Oct. 31, 1950 O. D. GRAY 2,528,430

LOCKED NUT UNLOCKING SOCKET WRENCH

Original Filed June 24, 1942 2 Sheets-Sheet 1

Fig. 1

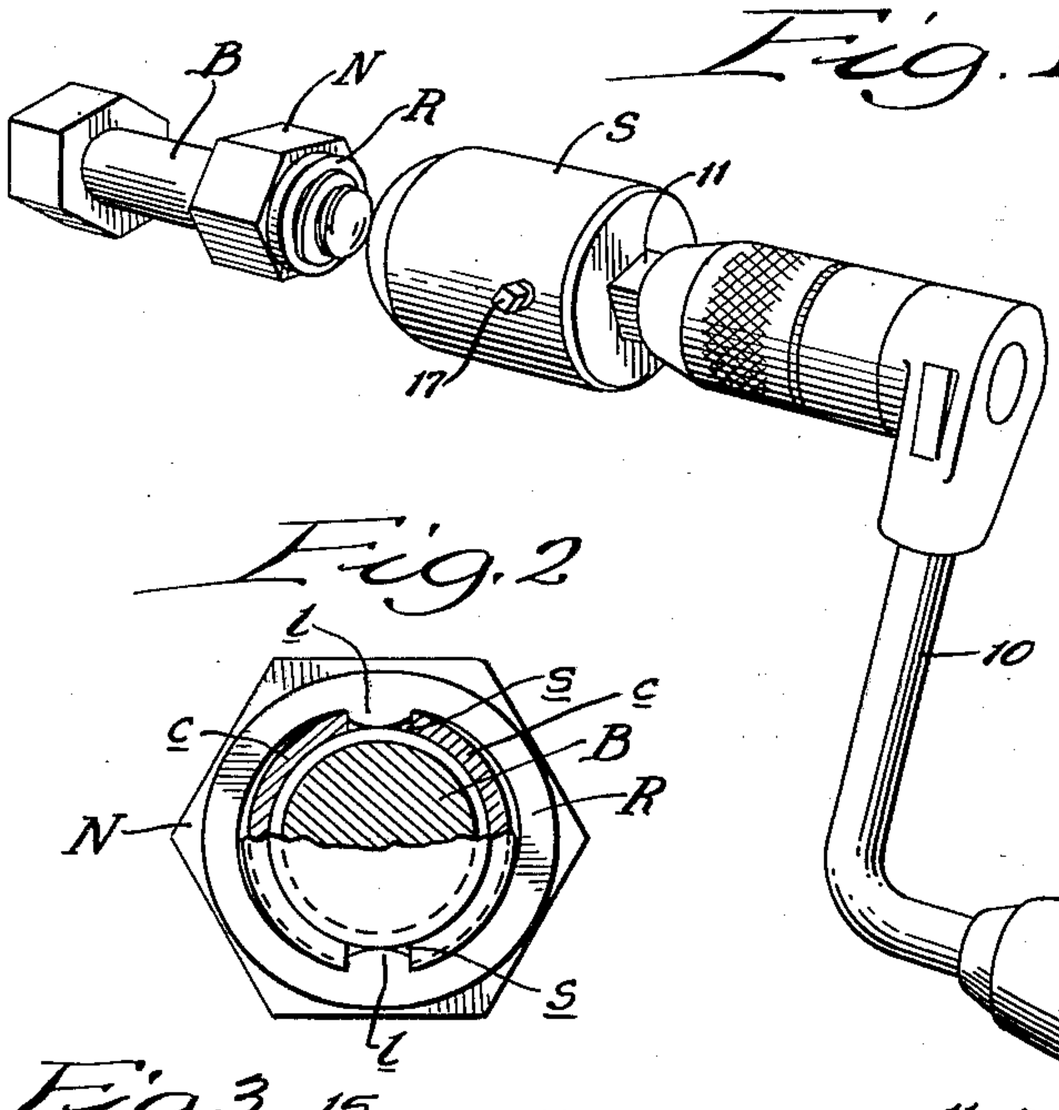

