

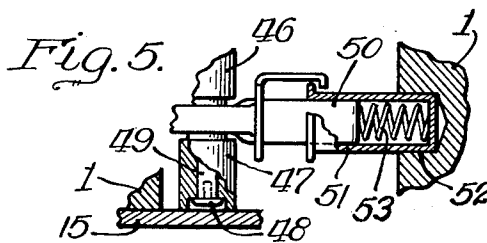
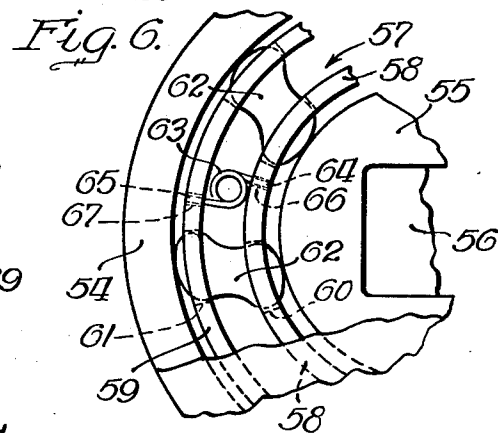
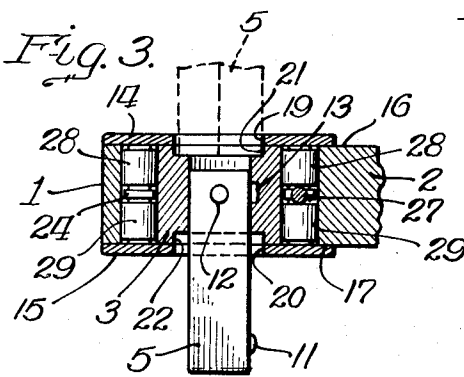
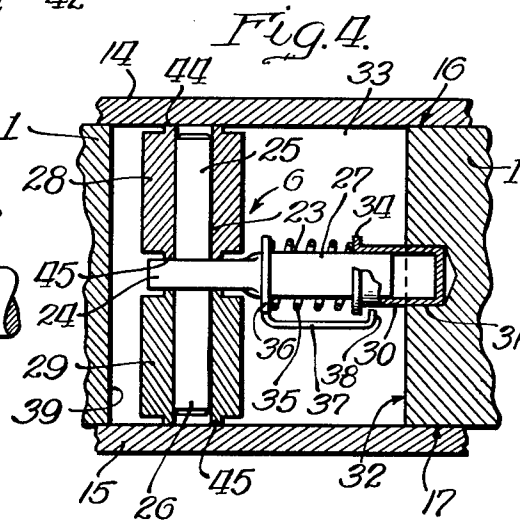
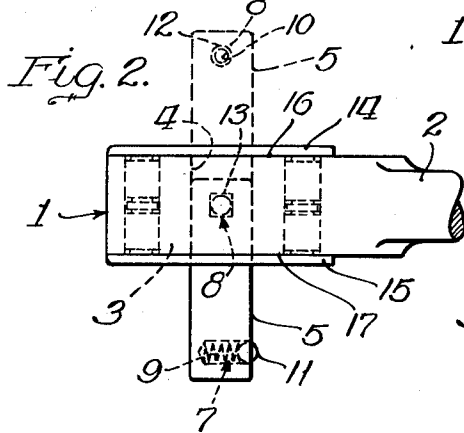
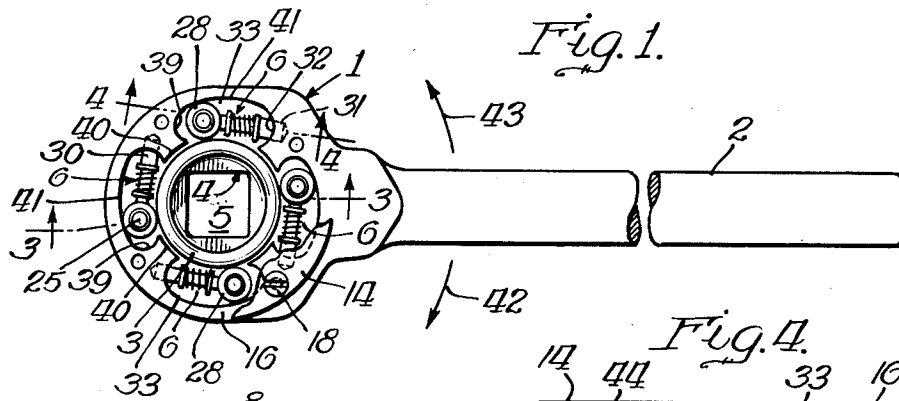
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3,204,496

INFINITE POSITION WRENCH

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INFINITE POSITION WRENCH

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This invention relates to a tool that is widely used in connection with the usual conventional socket wrench elements by mechanics and servicemen in shops and garages for all types of mechanical apparatus for assembly or disassembly.

