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H. C. MYERS
INTERNAL MANDREL

2,453,531

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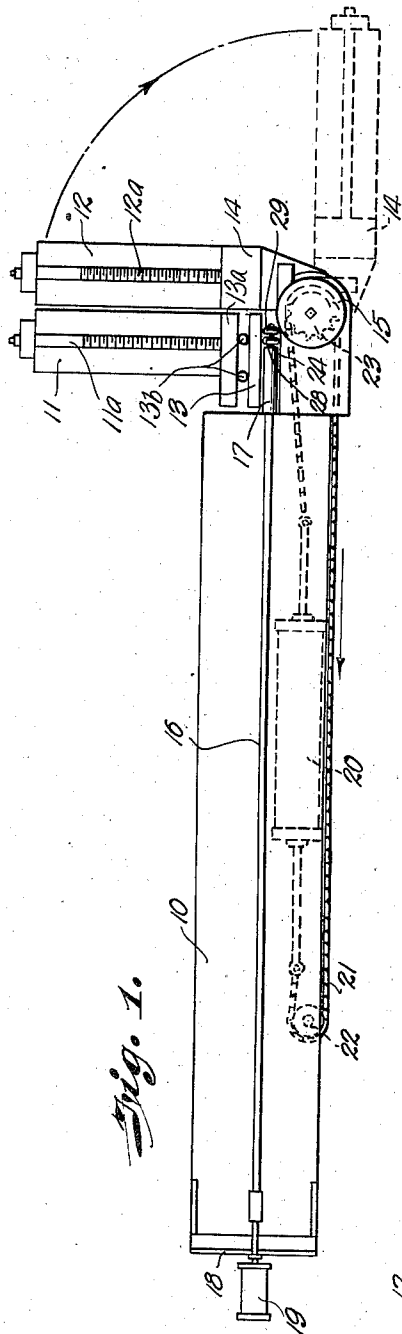


Fig. 1.

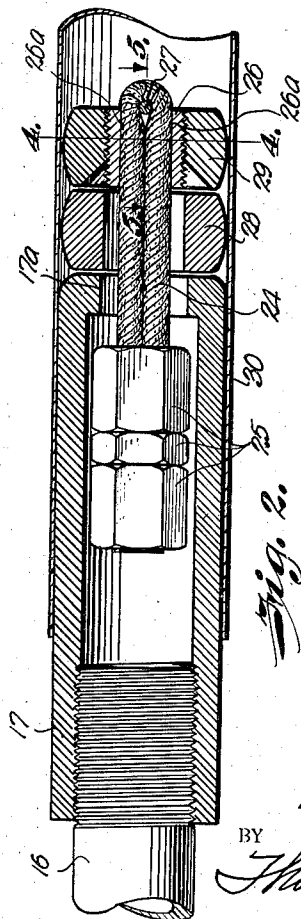


Fig. 2.

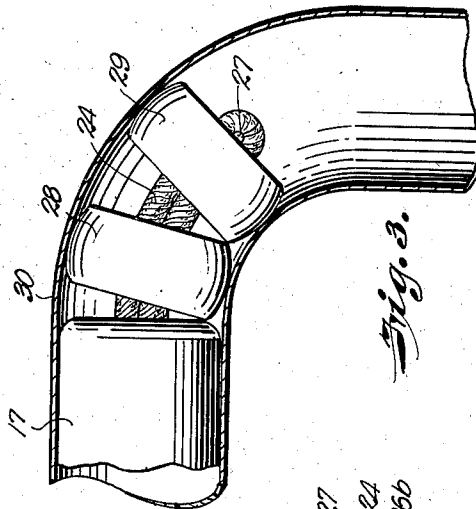


Fig. 3.

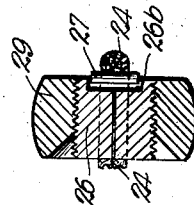


Fig. 4.



Fig. 5.

