SERVICE TEE CUTTING APPARATUS AND ABANDONMENT METHOD

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ABSTRACT

An apparatus for mounting a cutting tool or grinding tool in substantially perpendicular orientation with a pipe is provided. The apparatus comprises a support arm with a clamp for engaging the pipe; a pivot means on the support arm; and a tool mounting arm with a tool mount means for engaging the pivot. The clamp is positioned to grip the pipe, with the pivot means extending generally parallel to the pipe; the tool mounting arm is engaged with the support arm; then the cutting or grinding tool is mounted on the tool arm. A tool so mounted may then be swivelled in a generally arcuate path towards and away from the pipe to be cut in a plane generally perpendicular to the orientation of the pipe. A method for severing a service tee with the mounting apparatus is also provided.
FIG. 4a.

FIG. 4b.
SERVICE TEE CUTTING APPARATUS AND ABANDONMENT METHOD

FIELD OF THE INVENTION

[0001] This invention generally relates to pipe tools and maintenance, and in particular to a method and apparatus for service tee abandonment.

BACKGROUND OF THE INVENTION

[0002] Natural gas is distributed to commercial and residential buildings using underground gas mains which are connected and tapped to smaller service lines.

[0003] Typically, the service lines that provide gas to individual industrial and residential customers are connected to the gas main by service tees. A service tee comprises a generally cylindrical body with a threaded exterior surface, two open ends, and a service outlet provided in the body between the two ends. One end of the service tee is welded to the gas service main in more or less perpendicular orientation to the main; the service line, which may be formed of metal or plastic piping, is joined at the service outlet; the remaining end is used to enable access to the service main.

[0004] For example, when a half-inch service tee is connected to a steel main, the main body is welded to the main, and a cutter is turned down through the main body of the tee until it impinges the service main. The cutter is turned until it cuts a coupon out of the service main wall, then is retracted through the main body to allow gas to flow into the tee and out through the tee service outlet. The cutter remains in the tee body and access to it is capped. When the tee is to be abandoned, the gas technician blocks the opening in the main wall using the internal cutter, and purges and removes the service connection leading from the service tee to the service site. The tee may then be severed below the service outlet, and a cap welded over the tee opening to permanently seal the tee. The steps of severing the tee and welding the cap require a welder.

[0005] This process, because it requires welding, is inefficient. Typically the gas technician qualified to disconnect the gas service is not qualified as a welder; if a welder is not immediately available, then the crew carrying out the service abandonment must wait until a welder is available to cut and weld the service tee so that the technician may complete the abandonment process. It is therefore desirable to provide an apparatus and method for overcoming the foregoing disadvantages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In drawings which illustrate by way of example only a preferred embodiment of the invention,

[0007] FIG. 1 is an exploded perspective view of the mounting apparatus.

[0008] FIG. 2 is a cross-sectional view of a support plate in position at a service tee.

[0009] FIG. 3 is a perspective view of a mounting plate, bearing, and shield of the mounting apparatus of FIG. 1 with a grinder mounted thereon.

[0010] FIG. 4a is a front elevation of a pilot die.

[0011] FIG. 4b is a front elevation of a cap.

DETAILED DESCRIPTION OF THE INVENTION

[0012] In accordance with a preferred embodiment, a mounting apparatus is provided for mounting a grinder or cutter in relation to a pipe to be ground or cut.

[0013] The mounting apparatus 10 is shown in exploded view in FIG. 1. Preferably, the components of the mounting apparatus 10 herein are manufactured from suitable metals and finished in any appropriate method; for example, some components such as the support plate 20, described below, may be machined from aluminum and anodized; other components may be formed from bronze or steel. The following description describes suitable materials for manufacturing the components of the assembly, but those skilled in the art will appreciate that substitute materials of suitable hardness, finish, and density may be selected according to the component's function.

