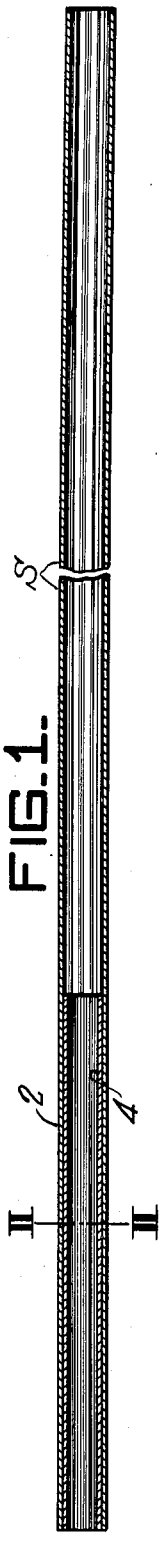
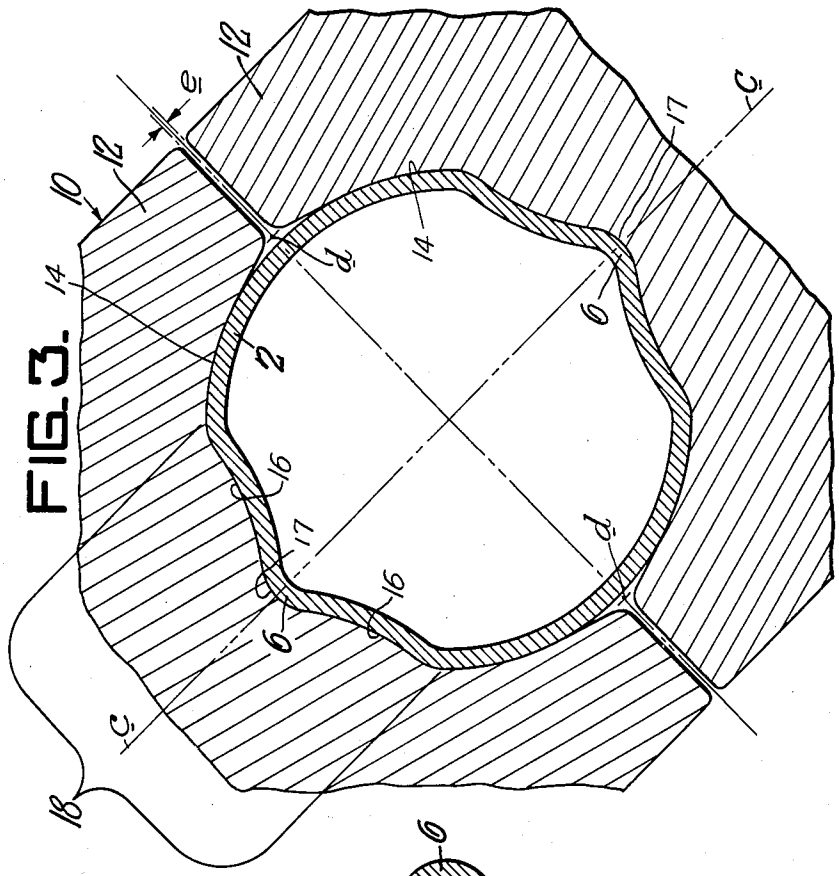
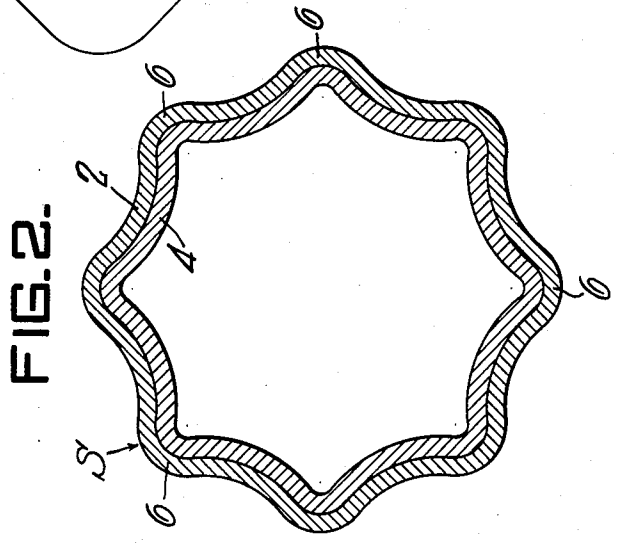
April 24, 1956 G. A. McGRANN 2,742,946

