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Haby

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[54] **PIPE JOINT MAKE-UP OR BREAK-OUT TOOL**

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[52] **U.S. Cl.** **81/57.34;** 81/57.36; 81/57.39

[51] **Int. Cl.** **B25b 13/50**

[58] **Field of Search** 81/57.34, 57.35, 57.36, 81/57.39, 57.22, 57.2

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Primary Examiner—James L. Jones, Jr.

Attorney, Agent, or Firm—William P. Green

[57] **ABSTRACT**

A tool for making or breaking a threaded pipe joint, including two gripping assemblies adapted to extend about and grip two pipe sections respectively and each having two jaws hinged together for opening and closing movement, with the two gripping assemblies being mounted for relative rotary movement about the pipe axis by power driven actuating means, preferably including two piston and cylinder mechanisms, each of which acts in one rotary direction against one of the gripping assemblies and in the opposite rotary direction against the other gripping assembly at essentially the location of the hinge between its two jaws.

25 Claims, 12 Drawing Figures

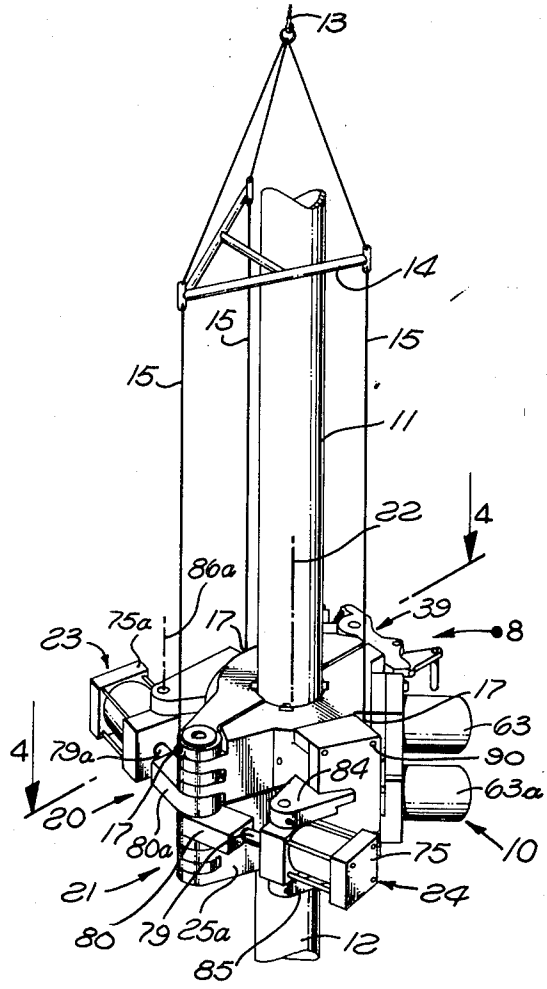


FIG. 1.

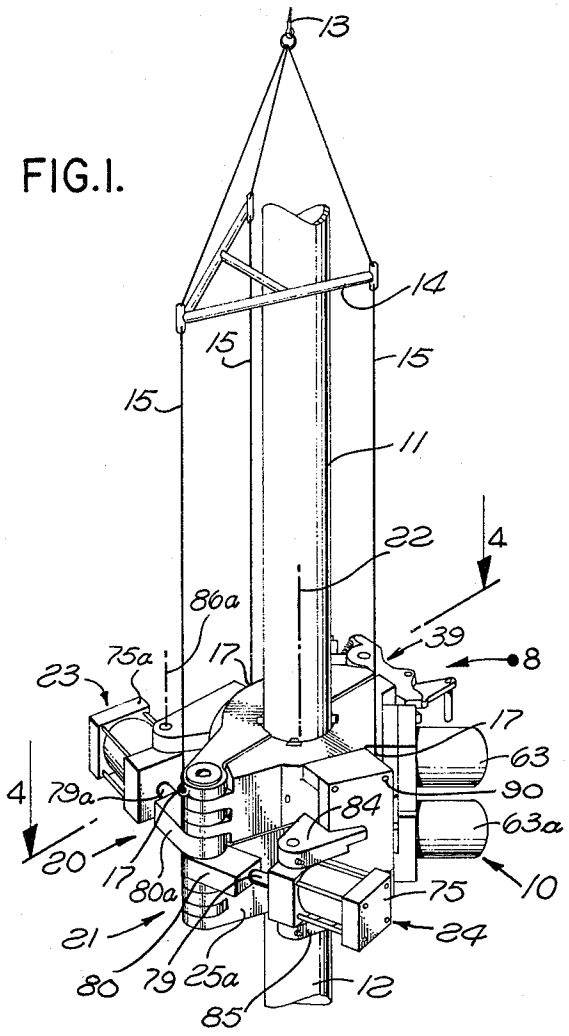


FIG. 2.

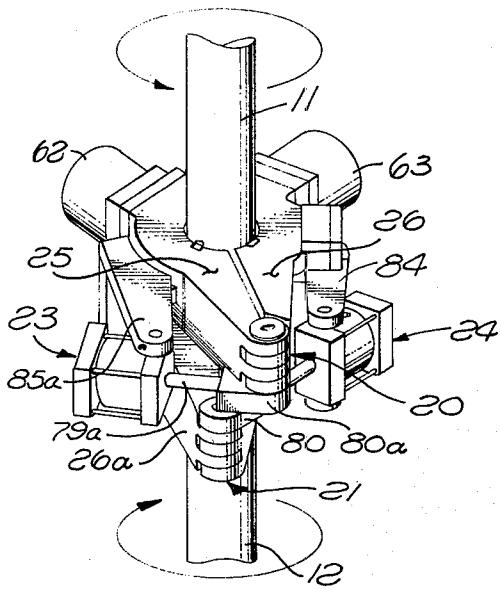
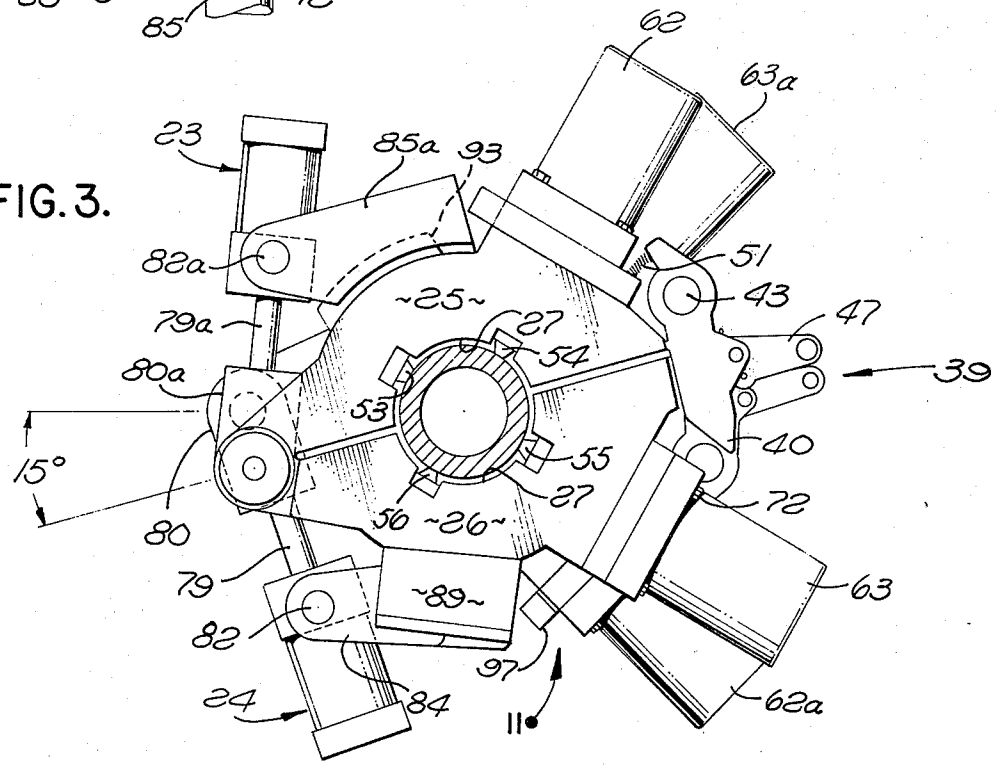