More specifically, this invention is directed to an infinite position wrench having unlimited uses as a wrench unit and one which, for example, is well adapted to connect with and operate socket wrenches for working nuts and bolts and the like.

One of the objects of the wrench of this invention is to be able to obtain a free non-force free running return movement of the wrench and its handle to any one position as determined by clearance factors or to any subsequent return positions having different angular limits, and to be able to power operate the wrench to turn the same per se and any connected device such as a socket wrench to turn a nut or bolt or like device in a given selected direction of rotation.

Another object is to provide a wrench of this character with overrunning means carried by the main body of the wrench having the handle and coaxing with a turnable part which has an opening that is made to retain a polygonal stem or stud, the latter being essentially devised for releasable connection with another tool piece such as a socket wrench or the like.

Another object is to provide a number of overrunning mechanisms each as individual unitary assemblies that are interchangeable and/or replaceable with ease and efficiency, requiring very little time to service, interchange or to replace as the case may be and as conditions warrant.

A further object is to incorporate dual overrunning rollers into the individual units that control the power and release turning motions of the wrench so as to provide a certain amount of self-alignment of the rollers between the adjacent coaxing surfaces on the wrench body and on the rotary element that drives the stem or stud serving the socket wrench. This will insure positive gripping at all times and also tend to better preserve the life of the surfaces between which the overrunning rollers act in the operation of the device.

It is another object to lock in all the overrunning assemblies with simple plate means and to reduce friction factors to a minimum except where needed directly between the rollers and the roller contacted parts of the wrench, so that all turning effort is substantially converted into productive effort and not partially expended to overcome unwanted friction.

The tool also incorporates a simple centering means to guide a stem or stud into the rotary wrench element, such stud also being endwise shiftable and equipped to engage a socket from either side or working face of the tool or wrench to permit reverse operation of the wrench.

Other objects and advantages of the infinite position wrench of this invention shall hereinafter appear in or become evident from the following detailed description thereof having reference to the accompanying drawing of some exemplary embodiments thereof, the drawing forming a part of this application.

In the drawing:

FIG. 1 is a plan elevational view of the infinite position wrench looking at one working face thereof, the cover on this side of the wrench having been broken away

to better illustrate the overrunning working assemblies of the wrench;

FIG. 2 is an edge or side elevational view of the head portion of the wrench diagrammatically showing some of the interior working units of the wrench in broken lines, the drive stud being illustrated down and in full lines in one driving relation to the wrench and up in broken lines in another driving relation for reverse drive purposes;

FIG. 3 is a vertical cross sectional view through the head of the wrench substantially as viewed along the general plane of the line 3—3 in FIG. 1;

FIG. 4 is a fragmentary enlarged vertical cross sectional view through an annular portion of the head of the wrench and substantially as viewed in the general plane of the line 4—4 in FIG. 1;

FIG. 5 is a fragmentary vertical sectional detail view on the order of FIG. 4, but illustrating a modified construction of the invention; and

FIG. 6 is another plan elevational view of a fragmentary part of the head of a modified construction of the infinite position wrench.

One form of the invention is portrayed in FIGS. 1 to 4 and comprises an infinite position wrench having a head 1, a handle 2, a rotatable drive tool holding chuck 3 provided with a polygonal opening 4 to carry a tool such as a drive stem or stud 5, and a plurality of overrunning assemblies 6 are interposed between the head and the drive chuck 3. As shown in FIGS. 1, 2 and 3, the tool holding chuck 3 is provided with an uninterrupted smooth and true circular outer peripheral surface and the chuck is rotatively carried within a bore in the head provided to accommodate the chuck.

The stud 5 is supplied with releasable orientation means 7 and 8 each having springs 9—10 and exposed balls such as 11—12 that register with suitable internal notches such as 13 in the chuck 3 to hold the stud 5 in one or the other of its selected positions as shown in FIG. 2, the exposed means 7 or 8 serving to latch into a socket wrench with the same means and in the usual conventional manner.

