ADJUSTABLE SELF-CLOSING PIPE WRENCH AND THE LIKE

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This invention relates to hand tools and more particularly to self-adjusting pipe wrenches, although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially the provision of improved hand tools of the pipe wrench type embodying self-closing expedients comprising the subject matter of United States Letters Patents 1,602,620; 1,830,033 and 2,351,821 which have been simplified in their construction to improve their operation, increase the capacity and to substantially reduce the manufacturing costs thereof.

One object of the present invention is to simplify the construction and improve the operation of devices of the general character mentioned.

Another object is to provide an improved pipe wrench that has a more effective jaw structure and an improved spring structure for rendering the jaws self-adjusting to the work that is to be turned.

A further object is to provide an improved combination pipe and nut turning wrench of the self-adjusting thumb trigger actuating type possessing effective gripping action and having a re-inforcing pivot providing appreciable load capacity.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

In the drawing:

Figure 1 is a side view in elevation of a pipe wrench embodying features of the present invention.

Figure 2 is an edge view of the pipe wrench shown in Figure 1, viewed from the open jaw side thereof.

Figure 3 is an enlarged fragmentary side view in elevation of the jaws with parts thereof broken away and shown in section to clarify the illustration.

Figure 4 is an enlarged fragmentary side view in elevation of the jaw structure view to correspond with the showing in Figure 3, parts thereof being removed to illustrate the self-closing spring assembly.

Figure 5 is a fragmentary sectional view taken substantially along line V—V of Figure 4.

Figure 6 is a sectional view in elevation similar to Figure 5, showing an improved re-inforced bearing for the movable jaw mounting pivot pin in wrenches made of light weight metals such as aluminum and the like.

Figure 7 is a fragmentary sectional view taken substantially along line VII—VII of Figure 6.

Figure 8 is a perspective view of the reinforced pivot pin bearing shown in Figures 6 and 7.

Figure 9 is an enlarged and inverted plan view of a spring anchoring bushing or collar used with either form of the bearing for the movable jaw pivot pin.

Figure 10 is an enlarged plan view of the spring and anchoring bushing sub-assembly shown in Figures 3 and 5.

Figure 11 is an enlarged perspective view of the fixed and movable jaw gripping elements showing the wedge anchoring clamps and extended serrated gripping face thereof.

The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the invention, but is merely illustrative thereof. There may be considerable variations and adaptations of all or part of the teachings depending upon the dictates of commercial practice.

The illustrated embodiment comprises an elongated wrench handle 10 that is forged or cast from an alloy steel composition to present a somewhat tapered manipulating shank. The handle shank 10 has rounded transversely extended integral webs 11, 12 formed near the free end thereof to terminate in an enlarged circular boss 13 through which a hole 14 is provided to lighten the construction and afford the hanging support thereof from a suitable vertical wall anchor such as a nail.

The shank 10 tapers slightly to terminate in a fixed or stationary jaw 18 that has an enlarged angular end portion 16 provided with tapered or complementary wedge-shaped transverse grooves 17, 18 to receive correspondingly shaped and sized wedge clamps 19—20 formed integral with an arcuate detachable jaw gripper element 21. The arcuate surface of the jaw gripper element 21 is provided with serrations or teeth 22 over the entire gripping surface thereof. The fixed or stationary jaw 15 projects from a somewhat enlarged circular boss 23 formed integral therewith at its juncture with the handle shank 10 to serve as a pivoting expedient for a movable jaw 24.

The movable jaw 24 is provided with correspondingly shaped and sized furcated bosses 25, 26 that are complementary to the fixed jaw boss 23 that is received therebetween for free relative rotation, but without any lateral play. The fixed jaw boss 23 and the complementary furcated bosses 25, 26 are provided with eccentrically positioned and aligned apertures 27, 28, and 29, respectively, to receive a stepped pivot pin 30 therethrough that is preferably threaded.
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(Figure 5) only at a reduced projecting end thereof and that provides for the pivoting of the movable jaw 24 relative to the fixed or stationary jaw 15. The movable jaw 24 has accentuated triangular concave thumb trigger extensions 32, 33 formed integral with the movable jaw 24, 25 to accommodate the thumb of the user for quickly opening the movable jaw 24 relative to the fixed jaw 15 to accommodate either a round or polygonal pipe or a fastener such as a nut therebetween.

