Dec. 25, 1951 R. G. SECONDI ET AL 2,580,247

CAM ACTUATED WRENCH

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Fig. 1.

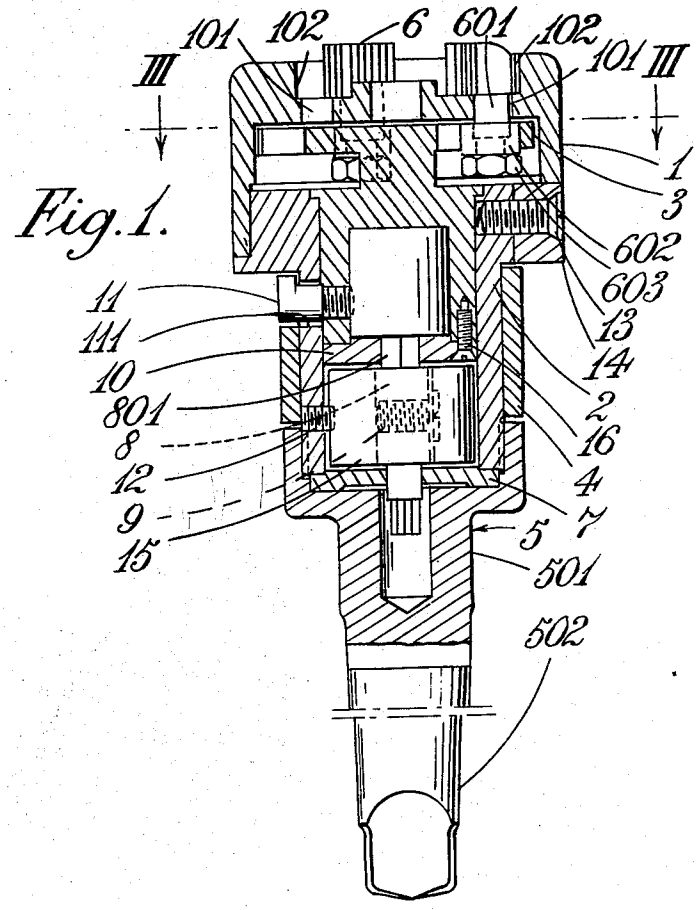
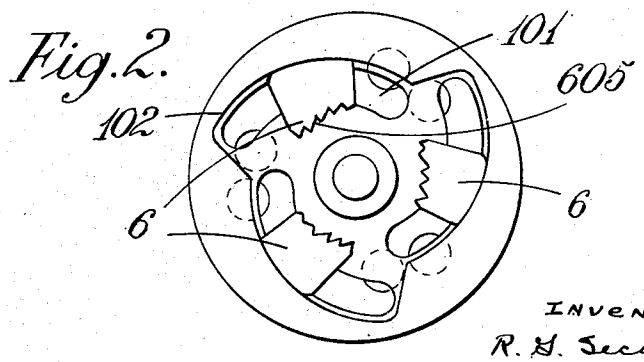


Fig. 2.



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Fig. 3.

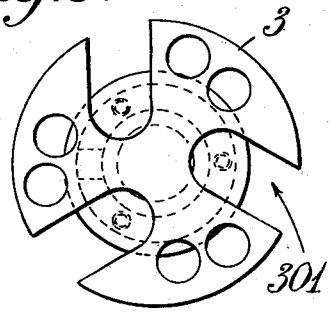


Fig. 4.

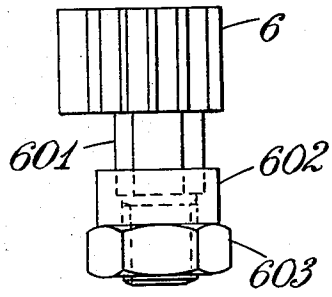


Fig. 5.

