

[54] **RESILIENT COUPLING**

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[58] Field of Search:.....**285/235, 417, 383, 369, 8,**  
**285/39, 370, 371, 423, 155, 156**

[56] **References Cited**

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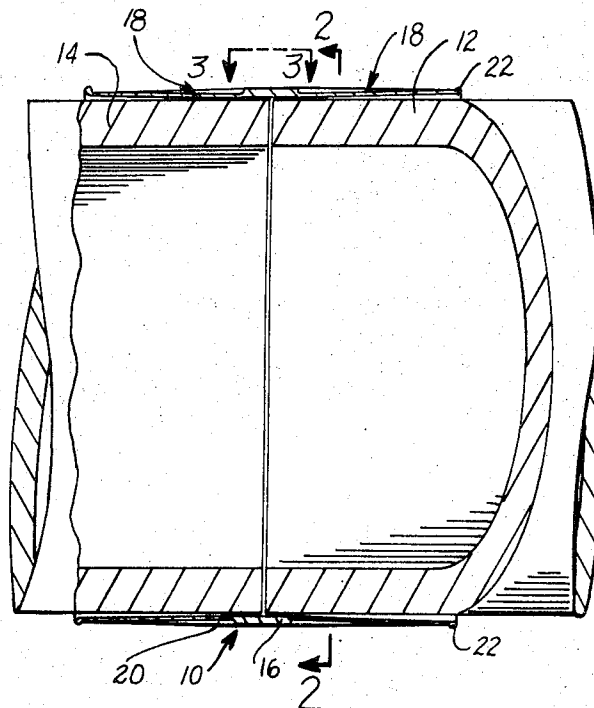
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[57] **ABSTRACT**

A resilient coupling for encircling the adjacent ends of substantially axially aligned, abutting, smooth wall pipe sections, comprising a synthetic resin, injection molded, sleeve which offers substantial reduction in weight and material with substantially no loss in beam or shear strength and which provides easier field application due to its flexibility. The outside of the sleeve is provided with a smooth central cylindrical surface, and a thin substantially uniform wall section, on either side of the central surface, makes up the major part of the outside of the sleeve. Each of the thin sections is reinforced by a plurality of circumferentially spaced solid ribs on the outside of the sleeve extending outwardly from the central surface and parallel to the axis of the sleeve, the ribs being tapered from a maximum height adjacent the ends of the central surface to a point closely adjacent each end of the sleeve where they intersect the surface of the uniform sections.

