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ADJUSTABLE JUNCTION BOOT AND METHOD OF ASSEMBLING SAME

Filed April 18, 1960

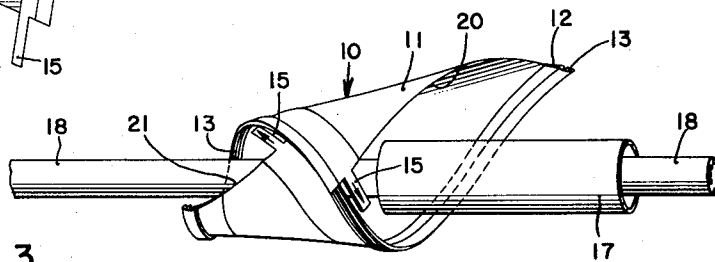
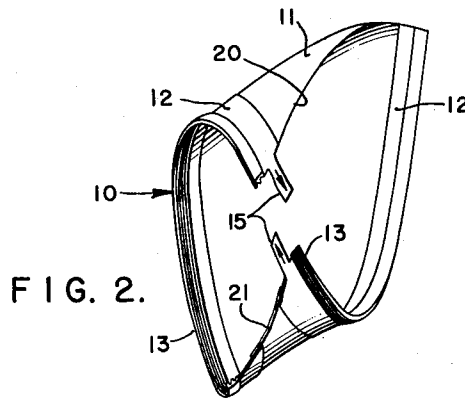
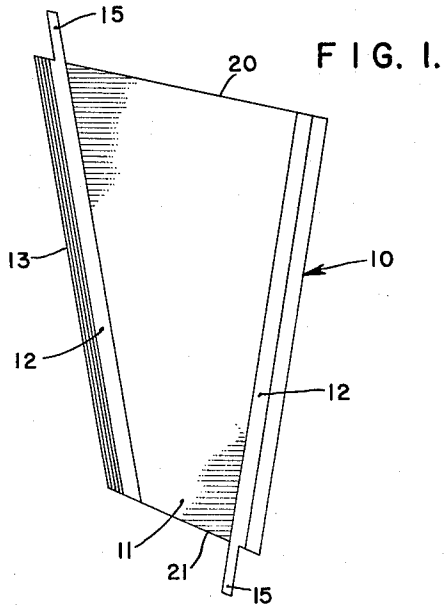


FIG. 3.

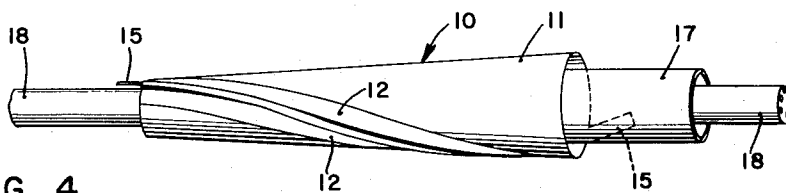


FIG. 4.

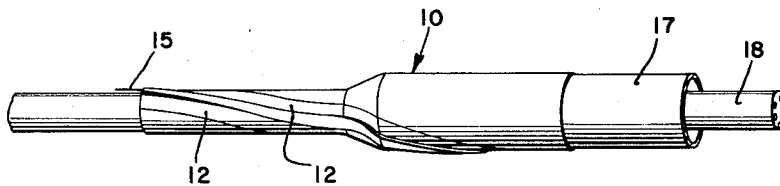


FIG. 5.

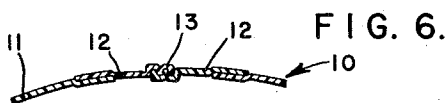


FIG. 6.

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3,139,116
**ADJUSTABLE JUNCTION BOOT AND METHOD
OF ASSEMBLING SAME**

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5 Claims. (Cl. 138-129)

This invention relates to protective boots of general application and more particularly to an improved boot of this character adapted to be assembled about cable junctions, pipe junctions, terminal fittings, and a great variety of similar joints and junctions having numerous features and advantages over prior structures of this general nature.

