United States Patent [19]

Dietzel

[11] **3,833,984**

[45] **Sept. 10, 1974**

[54] **PROCESS AND ARRANGEMENT FOR DOUBLE FLANGING OF PIPES**

[75] Inventor: **Klaus Dietzel,** Kapellen, Germany

[73] Assignee: **Zako Rohrverbindungen GmbH & Co. KG,** Dusseldorf, Germany

[22] Filed: **June 27, 1972**

[21] Appl. No.: **266,572**

[30] **Foreign Application Priority Data**

June 29, 1971 Germany 2132190

[52] **U.S. Cl.** ..... **29/157 R,** 29/523, 72/343, 72/370

[51] **Int. Cl.** **B21k 29/00,** B23p 11/02

[58] **Field of Search** ..... 29/157 R, 523; 72/343, 72/370

[56] **References Cited**

UNITED STATES PATENTS

2,516,689	7/1950	France et al.	29/523 X
3,047,937	8/1962	De Vecchi	29/157 R
3,239,931	3/1966	Guarnaschelli	29/157 R
3,335,484	8/1967	Parker et al.	29/157 R
3,742,590	7/1973	Douglas	29/523

Primary Examiner—Charles W. Lanham
Assistant Examiner—D. C. Reiley, III

[57] **ABSTRACT**

A process and arrangement for double flanging of pipes for making fluid-tight pipe joints. The pipe has a plastic interior coating and is coaxially mounted on an inner tubular pipe joint member having a collar and a conical bearing surface which is at least partially roughened.