**2 Claims, 10 Drawing Figures**



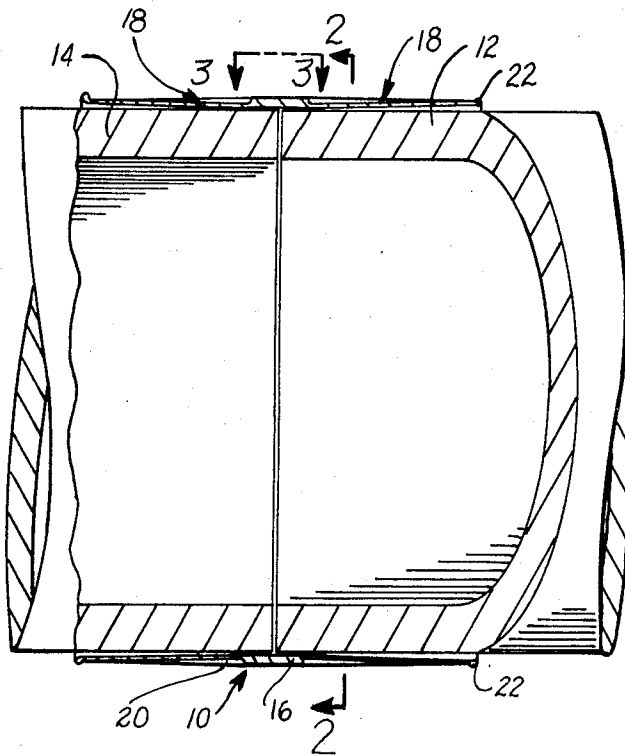


FIG. 1

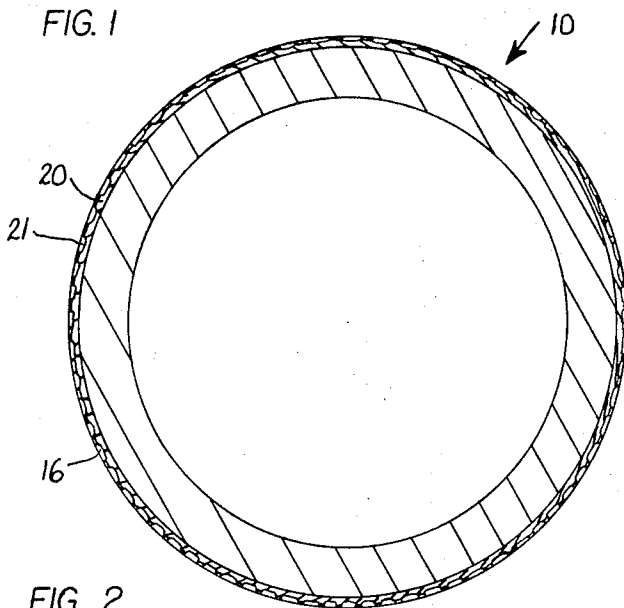


FIG. 2

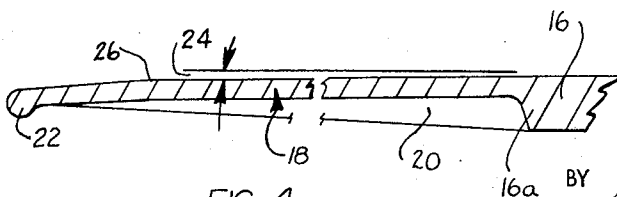


FIG. 4

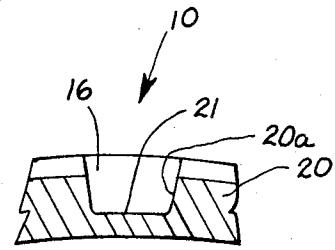


FIG. 5

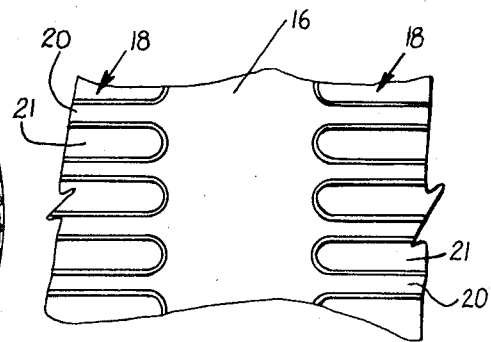


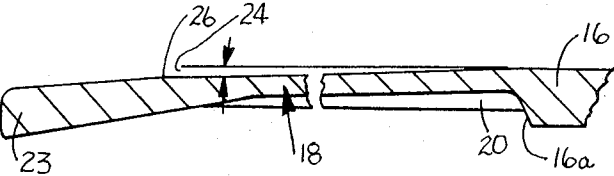
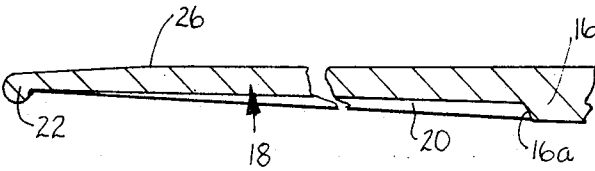
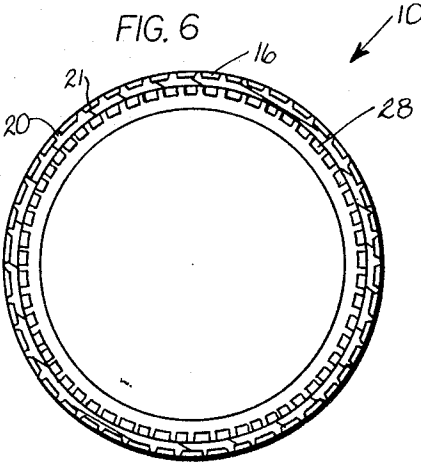
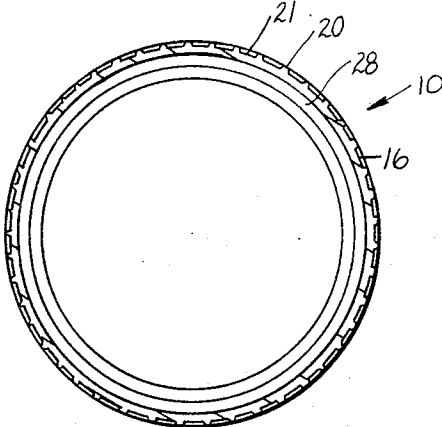
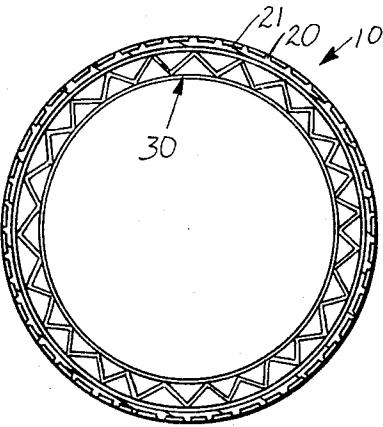
FIG. 3

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## RESILIENT COUPLING

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

This invention relates to pipe couplings, and more particularly to resilient, plastic sleeve couplings for pipe.

## 2. Description of the Prior Art

Prior art plastic sleeves or couplings used to join two substantially axially aligned, abutting, smooth wall pipe sections by encircling the adjacent ends of the sections, have been made from short lengths of extruded ABS plastic pipe. In practice, each short section was heated and upset slightly to provide a shallow taper at each end of the sleeve. The pipe sections were then butted together within the sleeve and chemically bonded or welded to the sleeve itself by means of any satisfactory solvent, if the pipe sections were plastic, or by means of any satisfactory adhesive, if the pipe sections were metal.

While the aforementioned prior art sleeves have proven to be satisfactory in some respects, they have also proven to have several major short comings. First, the sleeves or couplings are quite expensive to manufacture since multiple operations are often involved. Additionally, even if these sleeves or couplings are injection molded, there is an inefficient use of