The enclosure and weatherproofing of junctions between parts of different diameters has long presented designers with troublesome problems. A particularly troublesome aspect of the problem is the ever changing needs from a size standpoint owing to the great variety of relative sizes of the parts being joined and in need of covering. Unless both ends of the enclosing boot properly fit the underlying parts of the junction, the results are unsatisfactory if not totally unacceptable.

Proposals made to meet the endless size combinations encountered in actual practice include the use of elastic materials. However, these are not oftentimes quite satisfactory for various reasons. For example, elastomers are adversely affected by both high and low temperatures, by lubricants and other fluids often present in the operating environment. Furthermore, elastic materials have the very undesirable characteristic of cold flowing under dynamic conditions. Other proposals have proposed boots featuring thong or the like lacing means for holding the boot assembled about the junction and intended to accommodate the boot to fittings of different size ranges. However, boots of this type are not weatherproof, have multiple parts increasing the cost of production and are costly in time and labor to assemble.

The foregoing and numerous other disadvantages of prior boot structures are obviated by the boot of the present invention which features a one-piece, lightweight, flexible walled member easily and quickly assemblable about parts to be enclosed. Among its numerous features is the capability of fitting equally tightly and snugly a wide range of junction fitting sizes. This unique capability is bottomed on the fact that the jacketing comprises an elongated sheet-like body having tapered opposite edges each formed with interlocking tongue and groove seam means relatively slidable lengthwise of one another. This construction permits the boot to be wrapped about the parts as the diagonally opposed corners of the seam are longitudinally engaged to form a large diameter ringlet encircling the junction. By pulling the opposed corners lengthwise of the seam to assemble the seam progressively, the diameter of the boot is gradually decreased until it is brought into snug fitting engagement with the junction parts. The smallest diameter assembled condition of the boot is achieved when the seam lies parallel to the axis of the boot, larger diameter assembled conditions being characterized by a seam which spirals with a lesser or a greater pitch angle lengthwise of the boot.

Assembly of the boot and the reduction thereof to fit the underlying parts is facilitated by the provision of pull tabs on the diagonally opposed corners immediately adjacent the interfitting tongue and groove portions of the seam. Once the boot has been assembled by the aid of pull tabs, the latter may be cut away if desired, although this is not necessary.

A further and important feature of the invention resides in the use of heat reactive impervious plastic material for the body of the boot to render the same shrinkable

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when subjected to heating. When the boot is made of this material, as is preferable but not essential in certain applications of the invention, the assembly is made as indicated above, the two seam strips being pulled lengthwise of one another until the body has been reduced to a diameter closely embracing the junction parts. Thereafter, the boot is subjected to heating to shrink all parts thereof snugly against the underlying surfaces of the junction parts. If desired, the interfitting surfaces of the seams as well as the contacting surfaces of the boot and junction parts may be coated with a sealing agent which takes a set permanently locking and sealing the surfaces together.

Accordingly, it is a primary object of the present invention to provide a new and improved universal boot or enclosure for junctions of a wide variety of types and size ranges.

Another object of the invention is the provision of a universal boot formed in one piece of flexible impervious material and capable of being readily adjusted in size to accommodate the needs of a particular operating environment.

Another object of the invention is to provide a boot formed in one piece of flat flexible material adapted to be held assembled by slide fastener seam means extending longitudinally of its opposed non-parallel edges.

Another object of the invention is the provision of an enclosing boot for junctions and terminal fittings having a main body formed of heat reactive plastic material which shrinks when heated and including a longitudinal seam to facilitate application about the parts being enclosed and for holding the boot detachably assembled.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated:

FIGURE 1 is a plan view of a boot incorporating the invention, the boot being shown flat;

FIGURE 2 is a perspective view showing the diagonally opposed corners of the boot being brought into a preliminary assembly stage;

FIGURE 3 is a view similar to FIGURE 2 showing the boot during a somewhat later stage of assembly about a representative junction;

FIGURE 4 is a view similar to FIGURE 3 but showing the seam fully closed and the boot drawn into engagement with the junction parts;

FIGURE 5 is a view similar to FIGURE 4 after the boot has been heat shrunk snugly against the junction; and

FIGURE 6 is an enlarged cross-sectional view through one typical configuration of the seam structure while closed.

