Nov. 21, 1961 S. L. TODERICK 3,009,507

PIPE BENDING SHOE

Filed Oct. 15, 1958 3 Sheets-Sheet 1

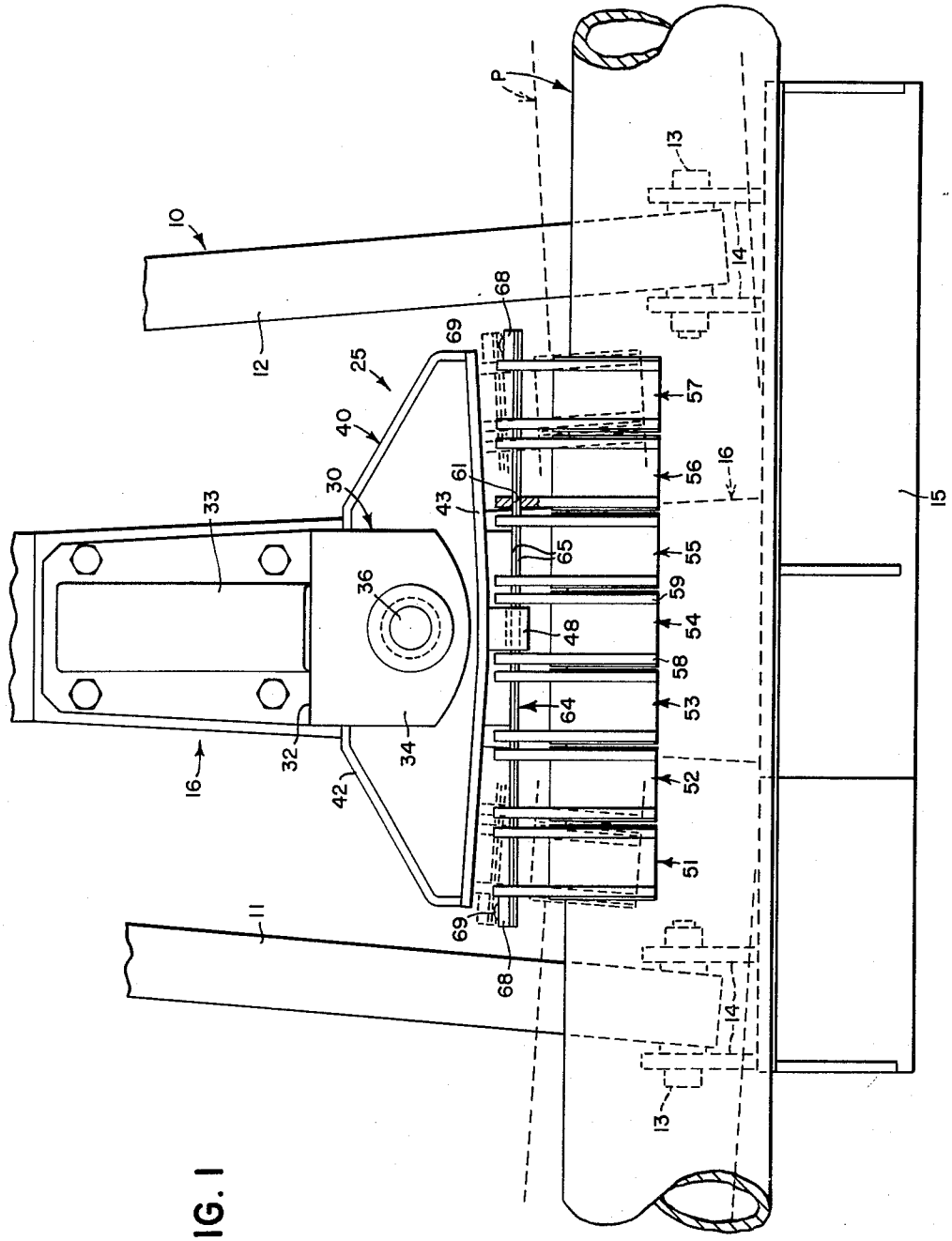


FIG. 1

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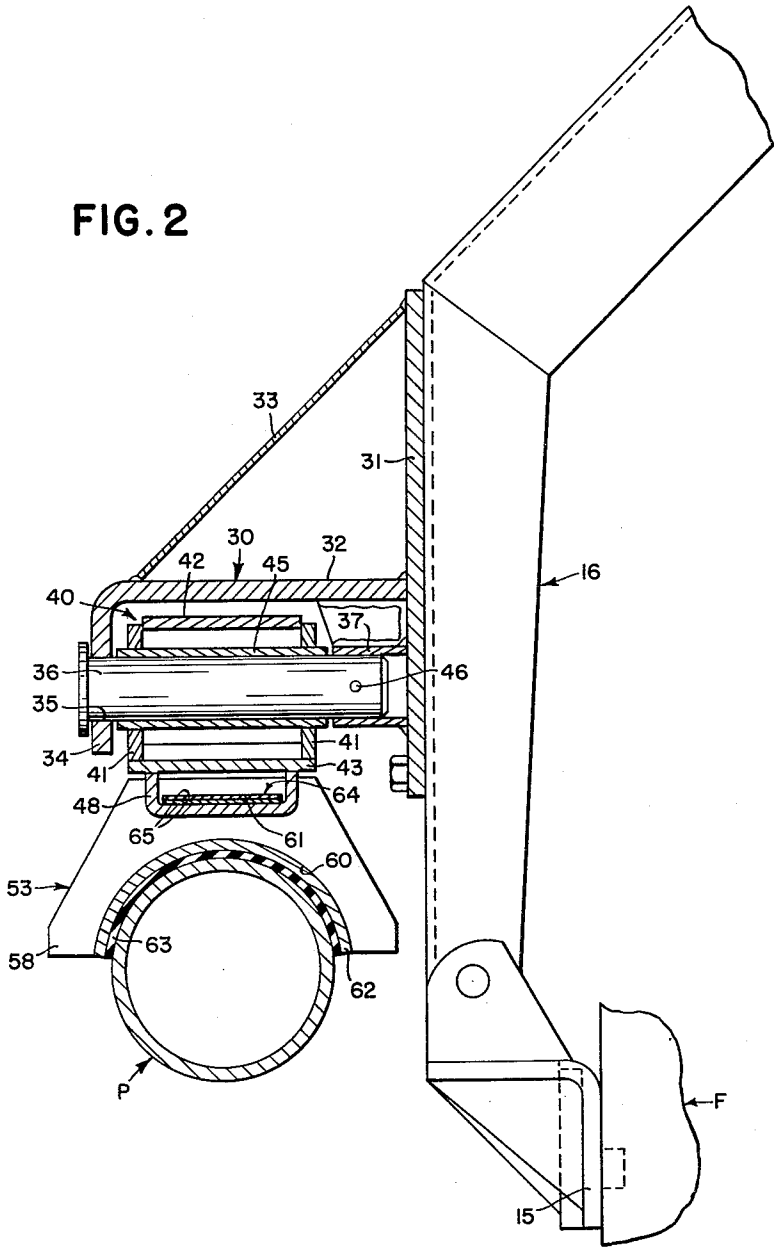
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FIG. 2



