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3,371,562

GRAPPLE

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2 Sheets-Sheet 1

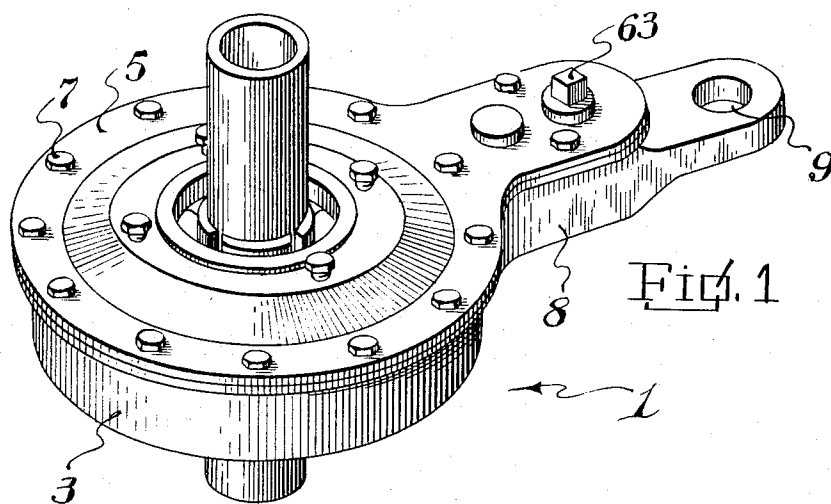


Fig. 1

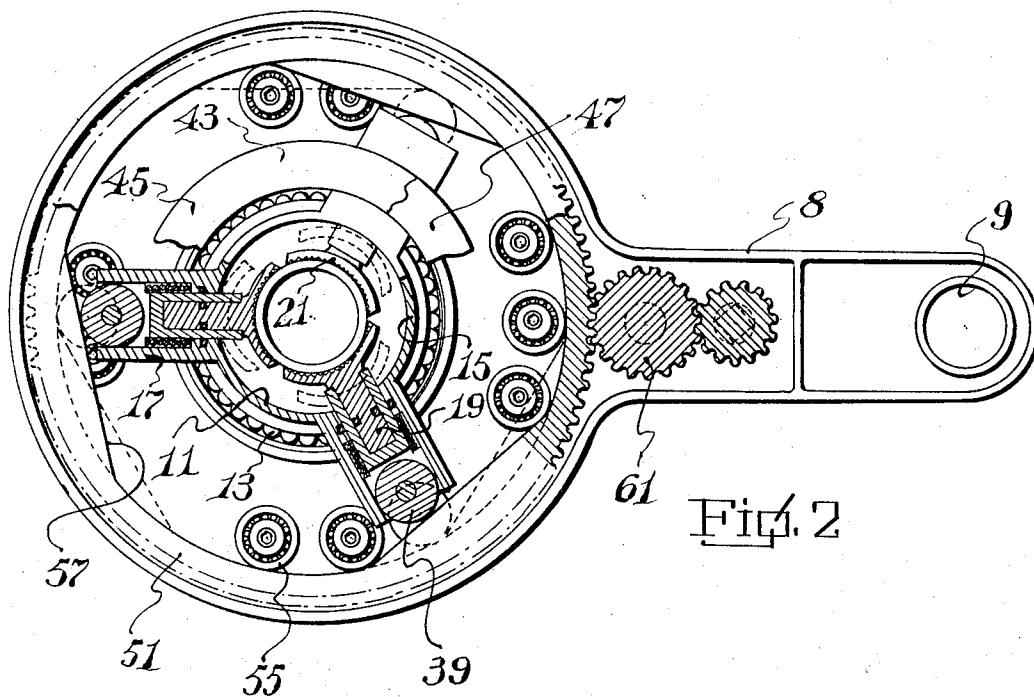


Fig. 2

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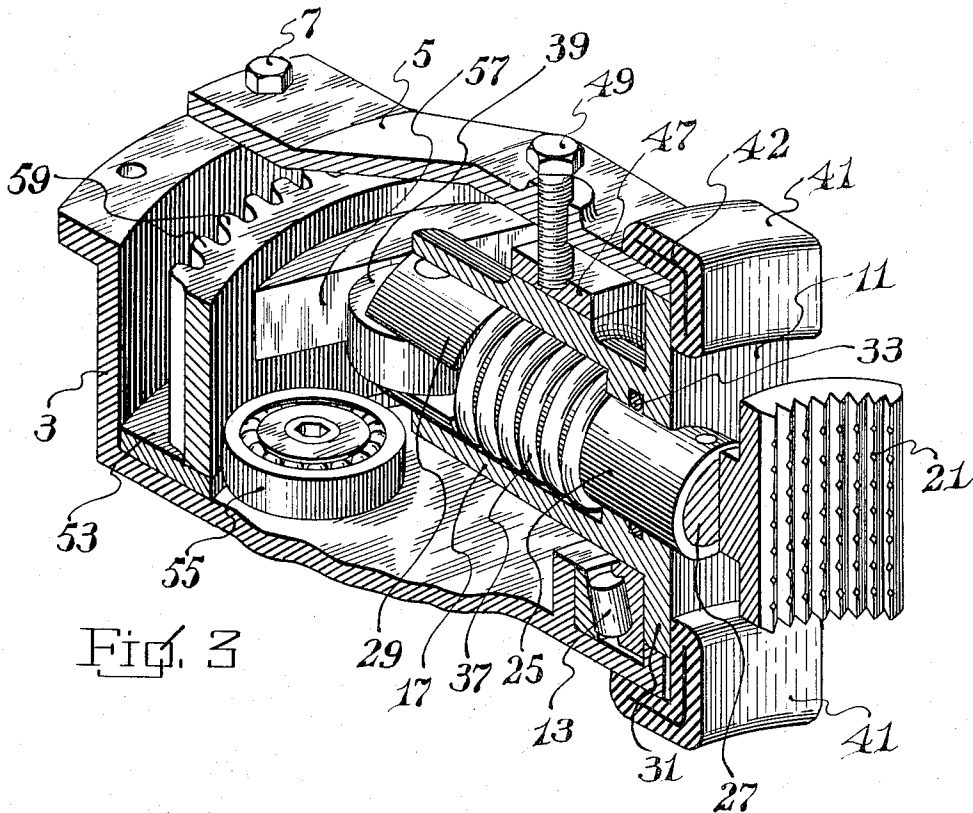


Fig. 3

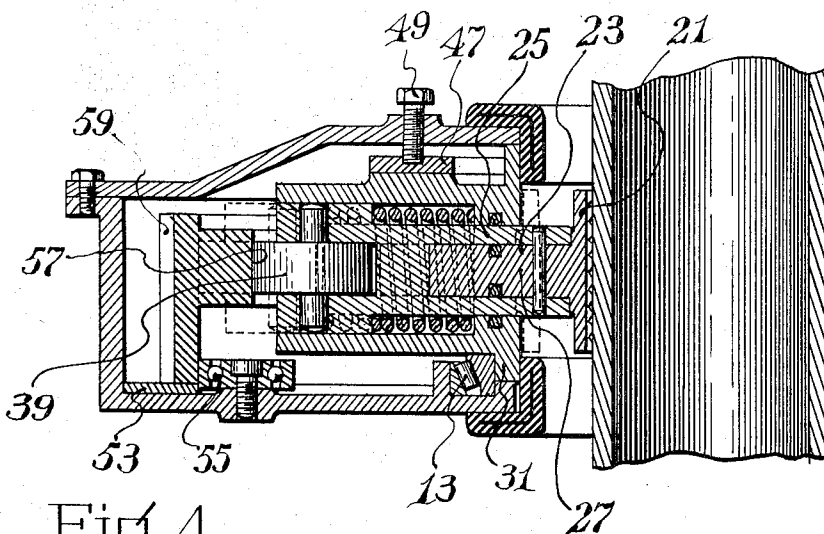


Fig. 4

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ABSTRACT OF THE DISCLOSURE

A grapple comprises a plurality of radially reciprocable jaws spring-urged outwardly, and movable inwardly by the rotation of a ring that has cam surfaces that bear against the radially outer ends of the jaws. A special brake and a special bumper are provided, as well as a special configuration of the jaw mountings.

The present invention relates to grapples, more particularly of the well type having contracting grapping means which are inwardly cammed. Grapples of this type are sometimes known as gear-operated machine wrenches.

It is an object of the present invention to provide a grapple which has a strong grip.

Another object of the present invention is the provision of a grapple in which the application of gripping force can be precisely controlled.

Finally, it is an object of the present invention to provide a grapple which will be relatively simple and inexpensive to manufacture, easy to apply, operate, maintain and repair, and rugged and durable in use.

Other objects and advantages of the present invention will become apparent from a consideration of the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is an outside perspective view of a grapple according to the present invention, in use in connection with well pipe or tubing;

FIGURE 2 is a vertical cross-sectional view of a grapple according to the present invention, with parts broken away for clarity;

FIGURE 3 is an enlarged fragmentary perspective view of a portion of a grapple according to the present invention; and

FIGURE 4 is a side cross-sectional view of the structure shown in FIG. 3.