Referring more particularly to FIGURES 1 and 2, there is shown by way of example a typical boot designated generally 10 embodying the present invention and formed in one unitary piece. As here shown, the boot has a main body 11 formed of any suitable flexible sheet material preferably of a type impervious to fluid. However, it will be understood that canvas, leather, coated fabrics and laminated sheet materials of a wide variety may be employed. However, a preferred material comprises heat reactive vinyl plastic of a type readily available on the market and having the property of shrinking as much as 30 percent when subjected to a proper temperature.

Heat-fused or otherwise suitably joined or sealed to the non-parallel longer lateral edges of body 11 are slide fastener strips 12, 12 each provided lengthwise of its outer free edge with suitable tongue and groove means 13

designed to mate and interlock with complementally shaped portions of the other strip. As here shown, these comprise a pair of identical complementally shaped interfitting and interlocking tongues and grooves 13 along a surface of each strip 12. However, it will be understood that one strip may carry only the female portion and the other strip only the male portion of the interlocking parts. Desirably, strips 12 and the interlocking tongues and grooves 13 are formed in one piece from extruded plastic material. Many suitable designs of such material are known to those skilled in this art, a particularly desirable design being shown in my co-pending application for United States Letters Patent Serial No. 777,817, filed December 1, 1958, now Patent No. 3,106,941.

A feature of the boot construction is the provision of pull tabs 15, 15 at its diagonally opposed corners, these being offset slightly laterally inward from the interlocking tongues and grooves 13. The reason for this offset will be readily understood from a consideration of FIGURES 2 and 3, it being pointed out that in a preferred mode of assembling the boot about parts to be enclosed, the workman encircles the parts with the boot while grasping the opposite longitudinal ends. Pull tabs 15, 15 are particularly suitable in performing this operation as well as for the next step which comprises aligning the tongues and grooves 13 of the two seam strips with one another as the tongues and grooves are being mated. Once mated, the tongues and grooves are slid together lengthwise of one another by light pulling forces applied to tabs 15, 15.

As will be appreciated from a consideration of FIGURES 1 and 3, the diameter of the ringlet initially made when undertaking to assemble the boot in the manner just referred to is dependent on the length of the boot. Thus, if the boot were three feet long, the initial ringlet would be approximately one foot in diameter when the opposite ends of the tongues and grooves are first mated and this is true irrespective of the width of the body portion of the boot. Accordingly, during initial assembly the boot fits the junction loosely with ample room for the endwise mating of the seam parts. At this stage the seam may spiral steeply about the junction parts, as for example about a large diameter terminal housing 17 of equipment to which it is desired to connect the smaller diameter sheathed cable 18 in a fluid-tight manner. As assembly proceeds, the pitch of the spiral seam grows steeper and steeper relative to the axis of the junction as the diameter of the boot becomes smaller and smaller. By the time the two parts of the seam have been pulled lengthwise of one another to reduce the diameter of the boot into engagement with the junction parts, the boot will have the general appearance indicated in FIGURE 4. If the transverse opposite ends 20 and 21 do not then lie in a plane generally perpendicular to the junction, it is a simple matter to trim the ends with suitable shears or a knife blade to present a neat appearance. Usually this operation is performed before the boot seam is fully assembled.

Once the boot has been assembled to the position shown in FIGURE 4, it is subjected to heat, as by infra red lamps or otherwise, in the manner prescribed for this purpose in order to heat shrink the boot tightly and snugly into contact with underlying surfaces of the parts being enclosed. This completes the assembly operation.

In many instances it is desirable that the boot be permanently closed about the parts. This objective is achieved by the simple expedient of coating the mating surfaces of tongues and grooves 13 with a suitable sealant which then sets and seals these parts together. Where the tongues and grooves are formed of plastic material, a liquid solvent may be lightly applied to the tongues and grooves before or as the seam is being pulled together. Thereafter the coated parts fuse together forming a permanent and fluid-tight seam lengthwise of the boot.