Fig. 2

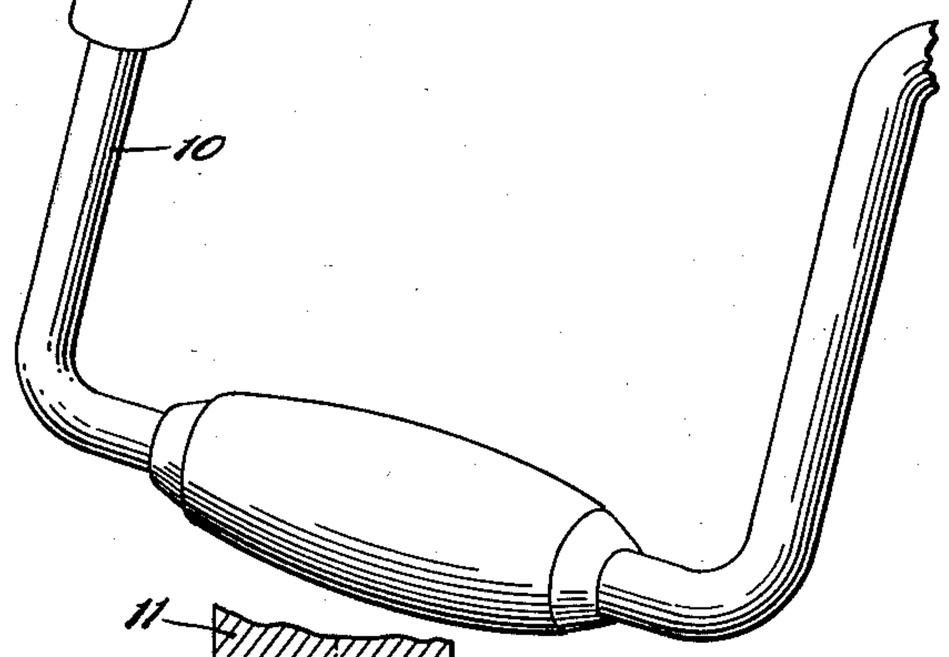

Fig. 3

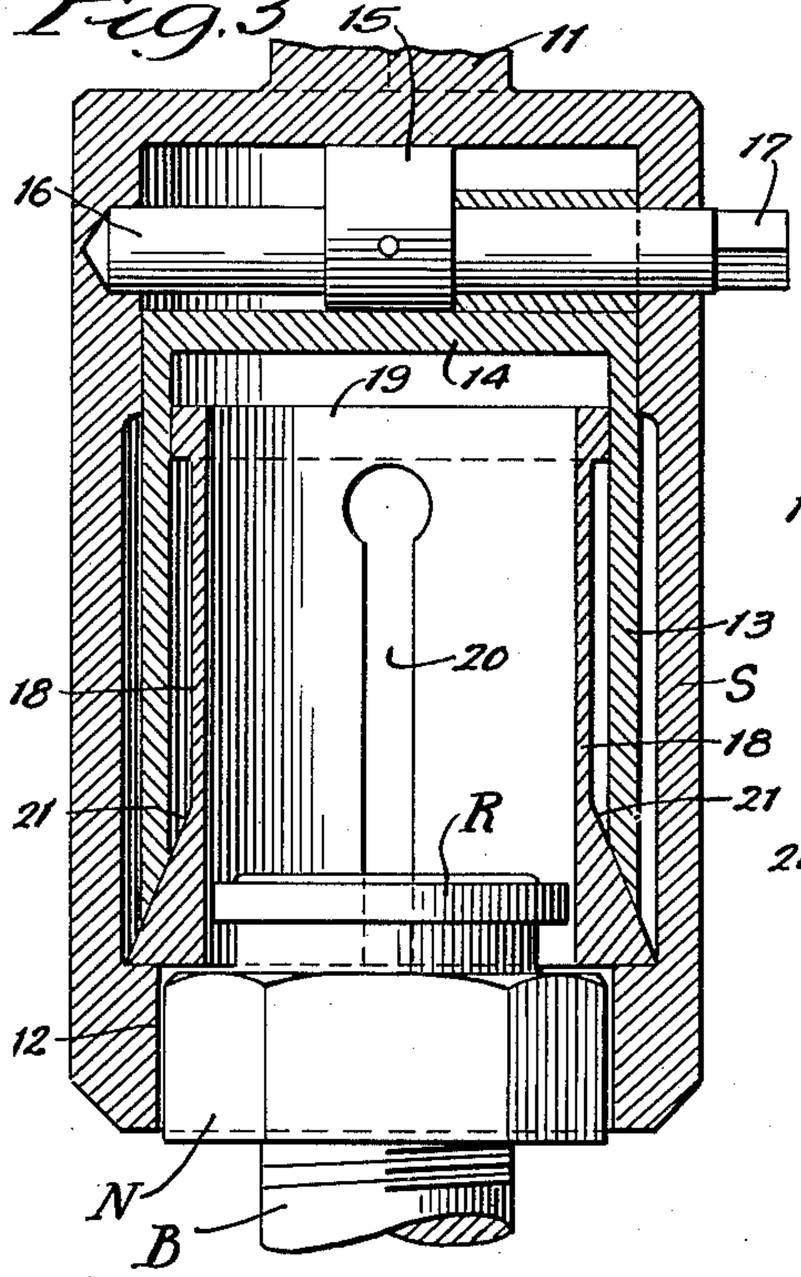

Fig. 4

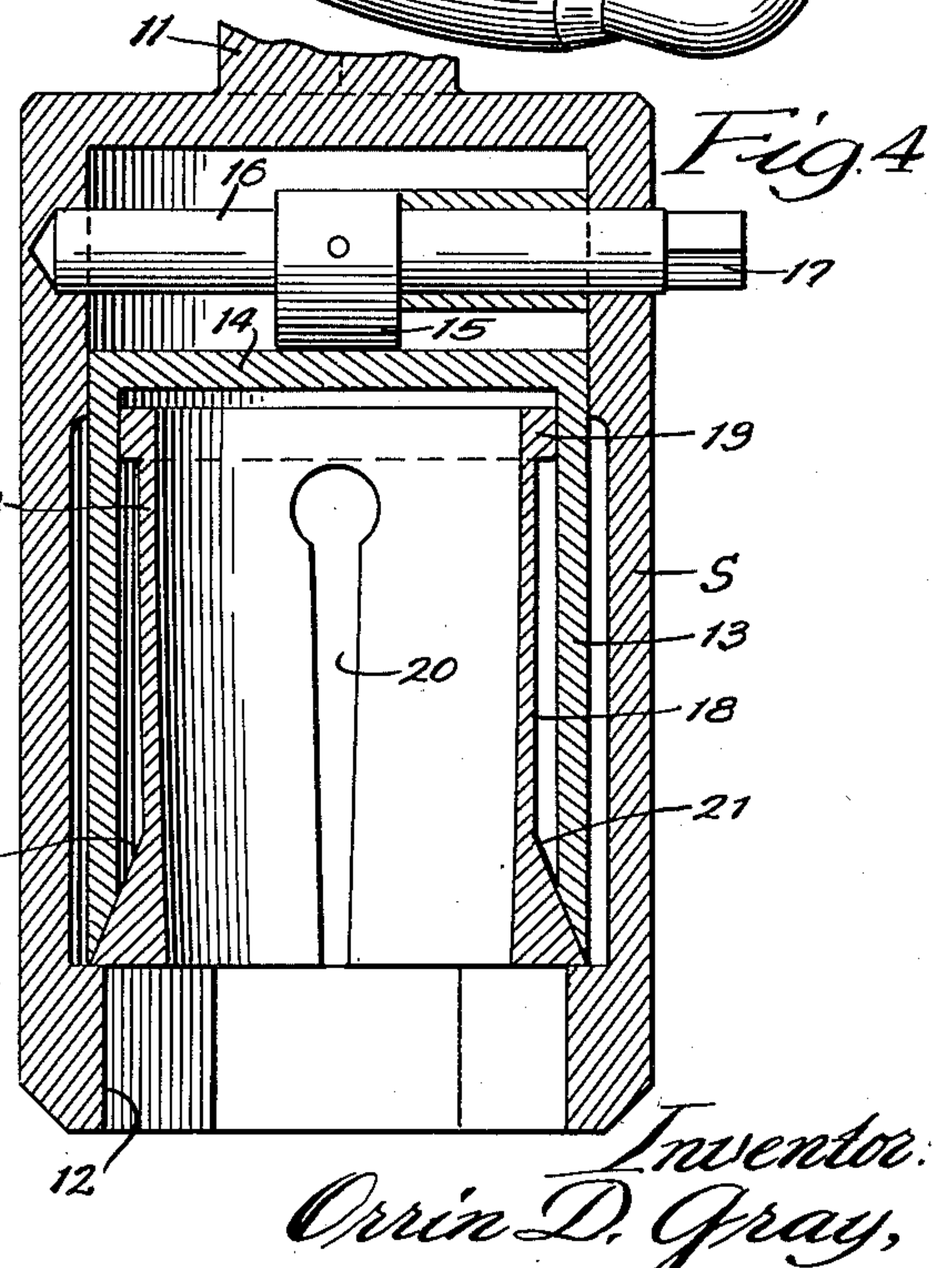

