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An agency of Industry Canada

CA 2195154 C 2002/04/23

(11)(21) 2 195 154

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1997/01/15

(41) Mise à la disp. pub./Open to Public Insp.: 1997/07/17

(45) Date de délivrance/Issue Date: 2002/04/23

(30) Priorité/Priority: 1996/01/16 (08/587,301) US

(51) Cl.Int.^{6}/Int.Cl.^{6} B23D 45/00, B23D 61/00

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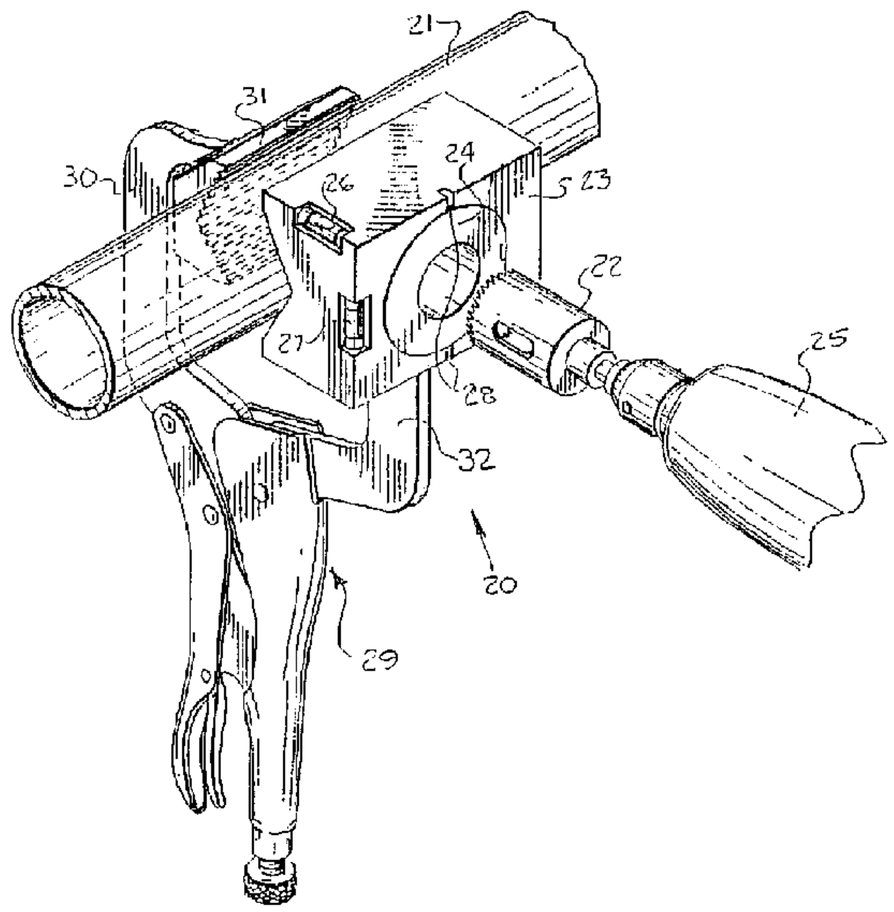
(54) Titre : SYSTEME DE SERRAGE POUR GUIDE DE SCIE A TROUS
(54) Title: HOLE SAW GUIDE CLAMP SYSTEM



(57) Abrégé/Abstract:
A system and method are provided for using a portable tool for assisting the making of holes in installed pipes, e.g., as water pipes and the like, to prepare for interconnected piping. Such system includes a hollow, cylindrical hole-saw guide, having an axis, for guiding the hole-saw while the hole-saw is making a hole in only the first side of the hollow installed pipe. The tool is constructed and arranged to maintain user-selected relative positions between the hollow installed pipe and the hole-saw while the hole-saw is making the hole in only the first side of the hollow installed pipe. A first fixed clamp-head is provided for positioning the hollow, cylindrical hole-saw guide adjacent the first side of the hollow installed pipe. A second movable and swivelable clamp-head is provided for holding a second side, opposed to the first side, of the hollow installed pipe in such manner as to have the centre line of the hollow installed pipe intersect the axis of the hollow cylindrical hole-saw guide. The second movable and swivelable clamp-head includes a V-shaped member solid which is closed along the axis of the hollow cylindrical hole-saw guide. A grip is provided for adjusting and positioning the first and second clamp-heads into a user-selected clamping position about the hollow installed pipe. The hole saw guide is preferably contained in a clamp-head at the end of the fixed jaw of a VICE-GRIP$_{TM}$ - like device. Such clamp-head accommodates various sizes of guide bushings and hole-saws for making various size holes in various size pipes. Other features assist accurate hole positioning, e.g., horizontal and vertical levels, centre marks, and V-shaped holding surfaces on the clamp-heads.

ABSTRACT

A system and method are provided for using a portable tool for assisting the making of holes in installed pipes, e.g., as water pipes and the like, to prepare for interconnected piping. Such system includes a hollow, cylindrical hole-saw guide, having an axis, for guiding the hole-saw while the hole-saw is making a hole in only the first side of the hollow installed pipe. The tool is constructed and arranged to maintain user-selected relative positions between the hollow installed pipe and the hole-saw while the hole-saw is making the hole in only the first side of the hollow installed pipe. A first fixed clamp-head is provided for positioning the hollow, cylindrical hole-saw guide adjacent the first side of the hollow installed pipe. A second movable and swivelable clamp-head is provided for holding a second side, opposed to the first side, of the hollow installed pipe in such manner as to have the centre line of the hollow installed pipe intersect the axis of the hollow cylindrical hole-saw guide. The second movable and swivelable clamp-head includes a V-shaped member solid which is closed along the axis of the hollow cylindrical hole-saw guide. A grip is provided for adjusting and positioning the first and second clamp-heads into a user-selected clamping position about the hollow installed pipe. The hole saw guide is preferably contained in a clamp-head at the end of the fixed jaw of a VICE-GRIP$_{TM}$ -like device. Such clamp-head accommodates various sizes of guide bushings and hole-saws for making various size holes in various size pipes. Other features assist accurate hole positioning, e.g., horizontal and vertical levels, centre marks, and V-shaped holding surfaces on the clamp-heads.

(a) TITLE OF THE INVENTION

HOLE SAW GUIDE SYSTEM

(B) TECHNICAL FIELD TO WHICH THE INVENTION RELATES

This invention relates to a portable system for assisting the making of holes in installed pipes, e.g., in water pipes and the like, to prepare for interconnected piping. More particularly, this invention concerns such a system utilizing a hole saw guide.

(c) BACKGROUND ART

Typically, when pipe fitting, or, more specifically, drilling holes in the wall of round pipe (or tubing), a substantial challenge is encountered. The difficulty is related to locating, positioning, and holding the hole-cutting means, e.g., a drill, in a stable and accurate manner. When holes are pre-drilled in a machine shop, prior to installation of the pipe, common machine tools and fixtures are used and these generally reduce or eliminate the difficulty of the task. However, when performing this task in the field on pipes which have already been installed, such machine tools and fixtures are not available or possible to use. When field fitting piping, e.g., steel water piping used for sprinkler systems, locations for interconnecting runs might not e easily predetermined, particularly if a branch run is later added to a previously-installed system. This precludes the use of heavy and large tools, e.g., milling machines and mill vises. When drilling a hole, and more specifically a large hole, into the ground surface of a pipe, a hole saw is commonly used. The hole saw, instead of cutting all the material within the required diameter of the hole to be drilled, actually cuts or saws only the "circular" border of the hole.