If additional sealing is desired the interior surface of the boot and the exterior surfaces of the parts being en-

closed may be similarly coated with a solvent or other sealant agent. If the boot is being assembled about metal surfaces or others to which the boot material does not readily fuse, any suitable adhesive or plastic sealing agent may be coated on the parts prior to assembly of the boot. It will be understood that such sealants include both those which take a permanent set and those which remain semi-plastic but nevertheless effective to fill voids and exclude moisture and foreign material from the jacketing enclosure formed by the boot.

From the foregoing it will be apparent that there has been disclosed a universal flexible walled boot formed in one piece and capable of being quickly assembled about junctions and couplings in fluid-tight, neat appearing manner. Furthermore, the same strip of boot material is equally effective to enclose either a large or a small diameter junction as well as those of intermediate size.

While the particular adjustable junction boot and method of assembling same herein shown and disclosed in detail are fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that they are merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. In a longitudinally seamable heat shrinkable flexible sheet member of generally trapezoidal configuration adapted to be packaged substantially flat and subsequently fastened about longitudinally related members having varying diameters and collectively to be enclosed: said sheet member having opposite lateral margins inclined to one another when said sheet member is in substantially flat, planar condition thereby providing a relatively narrow portion adjacent one of its ends and a relatively wide portion adjacent its other end, said narrow end portion being of a width very substantially less than the width of said wide portion, interengageable tongue and groove elements comprising components of a fastener means carried respectively by and substantially throughout said opposite margins whereby when said heat shrinkable sheet member and its complementary fastener means is assembled about such members by end engagement of the end of one of said fastener means at the narrow portion with the end of another of said fastener means at the diametrically opposite extremity of the wide portion thereof, there is formed a partial helically seamed wrap about said members, said wrap being generally frusto-conical in shape and substantially complementary to the configuration of said members and continuous longitudinal engagement of said respective complementary fastener means helically of said wrap provides an increased length of longitudinal seam until this contacts said members, said entire assembly subsequently being subjected to heat to shrink said sheet member closely about said members.

2. In a longitudinally seamable flexible sheet member as claimed in claim 1, wherein pull tabs extend beyond the ends of the respective relatively narrow portion and the relatively wide portion of the diametrically opposed extremities of said wrap and adjacent the fastener means to facilitate assembly thereof.

3. A method of assembling a flexible sheet member having a generally trapezoidal configuration about longitudinally related members having varying diameters and collectively to be enclosed and in which there is provided a longitudinal seamable flexible sheet member having a relatively narrow portion adjacent one of its ends and a relatively wide portion adjacent its other end, and including interengageable elements of complementary fastener means carried respectively by and substantially throughout the opposite margins thereof, said longitudinal seam being formed by interfitting tongue and groove members slidable relative to one another lengthwise thereof, said method comprising helically wrapping said longitudinal

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seamable flexible sheet member about the longitudinally related members having varying diameters collectively to be enclosed with the narrow end of said flexible sheet member opposite the smaller diameter portion thereof, said narrow end portion being of a width very substantially less than the width of said wide portion, inserting the diagonally opposed ends of said tongue and groove means into endwise mating engagement, and then pulling said diagonally opposed corner portions of said flexible sheet member in opposite relative directions and in a generally helical path to assemble said seam as the diameter of the flexible sheet member is decreased longitudinally and progressively into contacting engagement with the members to be enclosed.

4. The method claimed in claim 3 wherein the main body of said flexible sheet member is formed of heat reactive sheet plastic which shrinks when heated, said method being characterized in the heating of said assembled flexible sheet member to shrink the same into snug fitting engagement with the members to be enclosed.

5. The method claimed in claim 3 wherein pull tabs secured to said flexible sheet member extend beyond the

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ends of the respective relatively narrow portion and the relatively wide portion at said diametrically opposed extremities and adjacent the complementary fastener means, said method being characterized by inserting the diagonally opposed ends of said fasteners into endwise mating engagement and then pulling upon said tabs to assemble the flexible sheet member into engagement with the members to be enclosed.

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