7 Claims, 13 Drawing Figures

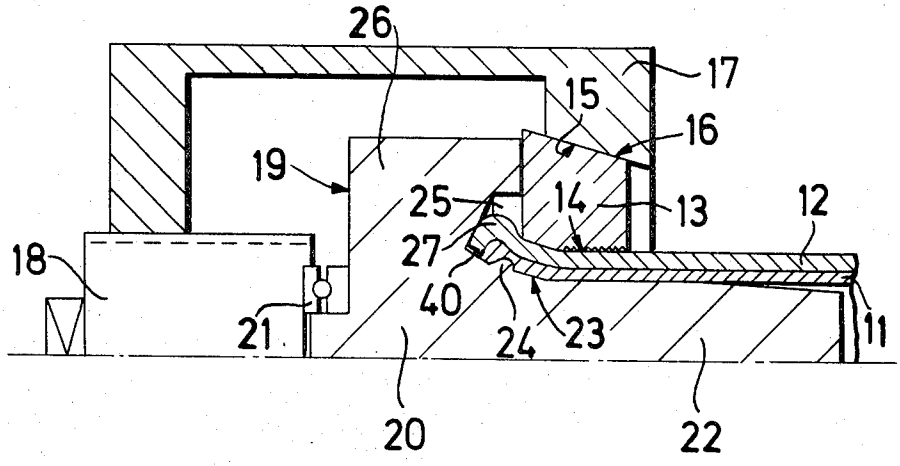


FIG. 1

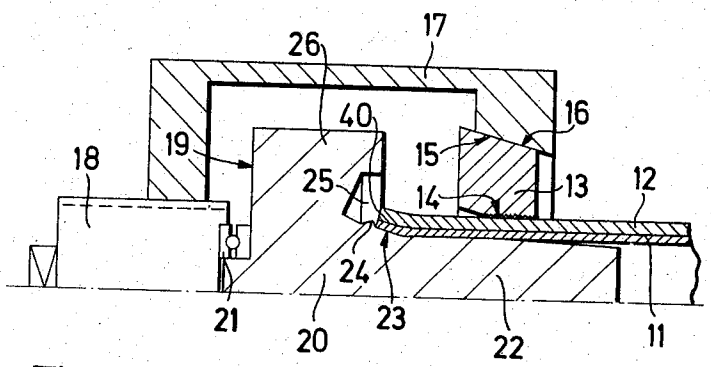


FIG. 2

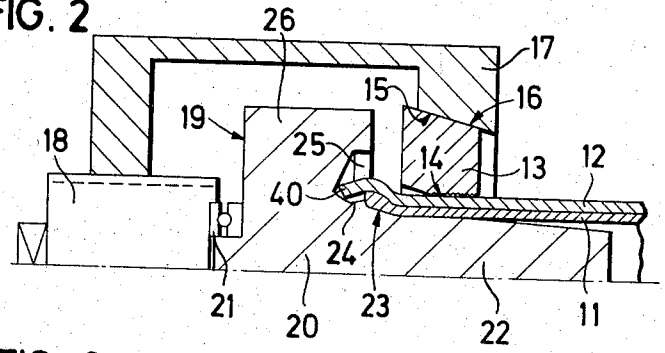


FIG. 3

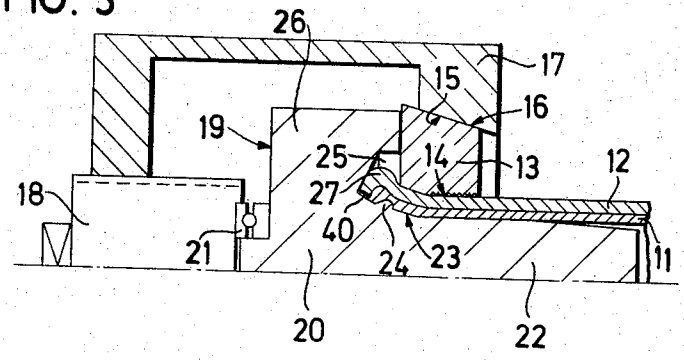


FIG. 4

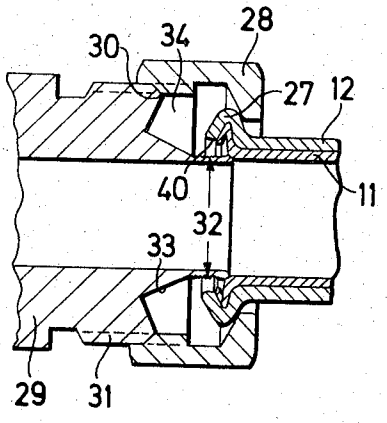
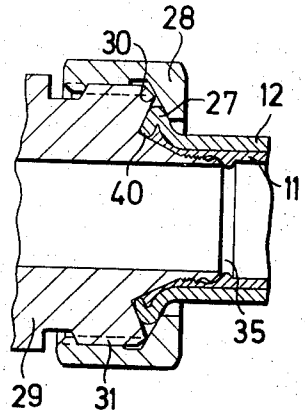