FIG. 3.



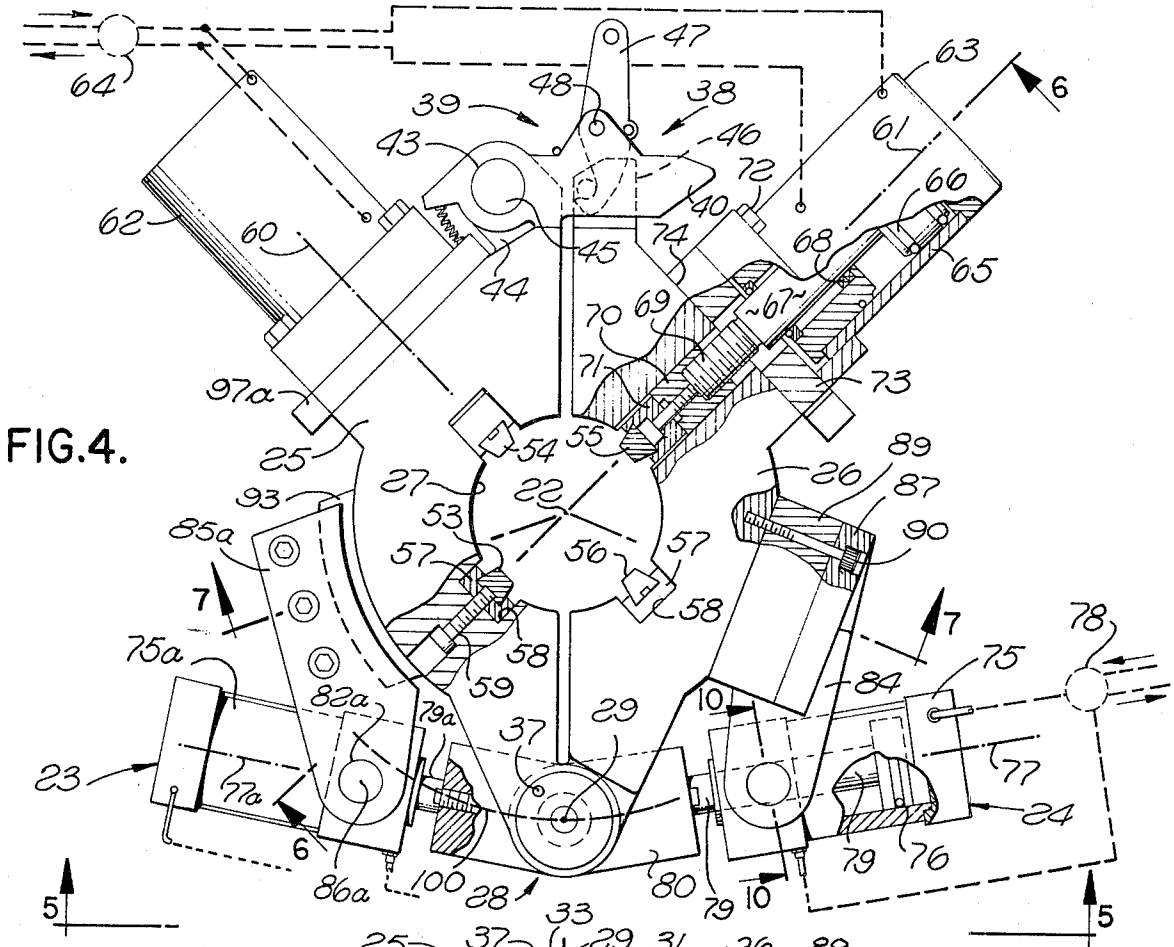


FIG.4.

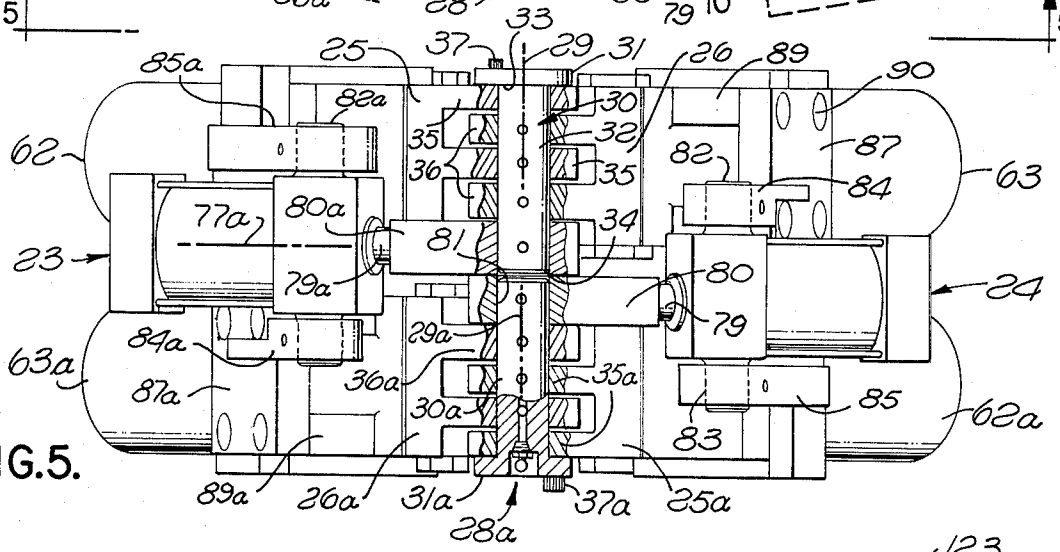


FIG.5.

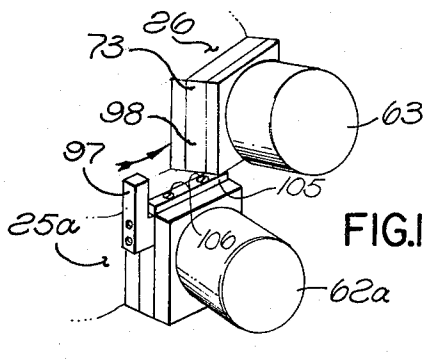


FIG.11.