Referring now to the drawings in greater detail, there is shown a grapple indicated generally at 1, comprising a casing 3 in the general shape of a shallow upwardly open pan. A cover 5 removably covers the contents of casing 3, and is detachably secured to the marginal flanges of casing 3 by means of a plurality of bolts 7. Casing 3 has a laterally outward extension 8 which provides a gear housing, as will be explained later; and extension 8 terminates in a catline eye 9 by which the grapple may be carried when being moved from place to place.

Mounted concentrically within casing 3 is a rotatable frame 11 which is carried by radial and thrust bearing 13 which in turn is carried by the lower portion of casing 3. Frame 11 has an inner upstanding cylindrical wall 15 concentric with the grapple and a plurality of radially outwardly extending housings 17. Each housing 17 is in the general shape of a cylinder and is hollow and opens inwardly toward the axis of the grapple. The axes of housings 17 intersect the axis of the grapple at a common point.

Mounted for radially outward and inward reciprocation in each housing 17 is a jaw 19. Each jaw 19 comprises a radially innermost gripping shoe 21, that has usual roughened radially inner cylindrical surface concentric with the axis of the grapple. Each shoe 21 is carried on a

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radially outwardly directed extension 23 disposed in a cylindrical sleeve 25 of a shank 27. If desired, each extension 23 may be pinned within its corresponding sleeve 25. In this way, shoes 21 may be removed and replaced when worn or damaged.

Each jaw 19 terminates outwardly in a head 29 that has an at-least-partial outer cylindrical surface in sliding contact with the interior of the corresponding housing 17. Each housing 17, in turn, has a radially inwardly extending annular shoulder 31 about its inner end. A seal 33 in the form of an O-ring seals the sliding connection between shoulder 31 and sleeve 25. A similar O-ring seal 35 seals between extension 23 and sleeve 25, although there is ordinarily no relative movement between extension 23 and sleeve 25. Seals 33 and 35 exclusive dirt and water from the interior of the structure. A coil compression spring 37 encircles shank 27 and acts resiliently between shoulder 31 and head 29 continuously yieldably to urge jaw 19 radially outwardly to the dotted line position shown in FIG. 2. Each head 29 carries a roller 39 thereon, which is of the largest diameter that can conveniently fit within housing 17, and which is mounted for rotation on and relative to head 29 about an axis parallel to the axis of the grapple.

Casing 3 and cover 5 and inner wall 15 of frame 11 carry between them a pair of annular bumpers 41 disposed as shown in FIGS. 3 and 4. Each bumper 41 is of an elastic deformable material such as natural or synthetic rubber or other elastomer or the like, and is preferably provided with a steel reinforcing insert 42. Each bumper 41 overlies not only the cylindrical marginal portions of the structure of the grapple that encircles the central opening of the grapple, but also the radially outwardly extending surfaces that border that opening.

Thus, bumpers 41 are L-shaped or V-shaped in cross section and protect the upper and lower as well as the radially inner surfaces of the grapple. It is particularly to be noted that in their radially outermost positions, shoes 21 are largely protected within the contours of bumpers 41, so that when the grapple is placed on or removed from a length of pipe or tubing, accidental contact between the grapple and the tubing will be borne by bumpers 41 and not by shoes 21 or any other unyieldable portion of the structure of the grapple.

A solid ring 43 extends between and rigidly interconnects housings 17 and has an upper annular surface 45 disposed in a plane perpendicular to the axis of the grapple. A brake ring 47 concentric with the grapple is movably disposed within the casing of the grapple and has a lower surface that is in sliding area contact with surface 45 of ring 43. A plurality of screws 49, at least three in number, extend through cover 5 and are accessible from the outside of the grapple and terminate in relatively movable brake ring 47, for the purpose of adjusting the position of brake ring 47 axially of the grapple. By manipulation of screws 49, therefore, brake ring 47 can be pressed against surface 45 of ring 43 with more or less pressure, thereby to regulate the ease with which frame 11 can rotate in casing 3.

A ring 51 is rotatably disposed adjacent the periphery of casing 3. Ring 51 rotates about its axis, which is the axis of the grapple, on a wear ring 53, carried by the bottom of casing 3. Bearings 55, which may for example be in the form of roller bearings, are mounted for rotation on the bottom of casing 3 about vertical axes parallel to the axis of the grapple. Bearings 55 have outer cylindrical surfaces which bear against the inner cylindrical surface of ring 51. In this way, ring 51 is maintained freely rotatable in casing 3, but at all times coaxial with the grapple.