Typically, the hole saw utilizes a pilot drill bit first to engage the pipe then to position the round saw while it saws through the intended material. Also, typically, the main difficulty occurs with the saw teeth attempting evenly to cut on a curved surface, often resulting in the teeth unevenly grabbing and jerking the saw. As a result, doing this common piping job is currently a difficult operation to perform. Additionally, the actual task of locating the saw to the pipe to provide a hole of accurate location is difficult. Even after the centre point of the required hole is determined, a centre punch is all that is used to attempt to prevent the pilot drill bit from wandering off location. Thus, in the prior art,

whether the pipe to be drilling is large or small, or made of steel, of other metals, or of synthetic plastics materials, the field drilling of accurate side or top holes is usually an awkward operation which is fraught with the potential for costly errors.

(d) DESCRIPTION OF THE INVENTION

It is an object of a first aspect of the present invention to address the difficulties above described and to provide a tool which is simple, lightweight and portable.

An object of a second aspect of the present invention is to provide such a tool which is easy to use and is self contained.

In addition, it is an object of a third aspect of this invention to provide such a tool, as well as a method, which includes features for accurately locating the holes to be made.

It is also an object of a fourth aspect of this invention to provide a method and device which may be efficiently used to make a large range of hole sizes in a variety of pipe outside diameters and assist accurate hole cuts.

By one broad aspect of this invention, an improved portable tool is provided for assisting the use of a hole-saw for making a hole in only a first side of a hollow installed pipe. The tool includes, in combination, hollow-cylindrical hole-saw guide, having an axis, for guiding the hole-saw while the hole-saw is making a hole in only the first side of the hollow installed pipe, the tool being constructed and arranged to maintain user-selected relative positions between the hollow installed pipe and the hole-saw means while the hole-saw means is making the hole in only the first side of the hollow installed pipe. A first fixed clamp-head is provided for positioning the hollow-cylindrical hole-saw guide adjacent to the first side of the hollow installed pipe. A second movable and swivelable clamp-head is provided for holding a second side, opposed to the first side, of the hollow installed pipe in such manner as to have the centre line of the hollow installed pipe intersect the axis of the hollow cylindrical hole-saw guide, the second movable and swivelable clamp-head comprising a V-shaped member solid which is closed along the axis of the hollow cylindrical hole-saw guide means. A grip is provided for adjusting and positioning the first and second clamp-head into a user-selected clamping position about the hollow installed pipe.

By a first variant of this first broad aspect of this invention, the grip includes an adjustable C-clamp jaw clamp having a fixed jaw end and a movable jaw end, in which the first clamp-head is rigidly attached to the fixed jaw end and the second clamp-head is swivelably attached to the movable jaw end.

By a second variant of this first broad aspect of this invention, and/or the above variant thereof, the first and second clamp-heads each comprise a V-shaped holding members for clamping a hollow installed pipe in a user-selected clamping position. By a first variation thereof, the V-shaped holding member of the first clamp-head means comprises a smooth surface. By a second variation thereof, the V-shaped holding member of the second clamp-head means comprises a toothed surface.

By a third variant of this first broad aspect of this invention, and/or the above variants thereof, the first clamp-head comprises a first levelling member for visual measurement for levelling the first clamp-head.

By a fourth variant of this first broad aspect of this invention, and/or the above variants thereof, the first clamp-head comprises second levelling means which are perpendicular to the first levelling member for visual measurement for levelling the first clamp-head. By a first variation thereof, the first and second levelling members have a white background for improved visual measurement. By a second variation thereof, the first clamp-head comprises a centre-mark for assisting in locating a longitudinal position along a hollow installed pipe at which to locate the tool to make a hole in only the first side of the hollow installed pipe.

According to one preferred embodiment of the present invention, an improved portable tool is provided for assisting the use of rotary means to make a hole in an installed pipe. The portable tool includes a hollow-cylindrical guide for guiding such rotary means while such rotary means is making a such hole in a such pipe. The tool is constructed and arranged to maintain user-selected relative positions between such pipe and such rotary means while such rotary means is making a such hole in a such pipe. In such tool, such rotary means comprises hole-saw means. In addition, such tool further includes a first clamp-head , a second clamp-head and grip means for adjusting and positioning such first and second clamp-heads into a user-selected clamping position about such pipe. Such first clamp-head on such tool comprises a bushing for guiding such rotary means while such

rotary means is making such hole in such pipe. Furthermore, such first clamp-head means comprises attachment means for removably securing such bushing.

In accordance with a second embodiment thereof, such an improved portable tool includes grip means which comprises an adjustable locking C-clamp jaw clamp having a fixed jaw end and a movable jaw end. Such first clamp-head is rigidly attached to such fixed jaw end, and such second clamp-head is swivelably attached to such movable jaw end. Such first and second clamp-heads each preferably comprise V-shaped holding means for clamping such pipe in such user-selected clamping position. Further such V-shaped holding means of such first clamp-head comprises a smooth surface, and, further, such V-shaped holding means of such second clamp-head means comprises a toothed surface.

Even further, in such an improved portable tool, such first clamp-head comprises first levelling means for visual measurement for levelling such first clamp-head means, and, further such first clamp-head comprises second levelling means perpendicular to such first levelling means for visual measurement for levelling such first clamp-head means. Further, such first and second levelling means have a white background for improved such visual measurement. Further, such first clamp-head means comprises centre-mark means for assisting in locating a longitudinal position along such pipe at which to locate such tool to make such hole.

According to a third preferred embodiment of this aspect of the present invention, an adjustable, locking C-clamp jaw clamp device is provided for assisting the use of rotary means to make a hole in an installed pipe, such C-clamp jaw clamp comprises, in combination, a portable clamp having a fixed jaw end and a movable jaw end with a first clamp-head rigidly attached to such fixed jaw end, a second clamp-head swivelably attached to such movable jaw end. Such first clamp-head is constructed and arranged for removably receiving a hole-saw-guide bushing. Grip means are provided for adjusting and positioning such first and second clamp-heads into a user-selected clamping position. In such a device, such fixed jaw end is directionally longitudinally situated with respect to such grip means and such movable jaw end is directionally transversely situated with respect to such grip means. In such a device, such first and second clamp-heads each comprise V-shaped holding means, such V-shaped holding means of such first clamp-head

comprising a smooth surface and such V-shaped holding means of such second clamp-head comprising a toothed surface.

By a second aspect of this invention, a method is provided for making a hole in only a first side of a hollow installed pipe. The method includes the step of securely positioning a hole-saw guide cylinder adjacent to the first side of the hollow installed pipe in a user-selected position. Such step of securely positioning comprise the steps of securely clamping the pipe in the user-selected position with a portable clamp, the portable clamp comprising a rigid frame for holding the hole-saw guide cylinder, and removably securing the hole-saw guide cylinder in the rigid frame. The next step involves using the hole-saw guide cylinder to guide a hole-saw which is sized to fit the hole-saw guide cylinder in such manner as to saw the hole in only a first side of the hollow installed pipe. The third step involves using a position-information member on the portable clamp for positioning the portable clamp on the hollow installed pipe to make a horizontal hole in only a first side of the hollow installed pipe at the user-selected position.