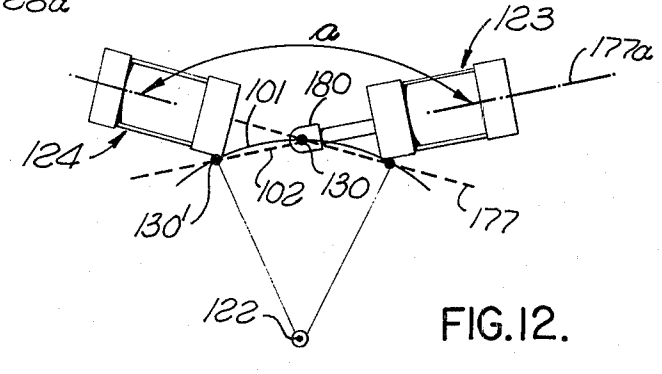


FIG.12.

FIG.6.

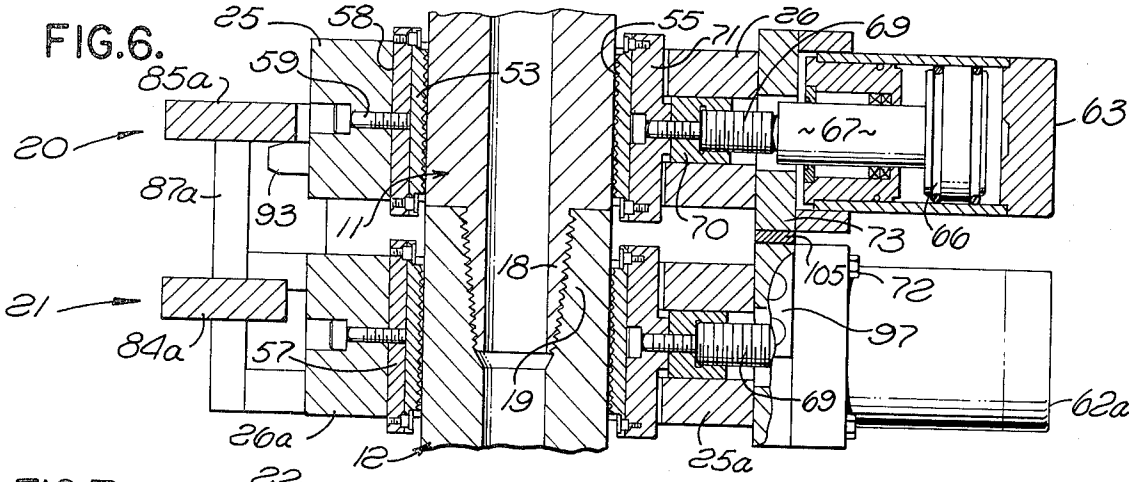
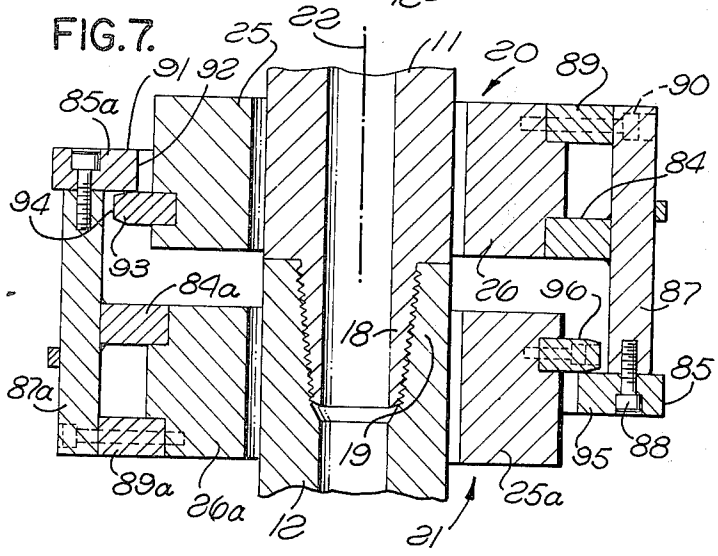


FIG.7.



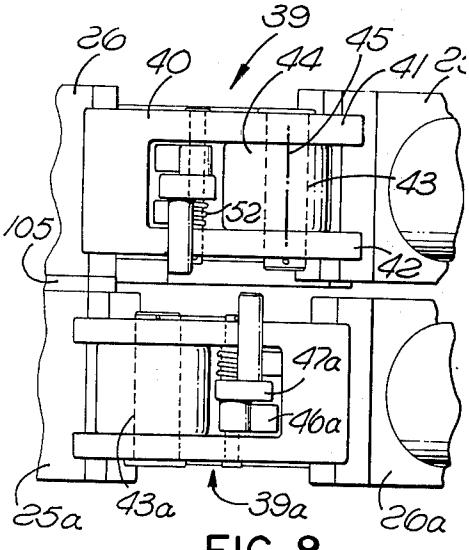


FIG. 8.

FIG.9.

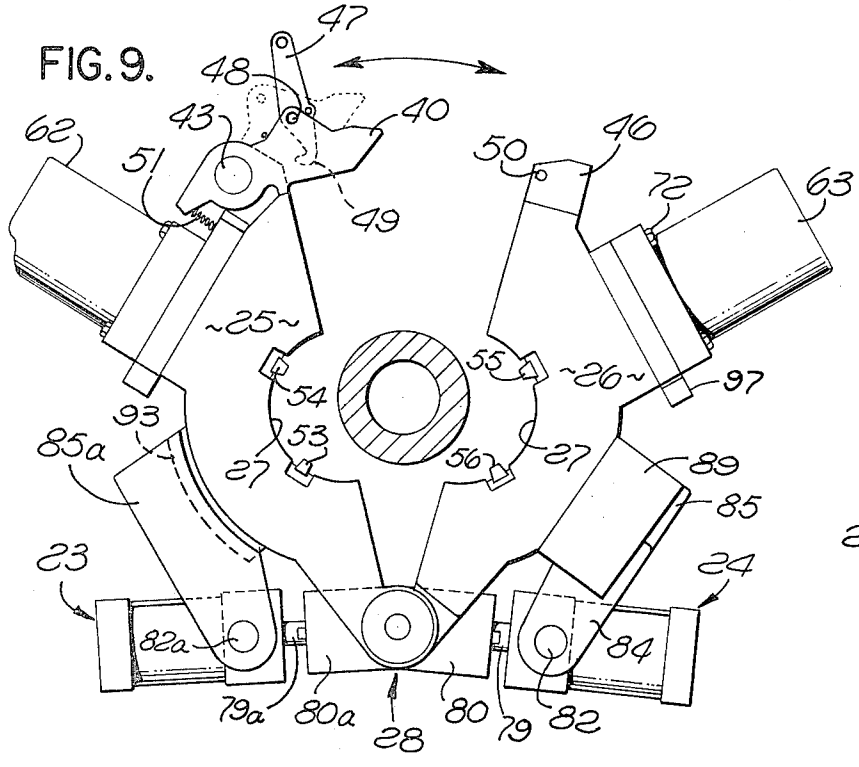
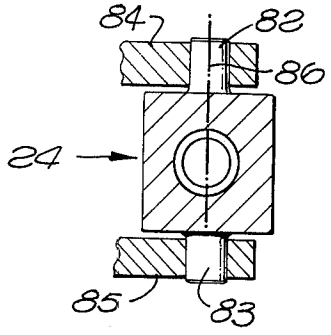


FIG.10.