material because the wall thickness of each sleeve or coupling is necessarily thick, thus providing undesired rigidity therein. Further, when prior art sleeves or couplings are used to join abutting, smooth wall pipe sections which are slightly out-of-round, or which have surface abnormalities, uniform contact is not always obtained and leaking occurs.

Accordingly, it is an object of the present invention to provide a resilient, plastic sleeve or coupling for smooth solid wall or truss pipe which offers more flexure of the jointing system in bending, as well as a coupling which offers reduction in weight and material with no appreciable loss in beam or shear strength. Additionally, it is an object of the present invention to provide a sleeve or coupling which has easier field application due to its flexibility and which conforms readily to abnormalities in the surface of the pipe sections, such as out-of-roundness or scoloped edges.

## SUMMARY OF THE INVENTION

The present invention provides coupling means for encircling the adjacent ends of at least two substantially, axially aligned, abutting, smooth wall pipe sections. In its broadest application, the coupling means comprises a resilient, plastic sleeve having a smooth central cylindrical surface on the outside thereof and a thin, substantially uniform wall thickness on either side of the central surface making up the major part of the sleeve. Each of the thin uniform sections is reinforced by a plurality of ribs extending outwardly from the central surface and parallel to the axes of the pipe sections. The ribs are tapered so that they provide maximum reinforcement substantially adjacent the butted pipe sections and essentially no reinforcement at the ends of the sleeve.