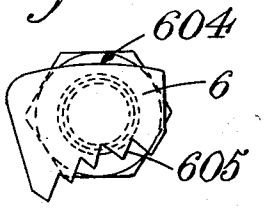
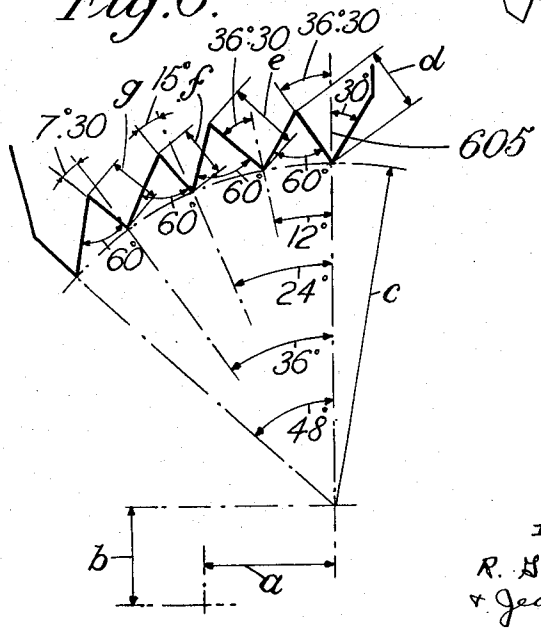


Fig. 6.



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Fig. 7.

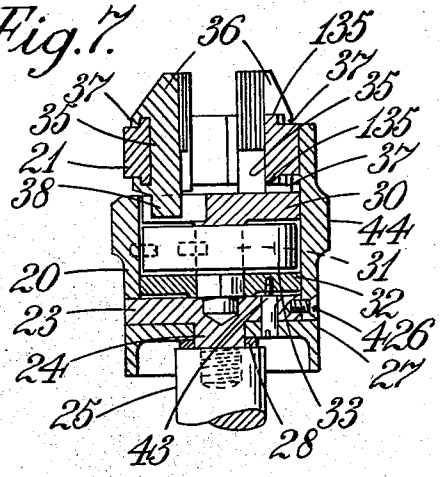


Fig. 10.

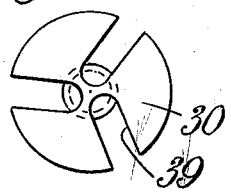


Fig. 11.

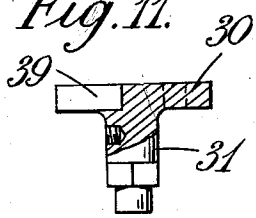


Fig. 8.

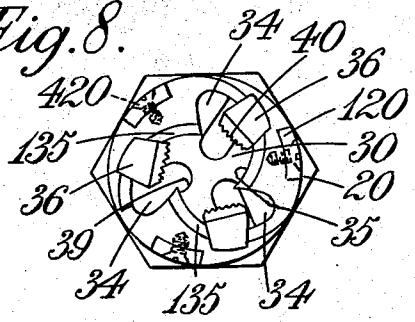


Fig. 12.

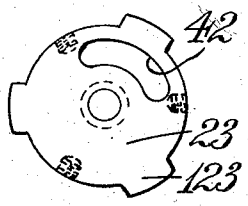


Fig. 9.

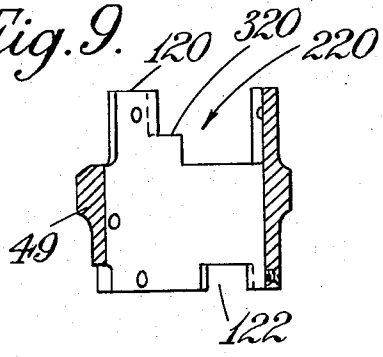


Fig. 13.

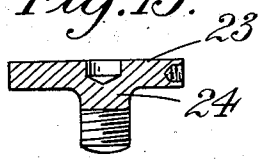
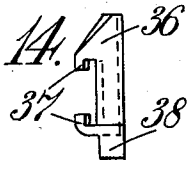


Fig. 14.



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Fig. 15.

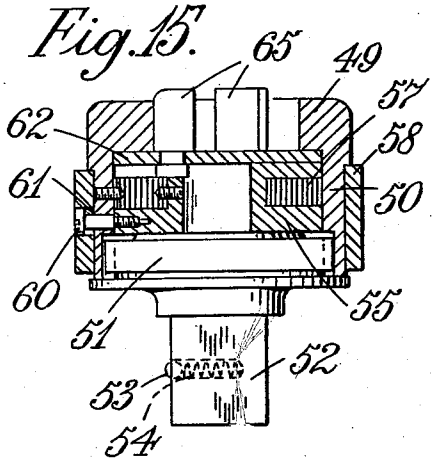


Fig. 16.