On its radially inner surface, ring 51 carries a plurality of identical cam tracks 57. Cam tracks are identical

in number and in peripheral spacing to the rollers 39 of jaws 19. Those rollers 39 roll against cam tracks 57, and also on the surfaces of ring 51 between cam tracks 57. The coil compression springs 37 continuously yieldably maintain rollers 39 in contact with the adjacent surfaces of ring 51. There are thus provided surfaces on ring 51 which are various distances from the axis of the grapple, so that movement of ring 51 relative to frame 11 causes radially inward or outward movement of jaws 19 relative to frame 11.

The outer periphery of ring 51 is provided with a plurality of gear teeth 59. Gear teeth 59 mesh with a gear train 61, housed in extension 8, the drive gear of which is provided with a power connection 63 that extends outside the grapple casing, as shown in FIG. 1. Thus, when power is applied to power connection 63 to rotate the drive gear, the gear train 61 is rotated, which rotates ring 51 relative to frame 11, thereby to force the jaws radially inwardly or to permit the jaws to be pushed radially outwardly under the urging of springs 37 so long as frame 11 is stationary.

In order to prevent rotation of frame 11 such as would cause shoes 21 to turn on and score the pipe or tubing on which the grapple is being used, the brake ring 47 is adjusted by means of screws 49 until the frictional contact between the brake ring and ring 43 of frame 11 is sufficient to maintain frame 11 initially stationary. However, once the shoes 21 have engaged the pipe or tubing, it is desired that the ring 51 and frame 11 rotate together as a unit, driven by the gear train 61. It is thus an important feature of the present invention that the brake ring 47 can provide enough braking effect to prevent rotation of frame 11 during initial engagement of the shoes 21, but to permit turning movement of frame 11 as a unit with ring 51 relative to casing 3 once the shoes 21 have been firmly engaged on the pipe or tubing. The casing 3 remains stationary throughout.

Upon reversing gear train 61, ring 51 is driven in the opposite direction. First, rollers leave their former cam tracks 57, and jaws 19 are released. Then rollers 39 move about ring 51 between cam tracks 57 and then mount the next adjacent cam tracks 57, whereupon the previous operation is repeated but in the opposite direction.

Of course it will be understood that the spacing and contour of cam tracks 57 determine not only the gripping strength of jaws 19 but also the diameter of pipe or tubing that the grapple is adapted to handle. Accordingly, it will be observed that removal and replacement of ring 51 with a ring having other configurations of cam tracks 57 is not only possible but quite easy with the construction of the present invention.

From a consideration of the foregoing disclosure, therefore, it will be evident that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been disclosed and illustrated in connection with a preferred embodiment, it is to be understood that modifications and variations

may be resorted to, as will be understood by those skilled in this art. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

Having described my invention, I claim:

1. A grapple comprising a casing, a ring rotatable about its axis in the casing, a plurality of gripping jaws disposed within and reciprocable radially of the ring, the ring having internal portions at varying distances from the axis, means yieldably urging the jaws radially outwardly, the jaws bearing against said internal portions, means for rotating the ring to move said jaws simultaneously radially toward or away from said axis as the jaws bear against said internal portions of the ring, the jaws having radially outwardly extending shanks, a frame through which said shanks extend, the frame and casing having a central opening therethrough, and yieldable bumper means on the grapple lining the opening and extending outwardly of the opening, the jaws in their radially outermost position extending radially inwardly substantially no farther than said bumper means, the jaws in their radially innermost position extending radially inwardly farther than said bumper means.

2. A grapple comprising a casing, a ring rotatable about its axis in the casing, a plurality of gripping jaws disposed within and reciprocable radially of the ring, the ring having internal portions at varying distances from the axis, means yieldably urging the jaws radially outwardly, the jaws bearing against said internal portions, means for rotating the ring to move said jaws simultaneously radially toward or away from said axis as the jaws bear against said internal portions of the ring, the jaws having radially outwardly extending shanks, a frame through which the shanks extend, and the yieldably urging means comprising coil compression spring means surrounding and coaxial with said shanks and acting between the frame and said shanks, and roller means carried by said shanks and rolling on said internal portions, said shanks having enlarged heads at their radially outer ends, said coil compression spring means bearing against the radially inner sides of said heads, said heads being bifurcated for the reception of said roller means so that a portion of each head is disposed above said roller means and another portion of said head is disposed below said roller means, said roller means having axles that extend in opposite directions from said roller means and are rotatably received in said head portions on opposite sides of said roller means.

References Cited

UNITED STATES PATENTS

2,181,641	11/1939	Hicks	81—57
2,518,398	8/1950	Stone	81—57.3
2,550,045	4/1951	De Hetre	81—54.1
2,933,961	4/1960	Adams	81—57.3
3,180,186	4/1965	Catland	81—57.3

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