By a third aspect of this invention, a method is provided for making a hole in only a first side of a hollow installed pipe. The method includes the step of securely positioning a hole-saw guide cylinder adjacent to the first side of the hollow installed pipe in a user-selected position. That step of securely positioning comprises the steps of securely clamping the pipe in the user-selected position with a portable clamp, the portable clamp comprising a rigid frame for holding the hole-saw guide cylinder, and removably securing the hole-saw guide cylinder in the rigid frame. The next step involves using the hole-saw guide cylinder to guide a hole-saw which is sized to fit the hole-saw guide cylinder in such manner as to saw the hole in only a first side of the hollow installed pipe. The third step involves using a position-information member on the portable clamp means for positioning the portable clamp on the hollow installed pipe to make a vertical hole in only a first side of the hollow installed pipe at the user-selected position.

According to a first preferred embodiment of this aspect of the invention, a method is provided for making a hole in an installed pipe. The method includes the first step of securely positioning a hole-saw guide cylinder adjacent such pipe in a user-selected position. Such hole-saw guide cylinder is then used to guide a hole-saw sized to fit such hole-saw guide cylinder, sawing such hole in such pipe. Such step of securely positioning

comprises the steps of securely clamping such pipe in such user-selected position with portable clamp means, such portable clamp means comprising a rigid frame for holding such hole-saw guide cylinder, and removably securing such hole-saw guide cylinder in such rigid frame. The next step comprises, using position-information means on such portable clamp means, the step of positioning such portable clamp means on such pipe to make a horizontal such hole in such pipe at such user-selected position. The final step comprises, using position-information means on such portable clamp means, for positioning such portable clamp means on such pipe to make a vertical such hole in such pipe at such user-selected position.

(e) DESCRIPTION OF THE FIGURES

In the accompanying drawings:

FIG. 1 is a perspective view of a preferred embodiment of the hole saw guide clamp system of an aspect of the present invention, shown in position for use in making a hole in the sidewall of a round pipe.

FIG. 2 is a side view of the preferred embodiment of the hole saw guide clamp shown in FIG. 1, shown clamp.

FIG. 3 is a partial side view of the illustrated saw guide clamp, shown clamped.

FIG. 4 is a partial exploded perspective view of the illustrated hole saw guide clamp.

FIG. 5 is a cross-sectional view of the illustrated hole saw guide clamp, in use with a hole saw.

FIG. 6 is a top view of the illustrated hole saw guide clamp.

FIG. 7 is a partial front view of a clamp-head and bushing means of the illustrated hole saw guide clamp.

FIG. 8 is a partial perspective view of the clamp-head of FIG. 7 illustrating a levelling means of an embodiment of an aspect of the present invention.

FIGS. 9 through 14 illustrate in perspective view a preferred embodiment of the method of an aspect of this invention of use of the illustrated hole saw guide clamp according to the system of an aspect of this invention.

(f) ONE MODE FOR CARRYING OUT THE INVENTION

Illustrated in FIG. 1, and shown in perspective view, according to a preferred embodiment of an aspect of this invention, is portable tool 20 of one embodiment of the present invention, used to assist in making a hole in the wall (usually a side wall or top wall) of an installed pipe 21 (or round tubing) with rotary means, preferably a hole saw means embodied by hole saw 22. The installed pipe 21 to be drilled/sawed as shown may be metal, e.g., steel or copper, or of plastic material, and may be piping used for various purposes, e.g., supplying water for fire prevention systems. Of course, the installed pipe 21 may be used for other purposes, e.g., supplying other liquids or air. The need for the use of the portable tool 20 universally occurs when a round hole is needed in the wall of an installed pipe 21. This occurs when a side branch or fitting must be installed on the wall of the pipe. The resulting hole would then be used (in well-known ways) for welding on a branch pipe, a common branch weld fitting, or a gasketed clamp-on branch fitting.

The portable tool 20 is used primarily in conjunction with a conventional hole saw 22 but may also be used with a conventional drill bit. Preferably, the portable tool 20 may be used when the diameter of the required hole would be large enough to desire the use of a hole saw 22. The primary working part of the portable tool 20 is the guiding clamp-head embodied by guiding clamp-head 23, which is designed to accept a bushing embodied by bushing 24, which positions and guides the hole saw 22 while the hole is being cut. Since a variety of hole diameters may be needed, the guiding clamp-head 23 accepts a bushing 24 which may incorporate an inside diameter of various sizes to guide a hole saw 22 with a variety of diameters. Therefore, the portable tool 20 might be supplied for use along with a variety of sizes of bushings 24 (all designed to fit within clamp-head 23) for use with a variety of sizes of hole saws. The hole saw 22 of the desired size used in conjunction with the bushing 24 of matched size will normally be powered with a rotary drill 25 to produce the desired hole.

The guiding clamp-head 23 contains a pair of levelling means, embodied by a horizontal level 26 and a vertical level 27. It contains a centre mark embodied by centre mark 28 to facilitate locating the guiding clamp-head 23 to the installed pipe 21 as will be discussed in detail later. The guiding clamp-head 23 is rigidly attached to a grip means embodied by an adjustable locking C-clamp jaw clamp grip 29 which is of the one piece,

adjustable, locking C-clamp variety. The clamp grip 29 is conveniently operable with one hand and is preferably a means of the type popularly identified with the trade-mark VICE-GRIP$_{TM}$.

Attached non-rigidly, in a swivelling-locating manner to the movable (rear, as shown) jaw 30 of the clamp grip 29 is the swivelable clamp-head 31. When clamped to the installed pipe 21, the guiding clamp-head 23 is held firmly by the opposing swivelable clamp-head 31 and may then be used to position and guide the hole saw 22 while it is powered with the drill 25 to make the desired hole in the installed pipe 21. The clamp grip 29 is adjustable to allow the guiding clamp-head 23 and the swivelable clamp-head 31 firmly to grip a varying range of pipe diameters.

Shown in the side view of FIG. 2 is the portable tool 20 which is clamped to installed pipe 21 and which is positioned to assist in making a hole represented with centre line A in a horizontal plane. This orientation may be accurately established by using the horizontal level 26 as a guide when c lamping the portable tool 20 to the installed pipe 21. With the guiding clamp-head 23 rigidly attached to the fixed jaw 32 of clamp grip 29, it is convenient to position the guiding clamp-head 23 against the installed pipe 21 as desired. The V-shaped holding means, embodied by holding surface 33 of guiding clamp-head 23 is V-shaped to position the centre line A in the same plane as the centre line of installed pipe 21. The adjuster 34 of clamp grip 29 is used (in well-known ways) to adjust the desired clamping action and grip force against installed pipe 21. While the movable jaw 30 of tool 20 pivots in an arc B around pivot point 35 of fixed jaw 32, the swivelable clamp-head 31 contact installed pipe 21 in a location varying with differing installed diameters of pipe 21. The swivel connection 36 self-adjusts (in well-known ways) to position the holding surface 37 (which is also V-shaped) of the swivelable clamp-head 31 into uniform contact with installed pipe 21.

Further to assure a secure grip of the portable tool 20 on installed pipe 21, holding surface 37 incorporates teeth 38 which are positioned parallel to the installed pipe 21 providing a non-slip interface. It is noted that teeth for gripping are not incorporated on holding surface 33 of guiding clamp-head 23 in order to prevent any marring of the outer surface of the installed pipe 21 in the area surrounding the area where the hole is to be

drilled. A smooth surface is required at this location for some styles of gasketed clamp fittings that may be installed on the installed pipe 21.

The portable tool 20 may also be accurately and easily positioned on installed pipe 21 for drilling a vertical hole with centre line C by utilizing vertical level 27 as illustrated in FIG. 3. The horizontal level 26 and vertical level 27 are of the bubble variety using a liquid-filled cylindrical glass tube. The glass tubes 39 are contained within cavities 40 of the guiding clamp-head 23 as prevention against damage. Details are shown in FIGS. 4 and 8.