It is to be noted that the spaced thumb actuated trigger extensions 32, 33 accommodate the handle 10 therebetween while the movable jaw 24 is solid in construction and has a widened portion 34 substantially conforming to the widened angular portion 16 of the stationary jaw 15. The movable jaw portion 34 detachably receives a complementary gripping element 35 comprising a straight serrated rectangular portion 36 and an integral relatively smooth portion 37. The detachable angular gripping element 35 has transverse wedge cleats 38, 39 to tightly fit into correspondingly shaped transverse grooves 40, 41 in the movable jaw portion 34 which conforms and cooperates with the detachable stationary jaw arcuate gripping element 21.

The detachable gripping elements 21 and 35 are made from high carbon steel which is hardened to provide maximum wear resistance being more durable than the remaining structural parts, these gripping elements 21, 35 (Figure 11) are detachable for ready replacement to give extended life to the wrench structure. This replacement is rendered possible by the wedge-shaped cleats 19, 20 and 38, 39 on the gripping elements 21, 35, respectively. These transverse cleats 19, 20 and 38, 39 fit into correspondingly shaped transverse grooves 17, 18 and 40, 41. With this arrangement, any user can more or less instantly knock out or replace the gripping elements 21, 35. It should be noted that the gripping elements 21, 35 may be varied in shape and structure depending upon the dictates of commercial practice.

By thumbing the trigger extensions 32, 33 in a clockwise direction (viewed from Figure 9) the jaws 15, 24 can be readily opened to accommodate the work that is to be turned therewith. By thumbing the triggers 32, 33 in a counterclockwise direction (viewed from Figure 3) increased pressure can be imparted to the pipe or nut which is being grasped between jaws 15, 24 to increase the gripping action thereon, under extreme conditions to initiate the gripping action and procure more effective results therewith. The concave and extended thumb engaging surface of the triggers 32, 33 facilitates thumb manipulation of the movable jaw 24 without inconvenience or abrasion to the thumb.

In order to render the movable jaw 24 self-adjusting toward the stationary jaw 15 to accommodate the work therebetween and to effectively grasp such without requiring the use of two hands, a flat spiral spring 42 is provided within an annular recess 43 provided in the face of the boss 25 of the movable jaw 24. The flat spiral spring 42 has an enlarged angular extremity 44 directed outwardly therefrom to serve as a complement of a radial slot 45 provided in a lug or ear formed adjacent the circumference of the central boss 25 and defining the anchoring expedient for the flat spiral spring 42. The radial slot 45 is provided in the boss 25 proximate to the periphery thereof to establish communica-

tion with the annular recess 43 so that the enlarged spring extremity 44 can rest therein and serve to anchor the flat spiral spring 42 which surrounds an axial collar 46.

The axial collar 45 is tubular and has an axial bore 47 at one end to freely fit over that portion of the movable jaw 24, 25 to accommodate the transverse diameter, and has a reduced bore 48 at its other end as a complement of a reduced pin shoulder extension 49 on the pin 30 adjacent the threaded extremity 31 thereof. Diagonally extending and downwardly projecting lugs 50, 51 are formed on the lower surface of the pin 30 adjacent to the movable jaw mounting pin 30 to register with corresponding sized and spaced recesses 50', 51' in the adjacent surface of the fixed jaw boss 23 to retain the collar 46 against rotation relative to the handle 10 and fixed jaw 15. An inwardly directed and axially offset extremity 52 of the flat spiral spring 42 is inserted in one of a plurality of radial slots 53, in this instance three, provided in the periphery of the collar 46 so that the tension of the flat spiral spring 42 is adjustable. This enables the best setting of the spring 42 to effectivel)y displace the movable jaw 24 toward the stationary jaw 15 thereby normally urging the movable jaw 24 to a closed position. As shown, the coil spring 43 is confined within the annular recess or chamber 43 of the movable jaw boss 25, and it permits the rotary oscillation of the movable jaw 24 relative to the collar 46 and its associated parts within the limits of the slot 54 between and defined by the spaced furredcated movable jaw bosses 25, 26.