PIPE JOINT MAKE-UP OR BREAK-OUT TOOL

BACKGROUND OF THE INVENTION

This invention relates to improved tools for making and breaking a threaded connection between two pipes, such as for example between two successive stands of a well pipe.

In completing a threaded joint between two successive well pipe sections or the like, it is desirable to apply a substantial tightening torque to the pipe sections in order to assure their complete threaded interconnection in a manner forming a rigid and effective joint between the sections. Similarly, when a joint of this type is to be broken, a very substantial initial torque is required in order to release the threaded interengagement between the parts. Various types of tongs, or make-up and break-out tools, have been provided in the past for producing this desired torque, including for example the type of tool shown in U.S. Pat. No. **3041901** issued July **3, 1962.** That patent shows an arrangement including an outer frame structure containing two gripping assemblies which are relatively rotatably movable by a piston and cylinder mechanism, with each assembly including a pair of jaws hinged together for relative opening and closing movement. Other prior art tools have included two such gripping assemblies formed of jaws hinged together for swinging movement, but without the necessity for an outer mounting or retaining structure as discussed above. These various tools, however, have had disadvantages in use which have necessarily limited the extent to which the tools have been adopted for practical use in the field. For examaple, most such tools have been relatively bulky, to occupy more space than would be desired on the drill rig or other work area, and as a result of their size and construction have been inconvenient and cumbersome to handle, and in some instances completely impractical for wide scale use, and have been considerably more expensive than would be desired to purchase and/or operate.

SUMMARY OF THE INVENTION

The present invention provides an improved joint make-up or break-out tool which is much more compact structurally, and more easily manipulated into and out of an active pipe gripping position, than have been the make-up and break-out tools of the prior art. As will appear, the tool of the invention can extend about a well pipe or the like at the location of a threaded joint, and by reason of its construction need not project laterally outwardly from the pipe in any direction more than a limited amount, to thereby minimize the space requirements of the tool. The powered actuating unit or units of the device are so located relative to the pipe gripping portions of the tool as to produce a maximum effective torque with minimum structure, and to apply that torque to the gripping assemblies in a very manner virtually eliminating any tendency for exertion of unwanted couple forces against the joint.

These results are achieved in large part by use of an actuating unit which applies its torque producing force to one of the gripping assemblies at essentially the location of the hinge axis about which the jaws of that assembly swing between open and closed positions. Desirably this actuating unit is a piston and cylinder mechanism acting against a jaw of one gripping assembly at a location offset from the hinge axis of that assembly,

but acting against the other gripping assembly at its hinge axis. The connection to the hinge axis may be made by pivotally attaching the actuating unit to the same hinge pin which connects two of the jaws together. Preferably, two such piston and cylinder actuating units are employed, attached to the two hinge connections respectively of the two gripping assemblies. The cylinder of each assembly may be pivotally attached to a jaw while its piston may be pivotally connected to one of the hinge pins.

To maximize the torque developed by exertion of a particular force by the actuating units, each actuating unit should apply its force to the hinge connection essentially tangentially with respect to the arcuate path followed by that hinge connection during a joint making or breakinng operation. A particular feature of the invention resides in a preferred manner in which the force is desirably applied precisely tangentially at an intermediate point along the path of arcuate movement of the hinge connection, and varies slightly but only from precise tangency at opposite ends of that path of travel, thus assuring transmission of torque in optimum fashion to the two gripping assemblies.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawings, in which:

FIG. **1** is a perspective view showing a make-up and break-out tool constructed in accordance with the invention, as it appears when utilized for making or breaking a threaded connection in a well pipe;

FIG. **2** shows the tool of FIG. **1** after its upper gripping section has been rotated relative to the lower section in a counter-clockwise joint-breaking direction;

FIG. **3** is a enlarged plan view of the tool in the FIG. **2** condition;

FIG. **4** is a further enlarged top plane view, partially broken away, showing the tool in the FIG. **1** condition, and taken primarily on line **4—4** of FIG. **1**;

FIG. **5** is a rear elevational view taken primarily on line **5—5** of FIG. **4,** and partially broken away;

FIGS. **6** and **7** are vertical sections taken on lines **6—6** and **7—7** respectively of FIG. **4**;

FIG. **8** is an enlarged fragmentary front elevational view taken in the direction of the arrow **8** of FIG. **1**;

FIG. **9** is a top plan view similar to FIG. **4,** but showing the jaws in open condition;

FIG. **10** is a fragmentary vertical section taken on line **10—10** of FIG. **4**;

FIG. **11** is a fragmentary perpsection view taken essentially in the direction of the arrow **11** of FIG. **3**; and

FIG. **12** is a somewhat diagrammatic representation of a variational form of the invention in which the actuating piston and cylinder mechanisms are disposed at a different angle than in FIGS. **1** to **11.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. **1,** I have represented generally at **10** a joint make-up or break-out tool embodying the invention, as the tool appears when utilized for tightening or loosening a threaded joint between two upper and lower vertical well pipe sections or stands **11** and **12.** The tool **10** is suspended on the drilling rig by a suspension line **13** which may support a rigid member **14** having three

lines 15 extending downwardly to three appropriate spaced points of connection 17 to the tool. FIGS. 6 and 7 show the threaded connection between the two pipes 11 and 12, in which connection the upper stand 11 has a lower externally threaded 'pin' end 18 connected into an upwardly facing internally threaded 'box' end 19 of the lower stand 12.

The tool 10 includes two very similar upper and lower gripping assemblies 20 and 21 (see FIGS. 1, 6 and 7) for gripping the upper and lower joint sections 11 and 12 respectively. These two gripping assemblies 20 and 21 are adapted to be turned relative to one another about the vertical axis 22 of the pipe, between the position of FIGS. 1 and 4 and the position of FIGS. 2 and 3. For power actuating the gripping assemblies and the contained pipe sections between these positions, there are provided two piston and cylinder mechanisms 23 and 24 acting in opposite circular directions against the two gripping assemblies.

To describe first of all the upper assembly 20, this assembly includes two complementary jaws 25 and 26, each of which may be essentially semi-circular to extend about one-half of the circular extent of the pipe, so that in the closed condition of FIG. 4 the two jaws 25 and 26 completely encircle the pipe. At their inner sides, the jaws may have cylindrically curved inner surface 27 centered about the pipe axis 22 and received in close proximity to the outer surface of the upper pipe section.