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Fig. 5

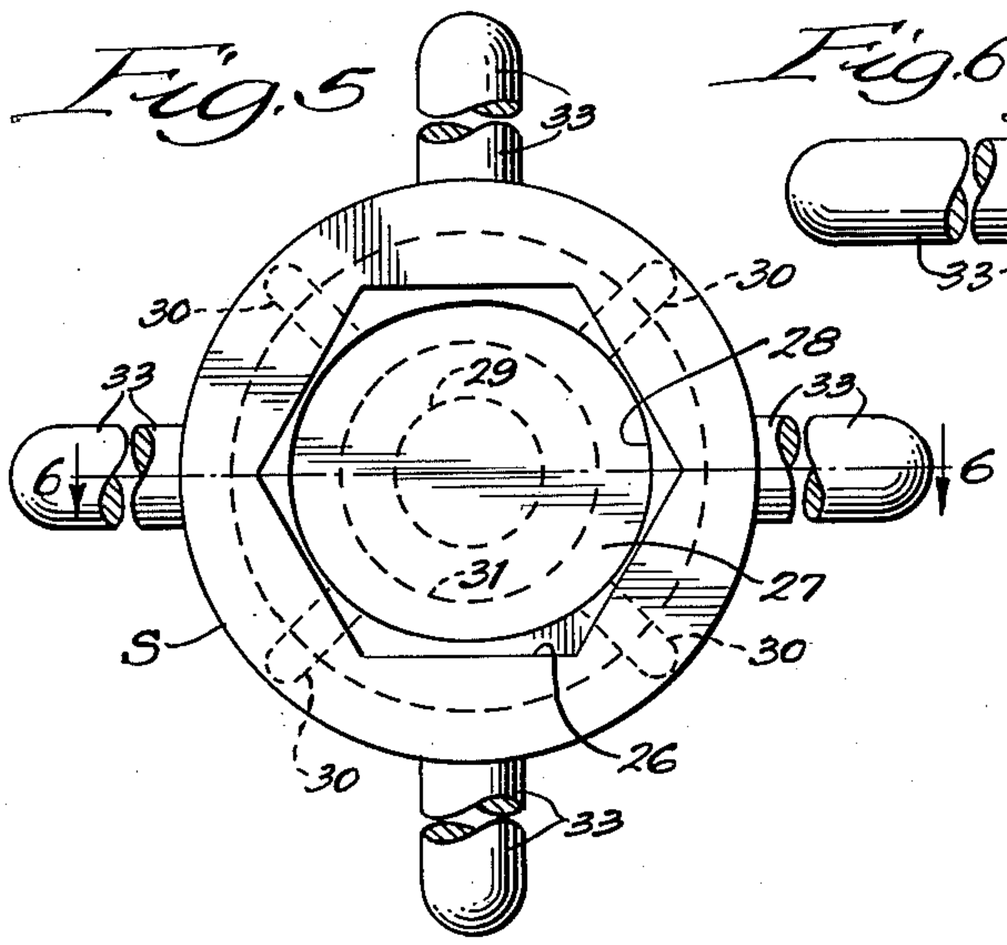


Fig. 6

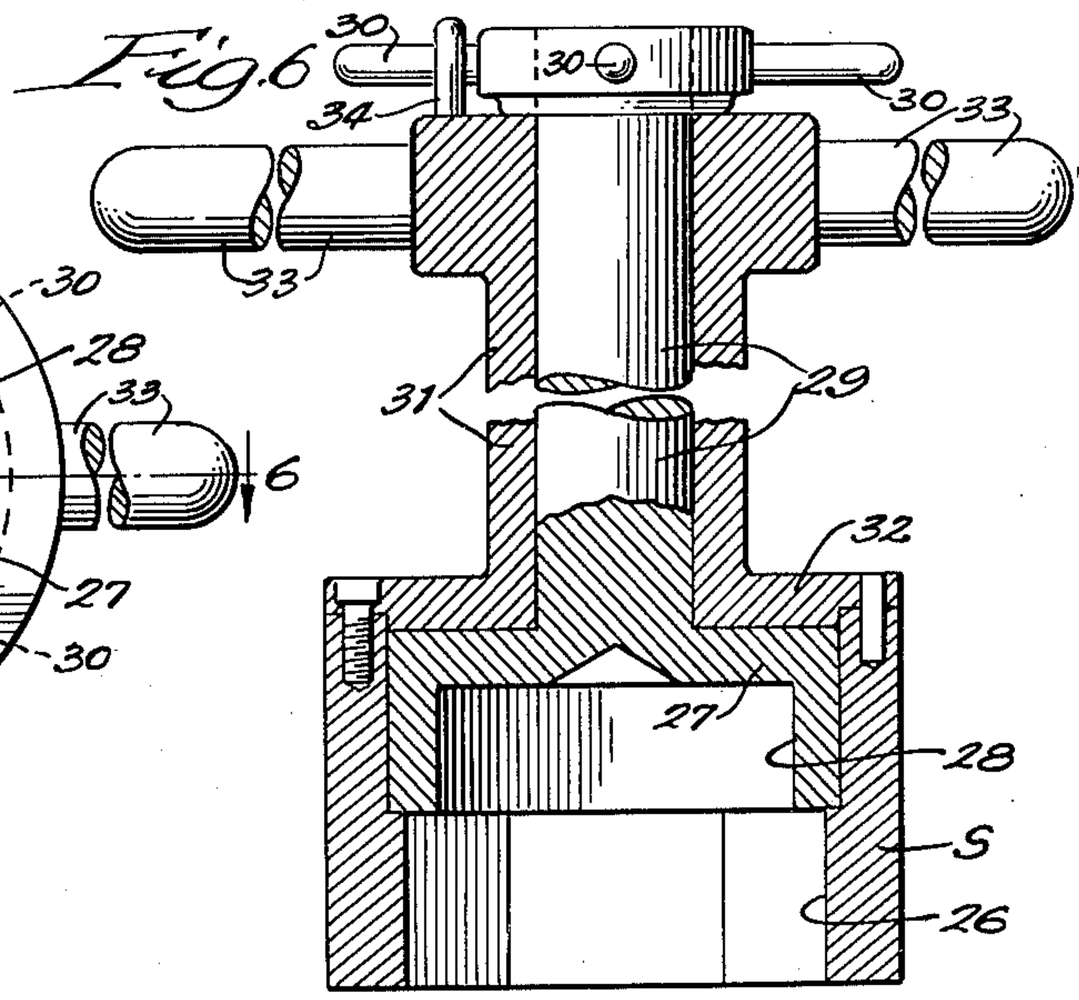


Fig. 7