All of the working parts such as the chuck 3 and the multiple unitary assemblies 6 comprising the overrunning means are maintained in their working relationships within the head 1 by means of covers 14 and 15 seated upon the opposite outward surfaces or sides 16 and 17 of the head 1 and secured in place by any suitable means such as screws, one such screw 18 being shown in FIG. 1 for purposes of illustration.

The covers 14 and 15 are each provided with central round openings 19 and 20 to match the cylindrical recessed openings 21 and 22 in the chuck 3 as shown in FIG. 3. The diameters of both sets of openings accommodate the polygonal corner portions of the stud 5 to orient the stud in such a fashion that when the stud is not in correct position for free entry into the polygonal opening 4 in the chuck 3, a slight turn of the stud in either direction will readily bring about the alignment and union of the stud 5 with the chuck 3.

The multiple overrunning means 6 are each of like design and comprise individual units that can readily be assembled with the head 1 to retain their operative positions even with the removal of the chuck 3 for repair or replacement by chucks of different sized openings. Each of said means comprises a T-fixture 23 having a flat surfaced divider 24 with rigidly connected aligned spindles 25 and 26, and an orientation or supporting pin 27. Individual overrunning rollers 28 and 29 are carried upon the spindles 25 and 26 with a predetermined amount of clearance to permit a certain amount of roller alignment through the thickness of the head 1 under operation.

A thimble 30 rides on the pin 27 and is made to seat

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into a hole 31 in the end wall 32 of the cavity 33 housing the overrunning means 6. The thimble also has an end flange 34 and an expansion spring 35 is on pin 27 abutting flange 34 of thimble 30 and extends to and abuts another flange 36 secured upon or fastened to pin 27 so that the spring 35 is constantly urging rollers 28 and 29 toward the left in FIG. 4 while the same spring action keeps the thimble 30 seated in opening or hole 31. A retaining strip 37 is provided as a part of flange 36 to carry a hook 38 in a position behind the thimble flange 34 to keep the thimble from flying off of the pin 27 upon removal of the roller assembly and its associated parts from within the head cavity 33.

It should be observed that each head cavity 33 has an undercut wall or curved end wall portion 39 to accommodate the assemblies 6 by holding the rollers 28 and 29 of each overrunning means in place within the cavity 33 during the removal of chuck 3 from operative position between the assemblies 6. The thimble 30 in opening 31 holds the other end of the overrunning means in place and any suitable tool with movable prong ends on the order of a tweezer may be employed to squeeze the flanges 34 and 36 toward each other to place the roller assemblies into their respective cavities 33 or to remove the same therefrom. Readmittance of a chuck 3 between the roller assemblies is readily accomplished with the insertion of wedge elements between the rollers and wall portions 39 to create clearance to accept the chuck 3 into the central chuck bore 40. The chuck may also be first inserted followed by the assemblies 6.

Head 1 is made with a central bore 40 which is larger than the outer diameter of the chuck 3 as best seen in FIG. 1. Also each radially outer curved wall 41 of the head cavities 33 is not formed or shaped concentrically with bore 40, but this wall curves in a large involute from the roller location toward the end wall 32 to thereby provide an increasingly larger cavity from the roller location to produce the effective overrunning action that allows immediate gripping action between the head and chuck when the handle 2 is moved in the direction of arrow 42 in FIG. 1 and which permits relative free motion between the head and chuck as the handle 2 is moved in the direction of the arrow 43 also shown in FIG. 1.

It should be noted that the spring 35 of each overrunning means 6 does not directly contact and engage either roller to mar the surface thereof and no spring friction is thus expended against the larger outer peripheries of the rollers. The spindles 25 and 26, with some clearance in the roller bores, will only expend lesser line contact areas within the rollers on smaller diameter portions of the rollers reducing friction in that fashion. It is also to be noted that the roller ends are cut back axially to provide small end hubs 44 and 45 to further reduce excessive frictional contacts between the rollers and their adjacent end members of the wrench assembly such as the covers and the divider.

In assembling the overrunning means 6 into the wrench head 1, only one cover 14 or 15 need be removed. Then by using a pronged tool or other suitable means to keep the flanges 34 and 36 together an amount to let the thimble 30 enter opening 31, each means can be placed in their respective housing cavities 33 into operative positions. While the rollers 28 and 29 are free on their respective spindles 25 and 26, holding the tool or wrench with the head 1 vertically, with surfaces 16 and 17 upright, the rollers will stay on the spindles for assembly since the latter are then placed into the head in a horizontal position as will be readily understood by those skilled in the art.

In the modified form shown in FIG. 5, the rollers 46 and 47 are made with recessed ends and small drive studs such as 48 are connected with the end portions of the roller spindles, one spindle 49 being there shown.