METHOD OF AND APPARATUS FOR FORMING A COMPOSITE TUBULAR SUPPORT

Filed Nov. 18, 1949 3 Sheets-Sheet 1







Inventor:
GEORGE A. McGRANN,
by: Donald G. Dalton
his Attorney

April 24, 1956 G. A. McGRANN 2,742,946

METHOD OF AND APPARATUS FOR FORMING A COMPOSITE TUBULAR SUPPORT

Filed Nov. 18, 1949 3 Sheets-Sheet 2

FIG. 5.

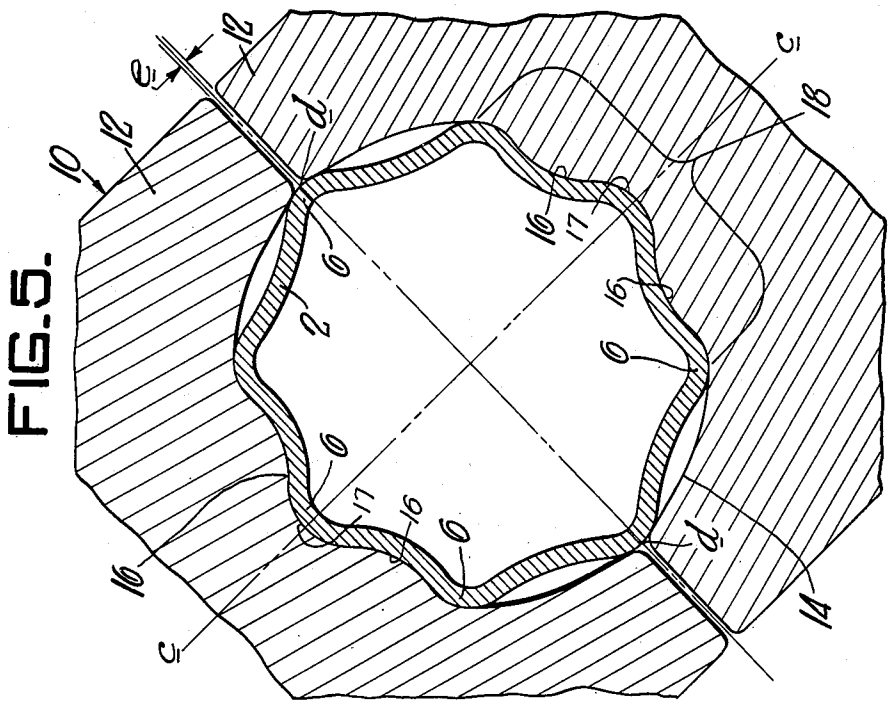
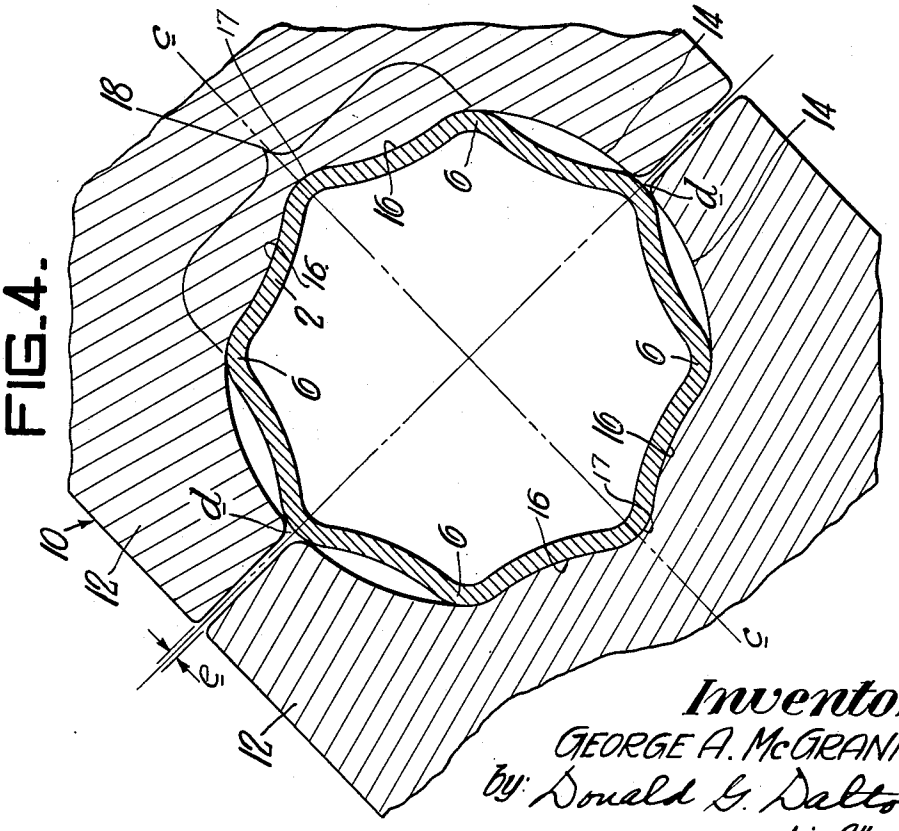