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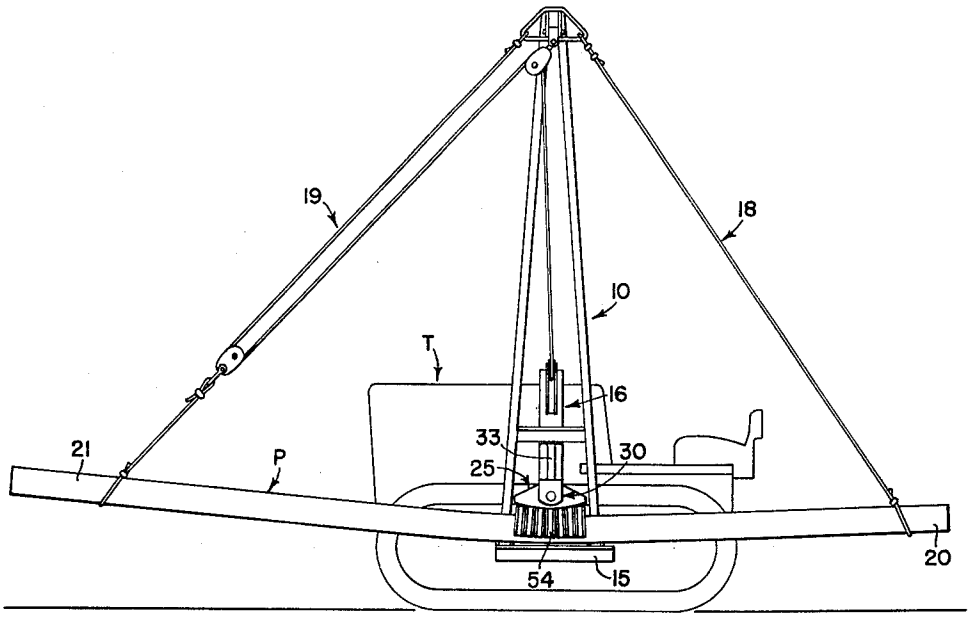


FIG. 3

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PIPE BENDING SHOE

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The present invention relates to pipe-bending apparatus and more particularly to pipe-bending attachments for tractor-mounted side booms, and similar equipment.

