flange 13, as illustrated in Fig. 9, the flange so formed being of two thicknesses of the walls of the metal stock. It should be noted that in forming the annulus by axial pressure, the walls tend to upset and thicken somewhat, depending upon the degree of heat. This tendency compensates for the reduction of wall thickness of the annulus and finished flange which would normally occur due to the increase in diameter.

If only a flange of single wall thickness is required, a longer piece of tubing may be used and, as illustrated in Fig. 10, a portion intermediate the ends, heated to the required degree, is formed into an outwardly bowed annulus 14 preferably by the application of axial pressure on the tubing. The annulus is then collapsed axially, as described, to form an annulus 15 as better illustrated in Fig. 11. To eliminate a sharp line of intersection between the flange and the remainder of the tube, the dies may have sloping

shoulders so as to cause a gradual taper from the flange to the tube as indicated at 16. A similar result may be obtained by swaging or reducing the extending ends of the blank by the usual ring die. This is quite often desirable, as the sharp line of intersection concentrates the stresses along that particular line, tending to break the tube therealong. Hubs may also be thus formed where the shoulder is not required.

As in the case of the hubs first described, the two sections of tubing are joined together at the flange by a circumferential band 17 of the flange 13. This may be sheared off or otherwise removed transversely of the flange, as indicated by the lines C—C of Fig. 12, or split radially of the flange as indicated by the line E—E. The severance of removal of the band 17 for the full depth separates the two lengths of the tubing, a flange of one thickness of tube wall being thus formed on each length. The flanges resulting from the transverse cut are illustrated in Fig. 13 and those from the radial cut in Fig. 14.

By operating on a tube of much greater length and thus flanging it at a number of predetermined points along its length, obviously several flanged pipes or tubes of standard or any required length may be made with the negligible loss of only the material contained in the circumferential band 17. For this reason the method herein described is very desirable, as described in my copending application Ser. No. 473,484, filed August 6, 1930, by which tubing of great length may be formed.

Furthermore, tubing produced by the process of my copending application is welded for the full depth and consequently will not split along the seam.

As stated I have described two widely different applications of my invention for the purposes of illustration, but I do not intend to limit my invention thereto. For instance, I may wish to collapse the annulus axially without bringing the walls into contact, thus forming a somewhat rounded or bowl shaped flange instead of a flat flange normal to the tube. Therefore, in speaking of flanges and axial collapsing thereof, I do not mean that the flanges are of a particular form or that the walls of the annulus are brought into contact.

In some cases especially in the case of steam pipe or conduit subject to different degrees of temperature provision must be made for longitudinal expansion. By the method of my invention the annulus 12 may be only partially collapsed, as illustrated in Fig. 10 by the dotted line 18. The circumferential portion of the annulus in such a case is not disconnected but the flanges of each of the adjacent lengths of the tubing are left joined together by this somewhat widened annular band 19.

Obviously, by bending the wall of the band 19 and slightly deflecting the walls of the flanges, it is possible to absorb and relieve the longitudinal expansion of the pipe, the walls of the flanges or annulus moving relatively together and apart to accomplish this purpose.

A tube or pipe so formed is illustrated in Figs. 15 and 16. As there illustrated, a number of somewhat flattened annuli 20 may be formed on the tube at intervals of a few feet or few hundred feet, depending on the amount of expansion to be absorbed.

The end of the pipe lengths may likewise be formed into uncollapsed annuli and the peripheral band removed as described. In this manner the end of the pipe instead of being formed into

a flange by fully collapsing the annulus is left as a half annulus 21. The ends of other pipe lengths may be similarly framed and the pipes joined by welding together the ends of the annuli 21 as indicated at 22. Thus the connecting joints are also expansion joints.

I claim:

1. A method of forming hubs from cylindrical blank stock which includes forming a predetermined length of the stock intermediate the ends thereof into an outwardly bowed annulus and collapsing the annulus axially to form a flange and reducing the diameter of the ends extending outwardly from the flange and then removing an outer annular portion of the flange substantially equal in radial width to the thickness of the metal stock to disconnect the two sections of the blank whereby each section forms a flanged hub member.

2. A method of forming hubs from cylindrical blank stock which includes heating a portion of the stock intermediate the ends and subjecting the stock to axial pressure to form the heated portion into an outwardly bowed annulus and collapsing the annulus axially and reducing a portion of the ends of the blank extending outwardly from the annulus and spaced a predetermined distance therefrom, whereby an annular shoulder is formed on each side of the flange between the flange and the outer ends of the

blank, and disconnecting the blanks by removing the outer annular portion of the flange substantially equal in radial width to the thickness of the blank.

3. A method of forming hubs from cylindrical blank stock which includes forming a predetermined length of the stock intermediate the ends thereof into an outwardly bowed annulus and collapsing the annulus axially to form a flange, and reducing the diameter of the ends extending outwardly from the flange to thicken the walls thereof, and removing an outer circumferential portion of the flange to disconnect the two sections of the blank whereby each section forms a hub member having a flange and thickened wall bearing ring retainers.

4. The method of forming cylindrical flanged articles from thick walled cylindrical blanks which includes forming a predetermined length of the blank intermediate the ends into an outwardly bowed annulus and collapsing the annulus axially to form substantially a double wall flange, and reducing the ends of the blank projecting outwardly from the flange portion into a predetermined contour, and disconnecting the flange walls whereby two separate flanged articles each having a flange of one thickness of metal stock are formed.

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