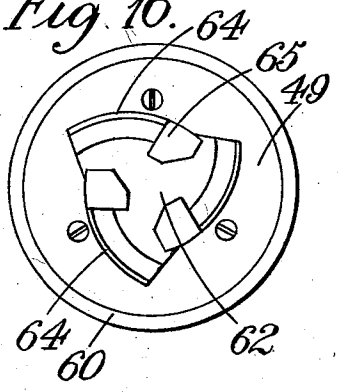


Fig. 18.

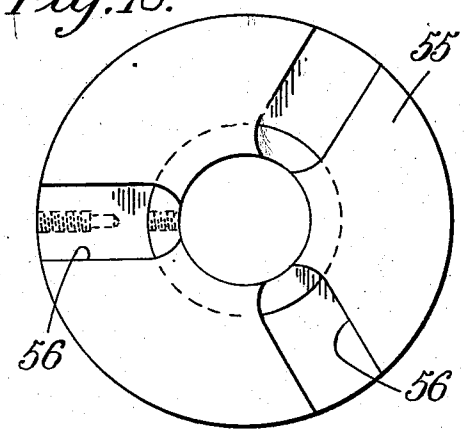


Fig. 17.

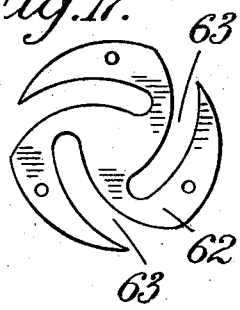


Fig. 20.

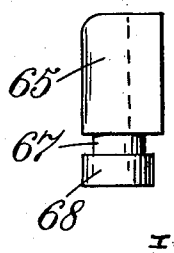
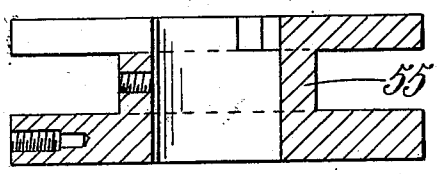


Fig. 19.



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Patented Dec. 25, 1951 2,580,247

UNITED STATES PATENT OFFICE

2,580,247

CAM ACTUATED WRENCH

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Application May 19, 1950, Serial No. 162,842
In Great Britain June 13, 1949

5 Claims. (Cl. 81—53)

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The invention relates to wrenches and has for an object the provision of a construction of wrench which positively grips the part to be turned and may, therefore be employed to grip and turn parts (e. g. boiler-staybolts) which are of round or nearly round section although the invention is not restricted to the application of the wrench to round or nearly round sections. The wrench may be used on hexagonal parts for instance.

In its broad form the invention consists in a wrench for gripping and turning parts, which wrench comprises a body arranged for turning movement by application thereto of torque, at least two jaws for engagement with the part to be turned, at least one of the jaws being movable relative to the remainder of the jaws to effect gripping engagement of the part and also for a limited degree of circumferential movement relative to the body and with respect to the axis of rotation, and cam means for the movable jaw movable with the body and arranged on rotational movement of the body effected relative to the movable jaw to force the jaw into gripping engagement as aforesaid and then, on continued rotational movement, to effect rotation of the jaw with the body.

More specifically the invention consists in a wrench for gripping and turning parts, which wrench comprises a body arranged for turning movement by application thereto of torque (e. g. by means of a lever or spanner), two or more, preferably three, jaws spaced around the axis of rotation of the body for engagement with the part to be turned, the jaws being arranged for radial movement relative to the axis of rotation to grip the part and also for a limited degree of circumferential movement relative to the body and cam means for each jaw formed on or carried by the body arranged on initial rotational movement of the body effected relative to the jaws to force the jaws radially into gripping engagement with the part and then, on continued rotational movement, to effect rotation of the jaws with the body.

In the preferred form of the wrench the jaws are spring urged into initial gripping engagement with the part, the initial engagement being increased by the action of the cam means as aforesaid.