This arrangement also has a T-fixture as in the previously described form of the invention, with a pin 50 riding

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in a thimble 51 which seats in opening 52 in an end wall portion of the head 1. The expansion spring 53 is confined in this design within the thimble 51 and between the end of the pin 50 and the end of the thimble.

FIG. 6 shows a modified sprag arrangement comprising a head 54 and chuck 55 carrying a stud 56, with an overrunning sprag means 57 interposed between the head and chuck. The sprag means 57 comprises sprag rings 58 and 59 having suitable openings 60 and 61 to accommodate sprags 62, as all diagrammatically shown. Suitable coil springs such as 63 are carried between the rings 58 and 59 and provide free spring ends 64 and 65 that lie in openings 66 and 67 in rings 58 and 59, the springs acting to hold the rings in positions to normally keep the sprags 62 in operative gripping positions.

The description relates to certain preferred forms of the invention shown by way of example only and for purposes of disclosure. It is contemplated that certain changes may be made in the individual elements and in their combinations without departing from the fundamental concept of the invention. The extent of such modifications shall, however, be governed by the breadth and scope of the language of the following claimed subject matter directed to the infinite position wrench of the present invention.

What I claim is:

1. An infinite position wrench comprising a handle operated head having an opening formed therethrough, a chuck to drive a connected stud disposed in said head opening, and overrunning mechanisms carried by said head for operative engagement with said chuck periphery to cause instant rotation of said chuck when the handle turns said head in one direction about the chuck axis and to cause instant relative motion between the chuck and head when the handle turns the head in a reverse direction, said head providing cavities formed into the opening wall thereof to house said overrunning mechanisms, each of said overrunning mechanisms comprising a T-fixture having a pin with aligned spindles on one end thereof and a thimble on the other end, rollers on said spindles, a flange on said thimble, a flange on said pin, and a resilient element operably confined between said two flanges to urge said pin and thimble apart, said thimble being seated in an opening in an end wall portion of its respective confining cavity with said resilient element acting to urge said rollers toward an opposite end wall portion of said same cavity, said resilient element functioning to keep the overrunning mechanism with the rollers in operative position between said head and chuck while releasably retaining the overrunning mechanism in its assembled relation in said head cavity.

2. In the combination of claim 1, with the addition of retaining means on one of said flanges coacting with the other of said flanges to prevent thimble separation from said pin during assembly or disassembly of said overrunning mechanism into or out of the head cavity housing same.

3. In the combination of claim 1, wherein said rollers are clearance fitted upon their respective spindles for automatic adjustable alignment with respect to the adjacent end wall of the head cavity, said orientation of the rollers relative to the adjacent end wall being augmented by said resilient element.

4. In the combination of claim 3, with the addition of cover members on said head to confine the chuck and overrunning mechanisms to the thickness of the head, said rollers being guided between said cover members and by said pin, and drive pins are provided to keep said rollers in operative relation to their respective spindles of said T-fixture.

5. An infinite position wrench comprising a handle driven head having a bore formed therethrough from face to face thereof, a circular chuck disposed within said bore in radially inwardly spaced relation thereto for relative rotation about the axis of said head bore, and

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overrunning mechanism disposed annularly in the space about said chuck and within the head bore to cause concerted positive motion between said chuck and head from any angular position when said handle is turned in one direction and to cause relative motion between said chuck and head from any angular position when the handle is turned in the reverse direction, said overrunning mechanism to produce the locking effect comprising a pair of concentric relatively movable rings occupying spaced annular positions around said chuck and within said head bore, rockable sprags carried generally radially of the chuck and head bore area by said rings through orientation openings in said rings and arranged for operative frictional endwise contact with said chuck and said head, and spring means operably connected with said coacting rings to urge said rings in a direction to urge said sprags into endwise frictional operative positions between said chuck and head at all times to effectively lock said chuck against relative rotary motion within said head bore as said head is actuated in one rotational direction and to frictionally release said rockable sprags to allow said chuck to turn freely in said head bore when the head is actuated in the opposite direction.

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6. In the combination of claim 5, wherein said head is provided with a relatively narrow head from face-to-face thereof terminating in opposite outward flat sides, said chuck occupying a position within the flat sides of said head, and said ring and sprag elements all are confined within the thickness of the head eliminating all projections of any kind from the head thickness limits, and cover means are provided on each side of said head to enclose the entire working part zones to house such parts within the head and to streamline the wrench for use in tight hard to get at places.

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