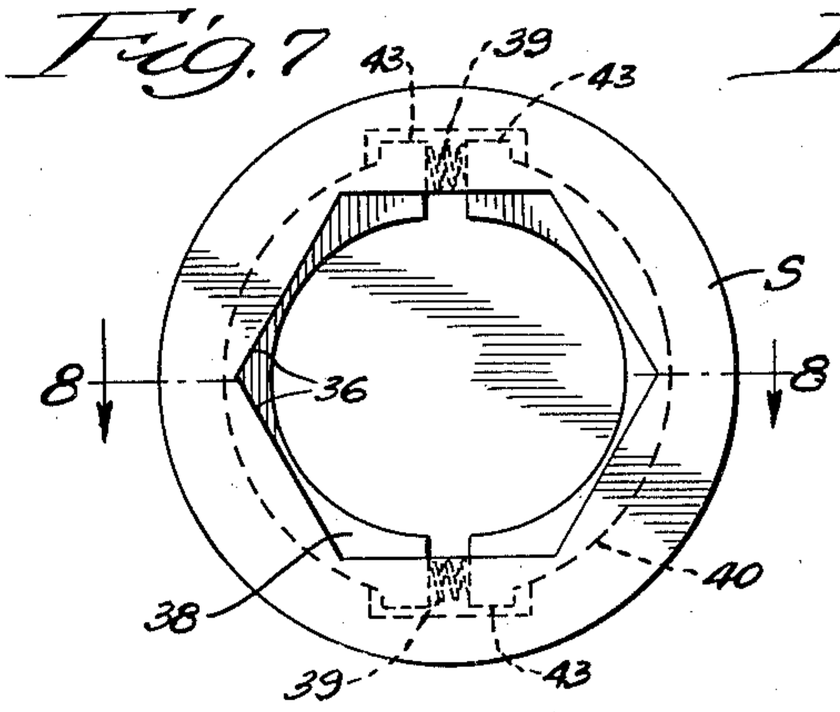


Fig. 8

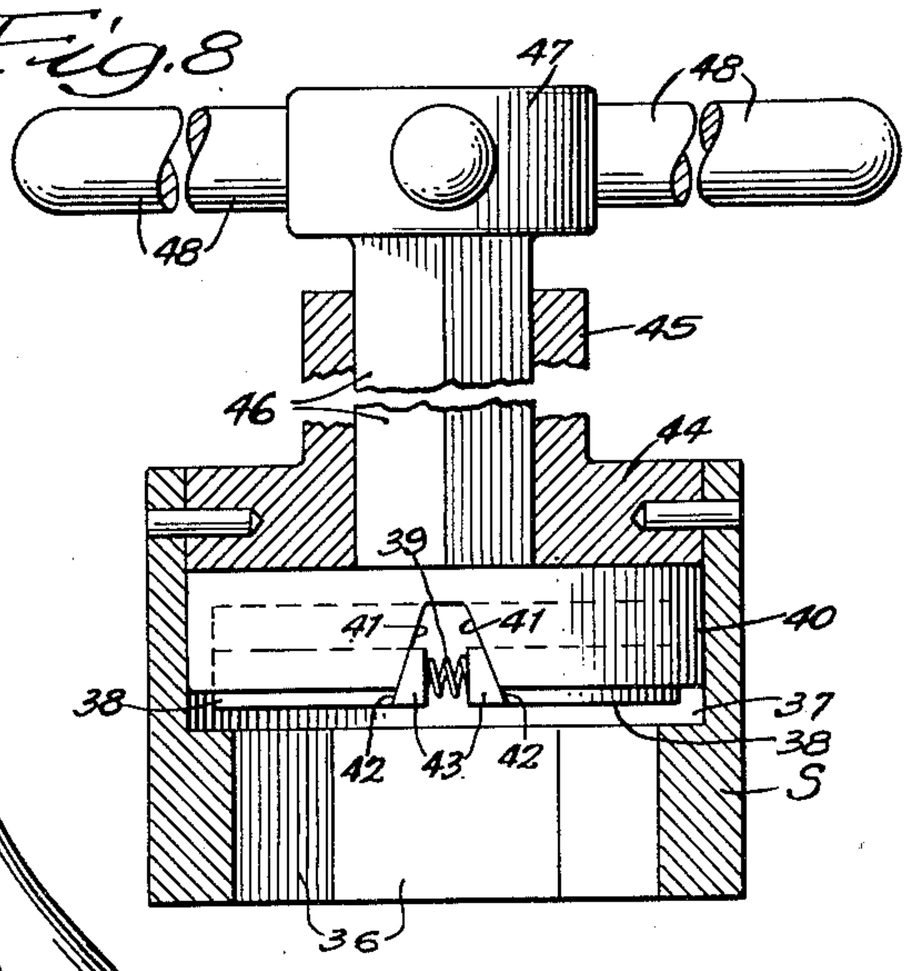
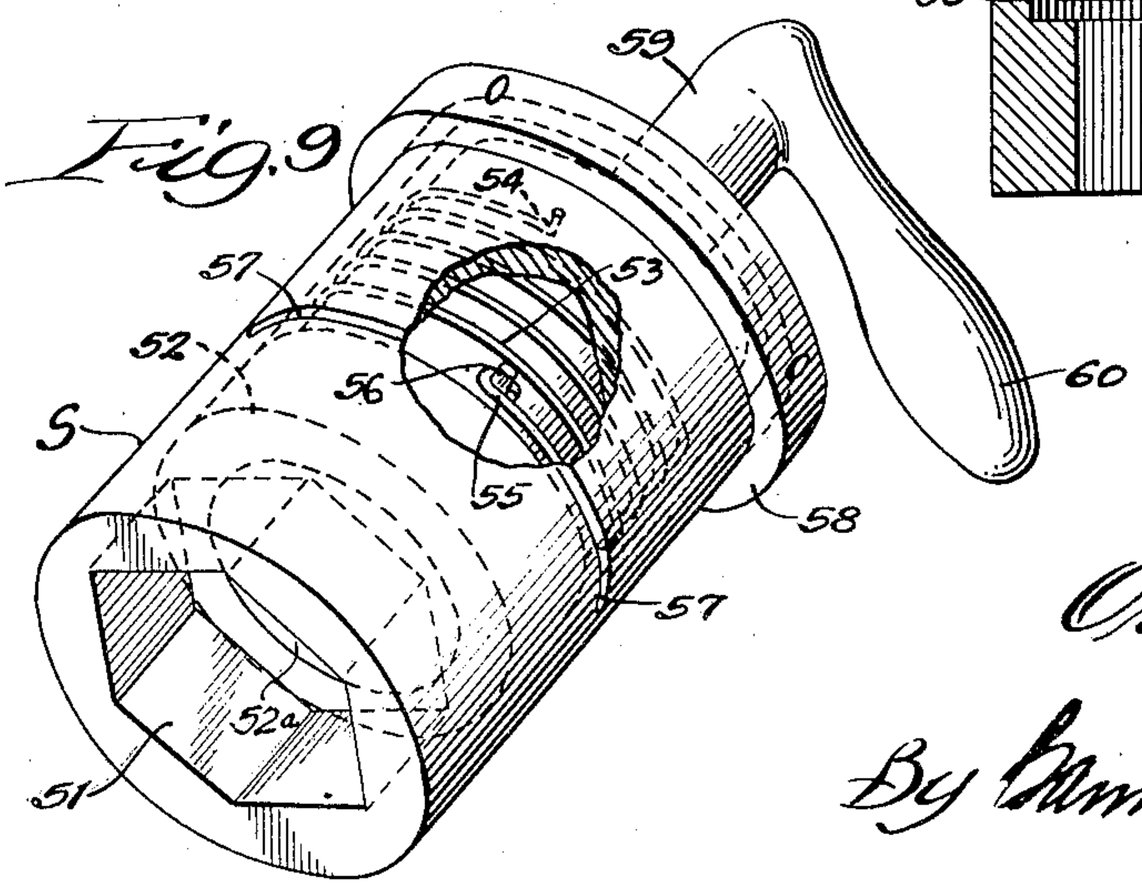


Fig. 9



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Patented Oct. 31, 1950 2,528,430

UNITED STATES PATENT OFFICE

2,528,430

LOCKED NUT UNLOCKING SOCKET WRENCH

Orrin D. Gray, Chicago, Ill.