The cam means may comprise, for each jaw, a spiral cam surface on the body engaging the back of the jaw to force the jaw during relative circumferential movement between the jaw and the surface, radially (e. g. inwardly) of the body and on continued rotational movement of the body to effect rotation of the jaw with the body.

In one practical construction of the wrench the body is constructed in two relatively rotatable portions (later referred to as the primary

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and secondary portions) of which the primary portion is provided with cam surfaces engaging the jaws to constitute the cam means and also with guide means cooperating with means on the jaws for maintaining the jaws in contact with, or close to, the cam surfaces during rotational movement of the body relative to the jaws and the jaws have shanks which are engaged in outwardly directed slots in the secondary body portion so that relative rotation effected (e. g. manually against a return spring) between the two body portions in one direction will move the jaws along the guide means and thereby move the jaws radially to open the jaws for fitting on to the part to be gripped and in the other direction will move the jaws along the cam surfaces to close the jaws on to the part.

The guide means may comprise slots in the primary portion conforming in configuration with the cam surfaces, and the said co-operating means on the jaws may consist of parts thereof (e. g. the shanks aforesaid) engaged within the slots.

Alternatively the guide means may comprise rails conforming to the shape of the cam surfaces and the co-operating means on the jaws may consist of claws thereon fitting over the rails.

Three specific embodiments of wrenches according to the invention will now be described by way of example of the invention and with reference to the accompanying drawings, in which:

Figure 1 is a section through one embodiment of a wrench,

Figure 2 is an end view of the wrench,

Figure 3 is a view on the line III—III in Figure 1 of the secondary body portion,

Figure 4 is a side view of one of the jaws,

Figure 5 is an end view of the jaw shown in Figure 4,

Figure 6 is a view of an enlarged scale of the jaw teeth,

Figure 7 is a section through the wrench according to the second embodiment,

Figure 8 is an end view of this wrench,

Figure 9 is a section through the body part of this wrench,

Figure 10 is a plan view of part of the secondary body portion,

Figure 11 is an elevation of the part shown in Figure 3,

Figure 12 is a plan view of an end closure in the primary body portion,

Figure 13 is an elevation of the end closure shown in Figure 12,

Figure 14 is a side elevation of one of the jaws,

Figure 15 is a section through the wrench according to the third embodiment,

Figure 16 is an end view of the wrench shown in Fig. 15,

Figure 17 is a plan view of the jaw bearing disc,

Figure 18 is a plan view of part of the secondary body portion,

Figure 19 is an elevation of the part shown in Figure 18, and

Figure 20 is an elevation of one of the jaws.

The wrench forming the subject of the example shown in Figures 1 to 6 is intended for inserting screwed stay-bolts into the fire-boxes of locomotive boilers.

The wrench comprises a primary body portion composed of a cap 1 screwed to a tubular part 2, the two parts being locked against rotation by a key 14 engaging in a slot in the cap and held to the tubular part by a screw 13. Screwed on to the end of the tubular part there is a shank 5 having a square portion 501 for engagement by a spanner and a Morse taper portion 502. This shank may be interchanged with a shank of different size or construction.

Within the primary body portion there is a secondary body portion 3. Surrounding the tubular part 2 there is a sleeve 4 which has a notch fitting over the head of a screw 11 engaging in the secondary body portion 3. The screw 11 passes through a circumferential slot 111 in the part 2 so that limited relative rotation of the two body portions may be effected by rotation of the sleeve around the primary body portion.

The cap 1 is provided in its end face with three spiral slots 101 and three cam surfaces 102 conforming with the slots. There are three toothed jaws 6 allocated to the three slots and cam surfaces respectively and each has a shank 601 passing through the appropriate slot 101 and also through a slot 301 in the secondary body portion 3. A washer or roller 602 surrounds the shank of the jaw when it passes through the slot 301 and the jaw is held in place by a nut 603. The back surface 604 of the head of the jaw conforms with the cam surface 102. The shape of the teeth 605 of the jaws is shown in detail in Figure 6 and the dimensions are shown in the following table:

Reference:	Dimensions	
a	millimeters	5
b	do	4
c	do	13.5
d	do	2.8
e	do	2.8
f	do	2.1
g	do	1.7

Within the tubular part 2 there is a spiral spring 15 of which the inner end is secured to a pin 9 in a spindle 8 rotatable with the secondary body portion, the spindle having a square shank 801 fitting into a socket of corresponding shape in a plate 10 secured to the end of the portion 3 by a screw 16. The other end of the spindle is supported in a bearing in a plate 7. The outer end of the spring is secured to a pin 12 in the tubular part 2 and the arrangement is such that the spring tends to effect relative rotation between the primary and the secondary body portions in the direction to move the jaws to the radially inner ends of the slots 101.