FIG. 4 illustrates in an exploded view the various components of the portable tool 20. The fixed jaw 32 portion of clamp grip 29 includes an integral attachment plate 41 with holes 42 for securing to guiding clamp-head 23 at threaded holes 43 with bolts 44 (only 1 of 4 being shown). The end of the movable jaw 30 of clamp grip 29 contains hole 45 for swivel attachment with pin 46 to the tangs 47 of swivelable clamp-head 31. The pin 46 is clearance-fitted to hole 45 and press-fitted to tangs 47 at holes 48. The holding surface 37 of swivelable clamp-head 31 is V-shaped and incorporates teeth 38. The guiding clamp-head 23 contains a round bore 49 which is concentric with hole centre line A. The round bore 49 incorporates a step 50 of smaller diameter to establish the depth to which bushing 24 may be inserted. Bushing 24 has an outside diameter which is mated to the round bore 49 with a slip fit. Bushing 24 is secured within guiding clamp-head 23 with set screw 51 tightening against slot 52, thus providing a hollow-cylindrical guide means. Shown are cavities 40 into which glass tubes 39 of horizontal level 26 and vertical level 27 are installed. The V shape of holding surface 33 is centred on the round bore 49 centre line thus positioning the hole A centre line on the same plane as the centre line of the pipe. The inside diameter of bushing 24 is sized for a slip fit to the outer diameter of hole saw 22. As mentioned, bushing 24 and hole saw 22 may be furnished in a variety of diameters to meet the requirements of the hole to be drilled.

Hole saw 22 is a common and conventional type but may be used without the normal pilot drill bit, shown along centre line A with phantom lines in FIG. 5. Guiding of the hole saw 22 into the hole 53 being cut of installed pipe 21 by bushing 24 is more precise than conventional guiding using the normal pilot drill bit. In addition to holding the hole saw 22 on the intended hole A centre line, the bushing 24 provides guidance to the direction or

angle of cut. This is much more accurate to an action of a hole saw which is guided by a pilot drill bit alone. Shown also in FIG. 5 is the centre positioning of guiding clamp-head 23 to installed pipe 21 by the holding surface 33 being of V shape which in turn positions the hole 22 directed towards the installed pipe 21 centre line. Also shown is the secure clamping to the installed pipe 21 through the self-aligning action of the movable jaw 30 and swivelable clamp-head 31 with its holding surface being V-shaped. In addition to the clamp-heads 23 and 31 being able to be clamped tightly to installed pipe 21, the teeth 38 of swivelable clamp-head 31 prevents the tool 20 from rotating around the installed pipe 21.

In FIG. 6 are shown the components of the portable tool 20 from the top view. The guiding clamp-head 23 with the horizontal level 26 is shown. Centre mark 28 is located on centre line A. In dotted lines is the round bore 49 for receiving the bushing 24 and the step 50 for positioning the insertion depth of bushing 24. Shown also is the swivel connection 36 of the movable jaw 30 of clamp grip 29 to the tangs 47 of swivelable clamp-head 31.

A front view (FIG. 7) of the guiding clamp-head 23 shows the location of set screw 51 in a threaded hole of the guiding clamp-head 23 and securing the bushing 24 in place in the round bore 49. The slot 52 of bushing 24 is the point against which set screw 51 tightens. Also shown is step 50 of round bore 49.

A detail of level typical of the horizontal level 26 and vertical level 27 is shown in FIG. 8. The liquid-filled glass tube 39 is inserted into a round cavity 40 of guiding clamp-head 23 either parallel or perpendicular to the hole centre line A, to a depth centred under machined recess 54. The level is preferably a conventional bubble level containing an air bubble in the liquid and is registered between circular lines on the glass tube (in well-known ways). Because the level is at some depth within the guiding clamp-head 23 shadows and there is frequently lack of lighting against the dark background of this clamp-head, reading the location of the air bubble is difficult. Therefore it is preferred that the cavity 40 (or the glass tube 39 on its inward surface) be painted with white paint (or an equivalent) prior to assembly. This white background enhances the reading of the level. The glass tube 39 is retained within the cavity 40 of the guiding clamp-head 23 by potting or other conventional method.

The preferred method of use, according to an aspect of this invention of the preferred system of an aspect of the invention for using portable tool 20 in producing a hole 55

installed pipe 21 is illustrated in sequence in FIGS. 9 through 14. In FIG. 9 the portable tool 20 is positioned and adjusted for diameter of the installed pipe 21 with adjuster 34. The method of adjusting and clamping is well-known and is the same as with other commonly-used locking C-clamps. Prior to firmly clamping the portable tool 20 to installed pipe 21, portable tool 20 is positioned and located for desired placement of the hole that is to be cut. As shown in FIG. 10, the centre mark 28, being on the centre line A of the hole to be cut, may be used as a convenient measuring point with a measuring device 56 to position the portable tool 20 a desired distance from a wall 57 (or from other pipe connections or related features). Additionally, the included levels, in this case the horizontal level 26, may be used correctly to position the portable tool 20. After positioning, the portable tool 20 may be secured to the installed pipe 21 by squeezing the clamp grip 29, to the position shown in FIGS. 10 and 11.

Also, after determining the diameter of the hole to be cut into the installed pipe 21, the appropriate hole saw 22 and a mating bushing 24 are selected. The bushing 24 is inserted into the round bore 49 of the guiding clamp-head 23 and is secured in place with set screw 51 and is tightened with a suitable wrench 58 (see FIG. 11).

As shown in FIG. 12, the selected hole saw 22, being chucked into drill 25, is inserted into bushing 24 and the hole then is cut through the wall of installed pipe 21 by advancing the hole saw 22 as it is guided by the bushing 24. After withdrawing the hole saw 22 and the slug from the hole cut, and after unclamping and removing the portable otol 20 from the installed pipe 21, t he hole 55 is completed and is ready for its intended usage.

In FIG. 13 is shown a style of bolt-on clamp port 59 which uses a gasket 60 to provide sealing around the hole 55 in the installed pipe 21. To provide a leakproof seal, the pipe surface (as mentioned hereinbefore) should remain unmarred, as is provided using the portable tool 20.

FIG. 14 shows a typical clamp port 59 which is sealed with a gasket 60 which is installed on installed pipe 21 over hole 55 and with its interconnecting piping typically installed.

CLAIMS

1. An improved portable tool, for assisting the use of hole-saw means for making a hole in only a first side of a hollow installed pipe, comprising, in combination:

a. hollow-cylindrical hole-saw guide means, having an axis, for guiding said hole-saw means while said hole-saw means is making said hole in only said first side of said hollow installed pipe, said tool being constructed and arranged to maintain user-selected relative positions between said hollow installed pipe and said hole-saw means while said hole-saw means is making said hole in only said first side of said hollow installed pipe;

b) first fixed clamp-head means for positioning said hollow-cylindrical hole-saw guide means adjacent to said first side of said hollow installed pipe;

c) second movable and swivelable clamp-head means for holding a second side, which is opposed to said first side, of said hollow installed pipe in such manner as to have the centre line of said hollow installed pipe intersect said axis of said hollow cylindrical hole-saw guide means, said second movable and swivelable clamp-head means comprising a V-shaped member solid which is closed along said axis of said hollow cylindrical hole-saw guide means; and

d) grip means for adjusting and positioning said first and second clamp-head means into a user-selected clamping position about said hollow installed pipe.