[0014] Referring to FIG. 1, a support 20 is provided. The support 20 is generally elongated, preferably a generally rectangular plate of anodized aluminum. A cutout 22 may be provided in the support 20 to reduce the weight of the component, provided that the support 20 remains sufficiently rigid to withstand the forces applied to the support 20 in use. At a first end of the support 20, a first clamp member 50 is provided. While the first clamp member 50 may be machined from aluminum, preferably the first clamp member 50 is manufactured from a suitable tool steel. If the first clamp member 50 is manufactured as a separate component, means are provided on the support 20 and the first clamp member 50 for fixing the first clamp member 50 to the support 20; as shown in FIG. 1, preferably a plurality of screw bosses 54, 54' are provided for attaching the two components by means of screws (not shown). The first clamp member 50 may be welded to the support 20. Alternatively, the first clamp member 50 may be formed integrally with the support 20.

[0015] The first clamp member 50 comprises a first clamp face 52, which cooperates with a second clamp face 62 provided on a second clamp member 60 to accommodate a pipe. Preferably, each of the first clamp face 52 and the second clamp face 62 is shaped to fit a variety of pipe diameters; as shown in FIG. 1, the first and second clamp members 50, 60 may fit a range of diameters by adjusting the distance between the first and second clamp faces 52, 62.

[0016] The second clamp member 60 is preferably manufactured of the same material as the first clamp member 50. In the embodiment shown in FIG. 1, the second clamp member 60 is provided with bores 64 extending from an outer face 66 through the inner face 67, and the first clamp member 50 is provided with corresponding bores 64' at its outer face 57. Bolts may be provided (not shown) to removably and adjustably fasten the second clamp member 60 to the first clamp member 50. The embodiment depicted in the figures is a two-part clamp that is fixed around a service tee by means of bolts inserted on either side of the first and second clamp faces 52, 62; in a further embodiment, other clamp means fixed to the support 20 may be provided, for example a C-clamp type clamp.

[0017] At the distal end of the support 20, a shaft 40 is provided extending substantially perpendicularly from a surface 21 of the support 20. In the preferred embodiment, the shaft is formed of steel and is fixed to the support 20 by
means of bolts (not shown) through corresponding bores 42. These bores 42 are preferably provided in a flange 44 around the base of the shaft 40. Again, in an alternate embodiment, the shaft 40 may be formed integrally with the support 20, or the shaft 40 may be welded to the support 20.

[0018] There is also provided a cap 75. The cap 75 is preferably formed from steel, and is removable from the shaft 40; as can be seen from FIG. 1, the shaft 40 is provided with a threaded bore 46, and the cap 75 is provided with a screw member 77.

[0019] A mounting plate 30 is further provided. The mounting plate 30, like the support 20, is preferably formed of anodized aluminum; although persons skilled in the art will appreciate that alternative materials may be used. The mounting plate 30, like the support 20, is an elongated member and is preferably substantially rectangular. A first end comprises a tool mount 38. The tool mount 38, in the embodiment shown in FIG. 1, is a slightly enlarged portion comprising screw bores 37 and an aperture 35 for removably mounting a grinding or cutting tool 100, shown in FIG. 2. The aperture 35 is preferably circular, although it may be another shape. With reference to FIG. 4, a preferred cutter or grinder 100, such as the Heavy Duty Vertical Grinder Model No. 1410006 sold by Superior Pneumatic & Manufacturing, Inc. of Cleveland, Ohio, is provided with a cutting or grinding disc 104 that is removably mounted on a drive shaft connected to the body 110, and with a handle 112 extending from the body 110, preferably generally perpendicularly to the axis of the drive shaft. The cutter or grinder 100 may be placed on the tool mount 38 such that the drive shaft is generally coaxial or otherwise aligned with the aperture 35. The slight enlargement at the first end of the mounting plate 30, if provided, adds additional support for the grinding or cutting tool 100. The tool mount 38 may be adapted as necessary to accommodate the grinding or cutting tool 100, preferably so that the angle of the grinder or cutter with respect to the mounting plate 30 may be adjusted. The tool mount 38 may even be provided as a separate component from the mounting plate 30, and attached to the mounting plate 30 by suitable means, including screws or welding. The mounting plate 30 further comprises an optional cutout 31 for reducing the weight of the component.