In the operation of the wrench to insert a stay-bolt the sleeve 4 is rotated manually to move the jaws towards the radially outer ends of the slots 101 thereby to open the jaws and to enable them to be fitted over the end of the stay-bolt. The sleeve 2 is then released to allow the spring to rotate the secondary body portion and thereby to move the jaws towards the inner ends of the slots

101 and to cause the jaws to grip the bolt. Turning movement is then applied to the shank either by means griping the taper or by a spanner on the square 501 which causes the jaws to move further towards the inner ends of the slots 101 and by the action of the cam surface 102 on the backs of the jaws to force the teeth into effective gripping engagement with the bolt.

According to the second embodiment (Figures 7–14) the wrench comprises a primary body portion and a secondary body portion contained therein. The primary body portion consists of a tubular body part 20 with a uniform circular internal cross-section throughout its length and has at one end a cam-plate 21 and at the other end a disc 23.

The body part 20 is formed at one end with lugs 120 between stepped slots 220 and at its other end with simple slots 122. The cam-plate 21 has slots which interfit with the lugs to prevent relative rotation between the plate and the body part. The plate seats on the steps 320. The plate is secured by screws 420. The disc 23 has lugs 123 which fit into the slots 122 to prevent relative rotation between the disc and the body part and the disc is held in position by screws 426.

A spigot 24 integral with the disc 23 at the centre thereof, and projecting outwardly from the body part 20, has two portions of different diameter; the one of larger diameter is adjacent the disc 23 and passes through a flanged circular plate 27, and the other portion is threaded for securing it to a tapered and/or square shank 25, which may be one of several of different sizes.

The secondary body portion comprises a plate 30 integral at its centre with a spindle 31 which may rotate in a socket in the inner surface of the disc 23; a disc 32 is constrained to rotate with the spindle 31 and there is a spiral spring 33 contained in a housing formed by the plates 30, 32, the spindle 31 and the tubular body portion 20. One end of the spring is anchored to the wall of the body portion and the other end to the spindle 31.

The cam-plate 21 has three identical curved slots 34 symmetrically disposed around the axis of the body and providing three curved cam faces 35. A raised rail 135 is provided along each edge of each cam surface.

The cam plate 21 carries three jaws 36; one for each cam 35. Each jaw has two claws 37, one fitting over each of the rails 135 of the associated cam and each jaw is provided with a shank 38 which may slide in one of three outwardly directed slots 39 disposed, at angular intervals of 120°, in the plate 30. The inside face of each jaw is serrated as shown at 40 to improve the grip on the stay-bolt or other part.

The disc 23 is provided with an arcuate slot 42, of length subtending an angle of 120° at the centre of the disc. A stud 43 passes through a hole in the flanged circular plate 27 and the slot 42 and is finally screwed to the plate 32.

The body part 20 has an external enlargement 44 intermediate of its ends, of hexagonal cross-section.

In the operation of the wrench the jaws are first opened to fit on to the part to be rotated by rotating (e. g. manually) the body part 20 relative to the plate 27 in the clockwise direction as viewed in Figure 8, thereby causing the jaws to be guided outwardly by the rails 135. The jaws are then fitted over the part to be rotated and the parts 20, 27 released when the spring will effect relative rotation between these parts to close the jaws.

The wrench is then rotated as a unit, by torque applied either to the shank 25 or the hexagon 44 which further tightens the jaws on to the part by the action of the cams on the jaws and effects rotation thereof.

The wrench forming the subject of this example and having outwardly projecting jaws is especially suited for use on bolts, nuts and other parts positioned in countersunk recesses.

According to the third embodiment (Figures 15–20) the wrench comprises, as before, a primary body portion and a secondary body portion contained therein.