2. An improved portable tool according to claim 1, wherein said grip means comprises:

a) an adjustable C-clamp jaw clamp having a fixed jaw end and a movable jaw end;

b) said first clamp-head means being rigidly attached to said fixed jaw end and said second clamp-head means being swivelably attached to said movable jaw end.

3. An improved portable tool according to claim 1 or claim 2, wherein said first clamp head means and said second clamp-head means each comprise V-shaped holding means for clamping said hollow installed pipe in said user-selected clamping position.

4. An improved portable tool according to claim 3, wherein said V-shaped holding means of said first clamp-head means comprises a smooth surface.

5. An improved portable tool according to claim 3 or claim 4, wherein said V-shaped holding means of said second clamp-head means comprises a toothed surface.

6. An improved portable tool according to claims 1 to 5, wherein said first clamp-head means comprises a first levelling means for visual measurement for levelling said first clamp-head means.

7. An improved portable tool according to claims 1 to 6, wherein said first clamp-head means comprises second levelling means which are perpendicular to said first levelling means for visual measurement for levelling said first clamp-head means.

8. An improved portable tool according to claim 7, wherein said first levelling means and said second levelling means have a white background for improved visual measurement.

9. An improved portable tool according to claim 8, wherein said first clamp-head means comprises centre mark means for assisting in locating a longitudinal position along said hollow installed pipe at which to locate said tool to make said hole in only said first side of said hollow installed pipe.

10. A method for making a hole in only a first side of a hollow installed pipe, comprising the steps of:

a) securely positioning a hole-saw guide cylinder adjacent to said first side of said hollow installed pipe in a user-selected position, wherein said step of securely positioning comprise the steps of:

i) securely clamping said pipe in said user-selected position with portable clamp means, said portable clamp means comprising a rigid frame for holding said hole-saw guide cylinder; and

ii) removably securing said hole-saw guide cylinder in said rigid frame;

b) using said hole-saw guide cylinder to guide a hole-saw which is sized to fit said hole-saw guide cylinder in such manner as to saw said hole in only a first side of said hollow installed pipe; and

c) using position-information means on said portable clamp means, positioning said portable clamp means on said hollow installed pipe to make a horizontal said hole in only a first side of said hollow installed pipe at said user-selected position.

11. A method for making a hole in only a first side of a hollow installed pipe, comprising the steps of:

a) securely positioning a hole-saw guide cylinder adjacent to said first side of said hollow installed pipe in a user-selected position, wherein said step of securely positioning comprises the steps of:

i) securely clamping said pipe in said user-selected position with portable clamp means, said portable clamp means comprising a rigid frame for holding said hole-saw guide cylinder; and

ii) removably securing said hole-saw guide cylinder in said rigid frame;

b) using said hole-saw guide cylinder to guide a hole-saw which is sized to fit said hole-saw guide cylinder in such manner as to saw said hole in only a first side of said hollow installed pipe; and

c) using position-information means on said portable clamp means, positioning said portable clamp means on said hollow installed pipe to make a vertical said hole in only a first side of said hollow installed pipe at said user-selected position.