Jaws 25 and 26 are connected together by a hinge connection 28 for relative swinging movement between the closed position of FIG. 4 and the open position of FIG. 9, and about a vertical axis 29 which is disposed parallel to the previously mentioned vertical axis 22 of the well pipe. The hinge connection 28 preferably includes a vertical hinge pin 30, having an upper enlarged diameter head 31 and a downwardly projecting externally cylindrical shank 32 centered about axis 29. In FIG. 5, the cylindrical shank 32 extnds vertically from the underside 33 of head 31 to the lower extremity 34 of the hinge pin. Jaw 25 has two vertically spaced hing loops 35 disposed about pin 30, while the second jaw 26 has two similar vertically spaced hinge loops 36 disposed about the hinge pin at locations offset vertically from loops 35. As will be apparent, each of the loops 35 and 36 contains a circular opening having a cylindrically curved inner wall which is a close fit about the outer surface of pin 30 to effectively mount the two jaws 25 and 26 for only the desired pivotal movement about axis 29 relative to one another. The hinge pin 30 may be held in its illustrated assembled relation with respect to the jaws in any convenient manner, as by a screw 37 extending downwardly through an opening in the upper head 31 of the hinge pin and connecting threadedly into the upper hinge loop 35 of jaw 25.

At their forward ends 38, the two jaws 25 and 26 are detachably connected together in the closed condition of FIG. 4 by a latch mechanism 39. This latch mechanism may include a U-shaped latch part 40 (FIGS. 4 and 8), having vertically spaced parallel arms 41 and 42 connected by a hinge pin 43 to an outwardly projecting lug 44 formed on jaw 25, to mount latch part 40 for swinging movement about a vertical axis 45 between the full line active position and broken line released position of FIG. 9. In its active position, this latch part 40 extends about a pair of spaced outwardly projecting lugs 46 on jaw 26, to retain the two jaws in their closed FIG. 4 condition. A locking element 47 pivoted at 48 to latch 40 may have a hooked portion 49, receivable between lugs 46 and engageable with a pin 50 carried by and extending vertically between lugs 46, to releasably hold the latch part in its closed condition. A spring 51 urges the latch part 40 to its active condition, while a spring 52 (FIG. 8) urges the locking element 47 to its holding condition.

For gripping the pipe, the two jaws 25 and 26 carry four gripping dies 53, 54, 55 and 56 (FIG. 4) which may be spaced 90° apart as shown. Each of these gripping dies or elements has an inner preferably serrated face for engaging the outer cylindrical surface of the pipe and holding it against motion relative to the die. Two of the dies 53 and 56 are mounted to jaws 25 and 26 respectively in fixed positions relative to the carrying jaws. For this purpose, the dies 53 and 56 may be mounted in vertical die holders 57 which are retained within grooves 58 in the jaws by screws 59 extending through passages in the jaws and connecting threadedly into the holders.

The other two gripping dies 54 and 55 are mounted movably to the jaws 25 and 26 respectively, for powered actuation toward and away from the gripped pipe along two axes 60 and 61 which intersect and are perpendicular to, and therefore extend radially with respect to, the main vertical pipe axis 22. Two radially extending piston and cylinder mechanisms 62 and 63 actuate these dies radially inwardly and outwardly relative to the well pipe under the control of an appropriate three-way valve or the like diagrammatically represented at 64 in FIG. 4. As seen in the right hand portion of FIG. 4, each piston and cylinder mechanism includes an outer cylinder 65 rigidly secured to the corresponding jaw, and containing a piston 66 having a piston rod 67 projecting radially inwardly through a seal assembly 68, with the rod 67 being connected threadably at 69 to a member 70 which carries a holder 71 to which the die 54 or 55 is secured. Each cylinder 65 may be rigidly attached to the corresponding jaw in any convenient manner, as by screws represented at 72 in FIG. 4, with a rectangular block 73 desirably being received between the cylinder and an outer planar face 74 formed on the jaw.

The portions of the upper gripping assembly 20 thus far described are essentially duplicated in the lower gripping assembly 21, though inverted with respect thereto. Thus, the lower assembly 21 includes two jaws 25*a* and 26*a* constructed the same as upper jaws 25 and 26 respectively, and connected together by a hinge connection 28*a* essentially the same as the previously described upper hinge connection 28. More particularly, hinge connection 28*a* includes a hinge pin 30*a* which is the same as upper pin 30, but inverted so that head 31*a* of pin 30*a* is received at the underside of one of two hinge loops or lugs 35*a* of jaw 25*a*, and is secured thereto by a screw or other fastener 37*a*. The other lower jaw 26*a* has two hinge loops 36*a* corresponding to upper loops 36, so that the pin 30*a* interconnects jaws 25*a* and 26*a* for relative swinging movement about a vetical axis 29*a* between open and closed positions corresponding to those shown in FIGS. 9 and 4 respectively. In the condition of the tool illustrated in FIGS. 1, 4 and 5, the lower hinge connection 28*a* is directly beneath and in vertical alignment with the upper hinge connection 28, so that the two hinge axes 29 and 29*a* are in alignment or coincide. The forward ends of

lower jaws 25*a* and 26*a* are detachably connectible together in their closed condition by a latch mechanism 39*a* (FIG. 8), which may be essentially the same as upper latch assembly 39, though inverted. This latch mechanism 39*a* includes a latch part 40*a* engageable in latching relation with lugs 46*a* on jaw 26*a*, with part 40*a* being retainable in latched condition by a locking part 47*a* corresponding to element 47 of mechanism 39.

The actuating unit 24 for turning the two gripping assemblies relative to one another includes a cylinder 75 (FIGS. 1 and 4) and a contained piston 76, which is power actuable in opposite directions along an axis 77 relative to the cylinder 75 by pressure fluid supplied to the cylinder under the control of a four-way or other similar valve diagrammatically represented at 78 in FIG. 4. The piston rod 79 of unit 24 carries an enlargement 80 at its end containing a cylindrical vertical opening 81 (FIG. 5) which is a close fit about the upper portion of hinge pin 30*a* to pivotally connect the piston rod to that hinge pin. The cylinder 75 is in turn pivotally connected to the upper jaw 26, by upwardly and downwardly projecting aligned cylindrical trunnion lugs or stub shafts 82 and 83 (FIGS. 5 and 10), which are journalled within upper and lower horicontal mounting plates 84 and 85 attached rigidly to jaw 26. The pivotal axis 86 of the cylinder extends vertically and therefore parallel to axes 22, 29, and 29*a*, and intersects the horizontal axis 77 of piston and cylinder mechanism 24. Mounting plates 84 and 85 may be secured to jaw 26 in any convenient way, as by welding or bolting the plate 84 to he jaw, and then connecting the lower plate 85 to upper plate 84 by a vertical connector plate 87 (FIGS. 1 and 7). The lower plate 85 may be secured rigidly to vertical plate 87 by screws represented at 88 in FIG. 7. To further strengthen the connection of these parts to the jaw 26, an upper mounting plate 89 may be connected to the upper end of vertical plate 87, and be secured to the jaw by additional screws represented at 90 in FIGS. 1 and 7. Thus, a rigid structure is provided consisting of parts 84, 85, 87 and 89, all rigidly secured to jaw 26 in fixed position and pivotally carrying cylinder 75.