[0020] At the distal end, the mounting plate 30 is provided with a bushing 34 that extends generally perpendicularly from the mounting plate 30. Preferably, the bushing 34 is machined separately and then welded to the mounting plate 30, being inserted in an aperture 36 provided in the mounting plate 30. As shown in FIG. 3, the bushing 34 may also be provided with a flange. This flange and the mounting plate 30 may be provided with corresponding threaded bores, such that the bushing 34 may be bolted to the mounting plate 30 in a manner similar to that described for the shaft 40 and the support 20, above. In an alternative, the bushing 34 may be formed integrally with the mounting plate 30, although it is generally easier to machine the bushing 34 and the mounting plate 30 separately and then fix them together. The bushing 34 is provided with bores 32, 33; bore 32 is sized to accommodate a pin, preferably a metal pin (not shown) and is disposed longitudinally in the bushing 34, while the other bore 33 is disposed radially through the bushing 34. In a preferred embodiment, the mounting plate 30 is further provided with a further threaded bore 80 near the bushing 34, for receiving a height adjustment screw 81 (shown in FIG. 3).

[0021] A bearing 70 is further provided. The bearing 70 is preferably manufactured of bronze, and is sized with an outer diameter D1 to cooperate with the outer diameter D2 of the bushing 34, such that the bearing 70 may be inserted through the bushing 34 and allow the bushing 34 to be supported and rotate on the bearing 70. The inner diameter D3 of the bearing 70 is sized to cooperate with the outer diameter D4 of the shaft 40, such that the shaft 40 may be supported and rotate inside the bearing 70. The bearing 70 is preferably provided with a flange 72 at one end of the bearing 70, the flange 72 generally extended perpendicularly from the surface of the bearing 70. A pin bore 74 is provided in the flange 72, aligned generally longitudinally along the bearing 70.

[0022] A guard 90 is preferably provided. The guard 90 is preferably a generally truncated circular shield 96, formed of aluminum, with an aperture 92 and screw bores 94 generally corresponding to the aperture 35 and the screw bores 37 provided in the tool mount 38. A skirt 95 depends from the shield 96. The shield 90 may therefore be fixed to the tool mount 38 by means of screws through the screw bores 94, 37.

[0023] To assemble and mount to a service tee, reference is also made to FIG. 2 and to FIG. 3. The guard 90 is affixed to the tool mount 38. The shaft 40 is fixed to the support 20, if it is not already affixed.

[0024] The support 20 is preferably placed on a surface, such as a service main 200 adjacent a service tee 300. The first clamp face 52 is placed in contact with the service tee 300, as shown. The alignment of the service outlet 330 and the support 20 is preferably as shown, although the support 20 may be aligned in a different orientation with respect to the service outlet 330 as necessary such that the apparatus 10 and grinder will function as described below. The second clamp face 62 is placed on the other side of the service tee 300, and fastened to the first clamp member 50 using bolts screwed into the bores 64, 64'. Tightening the bolts in this embodiment reduces the area defined by the first and second clamp faces 52, 62, thus gripping the service tee 300. It will be appreciated by those skilled in the art that alternate clamp means may be provided, such as a C-clamp style clamp, provided the clamp secures the support 20 in place on the service tee 300 to generally hold the support 20 in fixed relation to the service tee 300.

[0025] The bearing 70 is placed on the shaft 40. The bushing 34 is then placed on the bearing 70. The mounting plate 30 may thus pivot around the shaft 40; suitable metal lubricants may be applied as necessary to reduce friction between the shaft 40, bearing 70, and bushing 34. Preferably, the cap 75 is mounted on the shaft 40 after assembly to prevent the shaft 40, bearing 70, and bushing 34 from vertically separating when in use. The bushing 34 and the bearing 70 may be oriented such that the pin bores 32, 74 are aligned, and a pin (not shown) may be inserted into the pin bores 32, 74 to temporarily secure the bushing 34 and the bearing 70 in fixed relation with each other. The bushing 34, provided on the mounting plate 30, and the bearing 70 may therefore pivot as a unit on the shaft 40. The grinder or cutter 100 is then mounted on the tool mount 38 on the face opposite the guard 90 such that the drive shaft (not shown) is aligned with the aperture 35. The cutting or grinding disc 104 is mounted on the drive shaft and secured as necessary; the shield 96 generally corresponds in shape with the disc 104, and the shield 96 and skirt 95 protect the operator from
the rotating disc 104 while exposing a portion of the disc edge for use when cutting or grinding. 