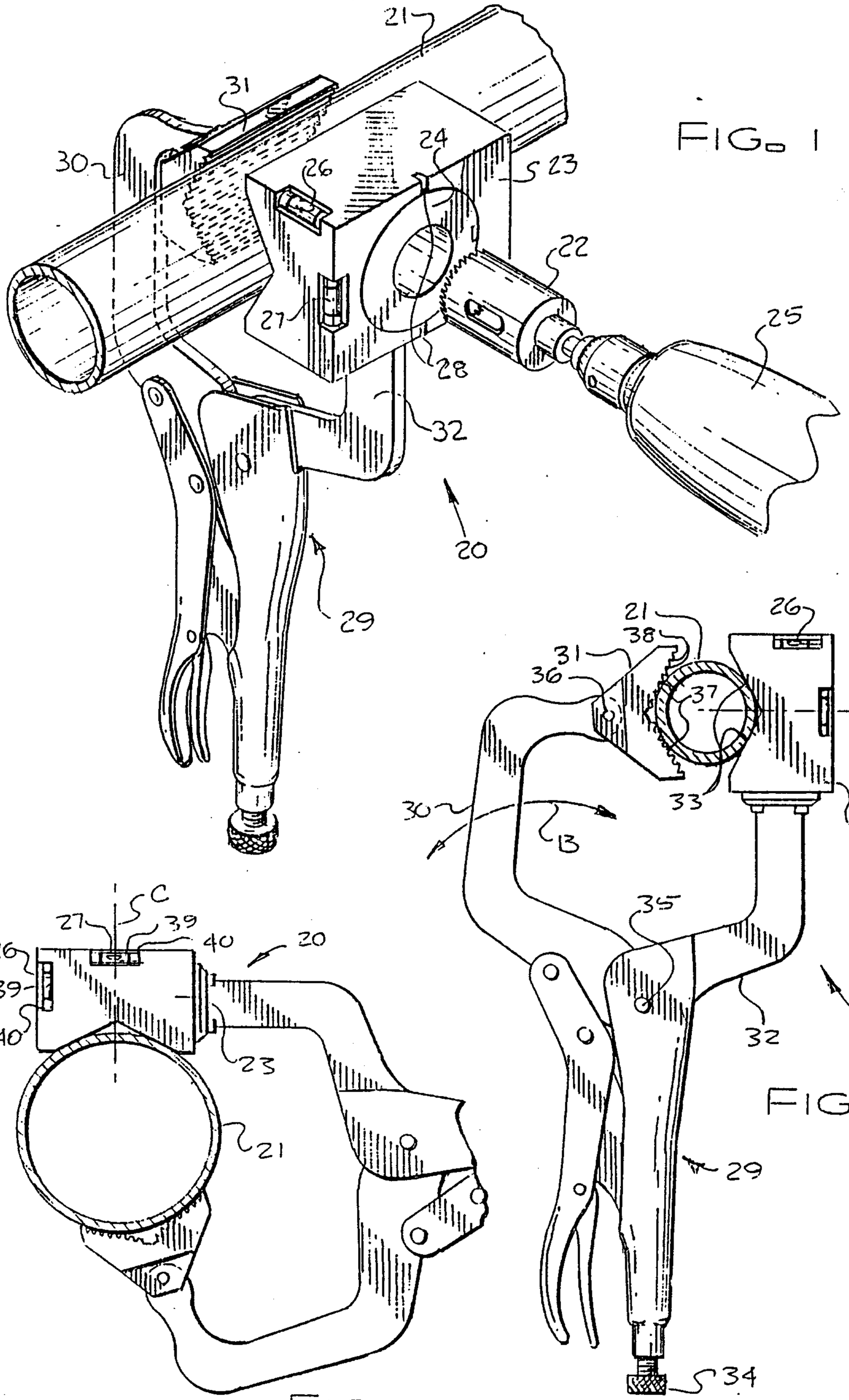


FIG. 1

FIG. 2

FIG. 3

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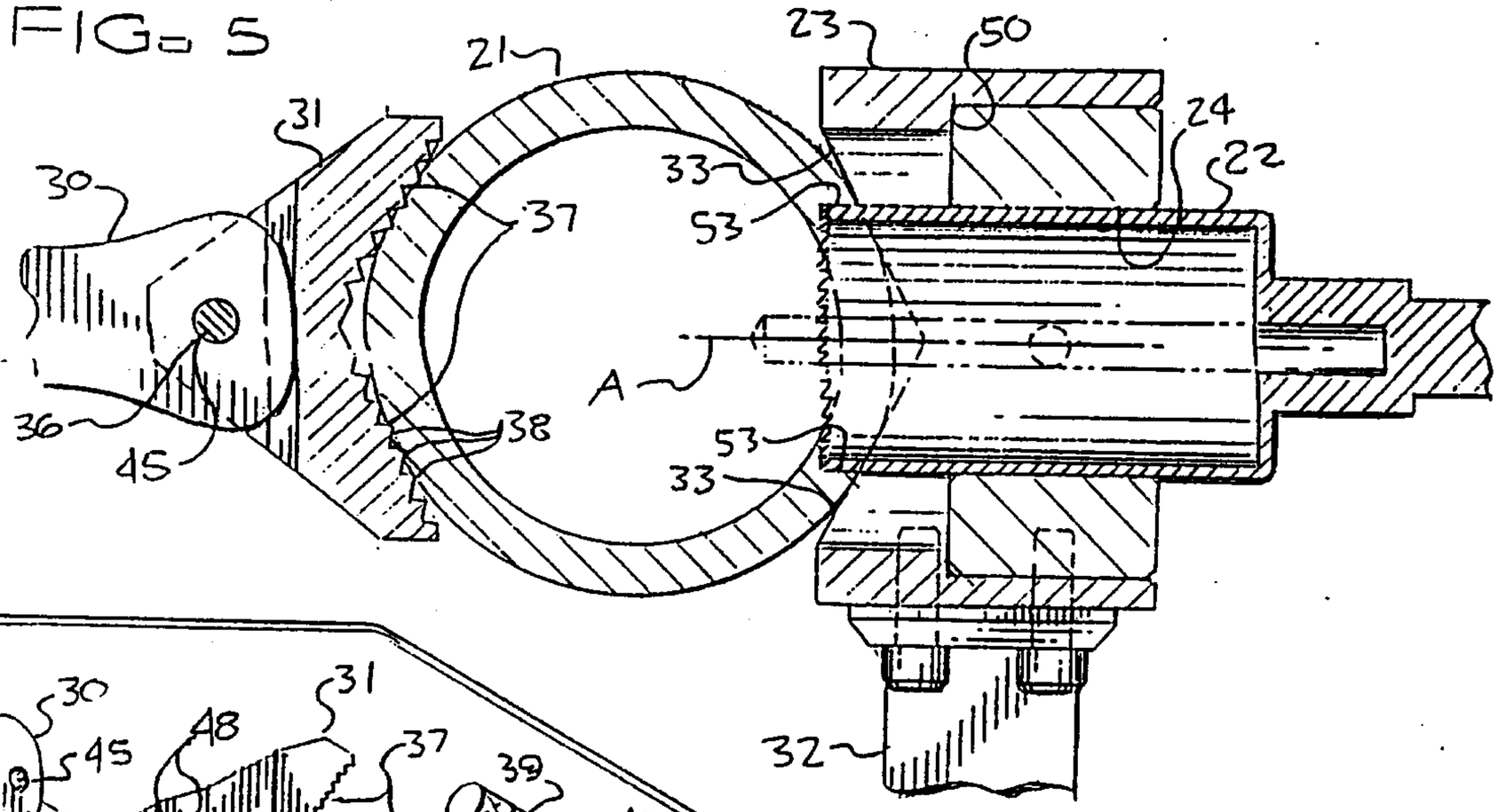
FIG. 5