At the opposite side of the tool 10, the second actuating unit 23 may be essentially the same as the piston and cylinder mechanism 24, but offset upwardly relative to unit 24 so that the part 80*a* corresponding to part 80 of unit 24 may be received about and pivotally connected to the lower end of hinge pin 30, just above and in slideable engagement with element 80 (see FIG. 5). As in the case of the first discussed actuating unit 24, the part 80*a* is carried by and movable with the piston rod 79*a* of a piston contained within cylinder 75*a* of unit 23. The cylinder 75*a* is hinged to lower jaw 25*a*, for relative pivotal movement about a vertical axis 86*a*. This mounting is effected by stub shafts 82*a* projecting upwardly and downwardly from cylinder 75*a* and pivotally received within two vertically spaced horizontal plates 84*a* and 85*a* corresponding to plates 84 and 85 at the other side of the tool. As will be understood best from FIGS. 5 and 7, the rigid structure at the left side of the tool consisting of parts 84*a*, 85*a*, 84*a* and 89*a* is inverted with respect to the corresponding structure 84, 85, 87 and 89 at the right side of the tool, so that the cylinder of unit 23 is pivotally secured to the lower jaw 26*a*. Also seen in FIG. 7, the upper plate 85*a* has a radially inwardly projecting horizintal portion 91 having an inner edge 92 extending arcuately about axis 22, to form an arcuate horizontal flange overlying a radially outwardly projecting horizontal flange part 93 carried rigidly by upper jaw 25. The outer ege 94 of flange 93 extends arcuately about pipe axis 22, so that in all relative rotary positions to which the two gripping assemblies may be turned, the two flanges 91 and 93 are engageable to support the lower assembly 21 from the upper assembly, and prevent relative axial separation of these two gripping assemblies. At the opposite side of the pipe, the previously discussed bottom plate 85 has a portion forming an arcuate radially inwardly projecting horizontal flange 95 engageable with the underside of a radially outwardly projecting flange 96 rigidly carried by jaw 25*a*, to coact with the previously mentioned flanges 91 and 93 in supporting the lower jaws from the upper jaws, and preventing axial separation of the two gripping assemblies. The axis of movement 77*a* of the piston within unit 23 is horizontal, and perpendicular to the vertical axis 86*a* of pivotal movement of cylinder 75*a*. Also, the axes 77 and 77*a* should intersect and be perpendicular to the vertical axes 29*a* and 29, respectively.

Lower jaw 25*a* may carry an upwardly projecting lug or shoulder 97 (FIG. 11), located adjacent piston and cylinder assembly 62*a* and engageable against a surface 98 on upper jaw 26 in a relation transmitting closing movement from jaw 25*a* to jaw 26. Element 97 may be carried by a plate of the lower jaw corresponding to the upper jaw plate 73 of FIG. 4, and may be engageable with a lower portion of the upper plate 73. At the opposite side of the tool, upper jaw 25 may carry a member 97*a* corresponding to part 97 but projecting downwardly for engagement with an adjacent vertical surface on the lower jaw 26*a*, in a relation transmitting closing movement from upper jaw 25 to lower jaw 26*a*. Thus, a user may close all four jaws by merely grasping the upper jaw 25 and the lower jaw 25*a*, which upon closure will take with them the other two jaws, as discussed. At each side of the tool, the lower of the two plates 73 may carry at its upper side a wear plate 105, retained by two screws 106 (FIGS. 6 and 11), for slidably engaging and supporting the other of the plates 73.

To now describe a cycle of use of the tool, assume that both sets of jaws initially in the open condition of FIG. 9. When in this open condition, the jaws can be moved to a position of recepttion about the pipe sections 11 and 12, and can then be closed to the condition of FIG. 4, with retention in that closed condition by the latch assemblies 39 and 39*a*. The operator then actuates valve 64 of FIG. 4 to admit pressurized hydraulic fluid to the radially outer portions of the cylinders of units 62 and 63, to thereby force the pistons in those cylinders radially inwardly, so that the dies 54 and 55 engage radially inwardly against the pipe and clamp it tightly against the opposed stationary jaws 53 and 56. This same action occurs in both of the gripping assemblies, so that the upper pipe section 11 is tightly gripped by the upper jaws, while the lower section 12 is tightly gripped by the lower jaws. As a next step, the operator admits pressurized fluid to the outer ends of the cylinders of actuating units 23 and 24, to force the contained pistons and rods along axes 77 and 77*a*. Piston 76 thus acts against lower hinge pin 30*a* to move it leftwardly in FIG. 5, while the piston of acutating unit 23 acts against the upper hinge pin 30 to move it rightwardly in FIG. 5. The result is that the two gripping as-

semblies and the gripped pipe sections turn about axis **22** relative to one another and to the actuated condition of FIGS. **2** and **3**. A very limited angular movement of this type is normally sufficient to break the threaded connection between the two pipe sections, and permit the upper section to be thereafter easily unscrewed from the lower section by other equipment. In FIG. **3**, the relative angular motion of the two gripping assemblies is assumed to be approximately **15°**. When it is desired to make, rather than break, a threaded connection, the upper section **11** may be screwed loosely into the lower section, and the actuating units **23** and **24** be then supplied with pressure fluid at their inner ends in a relation turning the upper and lower gripping assemblies relative to one another from the position of FIGS. **2** and **3** to the position of FIGS. **1** and **4**.

It is noted that in FIG. **4**, the actuating force applied to the hinge connections by units **23** and **24** is transmitted to the gripping assemblies approximately tangentially with respect to the path of arcuate movement of those hinge connections. That is, in FIG. **4**, the axis of movement **77** of piston **76** extends approximately tangentially with respect to the arcuate path **100** which the axis **29***a* of hinge connection **28***a* follows as it moves about pipe axis **22** upon energization actuating unit **24**. Similarly, at the opposite side of the tool, the piston of actuating unit **23** applies force essentially tangentially with respect to the path of movement of the hinge connection which it acts against. These tangential relationships assure the application of very high torque to the gripping assemblies for any given force developed in the actuating units **23** and **24**.

