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EXPANDABLE PIPE MANDREL

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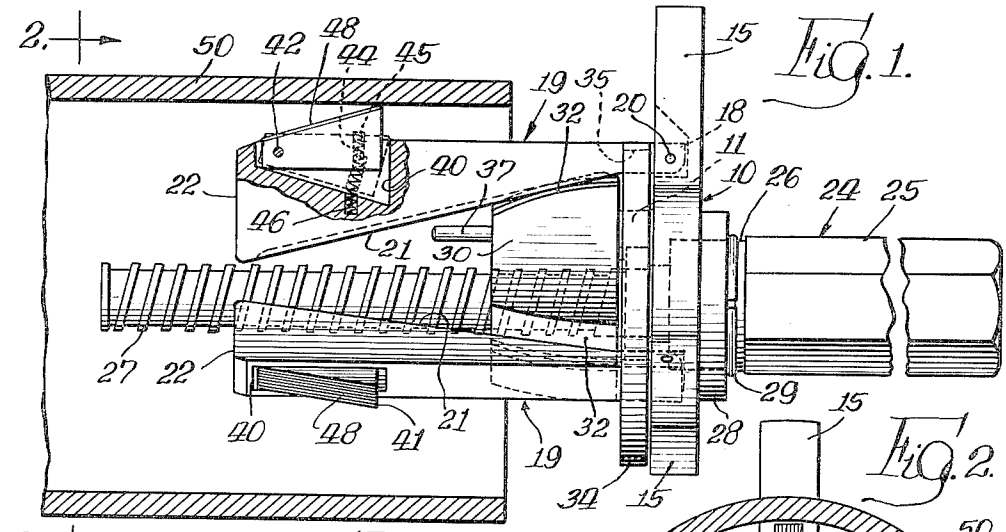

Fig. 1.

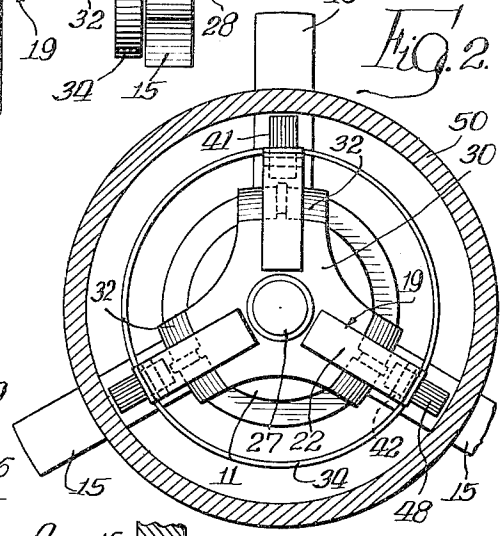

Fig. 2.

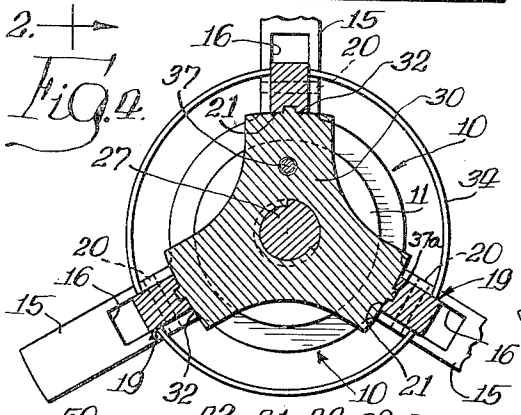

Fig. 4.

