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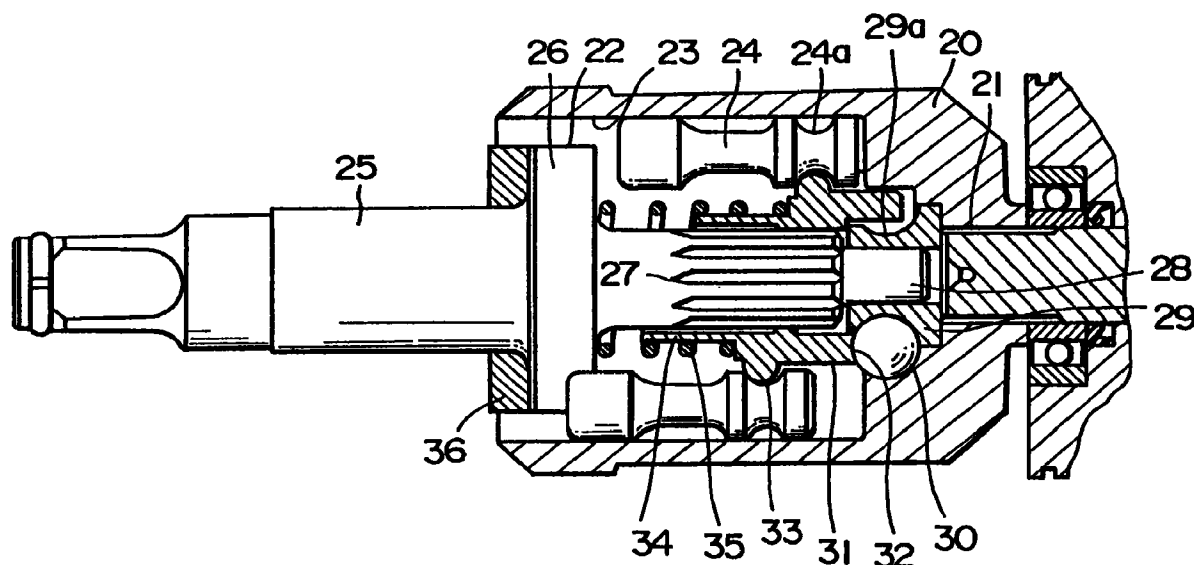
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(54) Support structure of an anvil pin in a cam-type impact wrench

(57) The support structure (20) of an anvil pin in a cam-type impact wrench has a feature in that the distance between centers of the concave grooves (23) in the axial direction in the hammer in which the anvil pin (24) slides to reciprocate is set to be larger than the

lumen (22) of the hammer so that the cylindrical anvil pin (24) does not move in the radial direction of the hammer, whereby the anvil pin (24) is not influenced even if the cam release spring (35) rattles a little.

FIG.4



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a support structure of an anvil pin for stably supporting an anvil pin which gives impact to an anvil in a cam-type impact wrench.

Description of the Prior Art

In a cam-type impact wrench, since a cam release spring moves changeably getting out of the axial center, rather than moving regularly in the axial direction, the anvil pin is unstable and cannot make an effective movement. Such unstable action causes wear of parts and problems in the durability. More specifically, in the conventional techniques, the cam release spring rattles, thereby the anvil and the anvil pin make unstable movement to cause many breaking phenomena of the anvil pin.

When the anvil pin is broken, it has to be replaced, which causes many economical problems or problems in the working efficiency such that the spares of the anvil pin have to be kept, the impact wrench must be broken up and replaced, and the like, therefore the improvement has been desired.

As one improvement, there can be mentioned U.S. Patent No. 4313505 (Fig. 1). This has a hammer 1 which is rotatably driven by an air motor; an anvil pin 2 generating rotation impact force; an anvil pin 7 which is held in a concave groove 3 provided inside of the hammer 1 and which is movable in the axial direction against the force of the cam release spring 5 to the position where the impact force is to be generated against the projecting ear 4 of the anvil 2, and has a middle portion 6 having a small diameter; and a ball cam 9 which corresponds to a cam sleeve 8 which engages with the anvil pin 7 to move the anvil pin 7 in the axial direction, and further includes a ring-shaped member 11 having concave portions 10 opposite in the diametral direction engaged with an end portion of the anvil pin 7 in the hammer 1, whereby the anvil pin 7 is exactly positioned in the axial direction to apply the impact force exactly in the axial direction against the anvil 2.

Thus, by incorporating the ring-shaped member 11 having concave portions 10, the anvil pin 7 is guided by the concave portions 10 and concave grooves 3 provided in the hammer 1 to reciprocate in the axial direction. When the cam release spring 5 is extended, however, since the ring-shaped member 11 is shorter than the length of the spring, a clearance is caused between a chin portion of the anvil 2 and the ring-shaped member 11. Moreover, since the inner diameter of the ring-shaped member 11 is larger than the outer diameter of the cam release spring 5, a clearance is also caused between them. Due to these clearances, when the anvil pin 7 moves swiftly toward the ear-like

projection of the anvil pin 2 in order to give rotational impact, the ring-shaped member 11 to guide the anvil pin 7 slips out of place from the axial center, whereby the tip of the anvil pin 7 strikes the chin portion of the anvil to damage the chin portion as well as the anvil pin itself.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a support structure of an anvil pin which can transmit rotation force coming from a rotor shaft to an anvil stably in a power impact wrench.