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INTERNAL MANDREL

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2 Claims. (Cl. 153—63)

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This invention relates to improvements in internal mandrels used in bending pipe and tubing and refers more particularly to mandrels having a flexible stranded member connecting the rolling members to the mandrel body.

Heretofore internal mandrels have employed link chains flexible only in one plane for connecting the rolling members or balls to the mandrel body. The use of such mandrels requires accurate adjustment or positioning of the mandrel with respect to its linkage so the bending plane of the mandrel coincides with the plane on which the pipe is to be bent. The time required for making the above adjustment results in an operational slow-down.

An important object of this invention is to provide an internal mandrel having a flexible stranded member connecting the rolling members to the mandrel body.

Another object is to provide an internal mandrel having a simple and rugged construction.

A further object is to provide an internal mandrel having rolling members adjustably mounted on the flexible stranded member.

Other and further objects of this invention will appear from the following description.

In the accompanying drawings which form a part of the instant specification and are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views,

Fig. 1 is a diagrammatic top plan view showing a hydraulic bending machine equipped with an internal mandrel.

Fig. 2 is an enlarged sectional view of an internal mandrel embodying the invention positioned in a pipe preparatory to bending.

Fig. 3 is a view of the mandrel and pipe shown in Fig. 2 after the pipe is bent showing the position assumed by the rolling members during the bending of the pipe.

Fig. 4 is a view taken on the line 4—4 in Fig. 2, and

Fig. 5 is a view taken along the line 5—5 in Fig. 2 in the direction of the arrows.

Referring to Fig. 1 a hydraulic bending machine is diagrammatically shown which may be used in conjunction with an internal mandrel embodying the present invention. The numeral 10 designates the table of the bending machine with clamping arm 11 and swinging arm 12 adjacent one end thereof. The arms 11 and 12 are equipped respectively with a bearing block 13 and a clamping die 14 which cooperate with a bending form 15 to hold the tubing during the bending

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operation. Above the bearing block 13 and between the bearing block and head 13a are rollers 13b which permit longitudinal movement of the bearing block along the pipe or tubing during the bending operation. The bearing block assembly and clamping die 14 are adjusted by the screw assemblies 11a and 12a in each of the arms. Swinging arm 12 and bending form 15 pivot or rotate together. Swinging arm 12 is shown in dotted lines in a position occupied by it at the completion of a bending operation in which a quarter bend is made in a pipe. This portion of the bending machine, in so far as its operation is concerned, is essentially similar to that shown in the patent to J. C. Wilson No. 1,007,834. Mandrel rod 16 extends longitudinally of table 10 and has a mandrel body 17 affixed at one end adjacent clamping die 13. At its other end rod 16 is supported on a frame 18 at the end of the table and is actuated by a hydraulic cylinder 19 capable of imparting a reciprocating movement to rod 16 to move the mandrel into an operative position and to withdraw the mandrel from the bend of the pipe on the completion of the bending operation. Beneath table 10 is a hydraulic actuating mechanism for rotating the swinging arm and bending form comprising a hydraulic cylinder 20, roller chain 21, guide sprocket 22, and drive sprocket 23. This mechanism is conventional and is very diagrammatically shown in dotted lines in the drawings in the interest of simplifying the disclosure.

Having described a type of bending machine in which the mandrel of this invention may be used, the mandrel is now referred to and is best illustrated in Figs. 2 and 3. The mandrel comprises a tubular mandrel body 17 screw threadedly connected to rod 16. A double stranded flexible wire rope 24 has its free ends slidably anchored within body 17. This is accomplished by an anchoring nut assembly 25 securely fastened to the free ends of the rope and confined within the body by a flange 17a. Adjacent the bended end of rope 24 is a sleeve like plug 26 which has two axial apertures 26a through which the two parts of rope are threaded. A cross pin or stop 27 positioned through the loop of the rope fits into a groove 26b in the end of the plug, as shown in Fig. 5, and prevents a cutting or crimping of the wire rope. In addition stop 27 spreads the loop of rope wedging its parts against the plug frictionally anchoring the rope in the plug. It is to be noted that the outside diameter of plug 26 is sufficiently small to permit it to pass through the flanged aperture

in the end of the mandrel body 17 in order that the mandrel may be assembled.