FIG. 5



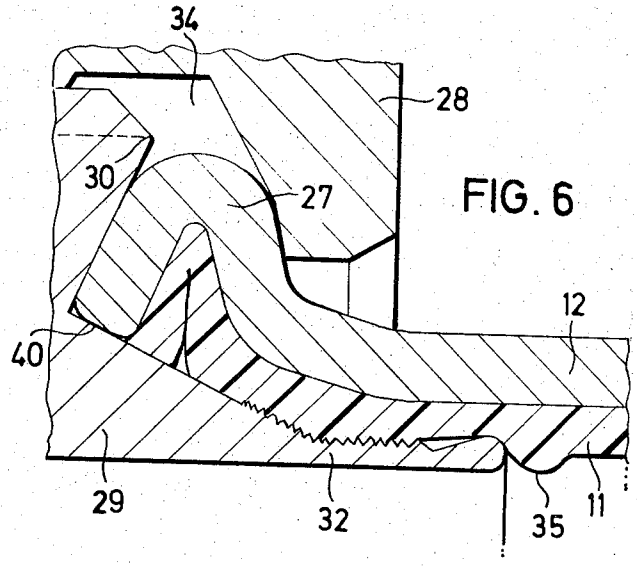


FIG. 6

FIG. 13

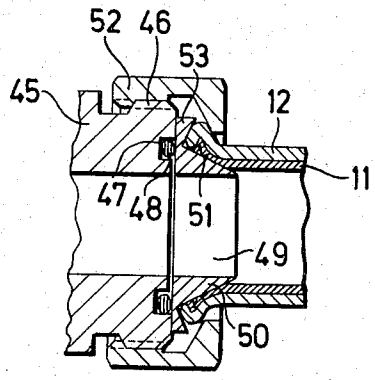


FIG. 7

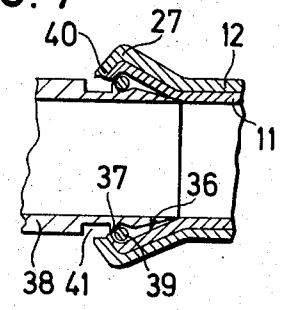


FIG. 8

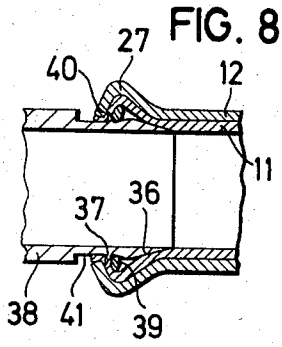


FIG. 9

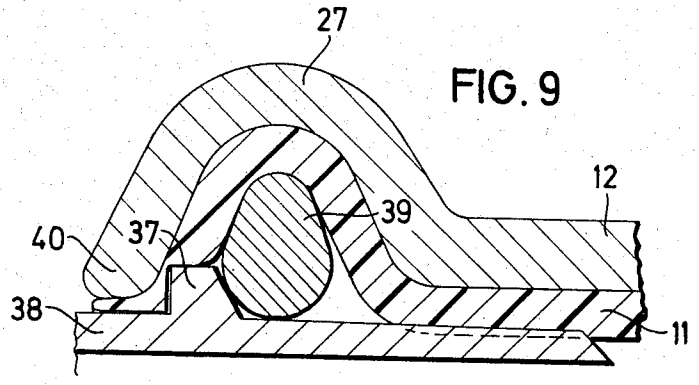


FIG. 10

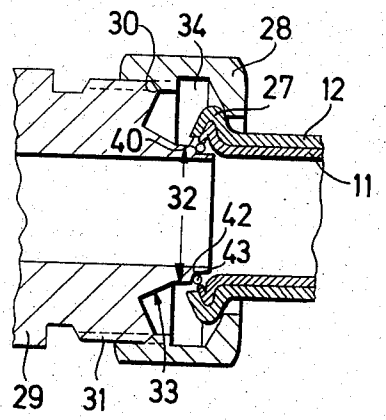


FIG. 11

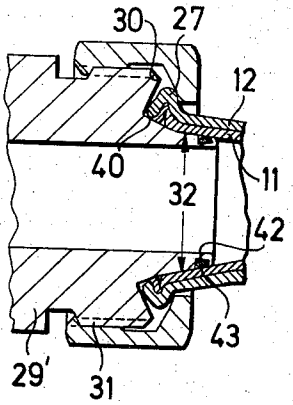
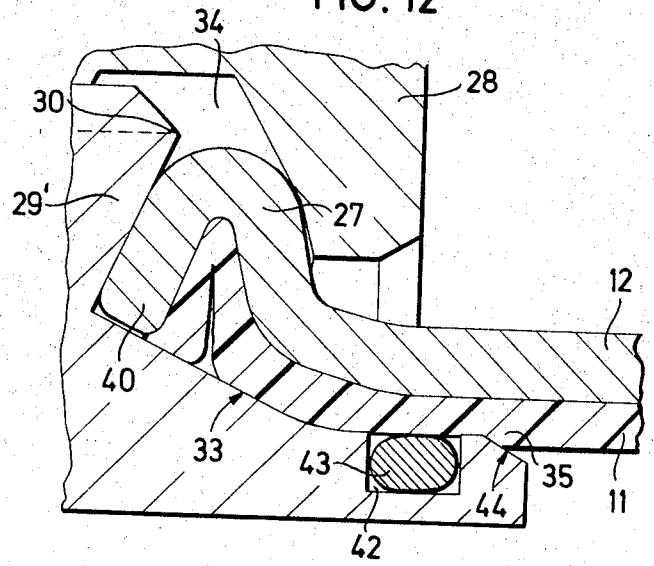