With this arrangement, the spring 42 will normally urge the movable jaw 24 toward the stationary jaw 15 from any position between the limits defined by the abutment of a transverse wall 55 (see Figures 3 and 4) of the slot 54 against the handle 10 (Figure 4) and by contact of the jaws with one another. As a result the attendant can thumb the triggers 32, 33 in a clockwise direction to open the movable jaw 24 relative to the stationary jaw 15 to any desired distance within the above defined limits.

In order to conceal the spring 42 and preclude any foreign substance from entering the annular recess 43, a washer or substantially circular plate 56 having an eccentrically disposed offset 57 as a complement of the movable jaw boss interior 43, is disposed over the threaded pin extremity 31 for retention in assembled relation by a fastener or nut 58. The threaded nut 58 confines the cover plate or washer 56 in a position for peripheral contact with the boss 25 to serve as a cover for the annular recess 43 and to confine the spring 42 therein. It should be noted that the boss 25 is (Figure 5) recessed or countersunk around the periphery of the annular recess 43 to accommodate the washer or plate 56 so that the latter will lie flush with the boss. It should be noted that the pin 30, washer 56, nut 58 and jaw 24 move as a unit, while collar 46 is fixed to collar 45 and handle 10 to enable the outer end 44 of spring 42 to actuate the movable jaw 24 relative thereto.

In the modified embodiment illustrated in Figures 6 to 9 inclusive, the structural features described supra are embodied therein, but an extra steel reinforcing pin bearing 60 is compositely associated with the comparatively lighter but essentially weaker handle 10 which may be cast, forged or otherwise shaped from aluminum or aluminum alloy. Such light metals have desir
able characteristics but do not normally possess the strength to carry appreciable loads in the region of the pin 30 which is similar in construction to the pivot described in connection with the preceding embodiment. To this end, the pin bearing 60 is provided with an axial bore 61 therethrough to freely receive the pin 30 and diametrically opposite recesses 62, 63 communicating with the bore 61 on the upper face 64 of the bearing 60. The diametrically opposed recesses 62, 63 register with the projecting lugs 50, 51 provided in the spring adjusting collar 46. With this arrangement, the adjusting collar 46 will be accurately disposed for registering with the steel pin bearing 60 so that one cannot rotate relative to the other, the pin 30 extending therethrough for rotary movement relative to both the adjusting collar 46 and the pin bearing 60.

The pin bearing 60 is, in this instance provided with an annular peripheral groove 56 which is interrupted by opposed tangential and parallel 65, 66 so that when the handle 10 with the stationary jaw 15 is cast or otherwise shaped from aluminum or similar materials, the pin bearing 60 may be compositely associated therewith, thereby precluding the pin bearing 60 from rotating relative to the handle 10 and stationary jaw 15. The steel pin bearing 60 will appreciably increase the load bearing capacity of the comparatively lighter and weaker aluminum alloy 10, and all the advantages of a steel wrench are procured with the additional desirable feature of having an appreciably lighter wrench. By providing hardened high carbon steel gripping elements similar to the gripping elements illustrated and described in connection with figure 11, a very desirable and satisfactory light weight wrench results. It should also be noted that wrenches of this character may be cast or otherwise shaped from beryllium which assures adequate strength and provides a safe non-sparking tool that will meet the specifications and service requirements of oil refineries and other industries where highly inflammable substances are involved and cannot, therefore, be exposed or subjected to any possible spark.

With the arrangement of parts and structural features described above, it will be apparent that the movable jaw 24 that confronts the compound stationary jaw 15 accommodates both round and polygonal shapes so that the wrench can be utilized as a conventional pipe wrench as well as a nut turning wrench. This has been accomplished with a self-adjusting instrumentality which affords single hand manipulation and enables effective turning operations in a speedy manner without entailing any appreciable time or inconvenience.