The primary body portion comprises a cap 49 with an integral tubular body part 50. The body 50 is closed at the end remote from the cap by a plate 51 keyed into the tubular body part. Integral with the plate 51 at the centre thereof and projecting away from the body part there is a spigot 52 of square cross-section, one side of which contains a ball catch 53, pressed outwardly by a helical spring 54. A tapered shank, constructed to mate with the spigot, can be fitted over it and retained in position by the ball catch 53.

The cap 49 contains three internal cam faces 64. Secured to the underside (as viewed in Figure 15) of the cap there is a circular guide plate 62 having three identical guide slots 63 extending spirally inwards and conforming in configuration with the cam faces 64.

The secondary body portion comprises a spool 55, one flange of which—the upper flange in Figure 15—has three radial slots 56 disposed at equal angular intervals around the flange; and there is a spiral spring 57, one end of which is secured to the spool and the other end to the body part 50.

Surrounding the body part 50 there is a sleeve 58 fixed to the lower flange (as viewed in Figure 15) of the spool 55 by a screw 60, the shank of which is contained in a slot 61 in the tubular body part 50. The slot 61 extends in a plane parallel to the cap of the body part 50 over substantially one-quarter of the circumference. The sleeve and spool can therefore be revolved together relatively to the body part 49 for part of a revolution.

As in the previous examples there are three jaws. In this embodiment each jaw 65 has a cylindrical shank machined in two integral parts of different diameter. The part 67 having the smaller diameter is adjacent the jaw and may travel in one of the slots 63 in the guide plate 62. The other part 68 may travel in one of the radial slots 56 in the upper flange of the spool 55.

The spring tends to close the jaws; but by turning the sleeve to oppose the spring the jaws may, by being moved along the slots 63, be caused to open—all jaws moving simultaneously by equal amounts—in order to place the wrench over a stay-bolt or other part to be turned. On releasing the sleeve the spring holds the three jaws against the stay-bolt, and on turning the tapered shank the primary body portion is revolved tending to close the jaws against the stay-bolt.

In each of the above examples, to disengage the wrench from the bolt it is sometimes only necessary to pull the device in the axial direction off the end of the bolt. Alternatively, the shank may be rotated a small amount in the reverse direction which will release the cam pressure on the jaws. Rotation of the sleeve 4, the plate 27 or the sleeve 58 is not effective to release the grip of the jaws.

The devices forming the subject of the above examples and shown in the drawings are intended for clockwise rotation to screw into position bolts, screws, stay-bolts, nuts or other similar members. The devices may, however, be readily modified in a manner which will be obvious, for anti-clockwise rotation and for use in unscrewing members.

We claim:

1. A wrench for gripping and turning workpieces, comprising a primary body portion, a secondary body portion in nested relation to the primary body portion and arranged for rotation relative thereto, at least two jaws spaced apart around the axis of relative rotation of the two body portions and each providing on opposite faces thereof directed radially inwardly and outwardly from the axis of relative rotation respectively, a gripping surface and a bearing surface, at least two radially directed cam surfaces on the primary body portions and arranged to engage the bearing surface on the jaws respectively, to effect positive movement of the jaws in one radial direction on relative movement in one sense between the jaws and the primary body portion, a shank on each jaw received within a radially extending slot in the secondary body portion to constrain the jaw to move with the secondary portion on relative rotation between the portions and thereby to effect relative movement between the jaws and the primary body portion as aforesaid and cooperating guide means on the jaws and primary body portion following the general contour of the cam surface for positively maintaining the jaws in close proximity to the cam surfaces during relative movement between the jaws and the primary body portion in the other sense.

2. A wrench as claimed in claim 1 in which there are three jaws, equally spaced on a circle around the axis of relative rotation, and associated cam surfaces, radially extending slots and guide means therefor.

3. A wrench as claimed in claim 1 in which the guide means comprise the edges of slots formed in the primary body portions, in cooperation with shanks on the jaws passing through the slots.

4. A wrench as claimed in claim 1 in which the guide means comprise rails with primary body portions in cooperation with claws on the jaws.

5. A wrench as claimed in claim 1 and including spring means urging relative rotation between the body portions in the direction to engage the cam surfaces with the jaws.

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