FIG. **12** shows disgrammatically a variational arrangement which may be considered as identical with the form of the invention shown in FIGS. **1** through **11**, except that the two actuating piston and cylinder units **123** and **124** (corresponding to units **23** and **24** of the first form of the invention) have their axes **177** and **177***a* (corresponding to axes **77** and **77***a* of FIG. **4**) disposed at an angle *a* with respect to one another, which is so selected as to further maximize the amount of pipe turning torque which is developed. In FIG. **12**, the range of movement of one of the hinge axes **130** by unit **123** is from the full line position of FIG. **12** to the position represented at **130'** in that figure. The path of arcuate movement of the hinge connection and its axis, as well as the part **180** at the end of the piston rod, is represented by the arcuate path **101** extending abut pipe axis **122**. The piston and cylinder mechanism **123** is so located that its axis **177***a* is initially directed slightly inwardly relative to arcuate path **101**, and at the position **130'** is directed slightly outwardly relative to that path, so that a precisely tangential relationship with respect to an arc about pipe axis **122** is attained only at a central location **102**. Thus, maximum torque is developed at this intermediate point along the path of movement, and even at the extremities of the range of movement the variation from a true tangential relationship is minimized. The second actuating unit **124** has its piston axis **177** similarly disposed with respect to the arcuate path of movement of its associated hinge connection, so that unit **124** also applies force precisely tangentially at only a central location along its path of movement, but has minimum deviation from such tangential relation at the opposite ends of its path of travel. In an actual structure embodying the arrangement shown diagrammatically in FIG. **12**, the maximum deviation from precise tangency may be even less than it appears in FIG. **12**, since the total angle of movement between points **130** and **130'** has been exagerated in FIG. **12** for clarity of illustration, and may in fact be substantially less than that shown (preferably being about **15°** total as in FIG. **3**).

In both forms of the invention, the use of two piston and cylinder mechanisms **23** and **24** (or **123** and **124**), in the illustrated essentially opposed relationship, and preferably with the pistons connected to the hinge pins in very closely proximate planes (FIG. **5**), eliminates any substantial tendency for bodily lateral displacement of the two gripped pipes upon operation of the units **23** and **24** or **123** and **124**, and also avoids exertion of any substantial couple forces against the pipes. Further, the connection of the mechanisms **23** and **24** or **123** and **124** to the gripping assemblies at their hinge axes has the additional advantage, beyond those previously discussed, of enabling opening and closing of the jaws without extending or retracting movement of the pistons relative to their cylinders, since opening and closing of the jaws does not require movement of their hinge axes.

While certain specific embodiments of the present invention have been disclosed as typical, the invention is of course not limited to these particular forms, but rather is applicable broadly to all such variations as fall within the scope of the appended claims.

I claim:

1. A tool for effecting relative rotation between two threaded pipes about an axis of said pipes, comprising:

a first gripping assembly adapted to extend about and grip a first of said pipes, and including two jaws and a first hinge connection attaching said jaws together for relative swinging movement about a first hinge axis between open and closed positions;

a second gripping assembly adapted to extend about and grip a second of said pipes, and including two additional jaws and a second hinge connection attaching said additional jaws together for relative swinging movement about a second hinge axis between open and closed positions;

a power operated actuating unit for exerting force against said two gripping assemblies in a relation causing relative rotation between the pipes;

said two hinge connections being receivable substantially in axial alignment with one another in a position in which the jaws of both gripping assemblies are openable; and

a shoulder carried by a jaw of one of said gripping assemblies and engageable with a shoulder on a corresponding jaw of the other gripping assembly in a relation transmitting closing force from one jaw to the other when the two assembles are in said relative position in which they are openable.

2. A tool as recited in claim **1**, including an additional shoulder carried by the other jaw of said other gripping assembly and engageable with the other jaw of said one gripping assembly in a relation transmitting closing movement thereto.

3. A tool for effecting relative rotation between two threaded pipes about an axis of said pipes, comprising:

a first gripping assembly adapted to extend about and grip a first of said pipes, and including two jaws, pipe gripping means carried by both of said jaws, and a first hinge connection attaching said jaws to-

gether for relative swinging movement about a first hinge axis between open and closed positions;

a second gripping assembly adapted to extend about and grip a second of said pipes, and including two additional jaws, additional pipe gripping means carried thereby, and a second hinge connection attaching said additional jaws together for relative swinging movement about a second hinge axis between open and closed positions;

a power operated actuating unit for exerting force against said two gripping assemblies in opposite circular directions about said pipe axis and in a relation causing relation rotation between the pipes;

means for transmitting actuating force from said unit to said first gripping assembly; and

means for transmitting opposed actuating force from said actuating unit to said control gripping assembly at essentially the location of said second hinge axis and in a relation applying force to both of said additional jaws at essentially the location of said second hinge axis and in the same circular direction about said pipe axis.

4. A tool as recited in claim **3**, in which said actuating unit is a piston and cylinder merchanism applying actuating force to both of said additional jaws of said second gripping assembly generally transversely of said second hinge axis.

5. A tool as recited in claim **3**, in which said actuating unit includes two parts which act in opposite directions against said gripping assemblies respectively and which are power reciprocable relative to one another along a reciprocation axis which essentially intersects said second hinge axis.

6. A tool as recited in claim **3**, in which said first mentioned means connect said actuating unit to one of said jaws of said first gripping assembly at a location offset circular about said pipe axis from said first hinge axis.

7. A tool as recited in claim **3**, in which said first mentioned means include a pivotal connection between said actuating unit and one of said jaws of said first gripping assembly.

8. A tool as recited in claim **3**, in which said actuating unit is a piston and cylinder mechanism, and said first mentioned means include a pivotal connection attaching said mechanism to one of said jaws of said first gripping assembly for pivotal movement about an axis offset circularly from but essentially parallel to said first hinge axis.

9. A tool as recited in claim **3**, in which said last mentioned means connect said actuating unit to said second gripping assembly for pivotal movement relative to both of said additional jaws about said second hinge axis.

10. A tool as recited in claim **3**, in which said actuating unit is a piston and cylinder mechanism exerting force against said second gripping assembly at said second hinge axis in a direction extending esssentially tangentially with respect to an arcuate path of movement of said second hinge connection about the pipe axis relative to said first gripping assembly.

11. A tool as recited in claim **3**, in which said actuating unit is a fluid pressure operated mechanism having a cylinder connected by said first means to one of said jaws of said first gripping assembly for relative pivotal movement about an axis offset circularly from but essentially parallel to said pipe axis, and having a relatively reciprocable piston pivotally connected to both of said additional jaws of the second gripping assembly for pivotal movement relative to both of said additional jaws about said second hinge axis.

12. A tool as recited in claim **3**, including a second power operated actuating unit for exerting force in opposite directions against said two gripping assemblies and coacting with said first actuating unit to relatively rotate said gripping assemblies, means for transmitting actuating force from said second unit to said second gripping assembly, and means for transmitting actuating force from said second unit to said first gripping assembly at essentially the location of said first hinge axis and in a relation applying force to both of said jaws of the first gripping assembly at essentially the location of said first hinge axis and in a common circular direction which is the opposite of the direction in which said first actuating unit exerts force against said second gripping assembly.

13. A tool as recited in claim **3**, in which said power operated actuating unit is a piston and cylinder mechanism connected by said last mentioned means for pivotal movement relative to both of said jaws of said second gripping assembly about essentially said second hinge axis; there being a second piston and cylinder actuating unit exerting force in opposite directions against said second gripping assembly, and against both jaws of said first gripping assembly in a common direction and at essentially the location of said first hinge axis.

14. A tool as recited in claim **3**, in which said second hinge connection includes a hinge pin connecting said additional jaws together for relative swinging movement, said last mentioned means of claim **3** including a power actuated part for applying force from said unit to said second gripping assembly and pivotally connected to a portion of said hinge pin for pivotal movement relative to both of said additional jaws about said second hinge axis.