FIG. 4.



Inventor:
GEORGE A. McGRANN,
by: Donald G. Dalton
his Attorney.

April 24, 1956 G. A. McGRANN 2,742,946

METHOD OF AND APPARATUS FOR FORMING A COMPOSITE TUBULAR SUPPORT

Filed Nov. 18, 1949 3 Sheets-Sheet 3

FIG. 7.

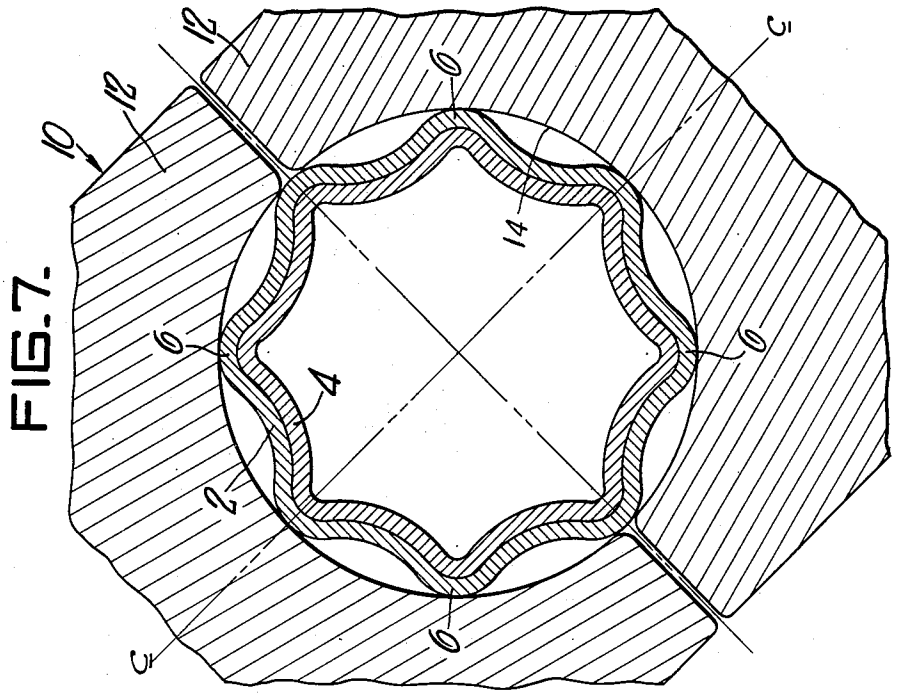
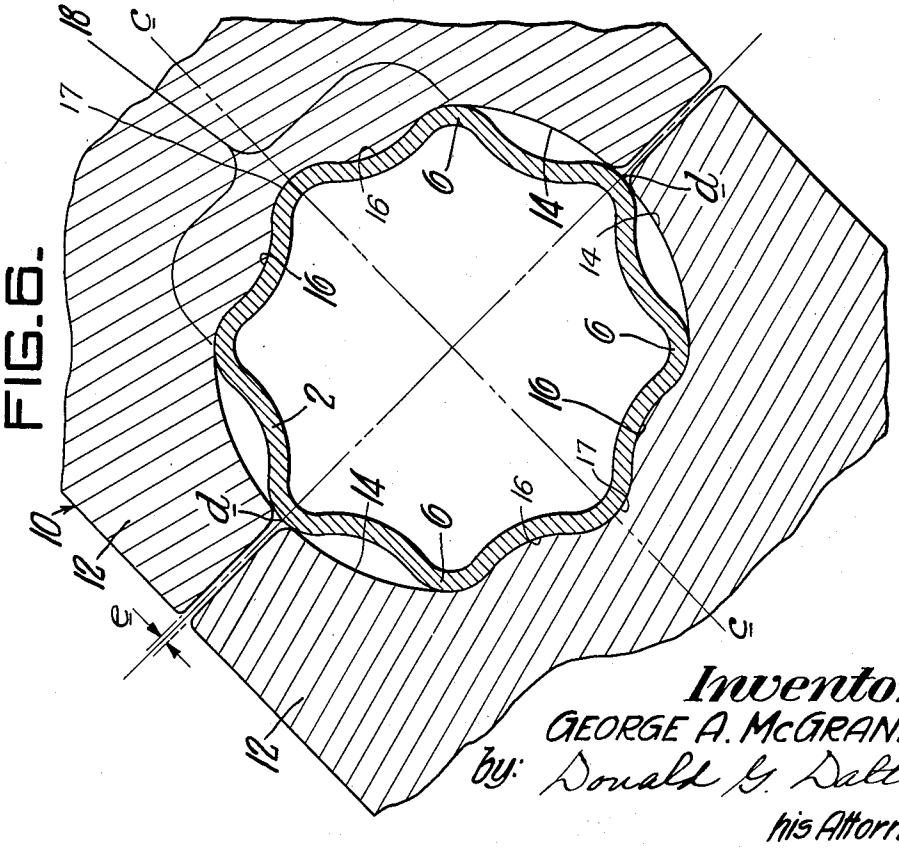


FIG. 6.



Inventor:
GEORGE A. McGRANN,
by: Donald G. Dalton
his Attorney.

United States Patent Office 2,742,946 Patented Apr. 24, 1956

2,742,946

METHOD OF AND APPARATUS FOR FORMING A COMPOSITE TUBULAR SUPPORT

George A. McGrann, Gary, Ind., assignor to United States Steel Corporation, a corporation of New Jersey

Application November 18, 1949, Serial No. 128,224

8 Claims. (Cl. 153—70)

This invention relates to a method of and apparatus for forming a reinforced tubular support.

It has heretofore been proposed to corrugate and introduce inserts into tubular members to increase the rigidity and strength thereof. However, the outer member has merely been forced into engagement with the inner member which retained its original circular shape so that the reenforcing action thereof was quite limited. Moreover, such members have been formed by drawing the same through dies which is a slow and expensive operation.

It is an object of the present invention to provide a method and apparatus for efficiently and cheaply corrugating tubular supporting members.