In a preferred embodiment the ribs on the uniform sections may be tapered downwardly from a maximum height adjacent the ends of the central surface to a point substantially tangent with the surface of the

uniform sections. A bead or reinforced edge may also be provided at each end of the plastic sleeve to prevent chipping during shipping, handling and installation. Additionally, the internal surface of the sleeve may be provided with a slight conical configuration or taper extending from each end and meeting at substantially the center of the sleeve. Finally, stop means may be provided projecting from the inside surface of the sleeve at the center thereof so as to center the pipe sections within the co-operating coupling means. The stop means may be intermittent and coplanar, or it may be continuous around the interior surface of the sleeve.

The resilient plastic sleeve may, of course, be made out of any suitable plastic, including both thermosetting and thermoplastic types. The plastic sleeve may also be fiber reinforced.

The pipe sections to be joined may be of any material, but commonly are composed of plastic, fiber, or metal. If the pipe sections are plastic, they may be solvent welded, chemically bonded, or heat bonded to the plastic sleeve to provide a leak resistant joint. Likewise, if the pipe sections are fiber or metal, they may be adhesive bonded to the plastic sleeve to provide a leak resistant joint.

The plastic sleeve may also be injection molded, in which case the walls of the ribs and the ends of the central surface are preferably slightly tapered to facilitate removal of the sleeve from the mold.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross sectional view showing two substantially, axially aligned, abutting, smooth wall pipe sections and cooperating coupling means of the present invention.

FIG. 2 is a cross sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a cross sectional view taken on the line 3—3 of FIG. 1.

FIGS. 4 and 5 are enlargements of details of the coupling means of FIGS. 1 and 2.

FIG. 6 is a cross sectional view similar to FIG. 2, showing the coupling means of the present invention cooperating with smooth wall, truss pipe sections.

FIG. 7 is a cross sectional view similar to FIG. 4 showing the coupling means of the present invention having a variation of the tapered ribs.

FIG. 8 is a cross sectional view similar to FIG. 4 showing the coupling means of the present invention having a non-uniform wall thickness on either side of the central surface.

FIGS. 9 and 10 are cross sectional views similar to FIG. 2 showing stop means projecting from the inside surface of the coupling means.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning first to FIG. 1, the resilient pipe sleeve 10 of the present invention is shown encircling the abutted ends of two substantially axially aligned, smooth wall pipe sections 12 and 14. The coupling means comprises a plastic sleeve having a smooth central cylindrical surface 16 on the outside thereof and a thin, substantially uniform wall thickness 18 on either side of the central surface 16, making up the major part of the sleeve 10. However, it will of course be clearly understood that

while the thin wall thickness 18 on either side of the central surface 16 are referred to throughout the specification as being substantially uniform, this term includes variations in the wall thickness such as shown in FIG. 8.

Each of the thin sections 18 are reinforced by a plurality of ribs 20 on the outside of the sleeve 10 extending downwardly from the central surface 16 and parallel to the axes of the pipe sections 12 and 14. The ribs 20 are tapered so that they provide maximum reinforcement substantially adjacent the butted pipe sections 12 and 14 and essentially no reinforcement at the ends of the sleeve 10. In practice, this preferably means that the ribs 20 are tapered from a maximum height at the central cylindrical surface 16 of the sleeve 10 to a point substantially at or near each end of the sleeve 10 where they are substantially level or tangent with the sections 18 as shown in FIG. 4. However, it will be understood that the taper of the ribs 20 may vary, such as shown in FIG. 7, as desired.

In a preferred embodiment, a bead 22 is provided at each end of the sleeve 10 to prevent chipping of the sleeve during shipping, handling and installation. However, it will, of course, be understood that such chipping may also be prevented by providing a reinforced edge 23 at each end of the sleeve 10, as shown in FIG. 7.

The interior of the sleeve 10 is preferably provided with a smooth wall having a slight conical configuration or taper from each end thereof to the center of the sleeve, as shown at 24. As will be more fully explained hereinafter, such conical configuration or taper provides for easier field application.