FIG. 12



PROCESS AND ARRANGEMENT FOR DOUBLE FLANGING OF PIPES

BACKGROUND OF THE INVENTION

The invention relates to a process and an arrangement for double flanging of pipes, and in particular for producing pipe joints and high pressure cylinders. According to the invention the pipe is tensioned at its free end and mounted on an inner tubular pipe joint member having a conical bearing surface.

There is already known in the state of the art a process for double flanging of pipes in which the free pipe end is first expanded by means of a conically shaped inner tubular member. Thereafter the expanded portion of the pipe is bent about 180° towards the interior. This process has the drawback that the double flanging requires two separate steps and the coaction of two separate members, respectively tension blocks. Furthermore, the aforementioned process of the state of the art is not suitable for double flanging pipes having an inner plastic coating because the deformation of the metallic pipe and of the plastic pipe follows different physical laws and therefore a clean flange cannot be obtained with this process of the state of the art. Consequently, pipes having inner plastic coatings require special steps for flanging in the process of providing a pipe joint. For example, pipe joints are known wherein the free pipe ends are provided with outer threads and have flange members threadably mounted thereon. Such a pipe is then connected to another pipe carrying a similar flange member by means of a union nut so that the assembly forms a screwed pipe joint. In this type of a pipe connection it is necessary, however, to provide sealing elements which must be adjusted insofar as their shape and dimensions are concerned for each particular pipe connection. Also forming part of the state of the art is a pipe connection disclosed in the German Utility Model No. 7,004,961. In this pipe connection the plastic inner coating of the pipe extends beyond the pipe end and forms a flange-like collar which bears against a similar collar extending from the adjacent pipe. The outer pipes in this arrangement are provided with end faces which are screwed together and the inner plastic pipes extend between these end faces.

SUMMARY OF THE INVENTION

It is accordingly a principal object of the invention to provide with relatively simple means a process for double flanging pipes having an inner plastic pipe and an outer metallic pipe, which are particularly adapted for use in the manufacture of pressure cylinders and pipe connections. The invention is based on the concept that in double flanging such combination pipes the axial movement of the inner plastic pipe or coating can be hindered with respect to the corresponding movement of the outer metallic pipe by means of a specially shaped flanging spine until the outer metallic pipe extends over the inner plastic coating or pipe. As the pipe combination is further axially moved the outer metallic pipe is bent inwardly in the direction of the inner plastic coating or pipe. Thus the double flanging, in accordance with the invention, is primarily based on the different relative movements of the outer metal pipe and the inner plastic pipe and does advantageously not require any complicated tools. Moreover, the flanging spine can form part of a bolted or screwed pipe connection and remains permanently in the double flange assembly.

In particular the invention resides in introducing in the process of making the pipe joint an inner tubular member having a collar and a conical surface which is at least partially roughened and which is driven into a combination pipe having an outer metallic pipe and an inner plastic pipe or coating. The inner plastic coating or pipe can extend through the entire pipe or only in that portion of the pipe which is in the region of the double flanging. The flanging spine can only be used for shaping the pipe end and can be removed from the pipe end after the double flanging operation has been completed, or, it can remain permanently in the pipe end thus being a tool which is only used once if it is so shaped that it forms simultaneously a portion of the pipe connection or forms an end piece for the pipe. Thus, the spine having a central opening can be driven into the free pipe end and used as a single action tool and remain in this pipe end, for example, as a part of a screwed pipe connection or for guiding a piston rod, for example, for an operating cylinder. In the latter case the free pipe end is preferably bent into an annular groove of the spine.