The foregoing and further objects will be apparent from the following specification when read in conjunction with the attached drawing, wherein:

Figure 1 is a longitudinal section of my improved support;

Figure 2 is a cross section of line II—II of Figure 1; and

Figures 3 through 7 are cross sections of roll passes embodying the teachings of my invention.

Referring more particularly to the drawings, the letter S indicates a tubular supporting member composed of an outer pipe **2** and a tubular reenforcing or insert member **4** disposed interiorly of the base portion of the pipe **2**. It will be noted that the pipe **2** has flutes or corrugations **6** extending longitudinally throughout the length thereof and that the supporting member **4** is similarly fluted so that the intermediate surfaces of the two members are in close, tight engagement throughout the whole extent thereof. As a result of such engagement, the insert member provides maximum stiffness to the assembly since it is impossible to produce a sliding action therebetween. As a matter of fact, the two members cannot be separated without destroying one or the other, or both.

The foregoing fluting is accomplished by cold rolling telescoped tubular members in the specially designed roll passes of my invention. The roll passes are disposed in longitudinally aligned stands as indicated by the numeral **10**, the pairs of rolls **12** in the alternate stands being disposed at 90° relative to the rolls in the intermediate stands. This is the generally conventional arrangement in so-called sinking or sinking-sizing mills and has accordingly not been shown in the drawings. However, the passes and contours of the rolls forming the same have novel features enabling the conjoint longitudinal fluting, which will be more fully explained hereinafter.

In the present arrangement, six stands or passes are preferred and Figures 3 to 7, inclusive, of the drawings are vertical sections thereof showing the contours of the rolls. As is indicated by the foregoing figures, the rolls have their axes of rotation disposed normal to the pass line. Each of the pairs of rolls **12** have complementary hollowed-out grooved portions **14** which define a rolling pass. It is noted that each of the rolls has a fluted portion **18** composed of flutes **16** on both sides of the and adjacent its center line *c—c* thereof. Preferably this portion extends for between about 45° to 60° on each side of the center line confining the fluting to arcs of 45° to 60° on each side of the center line thus preventing an undercut condition which occurs if the whole roll groove **14** is fluted. Moreover, it restricts the fluting action to the most effective forming portion of the rolls. Thus due to the alternate 90° disposition of the rolls, the second and fourth roll passes flute or work the portion of the workpiece not acted on by the rolls of the first and third passes. The fifth and sixth passes are rounding up passes and only do sufficient reducing of the composite member to insure the correct shape thereof.

An examination of the drawings also indicates that the rolls are contoured so that crests **17** of flutes are formed at the mid-portion of the rolls in the first and second passes and these crests are then alternately disposed at the edges of the two rolls in the succeeding passes. This enables better control of the rolling passes by insuring evenly distributed application of the rolling pressures. Further, the crests disposed at the edges of the rolls, which are rounded or radiused, tend to guide the workpiece and prevent any twisting thereof.

Another feature of the roll passes of my design, especially adapting them to the cold fluting of tubular members, is that the passes are slightly oval in shape. That is, the distance *d—d* across the width of the grooves is slightly greater than the combined depths along the center line thereof, plus the clearance *e—e* between the rolls. Preferably the width should exceed the combined depth and clearance an amount equal to between 2 and 5% of the combined depth and clearance. It will be apparent that the provision of ovality in the fluting passes permits a greater squeeze therein than would be possible if the passes were of generally circular cross section. This extra squeezing action is particularly desirable in that it compensates for the tendency of the cold rolled metal to spring back.

While I have shown and described one specific embodiment of my invention, it will be understood that this embodiment is merely for the purpose of illustration and description and that various other forms may be devised within the scope of my invention, as defined in the appended claims.

I claim:

1. The method of forming a composite tubular support member comprising telescoping a pair of tubular members and passing said telescoped tubular members through a plurality of grooved roll passes, the rolls forming said passes having their working mid-portions fluted, the rolls in the stands being disposed normal to the pass line and each of said stands being disposed at a ninety degree angle relative to the adjacent stands.