The object and general nature of the present invention is a provision of a pipe bending unit attachable to the base of a tractor-mounted side boom and providing a plurality of articulated pipe-engaging segmented plates or shoes that in operation provide the desired uniform bending of the pipe and the desired retention of the substantially unchanged circular cross section of the pipe without overstressing the latter through concentrated stresses.

More particularly, it is a feature of this invention to provide a bending shoe construction in which the parts are easy to assemble and disassemble, as when changing from one set of shoe segments to another that corresponds to the diameter of the particular pipe to be bent, and a further feature of this invention is to provide an assembly of pipe-engaging segments that are interconnectible through a flexible leaf spring member by virtue of which all mechanical pivots and similar joints are eliminated.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevation of portions of a tractor-mounted side boom with which a pipe bending shoe unit, constructed according to the principles of this invention, has been incorporated.

FIG. 2 is a sectional view taken generally along the line 2—2 of FIG. 1.

FIG. 3 is a view showing the tractor mounted side boom of this invention and the associated bending shoe and pipe end engaging means.

Referring first to FIG. 1, the tractor side boom is indicated in its entirety by the reference **10** and in general comprises an A frame made up of two upwardly converging beams **11** and **12** connected at the lower ends through pivots **13** with pairs of lugs **14** that are carried on the horizontal attachment angle **15** that is secured in any suitable way to the supporting tractor. Preferably, the angle **15** forms a part of a tractor carried arch frame **16** that conventionally extends over the body of the tractor T (FIG. 3) and is connected with the track frames F thereof at opposite sides of the tractor through the connection thereto of the angle member **15** mentioned above and a similar angle member (not shown) at the opposite side of the tractor.

As shown in FIG. 3, the side boom **10** includes cable means **18** and **19** that are connected with conventional winch means (not shown) and with the end portions of the pipe P whereby a pull may be exerted on the end portions **20** and **21** of the pipe to be bent. Thus, when a tractor-carried side boom of this general construction is used for bending pipe, it is customary to raise the boom **10** to a generally vertical position, connect the associated cable means **18** and **19** to opposite ends of the length of pipe P to be bent, and then by proper-actuation of the associated winch means, raise the pipe into contact with a bending shoe unit, such as the one indicated by the reference numeral **25**, carried by the

adjacent portion of the arch frame **16**, thus using the bending shoe as a fulcrum about which the pipe is bent by pulling on the ends of the pipe by the associated cable means.

The present invention is primarily concerned with a new and improved bending shoe attachment that produces the desired uniform bends without wrinkling or overstressing any portion of the pipe, and applicant's bending shoe attachment **25** will now be described.

As best shown in FIG. 2, I mount a supporting bracket **30** on the adjacent end of the arch frame **16**, the bracket **30** comprising a generally vertical attaching plate **31**, a laterally outwardly extending L-shaped part **32** and a reenforcing brace **33**, all securely and rigidly interconnected, as by welding of the like. The outermost portion of the part **32** extends downwardly, as indicated at **34**, and this portion is apertured at **35** to receive a headed pin or shaft **36** that extends through the aperture **35** into a short sleeve **37** and is fixed in any suitable way to the lower portion of the vertical plate **31**.

A curved supporting member **40** is swingably mounted on the shaft **36**. The member **40** comprises laterally spaced apart side plates **41**, an upper interconnecting plate **42** welded at its edges to the adjacent edges of the side plates **41**, and a lower curved plate **43** also welded to the edges of the side plates **41**. A central sleeve **45** is extended through openings in the side plates **41** and is rigidly fixed thereto in any suitable way. A cross pin **46** serves to releasably hold the pin or shaft **36** in position. It will be noted from FIG. 2 that there is sufficient clearance between the member **40** and the bracket **30** to accommodate a certain amount of rocking of the member **40** on the shaft **36**. Centrally of the lower curved plate **43**, the latter carries a loop **48**, reference to which will be made below.