[0026] Preferably, the grinder or cutter is of sufficient weight that simply setting the grinder or cutter 100 in the aperture 35 will provide sufficient support. It can be seen that once assembled in this manner, the grinder or cutter 100 may be swiveled away and towards the service tee 300, and preferably the grinder or cutter 100 may be rotated in the tool mount 38. Those skilled in the art will appreciate that the lengths of the support 20 and the mounting plate 30 will be selected to enable the grinder or cutter disc 104 to contact and sever the service tee. The truncated portion of the shield 96 is preferably oriented opposite any power or pneumatic connection provided on the cutter or grinder 100.

[0027] It will be appreciated that the mounting assembly 10 thus effectively provides a jointed arm, secured at one end to the service tee and provided at the other end with a cutting or grinding means for severing the service tee. It will also be appreciated that the mounting assembly 10 maintains the cutting or grinding disc 104 in substantially perpendicular relation to the service tee. The jointed arm of the mounting assembly 10 may thus be used to guide the disc 104 to the service tee; when the disc 104 severs the tee 300, the tee will be cut off at a substantially right angle to its axis. While the service tee 300 is preferably mounted vertically on the service main 200, even if the service tee 300 is connected to the service main 200 at an angle the mounting assembly 10 will enable the grinder or cutter 100 to sever the service tee 300 at a substantially right angle to the axis of the tee.

[0028] The support 20, which preferably rests on the service main 200, may be oriented at an angle from the service main 200, provided the clamping means is sufficiently secure to hold the disc 104 in substantially perpendicular relation to the tee 300.

[0029] In a preferred embodiment, the height of the disc 104 may be adjusted so that the service tee 300 is severed by the grinder or cutter 100 at a desirable height. A preferred height, for example, is immediately below the service outlet 330, as shown in FIG. 2. The height adjustment may be effected by providing a support 20 or a mounting plate 30 of a different thickness, or by providing a spacer (not shown) between the shaft 40 and the bearing 70. In the most preferred embodiment, a height adjustment may be effected by placing a height adjustment screw 81 in the bore 80, as shown in FIG. 3. The end of the screw 81 bears on the bearing flange 72. By tightening the screw 81 (usually by turning it counter-clockwise), the distance between the mounting arm 30 and the bearing flange 72 is increased, thereby raising the mounting plate 30 in relation to the support 20. By turning the screw 81 clockwise, the mounting plate 30 may be lowered.

[0030] Once the service tee 300 is severed, the portion of the tee comprising the service outlet 330 may be discarded. At this point, the top of the tee is preferably cleaned to remove rough edges, and with reference to FIG. 4a, a pilot die 370 is placed on the severed tee and turned down to tap the outer surface of the tee 300. Once the severed tee 300 is tapped, the threads may be cleaned with a wire brush or the like for removing metal shavings, and a cap 380 threaded to fit the threads cut by the pilot die is installed, as shown in FIG. 4b. Preferably a suitable thread sealing compound (pipe dope) is applied to the threads on the tapped tee 300 and the threads in the cap 380 prior to installing the cap.

[0031] Thus, if a service tee 300 previously in use is to be abandoned and removed, it may be disconnected from a service main 200 and severed in accordance with the following procedure:

[0032] First, the gas supply from the main 200 to the service outlet 330 is cut off in a manner known in the prior art. In the case of a self-tapping service tee, likely the service cap 320 would be removed, the cutter 325 would be screwed down into the main body of the tee 330 until it came in contact with the main 200, thereby substantially arresting gas flow through the service outlet 330. The service connection 340 would then preferably be purged to remove any residual gas.