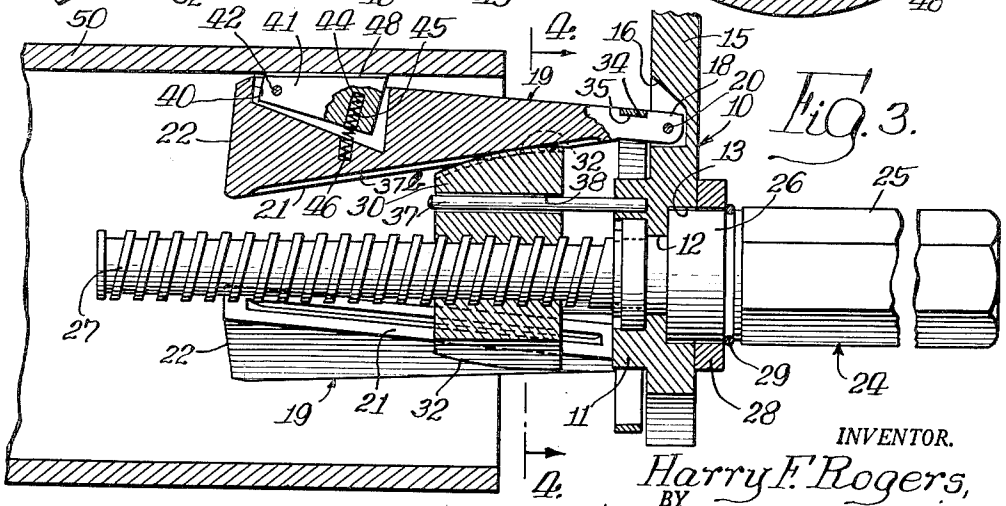

Fig. 3.

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EXPANDABLE PIPE MANDREL

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This invention relates to a mandrel for supporting one end of a tube, and more particularly to a mandrel for gripping the internal surface of a pipe.

The mandrel device of the invention enables one man to cut various diameter pipes any desired length without marring or scoring the external surface of the pipe. The mandrel firmly embeds itself on the inside surface of the pipe and securely holds it, preventing rotation, even under severe external forces created by cutting or threading of the pipe. The adjustability of the mandrel to fit various diameter pipes eliminates the need for multiple mandrels thereby reducing initial costs and maintenance.

It is a primary object of this invention to provide a novel type of mandrel for clamping the inside surface of a pipe, the mandrel being adjustable to clamp pipes having differing internal diameters.

One feature of the invention is a provision of a mandrel having a body pivotally supporting a plurality of first pivotal members, a second member pivotally carried on each of the first pivotal members, means to bias the second member radially outward from said first member, and means to selectively pivot the first pivotal members radially outward from the body to adjustably urge the second pivotal members into gripping contact with the internal surface of a tube.

Another object of this invention is to provide a mandrel as described in the preceding paragraph whereby the first pivotal members have a recess provided in a free end thereof for pivotally receiving a second pivotal member and spring means biasing the second pivotal member radially outward from the first member.

Another object is to provide a mandrel for supporting a tube comprising a body rotatably supporting a screw, a plurality of elongated jaw members longitudinally positioned and circumferentially spaced about the axis of the body and having one end pivotally connected to the body for radial swinging movement away from and back toward the axis of the body, a wedge member threadedly mounted for axial movement on said screw and cooperating with said jaw members to wedgedly force the jaw members radially outward from the axis of the body, and a dog pivotally mounted to each of said jaw members adjacent the free end thereof for radial movement relative to the axis of the body.

Another feature is that the jaw members of the mandrel are precluded from swinging outwardly from the axis of the body by a circular spring clip positioned around the jaw members adjacent their pivotal connection to the body.

Still another feature is that means are provided to prevent the wedge from rotating about the axis of the body while allowing axial movement of the wedge along the axis, including an elongated pin having one end secured to the body and extending longitudinally forward through the wedge, said wedge being slidable on the pin.