The interior of the sleeve 10 may also be provided with stop means 28 projecting from the inside surface at the center thereof, as shown in FIGS. 9 and 10, so as to center the pipe sections 12 and 14 within the cooperating coupling means 10. The stop means 28 may be intermittent and coplanar, as shown in FIG. 10, or it may be continuous around the interior surface of the sleeve, as shown in FIG. 9. If the pipe sections to be joined are smooth wall truss pipe 30, and it is desired to make a leak resistant joint, the stop means 28 should be continuous as shown in FIG. 9.

FIGS. 4 and 5 show enlarged details of the preferred coupling means 10. As can be seen from FIG. 4, the aforementioned conical configuration or taper of the interior of the sleeve from each end thereof to the center may be broken as at 26. This additional taper also aids in the field application of the sleeve 10.

As can be seen from FIGS. 4 and 5, the edges 16a of the smooth central cylindrical surface 16 may be slightly tapered. Likewise, the walls 20a of the ribs 20 may be slightly tapered. In this manner the removal of the plastic sleeve 10 from a mold is facilitated if the sleeve is injection molded.

It should be noted that while the coupling means of the present invention comprises a plastic sleeve 10, it may be utilized to join either smooth wall, plastic truss pipe sections, as shown in FIG. 6, or smooth, solid wall metal, fiber or plastic pipe sections, as shown in FIGS. 1, 2, 9 and 10. In practice, the pipe manufacturing plant will preferably attach the sleeves 10 to the end of a length of pipe so that the sleeves will not be shipped as a separate component. Then, during installation in

the field, the opposite end of a section of truss pipe is, for example, stabbed into the sleeve 10 until it abutts the adjacent section of truss pipe. This procedure is, of course, facilitated because of the hereinbefore mentioned conical taper of the interior surface 24 of the sleeve 10. If the joint so formed is to be made leak resistant, the interior of the pipe sleeve 10 may be either solvent welded, chemically bonded, heat bonded or adhesively bonded to the pipe sections, depending, of course, upon whether the pipe sections are plastic, fiber or metal, respectively. Any suitable solvent, chemical bonding agent or adhesive may be utilized.

It should be emphasized that the pipe sleeve 10 may be made of any suitable plastic. However, it has been found that ABS plastic is particularly satisfactory. Additionally, it is believed that favorable results would be achieved if the plastic sleeve 10 were made of vinyl plastic, high density polyethylene, fiber reinforced.

It will of course be understood that the taper of the ribs 20 as well as the spacing of the grooves 21 between the ribs 20 will vary with the diameter of the pipe sections to be joined. Additionally, it should also be understood that a rubber gasket could, of course, be utilized in lieu of solvent or adhesive welding in order to obtain a leak resistant joint.

While certain preferred embodiments of the invention have been specifically illustrated and described, it is understood that the invention is not limited thereto, as many variations will be apparent to those skilled in the art, and the invention is to be given its broadest interpretation within the terms of the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A resilient coupling comprising a synthetic resin, injection molded, sleeve having an interior cylindrical bore provided with a slight conical configuration from each end thereof to the center of said sleeve, a smooth central cylindrical surface on the outside thereof and a thin, substantially uniform wall section, on either side of said central surface, making up the major part of the outside of said sleeve, each of said thin sections being reinforced by a plurality of circumferentially spaced solid ribs on the outside of said sleeve extending outwardly from said central surface and parallel to the axis of said coupling, said ribs being tapered from a maximum height adjacent the ends of said central surface to a point closely adjacent each end of said sleeve where they intersect the surface of said uniform sections, so that they provide maximum reinforcement substantially at the center of said smooth central cylindrical surface and minimum reinforcement at the ends of said sleeve, the walls of said ribs being slightly tapered to facilitate removal of said sleeve from a mold, and a bead at each end of said sleeve to prevent chipping of said sleeve during shipping, handling and installation, whereby said sleeve offers substantial reduction in weight and material with substantially no loss in beam or shear strength and provides easier field application due to its flexibility.

2. The coupling according to claim 1, wherein stop means project from the interior surface of said sleeve at the center thereof, said stop means being continuous around the interior surface of said sleeve.

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