Another object of the present invention is to secure a stable reciprocating movement of the anvil pin such that the anvil pin can slide in the axial direction within the concave grooves of the hammer but cannot move in the radial direction of the hammer to the utmost, in order not to be effected even if the cam release spring is a little unstable and rattles.

The other object of the present invention is to provide a stable support structure of an anvil pin in an impact wrench which can generate strong impact force by making the tip of the anvil pin reach the ear-like projection smoothly without striking the chin portion of the anvil by a stable reciprocating movement.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described with reference to the accompanying drawings; wherein:

Fig. 1 is a sectional view of an impact wrench of a conventional type;

Fig. 2 is a sectional view along the line II-II of Fig. 1; Fig. 3 is a sectional view along the line III-III of Fig. 1;

Fig. 4 is a sectional view of an impact wrench according to the present invention;

Fig. 5 is a sectional view along the line V-V of Fig. 4; Fig. 6 is a detailed view of an anvil shaft and a hammer cam portion; and

Fig. 7 is an enlarged view of a concave groove in the hammer.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment will be described with reference to Fig. 4 and the following figures. Reference numeral 20 represents a hammer having a spline 21 engaged with a motor shaft. 22 represents a lumen. The hammer 20 has concave grooves 23 provided in the axial direction opposing in the diametral direction. In the concave grooves 23, anvil pins 24 are fitted movably in the axial direction.

25 represents an anvil shaft, and has a pair of ear-like anvils 26 provided integrally in the middle portion. 27 represents splines and 28 represents a cam pilot

system. 29 represents a cam pilot fitted rotatably to the system 28, and 30 represents a cam ball. 31 represents a hammer cam and engaged slidably with splines 27 of the anvil shaft 25. The hammer cam 31 has a cam portion 32 at one end thereof and a driving portion 33 having a large diameter engaged with a circular groove 24a of the anvil pin 24 in the middle portion.

The opposite side of the cam portion 32 of the hammer cam 31 is a cylindrical portion 34, and a cam release spring 35 is fitted into this portion. Relating to Fig. 7., a concave groove 23 provided in the hammer is shown on a larger scale. The concave groove 23 is a cylindrical concave groove making the point O a center, and the distance L between centers of the opposing concave grooves 23, 23 is larger than the inside diameter D of the lumen 22 of the hammer. Therefore, the structure is such that the opening width I of the concave groove 23 toward the lumen is smaller than the maximum diameter d of the anvil pin 24 ($1 < d$), thereby the anvil pin 24 cannot move toward inside in the radial direction. 36 represents an anvil spacer.

The tool rotates in either normal or reverse rotational direction. The state of the upper half of Fig. 4 shows the operational state, and in this state, movement in the axial direction is not applied to the hammer cam 31 and the anvil pin 24. The cam ball 30 is fitted into the peripheral groove 20a (Fig. 5) provided in the hammer 20, for example over 76 degree, and the ball race 29a of the cam pilot 29, and the ball 30 is engaged with the end of the peripheral groove 20a, the end of the peripheral groove 20a for driving being a spherical surface. When the ball 30 is engaged with the projecting cam portion 32 of the hammer cam 31, the hammer cam 31 is driven by the rotation of the hammer 20.

When the hammer cam 31 is driven to impart rotation, the rotation is imparted to the anvil shaft 25. When the anvil shaft 25 resists against it, the cam ball 30 is got on the surface of the projecting cam portion 32. And via a driving portion 33 having a large diameter engaged with the anvil pin 24, movement in the axial direction is imparted to the anvil pin 24, and the orbit of the anvil pin 24 crosses the ear-like anvil 26. And the impact force is transmitted to the anvil 26. The diameter of the end portion of the anvil pin 24 has a shape which coincides with the concave portions on the both sides of the anvil 26, whereby when the anvil pin 24 moves in the direction imparting the impact force to the anvil 26, the anvil 26 is moved in the axial direction by the hammer cam 31, while moving spirally. When the movement in the axial direction ends (the state of the lower half in Fig. 4), the cam ball 30 is got on the cam portion 32. Then, the hammer cam 31 and the anvil pin 24 are again moved in the reverse direction by the cam release spring 35.

During this operation, the anvil pin 24 moves in the axial direction, but hardly moves in the radial direction, as described above. Therefore, the anvil pin 24 operates stably without being influenced, even if the cam release spring 35 rattles a little.

As described above, the concave groove within the hammer in which the anvil pin is housed is so set that the distance between centers of the concave grooves is larger than the diameter D of the lumen of the hammer, and the opening width I of the concave groove toward the lumen is smaller than the diameter d of the anvil pin 24, thereby the anvil pin hardly moves in the radial direction, and moves only in the axial direction. Therefore, the anvil pin 24 operates stably to generate strong impact force without being influenced even if the cam release spring rattles a little. Furthermore, since the anvil pin moves exactly in the axial direction, it can be prevented that the anvil pin strikes the chin portion of the anvil to be damaged.