Further objects and advantages will be apparent from the following detailed description taken in connection with the accompanying drawing in which:

FIGURE 1 is a partial sectional elevational view of an internal vise embodying the invention with a portion shown in dotted lines;

FIGURE 2 is an end elevation of the vise taken substantially along the line 2—2 of FIGURE 1;

FIGURE 3 is a view similar to FIGURE 1 with the vise in clamping position; and

FIGURE 4 is a vertical section taken substantially along the line 4—4 of FIGURE 3.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail an embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring to the drawings, the internal vise comprises a body member **10** having a stepped down boss portion **11**. An axial bore **12** having a counter bore **13** extends through the body **10**. Three arms **15** extend radially outward from the body and are equally spaced about the axis thereof. Each of the arms **15** has a recess **16** in the surface thereof adjacent the body **10** which receives the butt end **18** of the elongated jaw member **19**, the butt end being pivotally supported in the recess by a pin **20** so that the jaw member may swing radially outwardly away from and back toward the axis of the body **10**. The jaw members **19** are equally positioned about the axis of the body **10** and spaced therefrom and have a surface **21** that is tapered longitudinally inward from the butt end **18** to a free forward end **22**.

A shaft **24** is rotatably mounted in the bore **12** and the counter bore **13** and has a rear portion **25** of a hexagonal cross section, a cylindrical intermediate portion **26** receivable in the counter bore **13** and a forward screw portion **27** of a smaller diameter than the remainder of the shaft that is receivable in the bore **12**. A washer **28** surrounds the intermediate portion **26** of the shaft and is held against the surface of the body **10** by a spring clip **29** to secure the shaft within the bore of the body while allowing relative rotational movement therebetween.

A three sided wedge member **30** is interposed between the jaw members **19** and threadedly mounted on the forward portion **27** of the shaft **24**. Each of the three sides of the wedge member **30** has an arcuate surface **32** that tapers inwardly in the same direction as the surfaces **21** of the jaw members **19**. The wedge member **30** is positioned so that the surfaces **32** are adjacent the tapered surfaces **21** of the jaw members and are in contact therewith. A circular spring clip **34** surrounds the jaw members **19** and is captured in notches **35** provided in the outer surface of the jaw members adjacent the butt ends **18** thereof. The clip **34** precludes the jaw members from swinging outwardly from the axis of the body **10** and maintains the surfaces **21** of the jaw members in contact with the surfaces **21** of the wedge **30**.

The wedge member **30** is precluded from rotational movement relative to the body **10** and the jaw members **19** by suitable means such as an elongated pin **37** having an end secured to the boss **11**, and a cooperating key **37***a* at the mid-portion of each wedge member surface **32** and an inwardly facing keyway **37***d* in the inner surface **21** of the respective jaw members **19**. If desired, the key and keyway structure may be eliminated, reliance being had solely on pin **37** to preclude such rotational movement between the body and jaw members or, alternatively, the pin **37** may be eliminated with reliance being had on the key and keyway structures solely for such rotational movement prevention. As shown in FIG. 3, pin **37** extends longitudinally forward through a hole **38** provided in the wedge member **30**. The hole **38** is of sufficient diameter to allow wedge **30** to easily slide longitudinally on pin **37**. When the rearward portion **25** of the shaft **24** is turned in one direction, wedge member **30** advances forwardly on the screw **27** and the wedge surfaces **32** force the jaw members **19** to swing radially outwardly about the pivot **20** away from the axis of the body **10** and against the restraining force of the circular clip **34**.

When the shaft 24 is turned in the other direction, the wedge moves rearward on the screw 27 and the jaw members swing back toward the axis of the body due to the urging of the circular spring clip 34.

Each of the jaw members 19 is provided with a recess 40 in an outer surface of its free forward end 22 and the recess tapers longitudinally downward in the direction opposite the taper of the surface 21. A wedge-shaped dog 41 is received by each of the recesses 40 and is pivotally mounted within the forward portion of the recess adjacent the narrow end thereof by a pin 42 which allows the dog to be swung radially outward away from the jaw member or inward within the confines of the recess. A compression spring 44 normally urges the dog 41 to its outward position as shown in FIGURE 1. Spring 44 has one end confined within a hole 45 provided in the bottom surface of the dog 41 and the other confined within a hole 46 provided in the bottom part of the recess 40. The depth of the forward portion of the recess 40 is such that it prevents dog 41 from swinging completely out of the recess so that the dog is always under the biasing force of spring 44. An outer surface 48 of each of the dog members 41 is serrated and comes in contact with the internal surface of the pipe 50 which is to be gripped as shown in FIG. 3.