A supplemental arbor 23 is strung on rope 24 by slipping it over plug 26 and a second arbor member 29 is screwed on the plug. By adjusting arbor 29 on plug 26 the proper longitudinal adjustment of the arbor members on rope 24 is readily accomplished.

The mandrel is easily assembled. First the end portions of stranded member 24 are threaded through the apertures in plug 26 and stop 27 is inserted in the loop of the stranded member. The plug is then forced against the stop to securely anchor it at the doubled end thereof. The anchoring nut assembly 25 is securely fastened to the free ends of the stranded member and this assembly is inserted in the threaded end of the mandrel body and slipped into the position shown in Fig. 2. Arbor member 28 is then slipped over the plug and arbor member 29 is threaded on plug 27 and adjusted longitudinally thereon.

The operation of the assembled mandrel in conjunction with the bending machine is obvious from what has gone before.

The assembled mandrel is screwed on mandrel rod 16 of the bending machine. A pipe or tubing 30, which is to be bent, is slipped over the mandrel, as shown in Fig. 2, and the clamping die 13 and pressure die 14 are adjusted against the pipe or tubing. Then an actuating lever, not shown in the drawings, is pressed to operate hydraulic actuator 19 which advances mandrel 17 into an operative position relative to bending form and the swinging arm. The hydraulic mechanism by which the pipe is bent is next actuated to rotate arm 12 and bending form 15 from their full line position to their dotted line position, shown in Fig. 1. This forms a quarter bend in pipe 30, as shown in Fig. 3. The angle of bend may be selectively adjusted to any desired degree. During the bending operation arbor members 28 and 29 assume the position within the bend of pipe 30, as shown in Fig. 3, internally supporting the tube wall thus maintaining the tube diameter throughout the bend. When the bend is complete actuator 19 withdraws mandrel rod 16 extracting arbor members 28 and 29 from the pipe bend. Dies 13 and 14 are then released from engagement with pipe 30 and the pipe is removed from the machine. Arm 12 and bending form 15 are then rotated in a reverse direction to their original position shown in full lines in the drawings.

While rope 24 is illustrated as a wire rope it is contemplated that any suitable stranded material may be used. The stranded characteristic of member 24 contributes an inherent universal flexibility to the connection. In other words the doubled rope or flexible portion of the mandrel is free to bend in any plane radial to its axis.

It will be seen that the objects of this invention have been accomplished. There has been

provided an internal mandrel which is universally flexible as distinguished from the axis of conventional type of mandrel which is movable only in one plane. The arrangement is such that the device is rugged, of simple construction and easily assembled. The construction provides an internal mandrel that is usable in conjunction with many types of bending machines and one that does not require careful alignment of the mandrel with the plane in which the pipe is to be bent.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the invention.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In an internal mandrel for use in bending pipe and tubing, a tubular body, arbor members, a flexible connection between the arbor members and body including a doubled stranded member having its free ends anchored within the tubular body, an apertured plug secured on said stranded member and one of said arbor members adjustably mounted on said plug.

2. In an internal mandrel for use in bending pipe and tubing, a tubular body, arbor members, a flexible connection between the arbor members and body including a doubled stranded member having its free ends anchored within the tubular body, an apertured plug strung on said stranded member, a stop inserted in the loop of the stranded member and engaging the end of the plug, and one of said arbor members adjustably mounted on said plug.

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REFERENCES CITED

The following references are of record in the file of this patent:

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1,007,834	Wilson	Nov. 7, 1911
1,016,770	Persons	Feb. 6, 1912
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