Original application January 24, 1942, Serial No. 428,073. Divided and this application September 23, 1944, Serial No. 555,494

9 Claims. (Cl. 81—10)

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This invention relates to a wrench of the socket type, and more particularly to the socket itself. A previous disclosure of the features which are special to the invention was made in my application filed January 24, 1942, Serial No. 428,073 of which this case is a division.

The present wrench is adapted for imparting rotation, either way, to a nut with which is associated a distortable spring ring adapted to exert a tension force, directly or indirectly, upon the coacting bolt whereby to frictionally lock the nut in a selected position of adjustment upon the bolt; in particular the present wrench, while transmitting a turning force to the nut, is adapted to maintain the associated spring ring in a condition of distortion whereby to relax its tension force which otherwise would be exerted upon the bolt. It is possible, by so counteracting the tension force of the spring, to operate the nut, on or off the bolt, substantially friction-free. At the conclusion of such an operation, however, mere disengagement of the wrench from the nut will suffice to release the spring ring for full exertion of its tension force so that thereupon the nut automatically becomes friction-locked to the bolt.

It is with a wrench socket having capacity for operating as above noted that this invention is primarily concerned. Such a socket which lends itself either to hand or power operation may be produced at small cost and requires little or no attention during a long life of hard service for which it is well suited. My invention may be embodied in various forms of which four suggestive examples are set forth in the accompanying drawings in the manner following:

Figure 1 illustrates in perspective a hand brace equipped with the present socket adapted while engaged with a nut to distort the spring locking ring thereof;

Fig. 2 is an end elevation of one form of nut (partly broken away to exhibit in section certain parts which otherwise would not appear) for which the present wrench socket is particularly designed;

Figs. 3 and 4 are central longitudinal sections showing one form of the present wrench socket with its operating parts in two different positions;

Fig. 5 is an end elevational view, looking into a wrench socket of modified construction, and Fig. 6 is a longitudinal section taken on line 6—6 thereof;

Fig. 7 is an end elevation looking into a wrench socket of still different construction, and Fig. 8

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is a longitudinal section taken on line 8—8 of the socket per se; and

Fig. 9 is a view in perspective of a wrench socket embodying a construction which is still different from the others.

While the lock nut presently to be described may be operated with an ordinary hand tool, the maximum advantage will be obtained by the employment of a wrench which is specially designed therefor. For rapid assembly work this is particularly true. As illustrative of certain wrenches which will facilitate easy application or removal of the present lock nut, I have shown herein certain suggestive constructions to which reference will now be made.

Considering first of all the lock nut N shown in Figs. 1 and 2, this is adapted for coaction with a conventional threaded bolt B upon which it is rotatable to reach a desired position of adjustment. The nut which is exteriorly polygonal is formed at one end with a collar *c* through which are opposed slots *s* affording exposure to the bolt inside. Fitted around the collar is a spring ring R having inwardly extending lugs *l*, one projecting within and through each slot for resilient pressure engagement with the bolt. The ring may be of elliptical contour with the lugs formed at its two sides. Between the ring lugs and the collar are spaces into which adjacent parts of the ring may be pressed, when properly distorted, thereby elongating the ring in the direction of its normally short diameter. When so distorted, the lugs are shifted away from each other to relax their pressure engagement with the bolt. It is, of course, desirable that this pressure engagement be relaxed during operation of the nut, and that it be restored and maintained at all other times. These objectives are attained by the present wrench socket S which, as will herein appear, is susceptible of embodiment in many different forms of which four are illustrated and will now be described.

To apply to the socket S a torsional force, the wrench, if hand operated, may employ a brace 10 having siutable clutch means for engaging and driving a polygonal boss 11 at one end of the socket. Alternatively, the socket may be power-operated in any of the ways now familiar to the industrial arts. Adjacent its open end the socket walls are inwardly extended at 12 and internally shaped to conform with the polygonal exterior contour of the nut body so as to provide therefor a wrench for applying a torsional force thereto. Slidably fitted within the socket S is a sleeve 13 whose inner end is

bridged by a head 14 adapted to receive engagement from a cam 15 which is carried on a shaft 16 that is extended diametrically across the socket and journaled for rotation in the walls thereof. One end 17 of this shaft is extended to a point exteriorly of the socket and formed with polygonal faces to provide a wrench hold therefor. Within the sleeve is a collet comprising, as shown, a pair of sections 18 integrally connected by a narrow head 19 at the inner end but separated elsewhere by a pair of diametrically opposite longitudinal slots 20. In the region of its free end the exterior of each collet section is outwardly tapered to provide an inclined surface 21 adapted to receive engagement from the lower end of the sleeve which is tapered in general conformity therewith.

A wrench of this description is adapted to engage the nut N whose polygonal body is received within the open end thereof up to the point of engagement with the outer end of the collet. The collar *c* of the nut, including the locking ring R thereon, is receivable within the collet whose spring sections are engageable with the locking ring at opposite points of greatest diameter thereof. With a tool related to the locking nut in this manner, the shaft 16 may then be rotated to force the sleeve outwardly, the collet sections being thereby forced inwardly to compress the locking ring and relax the pressure of its lugs against the nut threads (see Fig. 4). With this step completed, a driving force is then applied to the socket boss 11 to rotate the nut, either way, upon the bolt to a desired position. The shaft 16 is next rotated to permit inward movement of the sleeve, whereupon the collet sections are free to expand once more and thereby disengage from the locking ring (see Fig. 3).