To prevent the imposition of localized stresses during the bending operation and to produce a smooth or uniform bend in the pipe P, without appreciable loss of cross section area, I provide a plurality of segmental shoe elements **51**, **52** etc., each being of substantially identical construction and each comprising a pair of segmental plates **58** and **59**, each of which has at the lower side a generally semi-circular notch **60** and at the upper side an aperture **61**, and a curved plate **62** welded in the notches **60**. Each plate **62** carries cushioning or lining material **63**. A flexible or resilient member **64** extends through the apertures **61** of all the plates **58**, **59**. The member **64** preferably takes the form of a pair of relatively thin leaf spring members **65** that, as best shown in FIG. 2, passes through the loop element **48**. As will be seen from FIG. 1, the spring members **65** are longer than the assembly of segmental members **51–57** and in order to retain the latter members in closely spaced relation therealong the spring members are provided a pair of removable bars **68** detachably connected by any suitable means, such as a pair of bolts **69**, with the adjacent end portions of the spring member **64**. It will be seen from FIG. 1 that the loop element **48** is so dimensioned as to substantially fill the space between the associated central segment plates **58** and **59**, although some clearance is provided so that within limits the assembly of pipe-engaging shoe elements may shift more or less universally relative to the support **40**. However, relative movement is limited so thatt when the pipe is bent to the desired degree, as indicated by the dotted line in FIG. 1, at which time the upper edges of all of the segmental plates **58** and **59** come up against the curved plate **43**, contact between all of the plates **58** and **59** and the plate **43** is assured.

As will be clear from FIG. 2, the pipe-engaging units

51, 57 must, for best operation, fit rather snugly the pipe to be bent, and therefore different sets of pipe-engaging segments must be provided for pipes of different diameters. It is a feature of this invention to provid a construction in which it is easy and simple to change the pipe-engaging segments of one size for a set of pipe-engaging segments of another size. All that is necessary to do in changing the segments is to remove one of the bars 58, draw the spring member 64 out of the connecting loop 48 and from the pipe segments, replace the pipe-engaging segments with the desired segments, passing the spring members into the loop 48 at the proper point in the segment-mounting operation, and then reattaching the bar 68.

It will also be observed that by virtue of applicant's particular arrangement all pivots and joints are avoided and that since the members 65 are freely flexible they permit the pipe-engaging segments to move one with respect to the other as necessary during the pipe bending action.

While I have shown and described above the preferred structure in which the principles of the present invention have been incorporated, it is to be understood that my invention is not to be limited to the particular details, shown and described above, but that, in fact, widely different means may be employed in the practice of the broader aspects of my invention.

What I claim, therefore, and desire to secure by Letters Patent is:

1. In a pipe bending attachment, a support having a curved surface, a plurality of segmental pipe-engaging shoes having curved pipe-receiving portions and apertured portions, an elongated resilient member extending through said apertured portions, and means connecting the generally central portion only of said resilient member with said support so that both end portions of said resilient member and the associated shoes may move toward and away from the adjacent portions of said curved surface whereby during a pipe-bending operation when the pipe being bent engages said pipe-receiving shoe portions said resilient member yields and permits the inner edges of said shoes to engage the curved surface of said support.

2. A pipe bending shoe construction comprising a support having a curved face, a loop fixed to said face adjacent the center portion thereof and having an opening

therein, a spring member extended through said loop and having a cross section less than said opening whereby the spring member is loosely disposed therein, and a plurality of shoe segments mounted on said spring member, said segments having edge portions engageable with said curved face.

3. The invention set forth in claim 2, further characterized by means at the ends of said spring member retaining said shoe segments thereon.

4. A pipe bending apparatus comprising a bracket, a supporting part having a curved face and swingably connected at a generally midpoint with said bracket, an apertured portion projecting from the generally central portion of said curved face, a resilient member loosely disposed in said apertured portion and extending at opposite thereof along said curved faces, a plurality of individual pipe engaging shoe segments carried on said resilient member at opposite sides of said apertured portions, said segments being slidable along said resilient member, fastening means at each end of said resilient member for holding said segments on said resilient member substantially in engagement with one another, each segment having pipe engaging means at one side and at the other side face-engaging means, and pipe end engaging means to pull a pipe against said pipe engaging segment means and to thereby move the opposite portions of said segments against said curved face.

5. A pipe bending apparatus as defined in claim 4, further characterized by each of said segments including a pair of spaced apart plates and an interconnecting curved plate, a central segment being disposed with its spaced apart plates on opposite sides of said apertured portion.

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