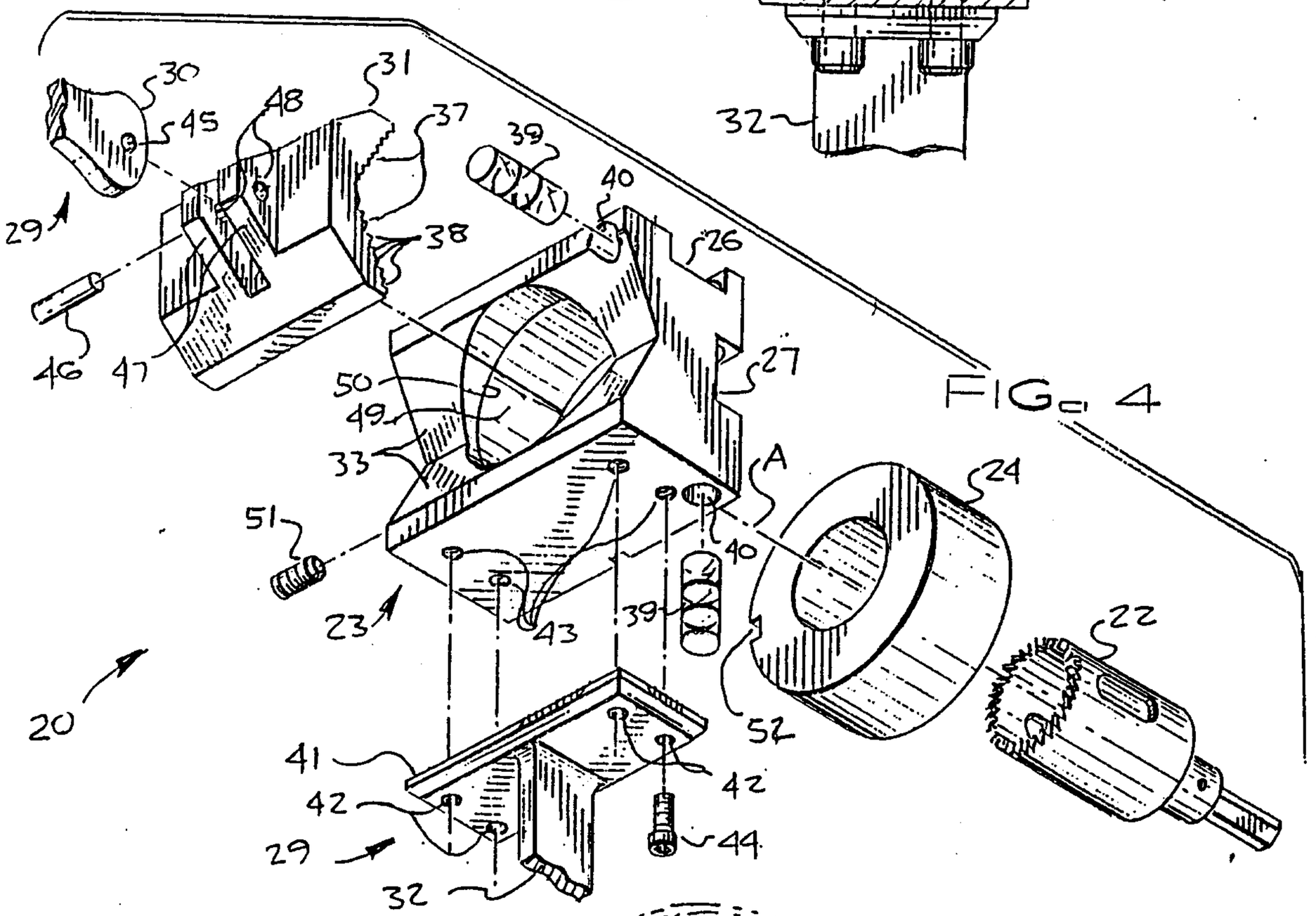


FIG. 4

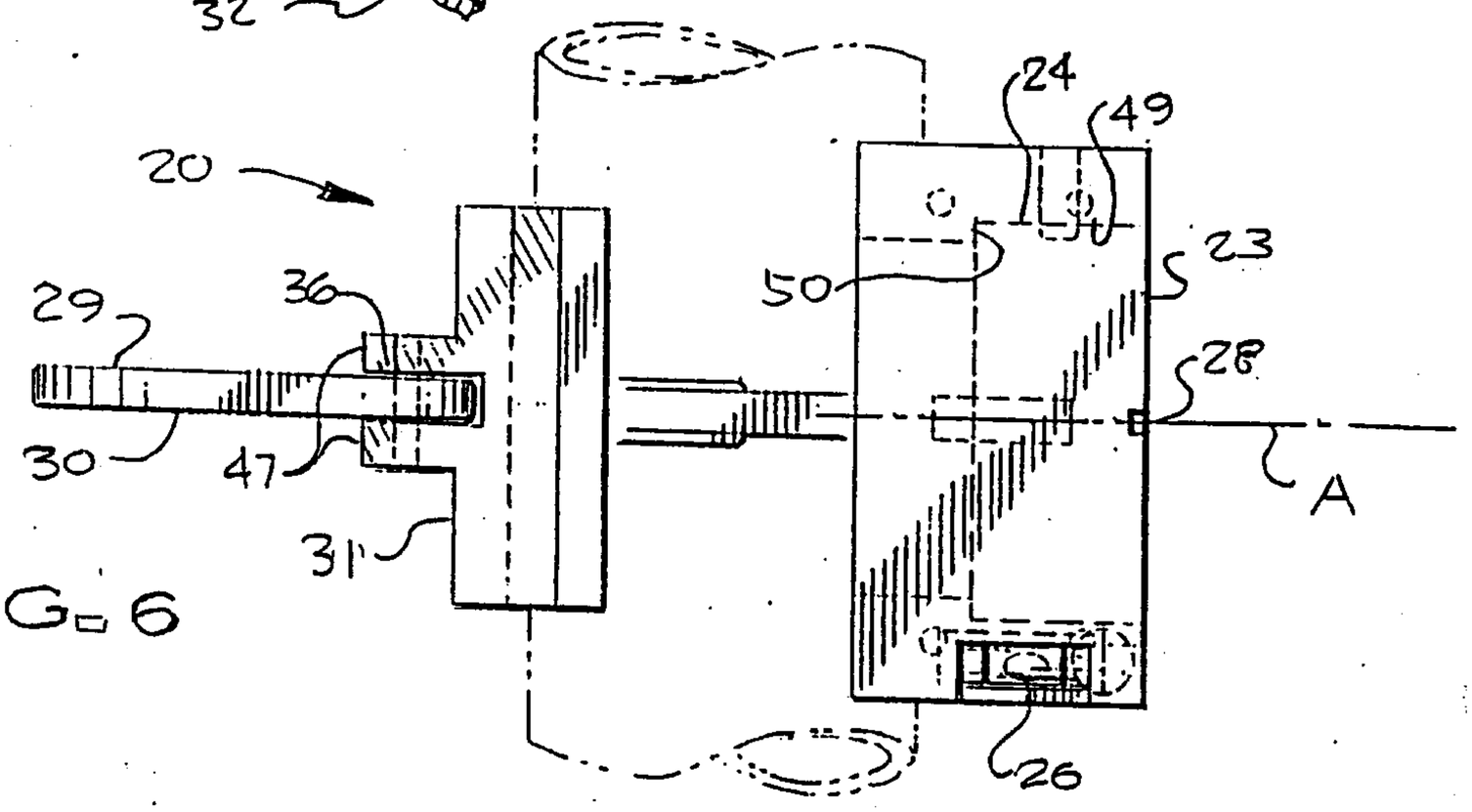


FIG. 6

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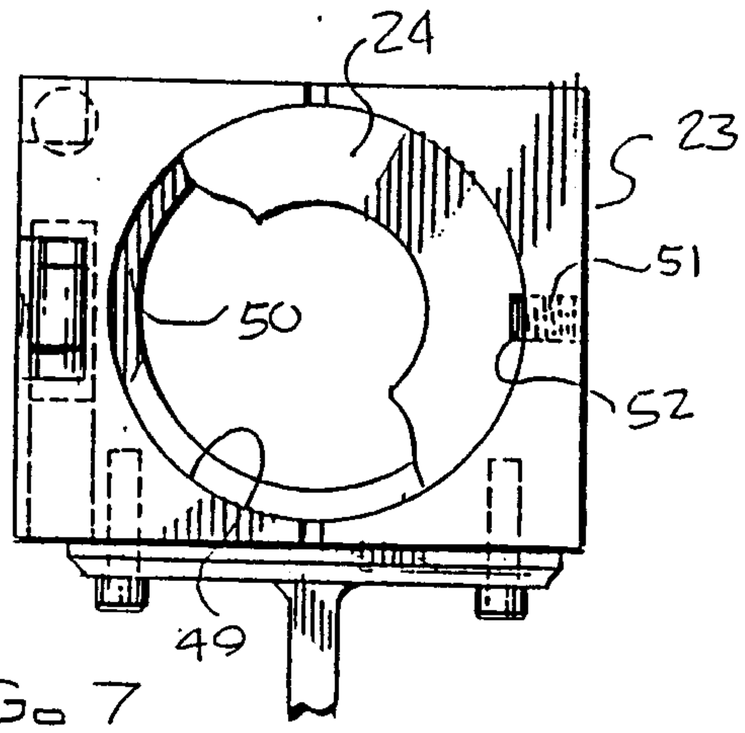


FIG. 7

FIG. 8.