[0033] Next, the mounting apparatus 10 would be assembled and installed on the main 200, as generally described above, and the grinder or cutter 100 would be moved into position on the mounting apparatus 10 for severing the service tee 300. The grinder or cutter 100 can then be activated to sever the service tee 300; the operator may swivel the grinder or cutter 100 on the shaft 40 to enable the disc 104 to progressively cut through the pipe.

[0034] Preferably, the severed tee 300 is then filed down as necessary using hand tools to provide a relatively smooth surface. To seal the severed tee 300, as described above a pilot die 370 may be used to cut a thread into the outer surface of the tee 300, the newly cut threads may be cleaned as necessary with a wire brush, and a cap 380 may then be installed with a sufficient amount of torque and preferably with pipe dope applied to the mating threads to reliably seal the service tee 300 against gas leaks.

[0035] Thus, the mounting apparatus 10 provides a means for reliably severing the service tee, or any similar generally vertically oriented pipe, at a right angle. In particular, by clamping a support 20 to the service tee 300, and by providing a pivot means on the support 20 for supporting a mounting plate 30 for supporting the grinder or cutter 100, the operator will be able to accurately and stably position the grinder or cutter 100 to make a perpendicular cut through the pipe. By enabling personnel to sever the service tee 300 in this manner, abandonment of a gas service tee 300 may be effected more efficiently; if the service tee 300 in question is a self-tapping tee with a suitable cutter 325, there is no longer a need for a seal to be welded onto the severed tee 300 because it may be threaded and capped without requiring the services of a welder. This mounting apparatus 10 therefore presents a savings in time and personnel.

[0036] If the service tee 300 to be abandoned does not comprise a cutter that may be used as a plug means for blocking gas flow from the service main 200, then other means may be required to cut off the gas supply to the service outlet 330.

[0037] It will be understood by those skilled in the art that this procedure may be adapted as necessary to conform to safety requirements; for example, after the cap 380 is installed, a leak test is preferably conducted to determine if there is a gas leak. It is also preferable to eliminate any static charge buildup during the abandonment process to reduce the risk of ignition. Such steps may be conducted using practices known in the art.

[0038] Typically, the service tee 300 is buried, and may be located underneath a paved surface. In those situations, excavation is necessary to expose the service tee 300 in order to proceed with cutting, maintenance, or abandonment. In an alternative embodiment, the mounting apparatus
10 may be adapted for use in a keyhole excavation environment by providing a clamping means 50, 60 that can be operated from a distance. For example, a pneumatically-driven jaw or clamp may be provided on the support 20, and a pneumatically-driven rotating brush may be provided for cleaning the severed tee 300 during the abandonment process.

[0039] Various embodiments of the present invention having been thus described in detail by way of example, it will be apparent to those skilled in the art that variations and modifications may be made without departing from the invention. For example, the present invention may be used to sever pipes other than gas service tees. The invention includes all such variations and modifications as fall within the scope of the appended claims.

I claim:

1. A mounting assembly for mounting a tool in movable relation to a pipe, comprising:
   a support means having a first face and comprising a clamp means at a first end and a pivot means near a second end, wherein the clamp means is adapted to engage a pipe extending substantially vertically from a surface and the pivot means extends from the first face;
   a tool mounting arm comprising a tool mount at a first end, the tool mounting arm adapted near a second end to be engaged with the pivot means, such that a tool mounted on the tool mount can be moved in a generally arcuate path towards and away from a pipe engaged by the clamp means.

2. The mounting assembly of claim 1, wherein the tool is a cutting tool.

3. The mounting assembly of claim 1, wherein the tool is a grinding tool.

4. The mounting assembly of claim 1, wherein the pipe is a service tee extending from a service main.

5. The mounting assembly of claim 1, wherein the pivot means comprises a separate bearing means.

6. A method for mounting a cutting tool for cutting a substantially vertical pipe extending from a surface, comprising the steps of:
   providing the mounting assembly of claim 1;
   providing a cutting tool;
   mounting the support means on the surface;
   clamping the clamp means around the pipe;
   mounting the tool mounting arm on the pivot means; and
   mounting the tool on the tool mounting arm.

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