Referring now to Figs. 5 and 6, the tool here shown comprises a socket S having adjacent its open end interior faces 26 which are formed to co-operate with the polygonal faces of the nut N so as to apply thereto a torsional force in response to turning movement of the socket within which is accommodated an inner socket 27 having an elliptical chamber 28 within which the nut collar *c* and spring ring R may be accommodated. The inner socket is formed with an axially extending shaft 29 having at its outer end radial pins 30 to facilitate hand-operation thereof, this shaft being journaled for rotation within a tube 31 which is extended axially from a head 32 which is secured over one end of the socket S to provide a closure therefor. At the outer end of the tube I provide radial pins 33 affording means for facilitating the application of a rotary force thereto, and also a stop pin 34 which extends outwardly in a direction parallel to the axis of the tube to lie between two of the radial pins 30 whereby to limit rotation of the inner socket 27. As shown, four of such pins 30 are provided whereby the range of oscillating movement of the inner socket is confined to slightly less than 90°.

In practice the wrench under description, when applied over the lock nut of this invention, will act to compress the spring ring R when a rotary force is exerted upon the pins 30 for transmission to the inner socket. Inasmuch as complete compression of the spring ring R will be effected by a rotary movement of 90°, or thereabouts, the stop pin 34 will arrest the operation of the inner socket at the right point, assuming, of course, that the wrench is fitted initially to the nut in

the proper position. With the locking ring compressed, the outer socket is next rotated, as through the medium of the pins 33, to effect an adjustment of the nut upon the bolt, either direction. At the conclusion of this operation, the inner socket is rotated back to its initial position so as to permit the spring ring to expand to its normal form, the wrench being thereupon freed for disengagement from the nut.

In Figs. 7 and 8 I have shown a wrench having a socket S interiorly formed near its open end with faces 36 adapted to engage the polygonal faces of the nut N for applying a rotary force thereto. At a point inwardly of its open end the socket is widened to provide a chamber 37 of increased diameter wherein is accommodated two complementary half-rings 38 between whose meeting ends are interposed compression springs 39 tending normally to separate them. These rings are confined in place within a holder 40 having an open circular chamber whose walls at diametrically opposite points are cut away and formed with facing inclined surfaces 41 which lie opposite similar inclined surfaces 42 formed on heads 43 which are provided at opposite ends of the half-rings. The socket is completed by fitting thereto a head plate 44 from which is extended an axial tube 45 having a polygonally faced interior wherein may be accommodated a shank 46 of similar contour which is projected from a head 47 provided with radial handles 48. Such a wrench may be fitted over the nut of this invention, and when an axial force is applied to the head 47 the holder 40 will be shifted longitudinally to compress the two half-rings 38 thereby applying to the spring ring therewithin an inward radial force at points remote from its lugs *l* whereby to relax the pressure of the latter against the bolt threads. Having performed this first step, a torsion force is then applied to the socket S for rotation of the nut N to a desired position, following which the endwise pressure upon the holder is withdrawn to permit it to resume the position shown in Fig. 8 where engagement with the spring ring is no longer maintained.

One further suggestive construction of a wrench which may be advantageously employed for operation of the present lock nut is shown in Fig. 9, wherein I have provided a cylindrical socket S having at its open end a polygonal chamber 51 for the reception of the nut N. Inwardly of this chamber is a sleeve 52 mounted for rotation therein and formed with an elliptical chamber 52ª for reception of the nut collar *c* and spring ring R. The normal rotative position of the sleeve within the socket is fixed by a coil spring 53 of which one end 54 is anchored to a wall of the socket, its other end 55 being hooked to a pin 56 which is extended radially from the sleeve to lie within a slot 57 which extends through a distance of about 190° circumferentially of the socket wall. The spring which normally holds the pin 56 in a mid-position lengthwise of the slot may yield to permit rotation of the sleeve through about 90°, either way, up to the point of engagement of the pin with each end of the slot. The socket is shown as provided at its inner end with a head 58 through which is extended an axial shaft 59 in connection with the sleeve therewithin, an operating handle 60 being extended from the shaft, as shown.

In use the wrench under description is fitted over the nut, its rotative position being determined, as with the other wrenches, by bringing

the longitudinal axis of the elliptical chamber into substantial alignment with the longitudinal axis of the locking ring. In this position the sleeve 52 has capacity for rotation either way through about 90°. Such a movement is imparted to the sleeve by operation of the handle 60 after which the pin 56, engaging with one end of the slot 57, transmits a rotary force to the socket itself. In this mechanism I have provided for a delayed movement on the part of the socket which is produced through the medium of a single operating handle that is connected directly with the sleeve.

I claim:

1. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench including a nut-receiving socket provided at one end with an interior polygonal nut-receiving portion and having a chamber adjacent the same inwardly of the interior polygonal nut-receiving portion, a sleeve fitted within the chamber for longitudinal sliding movement independently of the nut-receiving socket and provided at one end with a head, a collet arranged within the sleeve and provided with portions located diametrically opposite each other and movable inwardly and outwardly to compress and release the spring ring and outwardly tapered to provide inclined surfaces arranged to receive engagement from the other end of the sleeve, and a transverse shaft journaled in the socket and provided with a cam arranged to engage the head of the sleeve for moving the latter into engagement with the inclined surfaces of the diametrically opposite portions of the collet.

2. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench comprising a nut-receiving socket provided with an interior polygonal nut-receiving portion and having a cylindrical chamber located adjacent and inwardly of the socket with respect to the polygonal nut-receiving portion, a cylindrical cam socket axially accommodated within the cylindrical chamber of the socket for rotary movement therein independently of the nut-receiving socket, said cam socket having portions located diametrically opposite each other and advancing toward and receding from the spring ring when the cam socket is rotated, said diametrically opposite portions being engageable with the spring ring at diametrically opposite points on said ring to apply a radial force at said points to compress the ring towards the nut for holding the ring in a compressed condition while the nut is being rotated, and operating means for rotating the cam socket independently of the nut-receiving socket.

3. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench comprising a nut-receiving socket provided with an interior polygonal nut-receiving portion and having a cylindrical chamber located adjacent and inwardly of the socket with respect to the polygonal nut-receiving portion, a cylindrical cam socket axially accommodated within the cylindrical chamber of the socket for rotary movement therein independently of the nut-receiving socket, said cam socket having portions located diametrically opposite each other and advancing toward and receding from the spring ring when the cam socket is rotated, said diametrically opposite portions being engageable with the spring ring at diametrically opposite points on said ring to apply a radial force at said points to compress the ring towards the nut for holding the ring in a compressed condition while the nut is being rotated, and operating means for rotating the cam socket independently of the nut-receiving socket, and a single operating means for rotating the cam socket independently of the nut-receiving socket and for subsequently rotating the nut-receiving socket.

4. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench comprising a nut-receiving socket provided with an interior polygonal nut-receiving portion and having a cylindrical chamber located adjacent and inwardly of the socket with respect to the polygonal nut-receiving portion, a cylindrical cam socket axially accommodated within the cylindrical chamber of the socket for rotary movement therein independently of the nut-receiving socket, said cam socket having portions located diametrically opposite each other and advancing toward and receding from the spring ring when the cam socket is rotated, said diametrically opposite portions being engageable with the spring ring at diametrically opposite points on said ring to apply a radial force at said points to compress the ring towards the nut for holding the ring in a compresed condition while the nut is being rotated, and means for sequentially operating the cam socket and the nut-receiving socket.

5. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench comprising a nut-receiving socket provided with an interior polygonal nut-receiving portion and having a cylindrical chamber located adjacent and inwardly of the socket with respect to the polygonal nut-receiving portion, a cylindrical cam socket axially accommodated within the cylindrical chamber of the socket for rotary movement therein independently of the nut-receiving socket, said cam socket having portions located diametrically opposite each other and advancing toward and receding from the spring ring when the cam socket is rotated, said diametrically opposite portions being engageable with the spring ring at diametrically opposite points on said ring to apply a radial force at said points to compress the ring towards the nut for holding the ring in a compressed condition while the nut is being rotated, a handle having a stem connected with the cam socket for rotating the same independently of the nut-receiving socket and means for limiting the independent movement of the cam socket whereby continued rotation of the handle will rotate the nut-receiving socket for turning the nut.

6. For use with a polygonal nut to which is fitted a circumferential spring ring having portions in spaced relation to the nut at diametrically opposite points, a unitary device for compressing the spring and for rotating the nut comprising a socket shaped interiorly polygonally at its open end to fit the polygonal nut to provide therefor a wrench for applying torsional force to the nut, said socket being provided inwardly of its polygonal nut receiving open end with a compartment arranged to receive the spring ring of the nut, means located within the compartment and composed of two opposite portions movable radially toward each other for compressing the spaced portions of the spring ring, and means operable exteriorly of the socket for actuating the spring compressing means.

7. For use with a polygonal nut to which is fitted a circumferential spring ring having por-

tions in spaced relation to the nut at diametrically opposite points, a unitary device for compressing the spring and for rotating the nut comprising a socket shaped interiorly polygonally at its open end to fit the polygonal nut to provide therefor a wrench for applying torsional force to the nut, said socket being provided inwardly of its polygonal nut receiving open end with a compartment arranged to receive the spring ring of the nut, means located within the compartment for compressing the spaced portions of the spring ring, and means operable exteriorly of the socket for actuating the spring compressing means, said spring compressing means including spring engaging surfaces located diametrically opposite each other and means for moving said surfaces inwardly with relation to the walls of the compartment.

8. For use with a polygonal nut to which is fitted a circumferential spring ring having portions in spaced relation to the nut at diametrically opposite points, a unitary device for compressing the spring and for rotating the nut comprising a socket shaped interiorly polygonally at its open end to fit the polygonal nut to provide therefor a wrench for applying torsional force to the nut, said socket being provided inwardly of its polygonal nut receiving open end with a compartment arranged to receive the spring ring of the nut, means located within the compartment and including two opposite portions movable only radially toward and from each other for compressing the spaced portions of the spring ring and having cams arranged to transmit a radial compressive force to the spring ring, and means operable exteriorly of the socket for moving said portions of the spring compressing means radially inwardly.

9. For use with a nut to which is fitted a circumferential spring ring in spaced relation to the nut at diametrically opposite points, a wrench including a nut-receiving socket provided at one end with an interior polygonal nut-receiving portion and having a chamber adjacent the same inwardly of the interior polygonal nut-receiving portion, a sleeve fitted within the chamber for longitudinal sliding movement independently of the nut-receiving socket and having opposite side portions tapered to provide diverging inclined surfaces, a collet arranged within the sleeve and having opposite portions provided with diverging inclined surfaces arranged to receive engagement from the inclined portions of the sleeve, and movable inwardly and outwardly to compress and release the spring ring, and means for moving the sleeve for carrying the inclined surfaces thereof into engagement with the inclined surfaces of the collet for compressing the spring ring.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
669,608	Williams	Mar. 12, 1901
783,088	Vaughan	Feb. 21, 1905
1,143,127	Mentzer	June 15, 1915
1,480,811	Baron et al.	Jan. 15, 1924
1,708,147	Miller	Apr. 9, 1929
1,925,714	Crist	Sept. 5, 1933
2,181,678	Wright	Nov. 28, 1939
2,338,024	Bugg	Dec. 28, 1943