When the double flanging operation is carried out with a multi-spine, the pipe is advantageously mounted in a holding ring having roughened inner surfaces which displaces the pipe relative to the spine and relative to the plastic inner coating, thereby forming a double flange between the collar of the spine and the holding ring.

An arrangement for carrying out such a double flanging operation consists, according to the invention, of a spine with roughened outer conical surfaces and an annular groove, a holding ring which is mounted between the pipe and a clamping bushing. For example, a clamping nut is arranged with a holding ring having preferably a conical inner roughened surface as well as a pressure or tension arrangement, which, for example, consists of a spindle, between which and the front face of the spine there is arranged a roller bearing.

The process of the invention is particularly adapted for the production of pipe joints having a tubular connecting member with roughened outer conical surfaces and a ring-shaped shoulder, behind which the inner flanged free pipe end engages. An O-ring can be provided in the pressure direction in front of the shoulder. A clamping nut can be mounted on the free pipe end in accordance with the pressure requirement in the pipeline. This clamping nut is screwed on the adjacent connecting member and protects the pipe connection against inadvertent unsealing. The connecting member can also be formed of two parts and a cylindrical portion having an outer thread as well as a collar ring having a roughened outer conical surface which engages into the free pipe end.

The particular advantage of the pipe connection in accordance with the invention resides in a separation of the connecting and receiving functions in such a way that the sealing is maintained relatively free from the holding forces.

DESCRIPTION OF DRAWING

The invention is illustrated by way of example in the accompanying drawing which forms part of this application and in which;

FIGS. 1 to 3 illustrate three different operative steps of an arrangement for double flanging a combination pipe in accordance with a first embodiment of the invention;

FIGS. 4 and 5 are cross-sectional views of a pipe connection with a connecting member and a clamping nut in accordance with a second embodiment of the invention wherein the assembly is shown in two different positions;

FIG. 6 is an enlarged cross-sectional view of a detail of FIG. 5, said detail being delineated by a dash-dot circle in FIG. 5;

FIGS. 7 and 8 are cross-sectional views of a permanent pipe connection in accordance with a third embodiment of the invention, wherein the members forming the pipe connection are shown in two different positions;

FIG. 9 is an enlarged cross-sectional view of a detail of FIG. 8, said detail being delineated by a dash-dot circle in FIG. 8;

FIGS. 10 and 11 are cross-sectional views of a pipe connection similar to the pipe connection illustrated in FIGS. 4 to 6, in accordance with a fourth embodiment of the invention;

FIG. 12 is an enlarged cross-sectional view of a detail of FIG. 11, said detail being delineated by a dash-dot circle in FIG. 11; and

FIG. 13 is an enlarged cross-sectional view of a pipe connection which constitutes a fifth embodiment of the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawing, and in particular to FIGS. 1 to 3, there is illustrated a process in accordance with the invention. An outer metallic pipe 12 is at least partially covered on its interior surface with a plastic pipe 11. This pipe combination is mounted inside a holding ring 13 which has an interior conical roughened surface 14. This holding ring 13 has also an outer inclined conical surface 15 which bears against a mating conical surface 16 of a tension ring portion of a clamping unit 17. This clamping nut 7 is threadably mounted on a spindle 18 having an outer thread. A spine 20 having a face 19 is disposed opposite one end of the spindle 18 and a roller bearing 21 is mounted between the face 19 and the end of the spindle 18. The spine 20 has a hub —shaped portion 22 which extends into the interior of the combination pipe 12, 11. This hub portion has a conical roughened outer surface 23 and/or a shoulder 24 which is adjoined by an annular groove 25 as well as a collar 26.