15. A tool as recited in claim **3**, in which said last mentioned means connect said actuating unit to said second gripping assembly at a location axially between said two hinge connections.

16. A tool as recited in claim **3**, in which said actuating unit is connected by said last mentioned means to said jaws of said second gripping assembly at a location axially between said two hinge connections, there being a second actuating unit for relatively turning said gripping assemblies and pivotally connected to the jaws of said first gripping assembly for relative pivotal movement about essentially said first hinge axis and at a location axially between said two hinge connections.

17. A tool as recited in claim **3**, in which said two hinge connections include two hinge pins which in one condition of the tool are in essential axial alignment and extend through hinge loops of the jaws of the two gripping assemblies respectively, said actuating unit including a piston and cylinder merchanism, said last mentioned means of claim **3** including a connector part on said piston and cylinder mechanism pivotally connected to an end of one of said hinge pins axially between said loops of the jaws of the two gripping assemblies, there being a second actuating unit having a connector part pivotally connected to an end of the other hinge pin, at a location axially between said loops of the jaws of the two gripping assemblies, and axially adjacent said first mentioned connector part.

18. A tool as recited in claim 3, in which said pipe gripping means of the two gripping assemblies include gripping dies mounted to said jaws of both assemblies for relative radial movement, and power operated means for actuating said dies radially inwardly and outwardly relative to the carrying jaws and toward and away from a pipe to be gripped.

19. A tool as recited in claim 3, in which said pipe gripping means of said two assemblies include on each jaw a first pipe gripping die mounted to the jaw for relative movement radially inwardly and outwardly, a relatively fixed die, and a piston and cylinder mechanism for actuating said first mentioned die inwardly and outwardly relative to the associated jaw.

20. A tool as recited in claim 3, including shoulders on said two gripping assemblies interengageable to retain the two assemblies against relative axial separating movement.

21. A tool as recited in claim 3, in which sid first mentioned means include axially spaced plates connected to a jaw of said first gripping assembly and pivotally mounting said actuating unit, one of said plates having an arcuate inner edge portion forming a shoulder engageable with a coacting shoulder carried by a jaw of said second gripping assembly in a relation retaining said assemblies against relative axial separating movement.

22. A tool as recited in claim 21, including a second actuating unit, two spaced plates mounting said second actuating unit to a jaw of said second gripping assembly pivotally, one of said last mentioned plates having an inner arcuate edge portion forming a shoulder coacting with a shoulder carried by a jaw of said first gripping assembly to coact with said first mentioned shoulders in retaining said assemblies against relative axial separation.

23. A tool as recited in claim 3, in which said second hinge axis follows an arcuate path about said pipe axis relative to said first gripping assembly upon relative rotation of the assemblies, said last mentioned means of claim 3 including a reciprocally moveable force transmitting part moving along a line which is approximately tangential with respect to said arcuate path at opposite ends of said path, but is more precisely tangential with respect to an arc about said pipe axis at an intermediate point along said path.

24. A tool for effecting relative rotation between two threaded pipes about an axis of said pipes, comprising:

a first gripping assembly adapted to extend about and grip a first of said pipes, and including two approximately semi-circular jaws, pipe gripping dies carried by said jaws, powered means carried by the jaws for moving at least one of said dies radially inwardly and outwardly, a first hinge connection at first ends of said jaws attaching them together for relative swinging movement about a first hinge axis between open and closed positions, and a latch for detachably connecting second ends of the jaws together in closed relation;

a second gripping assembly adapted to extend about and grip a second of said pipes, and including two approximately semi-circular additional jaws, additional pipe gripping dies carried by said jaws, powered means for moving at least one of said additional dies radially inwardly and outwardly, a second hinge connection at first ends of said additional jaws attaching them together for relative swinging movement about a second hinge axis between open and closed positions, and a latch for detachably connecting second ends of said additional jaws together in closed relation;

first and second actuating units located at opposite sides of said hinge connections and each including relatively reciprocable piston and cylinder parts for exerting force against said two gripping assemblies in a relation causing relative rotation between the pipes;

means connecting one of said piston and cylinder parts of said first actuating unit to said second hinge connection for pivotal movement relative to both of said additional jaws about said second hinge axis and in a relation applying actuating force to both of said additional jaws at essentially said second hinge axis and in a common circular direction;

means connecting the other of said piston and cylinder parts of said first actuating unit to one of said jaws of said first gripping assembly at a location offset circularly from said first hinge axis;

means connecting one of said parts of said second actuating unit to said first hinge connection for pivotal movement relative to both of said jaws of said first gripping assembly about said first hinge axis and in a relation applying actuating force to both of said jaws of said firt gripping assembly at essentially said first hinge axis and in a common direction; and

means connecting the other of said parts of said second actuating unit to one of said jaws of said second gripping assembly at a location offset circularly from said second hinge axis.

25. A tool for effecting relative rotation between two threaded pipes about an axis of said pipes, comprising:

a first gripping assembly adapted to extend about and grip a first of said pipes, and including two approximately semi-circular jaws, pipe gripping dies carried by said jaws, piston and cylinder means carried by the jaws for moving at least one of said dies radially inwardly and outwardly, a first hinge pin at first ends of said jaws attaching them together for relative swinging movement about a first hinge axis between open and closed positions, and a latch for detachably connecting second ends of the jaws together in closed relation;

a second gripping assembly adapted to extend about and grip a second of said pipes, and including two approximately semi-circular additional jaws, additional pipe gripping dies carried by said jaws, piston and cylinder means for moving at least one of said additional dies radially inwardly and outwardly, a second hinge pin at first ends of said additional jaws attaching them together for relative swinging movement about a second hinge axis between open and closed positions, and a latch for detachably connecting second ends of said additional jaws together in closed relation;

first and second actuating units located at opposite sides of said hinge connections and each including relatively reciprocable piston and cylinder parts for exerting force against said two gripping assemblies in a relation causing relative rotation between the pipes;

a connector loop on one of said parts of said first actuating unit received rotatably about an end of said

second hinge pin at a location near said first hinge pin and connecting said one part to said pin for pivotal movement relative to both of said additional jaws about said second hinge axis and in a relation applying actuating force to both of said additional jaws at essentially said second hinge axis and in a common circular direction;

means connecting the other of said piston and cylinder parts of said first actuating unit pivotally to one of said jaws of said first gripping assembly at a location offset circularly from said first hinge axis;

a connector loop on one of said parts of said second actuating unit received rotatably about an end of said first hinge pin at a location near said second hinge pin and adjacent said first mentioned loop and connecting said one part of said second actuating unit to said first hinge pin for pivotal movement relative to both of said jaws of said first gripping assembly about saif first hinge axis and in a relation applying actuating force to both of said jaws of said first gripping assembly at essentially said first hinge axis and in a common direction; and

means connecting the other of said parts of said second actuating unit to one of said jaws of said second gripping assembly pivotally at a location offset circularly from said second hinge axis.

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