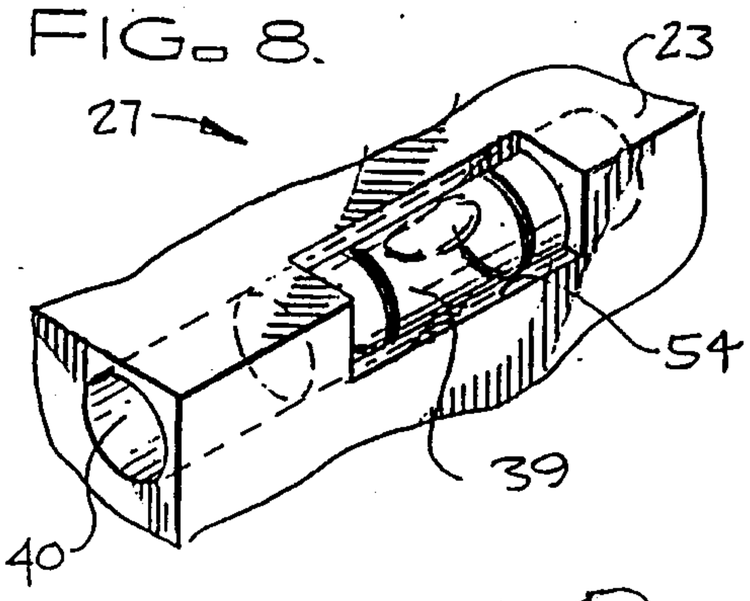


FIG. 10

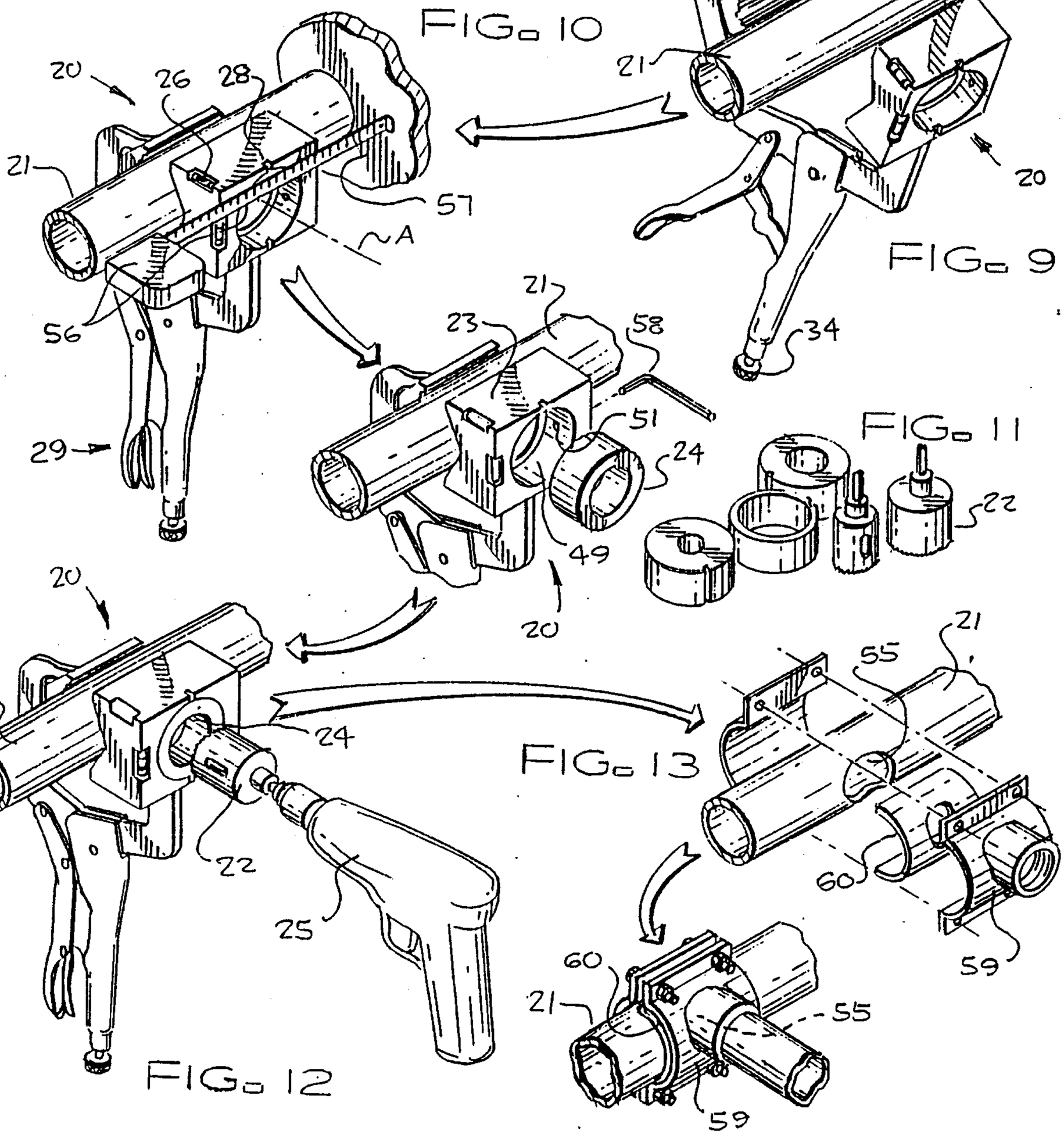


FIG. 9

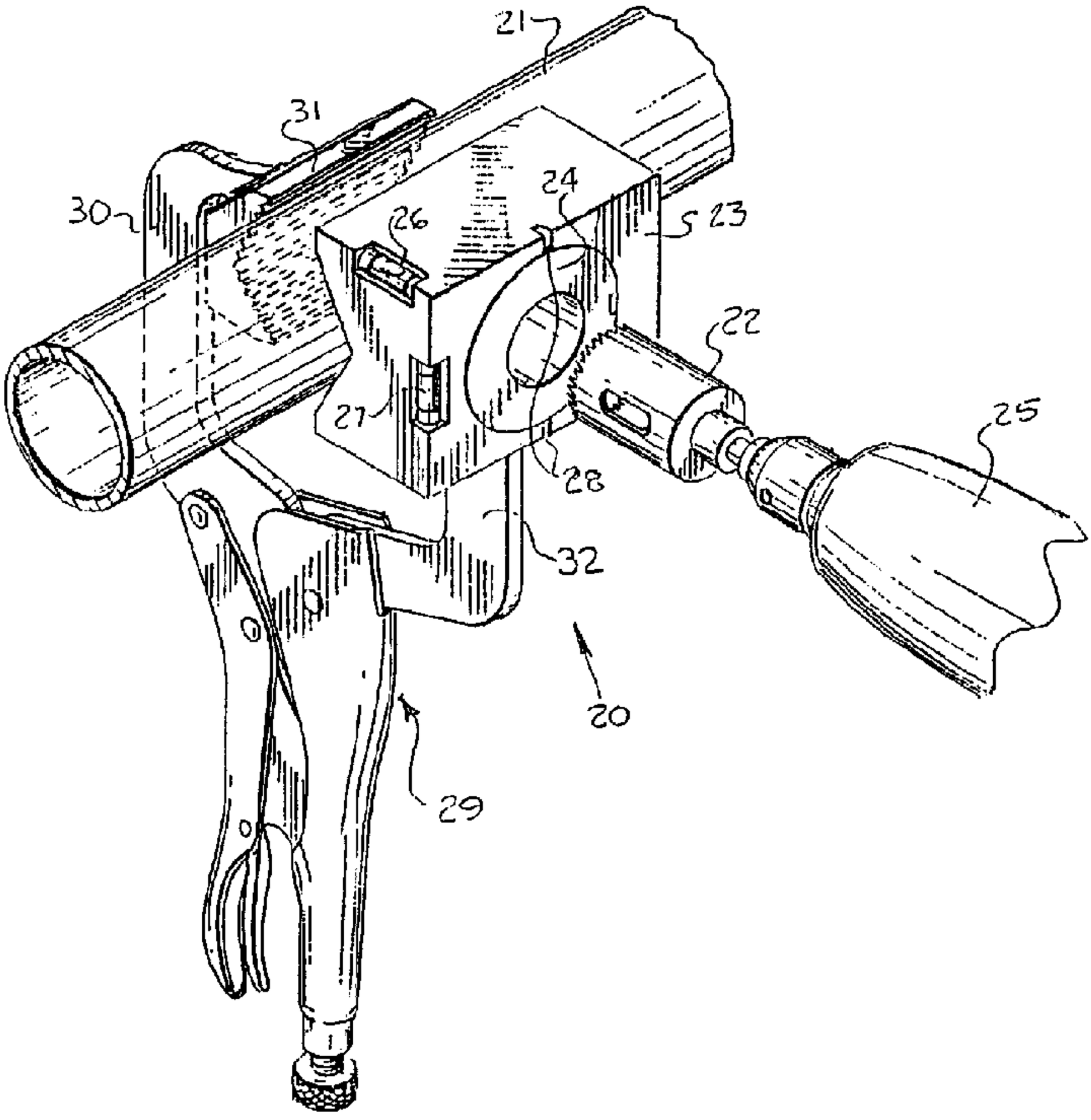
FIG. 11

FIG. 12

FIG. 13

FIG. 14

Marcus + Associates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