When the spindle 18 is turned, thereby pulling the combination pipe 11,12 by means of a clamping nut 17 and the holding ring 13 the combination pipe 11, 12 is moved in a direction towards the collar 26 of the spine 20. In this axial movement the movement of the inner plastic pipe 11 with respect to the movement of the outer metallic pipe 12 is hindered by the presence of the shoulder 24 and the frictional engagement between the outer conical surface of the hub 22 and the inner plastic pipe 11 so that the latter lags at the free pipe end behind the outer metallic pipe 12 and only the latter move into the annular groove, as is illustrated in FIG. 2. As the movement of the holding ring 13 progresses further the free end 40 of the outer pipe 12 is flanged inwardly and overcomes also the free end of the inner plastic pipe 11 which is bent around the shoulder 24, so that finally a double flange 27 is formed and the spine 20 is sealably connected with the combination pipe 11, 12 (see FIG. 3). The pipe with the spine 20 can then be removed from the assembly 16, 17, 18 and can be connected with the aid of a clamping nut to the connecting portion of another pipe in a manner of a screwed pipe connection, as is illustrated in FIG. 10.

In accordance with the process of this invention the pipe connection can also be formed with a spine member that can be removed but which has a configuration that is similar to the spine member 20 of FIGS. 1 to 3. That is such a spine member has also an annular groove as well as a shoulder or roughened outer surface which hinders the movement of the inner plastic pipe. With such a spine member there will be formed a double flange, as illustrated in FIGS. 4 to 6, and this spine member is thereafter removed. The clamping nut illustrated in FIGS. 4 and 5 can be used for this first step in conjunction with such a non-illustrated spine member which is similar to the spine member 20 of FIGS. 1 to 3. Thereafter the spine member is removed and a connecting member 29 is slid into the free end of the combination pipe. This connecting member 29 has an outer conical end portion 33 which is provided with a roughened or splined surface 32. This connecting member 29 is slid into the free end of the combination pipe. The connecting member 29 is provided with an outer threaded portion 31. A cap nut 28 is threaded onto this threaded portion 31 and pulls the combination pipe 11, 12 onto the conical portion 33 until the double flange portion 27 comes into contact with the stop wall 30 of an annular groove 34. The movement of the cap nut 28 is limited by the contact of the stop wall 30 and bent portion of the double flange 27. Due to the retardation of movement of the plastic coating or plastic pipe 11 there is formed in front of the end face of the connecting member 29 an annular bulge of plastic material 35 which provides an absolute seal for the pipe connection (see FIG. 5).

The principal advantage of this novel type of pipe connection results in that the plastic material, in contradistinction to the pipe connections of the prior art, does not have the tendency to creep away from the pressure surfaces. In contrast, the annular bulge 35 tends, due to internal stresses caused by the deformation of the plastic material, to wander or creep into the gap that is defined between the connecting member 29 and the exterior of the outer pipe 12. The embodiment of FIGS. 4 to 6 does, in particular, illustrate the separation of the holding function of the various parts forming the assembly (parts 28, 27, and 29) and the sealing function (see FIGS. 5 and 6). It should also be noted that no unduly large pressure forces can be produced in the pipe joint due to the function performed by the stop surface 30.

In the pipe joint illustrated in FIGS. 7 and 8 there is provided a connecting member 38, for example, a fitting, which has at its free end a conically shaped portion 36 which is provided with a shoulder 37. An O-ring 39 is mounted in front of the shoulder 37. A combination pipe 11, 12 which has already at its free end a double flange 27, made by an arrangement as illustrated and described with respect to FIGS. 1 and 3, is mounted on the connecting member 38 until the free end 40 of the combination pipe 11, 12 comes to rest in the annular groove 41 behind the shoulder 37. The inserting of the connecting member 38 into the combina-

tion pipe **11, 12** can be carried out manually or by means of a simple tool (not illustrated). After the combination pipe **11, 12** has been mounted as hereinbefore described on the connecting member **38,** the double flange **27** is acted on by a tool, for example, a special pair of pliers, which exerts radial forces on the double flange in the direction of the pipe axis so that the double flange assumes the position illustrated in FIGS. **8** and **9.**

The screwed pipe connection illustrated in FIGS. **10** to **12** does essentially only differentiate itself from the embodiment illustrated in FIGS. **4** to **6** in that an annular groove **42** is provided on the connecting member **29'**, in which an O-ring **43** is mounted. The bulge **35'** of plastic material contacts an oblique surface **44** of the connecting member **29'** thereby forming the seal of the pipe joint.