The operation of the mandrel will now be described. FIG. 1 shows the mandrel in its normal position, inserted within a pipe 50. The wedge member 30 is positioned rearward on the screw 27 of the shaft against boss 11 and dogs 41 are swung radially outward from the jaw members 19. The shaft 24 is rotated by inserting the rear portion 25 in a power driven pipe machine. Rotating the shaft 24 in one direction causes the wedge 30 to move longitudinally forward on screw 27 and on the pin 37. The outer tapered surfaces 32 of the wedge member 30 act against the surfaces 21 of the jaw members to effect a swinging of the jaw members radially outward about the pivots 20 and away from the axis of the body to bring the outwardly extending dogs 41 in gripping contact with the inner surface of the pipe 50. Further expansion of the jaw members will cause the dogs 41 to be swung inwardly against the urging of the spring 44 until the entire serrated surface 48 contacts the internal surface of the pipe. The three dogs form a wedging action against the internal pipe surface and hold it securely. It can be seen that pipes of larger diameters can be gripped and supported by the described mandrel by further advancing the wedge 30 to swing the jaw members further outward. The spring loaded dogs always pivot an amount sufficient to place the entire serrated surface 48 in the same plane as, and against the internal surface of the pipe.

I claim:

1. A mandrel for supporting one end of a tube, comprising: a body; a plurality of first pivot members pivotally mounted on said body for pivotal movement radially outwardly therefrom; a plurality of second members movably mounted one on each of said first pivot members for movement radially outwardly of said body; resilient means biasing said second members outwardly from said first said pivot members; and means for pivoting said first pivot members radially outward from said body to urge said second members into gripping contact with the internal surface of the tube.

2. A mandrel for supporting one end of a tube, comprising: a body coaxially carrying a rotatable screw; a plurality of jaw members pivotally mounted on said body and circumferentially spaced about the body for radial movement away from and back toward the axis of the body; wedge means threadably mounted on said screw; means preventing rotation of said wedge about the axis of the body while allowing longitudinal movement of the wedge; means selectively rotating said screw to effect axial movement of the wedge, whereby cooperating surfaces on the wedge and jaw members effect radially outward pivotal movement of the jaw members as a result of the axial movement of the wedge away from the body; a dog member pivotally mounted for radial movement relative to the axis of the body on each of said jaw members; and means biasing said dog member for radially outward pivotal movement.

3. A mandrel for gripping and supporting the internal surface of a tube comprising: a body having an axial bore therethrough; a screw rotatable in said bore; a plurality of elongated jaw members arranged longitudinally and circumferentially spaced about the axis of the body, each of said jaw members having a butt portion pivotally connected to said body for radial swinging movement away from and back toward the axis of said body, and having a surface tapering longitudinally inward from the butt end to a forward end thereof; a wedge member threadedly carried by said screw and having a tapered outer surface cooperating with the tapered surface of each of said jaw members; means mounting the wedge member to the body to preclude rotational movement of the wedge about the axis of the body while allowing longitudinal movement along said axis; a dog pivotally mounted on each of the jaw members adjacent the free end thereof; means biasing said dog member for radially outward pivotal movement away from the axis of the body; and means selectively rotating said screw to effect axial movement of the wedge away from the body whereby the cooperating tapered surfaces on the wedge and the jaw members effect radially outward pivotal movement of the jaw members as a result of the axial movement of the wedge.

4. A mandrel for supporting one end of the tube, comprising: a body having an axial bore therethrough and at least two radially outward extending arms; a screw rotatable in said bore; elongated jaw members arranged longitudinally and spaced circumferentially about the axis of the body, each of said jaw members having a butt end pivotally connected to one of said outwardly extending arms for radial swinging movement away from and back toward the axis of the body, and a surface tapering longitudinally inward from the butt end to a free forward end thereof, a dog pivotally mounted on each of the jaw members adjacent the free forward end thereof for radial movement relative to the axis of the body and biased radially outward from said axis; wedge means carried by said screw and having a tapered surface cooperating with the tapered surface of the jaw member; and means for selectively rotating said screw to effect axial movement of the wedge away from the body whereby the cooperating surfaces on the wedge and jaw members effect a radially outward pivotal movement of the jaw members as a result of the axial movement of the wedge.