2. The method of forming a composite tubular support member comprising telescoping a pair of tubular members and passing said tubular members while at substantially room temperature through a plurality of roll passes formed of pairs of grooved rolls, the rolls forming said passes having their mid-portions fluted, the rolls in the stands being disposed normal to the pass line and each of said stands being disposed at right angles relative to the adjacent stands, the width of the combined grooves in said pairs of rolls exceeding the depth thereof.

3. Apparatus for longitudinally corrugating steel tubular members by cold rolling comprising, a plurality of oppositely disposed pairs of grooved rolls forming aligned substantially enclosed working passes, the said rolls having their axes of rotation disposed normal to the pass line thereof and the axes of the successive pairs of rolls being disposed at right angles relative to the adjacent rolls on either side thereof, each of said rolls being fluted adjacent the mid-portion thereof, the width of the grooved rolling

pass formed by said rolls exceeding the depth thereof.

4. Apparatus for longitudinally corrugating steel tubular members by cold rolling comprising, a plurality of oppositely disposed pairs of grooved rolls forming aligned substantially enclosed working passes, the said rolls having their axes disposed normal to the pass line thereof and the axes of the successive pairs of rolls being disposed at right angles relative to the adjacent rolls on either side thereof, each of said rolls being fluted between 45° and 60° from each side of its center line and the width of the grooved rolling pass formed by each pair of said rolls exceeding the depth thereof.

5. Apparatus for longitudinally corrugating steel tubular members by cold rolling comprising, a plurality of oppositely disposed pairs of grooved rolls forming aligned substantially enclosed working passes, the said rolls having their axes of rotation disposed normal to the pass line thereof and the axes of the successive pairs of rolls being disposed at right angles relative to the adjacent rolls on either side thereof, each of said rolls being fluted between 45° and 60° from each side of its center line, the width of the grooved rolling pass formed by each pair of said rolls exceeding the depth thereof by an amount between 2 and 5%.

6. Apparatus for longitudinally corrugating steel tubular members by cold rolling comprising, a plurality of oppositely disposed pairs of grooved rolls forming aligned substantially enclosed working passes, the said rolls having their axes of rotation disposed normal to the pass line thereof and the axes of the successive pairs of rolls being disposed at right angles relative to the adjacent rolls on either side thereof, each of said rolls being fluted adjacent the mid-portion thereof, the width of the grooved rolling pass formed by each pair of said rolls exceeding the depth thereof by an amount between 2 and 5%.

7. The method of forming a composite tubular support member comprising telescoping a pair of tubular members and passing said telescoped tubular members through at least two grooved roll passes, the rolls forming said passes having their working mid-portions fluted, the telescoped tubular members being fluted on opposite sides thereof in the first of said passes and in the second pass fluted on opposite sides thereof intermediate the flutes formed in the first pass.

8. The method of forming a composite tubular support member comprising telescoping a pair of tubular members and passing said telescoped tubular members while at cold working temperatures through at least two grooved roll passes, the rolls forming said passes being fluted between 45° and 60° from each side of their center lines, the width of the grooved rolling pass formed by said rolls exceeding the depth thereof by an amount between 2 and 5%, the telescoped tubular members being fluted on opposite sides thereof in the first of said passes and in the second pass fluted on opposite sides thereof intermediate the flutes formed in the first pass.

References Cited in the file of this patent

UNITED STATES PATENTS

686,816	Macphail	Nov. 19, 1901
888,114	Numan	May 19, 1908
888,984	Fell	May 26, 1908
1,023,119	Barrick	Apr. 16, 1912
1,033,569	Fell	July 23, 1912
1,691,134	Schlaich	Nov. 13, 1928
1,779,185	Meiser et al.	Oct. 21, 1930
1,877,583	Pfaff	Sept. 13, 1932
1,963,057	Wilcox	June 12, 1934
2,205,893	Unger	June 25, 1940
2,442,850	Glesmann	June 8, 1948

FOREIGN PATENTS

95,041	Sweden	Mar. 15, 1939