The last embodiment of FIG. **13** illustrates a spine member **45** having an external threaded portion **46** and an end face on which there is an annular groove **47** in which is mounted an O-ring **48.** The double flanging of the combination pipe **11, 12** is effected by driving a collar ring **49** into the combination pipe **11, 12.** The collar ring **49** has an outer conical portion **50** which has a roughened or splined surface **51.** As the conical portion **50** of the collar ring **49** is driven into the combination pipe **11, 12** the axial movement of the plastic coating or plastic pipe **11** with respect to the axial movement of the outer pipe **12** is hindered due to the frictional engagement of the inner surface of the plastic pipe **11** with the roughened surface **51,** so that the free end of the outer pipe **12** advances with respect to the inner plastic pipe **11** and is bent towards the axis of the pipe by means of the collar **53** of the collar ring **49,** until a tool portion of a cap nut, said tool portion corresponding essentially to the parts **16, 17** of FIG. **1,** has pushed and pressed the double flange **27** into and against the collar **53.** Thereafter the pipe end can be connected by means of a cap nut **52** previously mounted on the combination pipe **11, 12** with the connecting member **45** by screwing the cap nut **52** in the usual way on the threaded portion **56** of the connecting member **45.**

While the outer pipe **12** has been described throughout the specification as metallic, it can also be made of any other suitable synthetic material.

The process in accordance with the invention makes it possible to cut a combination pipe at the building site to the desired length with simple devices and to flange such cut pipes, respectively, combine it with connecting members of another pipe. In this manner it is possible to eliminate all necessary welding and sweating of corrosion resistant pipes. In lieu of such expensive pipe and labor costs inexpensive plastic coated pipes can be used which require no welding, soldering or sweating.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A process for double-flanging of combination pipes having a plastic inner pipe portion and an outer pipe portion, including the steps of

engaging said combination pipe in the region of a free end thereof;

inserting an at least partially conically shaped member into said free end of said combination pipe and thereby jointly deforming said inner and outer pipe portions;

widening said free end by means of said conically shaped member;

said conically shaped member having a roughened surface and a collar portion, the roughened surface being adapted to engage the inner plastic pipe when the conically shaped member is inserted into said free end and to at least partially restrain the axial movement of said plastic inner pipe relative to said conically shaped member when axial tensional forces are applied to the combination pipe.

2. The process for double-flanging of combination pipes pipes having a plastic inner pipe portion and an outer pipe portion, as set forth in claim **1,** wherein said conically shaped member has an axial bore.

3. The process for double-flanging of combination pipes having a plastic inner pipe portion and an outer pipe portion, as set forth in claim **1,** wherein the engaging of said combination pipe is effected by a holding ring having an inner roughened surface.

4. The process for double-flanging of combination pipes having a plastic inner pipe portion and an outer pipe portion, as set forth in claim **3,** wherein said conically shaped member has an annular groove, and the step of bending the free end of said combination pipe into said annular groove.

5. An arrangement for double-flanging combination pipes having a plastic inner pipe portion and an outer pipe portion, comprising in combination,

an at least partially conically shaped member having an outer frusto-conically shaped surface and an annular groove and being adapted to be coaxially inserted into the free end of a combination pipe,

a spindle coaxially and rotatably mounted with respect to said conically shaped member and adapted to engage said outer pipe portion; and

a tensioning member operatively connected to said spindle and adapted to coact with said holding ring.

6. The arrangement for carrying out the process as defined in claim **5,** wherein the holding ring has an inner frusto-conical roughened surface, said tensioning member being coaxially and threadably mounted on said spindle.

7. The arrangement for carrying out the process as defined in claim **5,** wherein a ball bearing is mounted between the spindle and the conically shaped member.

* * * * *