5. A mandrel for gripping the internal surface of a tube comprising: a body having an axial bore therethrough and rotatably supporting a screw in said axial bore; a plurality of radially outward extending arms attached to said body; a plurality of jaw members equally spaced circumferentially about the axis of the body, each of said jaw members being pivotally connected at one end thereof to one of said outwardly extending arms for radial swinging movement away from and back toward the axis of said body; a wedge member threadedly mounted for longitudinal movement on said screw; cooperating tapered surfaces on the wedge member and the jaw members to effect radially outward pivotal movement of the jaw members as a result of axial movement of the wedge away from the body; a dog member pivotally mounted at the free end of each of said jaw members for radial movement relative to the axis of the body; and means biasing said dog members for radially outward pivotal movement.

6. The tube mandrel of claim 5 whereby the biasing means include a compression spring having an end receivable in an opening in the free end of the jaw member and the other end receivable in said dog.

7. The tube mandrel of claim 5 whereby each of said dogs has a top portion with a serrated outer surface for contacting and gripping the internal surface of the tube.

8. A mandrel for supporting one end of the tube comprising: a body rotatably and coaxially carrying a screw; a plurality of elongated jaw members positioned longitudinally and spaced circumferentially about the axis of said body, each of said jaw members having a butt end pivotally connected to said body for radially swinging movement away from and back toward the axis of the body, and a surface tapered inwardly from said butt end to a forward free end thereof; a wedge member having a tapered outer surface carried by said screw for axial movement therealong; yieldable means precluding said jaw members from swinging radially outward away from the axis of said body and for biasing the tapered surface of the jaw members against the tapered surface of said wedge; means for selectively rotating said screw to effect axial movement of the wedge away from the body whereby the contacting tapered surfaces on the wedge and the jaw members effect a radially outward pivotal movement of the jaws against the biasing action of said yieldable means as a result of the axial movement of the wedge.

9. The tube mandrel of claim 8 whereby the yieldable means precluding the radially outward swinging movement of the jaw members includes a circular spring clip encircling the jaw members and located adjacent the butt ends thereof at the pivotal connections to the body.

10. A tube mandrel comprising: a body coaxially carrying a rotatable screw, and having a plurality of radially outward extending arms at equally spaced circumferential points about the body; a plurality of elongated jaw members arranged longitudinally about the axis of the body, each of said jaw members having a butt end pivotally mounted to one of said outwardly extending arms for radial swinging movement away from and back toward axis of the body and a surface tapering longitudinally inward from the butt end to a forward free end thereof; a wedge member having a tapered surface, threadedly mounted on said screw for axial movement thereon; means connected to said body for preventing rotation of the wedge about the axis of the body while allowing axial movement of the wedge; yieldable means precluding said jaw members from swinging radially outward from the axis of the body and biasing the tapered surfaces of said jaw members against the tapered surface of said wedge; means for selectively rotating said screw to effect axial movement of the wedge away from the body and toward the free end of said jaw members, whereby the cooperating tapered surfaces on the wedge and jaw members effect a radially outward pivotal movement of the jaw members as a result of said axial movement; each of said jaw members having a recess adjacent the free end thereof for receiving a dog member, said dog member being pivotally mounted for radial movement relative to the axis of the body; and means biasing said dog member radially outward about the pivotal mounting.

11. The tube mandrel of claim 10 whereby the means preventing rotation of the wedge about the axis of the body includes at least one elongated pin having an end secured to the body at a point radially outward from the axis of the body and extending longitudinally forward therefrom, and said wedge being slidably mounted on said pin.

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