While I have illustrated and described a preferred embodiment of this invention, it must be understood that the invention is capable of considerable variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

I claim:

1. A hand tool comprising a handle member, a fixed jaw on said handle member, said fixed jaw having a serrated arcuate gripping surface, a movable jaw having an angular gripping element pivoted to said handle member, said movable angular gripping element comprising a straight serrated portion and a straight smooth portion disposed angularly to each other in confronting relation with said fixed jaw, a bearing of greater load sustaining capacity than said member permanently associated therewith to receive a pin for mounting said movable jaw, furcated trigger extensions formed integral with said movable jaw to enable the thumb actuation thereof, and spring means for normally urging said movable jaw relative to said fixed jaw.

2. A hand tool comprising an elongated handle member, a fixed convex serrated jaw formed on one end of said handle member, a movable jaw pivoted to said handle member to confront said fixed jaw, a bearing permanently associated with said handle member for journaled support of said movable jaw, said movable jaw having a straight serrated and an angularly disposed integral smooth portion, trigger extensions formed integral with said movable jaw to straddle said handle, a collar disposed axially of said bearing for fixed association therewith, and spring means adjustably anchored to said collar and to said movable jaw for normally urging said movable jaw toward said fixed jaw.

3. A hand tool comprising an elongated handle member, a fixed jaw formed on said handle member, a movable jaw pivoted to said handle member in confronting relation with said fixed jaw, a pivot pin extending through said movable jaw and handle member to pivotally mount said movable jaw relative to said fixed jaw, a collar surrounding said pivot pin and anchored to said handle member, and spiral spiring means associated with said confronting jaws to normally urge said movable jaw toward said fixed jaw, the inner end of said spiral spring means being adjustably anchored to said collar proximate to but offset from said movable jaw pivot, the outer extremity thereof being anchored to said movable jaw for normally urging the latter toward said fixed jaw, there being a circumferential annular recess in said movable jaw member to receive said spring, said collar being axially mounted relative to said annular recess, and said spring comprising offsets on the extremities of said spring for detachable connection with said collar and movable jaw.

4. A hand tool comprising an elongated handle member, a fixed jaw formed on said handle member, a movable jaw pivoted to said handle member in confronting relation with said fixed jaw, a pivot pin extending through said movable jaw and handle member to pivotally mount said movable jaw on a fixed axis, a collar surrounding said pivot pin and having means engaging said handle member to prevent relative rotation therebetween, said collar having radial slots therein, and spiral spring means associated with said confronting jaw to normally urge said movable jaw to said fixed jaw, the inner end of said spring means being anchored in one of the radial slots in said collar, the outer extremity of said spring being anchored to said movable jaw for normally urging the latter toward said fixed jaw for relative oscillatory movement, there being a circumferential annular recess in said movable jaw member to receive said spring, said collar being axially mounted relative to said annular recess, and said spring anchoring means comprising offsets on the extremities of said spring for detachable connection with said collar and movable jaw.

5. A hand tool comprising an elongated handle member, a fixed jaw formed on said handle member, a movable jaw pivoted to said handle member.
ber in confronting relation with said fixed jaw, a pivot pin extending through said movable jaw and handle member to pivotally mount said movable jaw on a fixed axis, a bearing having an irregular periphery cast for permanent association with said handle member to receive said pivot pin therethrough, a collar surrounding said pivot pin and having means engaging said handle member bearing to prevent relative rotation therebetween, said collar having radial slots therein, and spiral spring means associated with said confronting jaw to normally urge said movable jaw to said fixed jaw, the inner end of said spring means being anchored in one of the radial slots in said collar, the outer extremity of said spring being anchored to said movable jaw for normally urging the latter toward said fixed jaw for relative oscillatable movement, there being a circumferential annular recess in said movable jaw member to receive said spring, said collar being axially mounted relative to said annular recess, and said spring anchoring means comprising offsets on the extremities of said spring for detachable connection with said collar and movable jaw.

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