Therefore, the life of the anvil pin is further extended to make it very economical, while wasteful time required for exchanging the anvil pin can be saved, whereby it is suitable from the view point of working efficiency.

Claims

1. A support structure of an anvil pin in a cam-type impact wrench including a lumen 22 of a hammer rotatable around an axial center and an anvil pin 26, which has a cylindrical anvil pin 24 sliding in the axial direction with respect to the hammer 20 to give impact to the anvil 26, and a hammer cam 31 having a cam portion 32 at one end, a driving portion 33 having a large diameter engaged with a circular groove 24a of the anvil pin 24 in the middle portion, and a cylindrical portion 34 to which a cam release spring 35 is fitted at the other end, said hammer cam 31 being always energized in the direction apart from the anvil by the cam release spring 35, and said anvil pin 24 being fitted to a pair of concave grooves 23 in the axial direction provided opposite in the diametral direction in the lumen 22 of the hammer 20, wherein the distance L between centers of said pair of concave grooves 23 is set to be larger than the inner diameter D of the lumen 22 of the hammer, and the opening width I of the concave groove 23 toward the lumen is set to be smaller than the outer diameter d of the anvil pin 24.

FIG.1

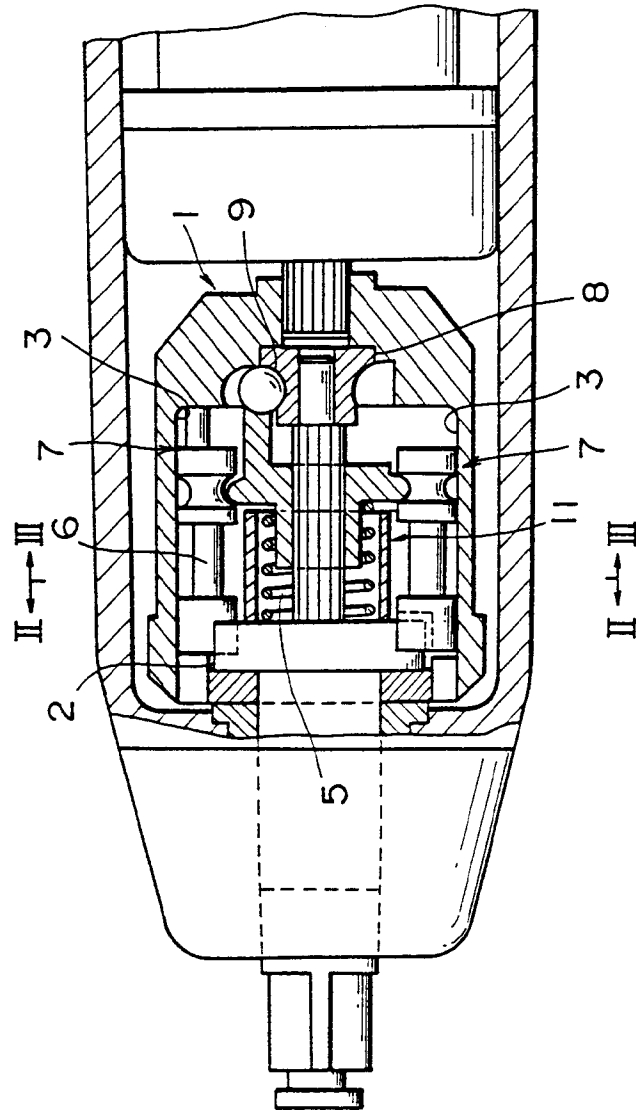


FIG.2

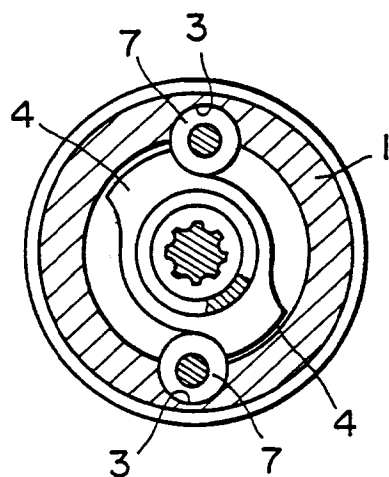


FIG.3

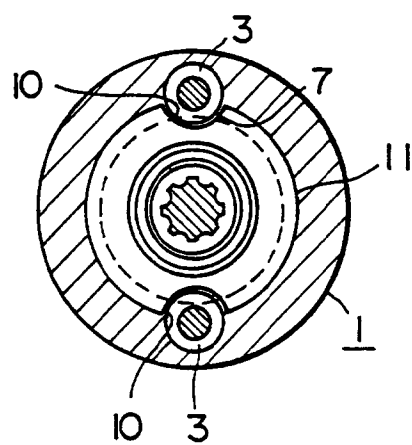


FIG.4

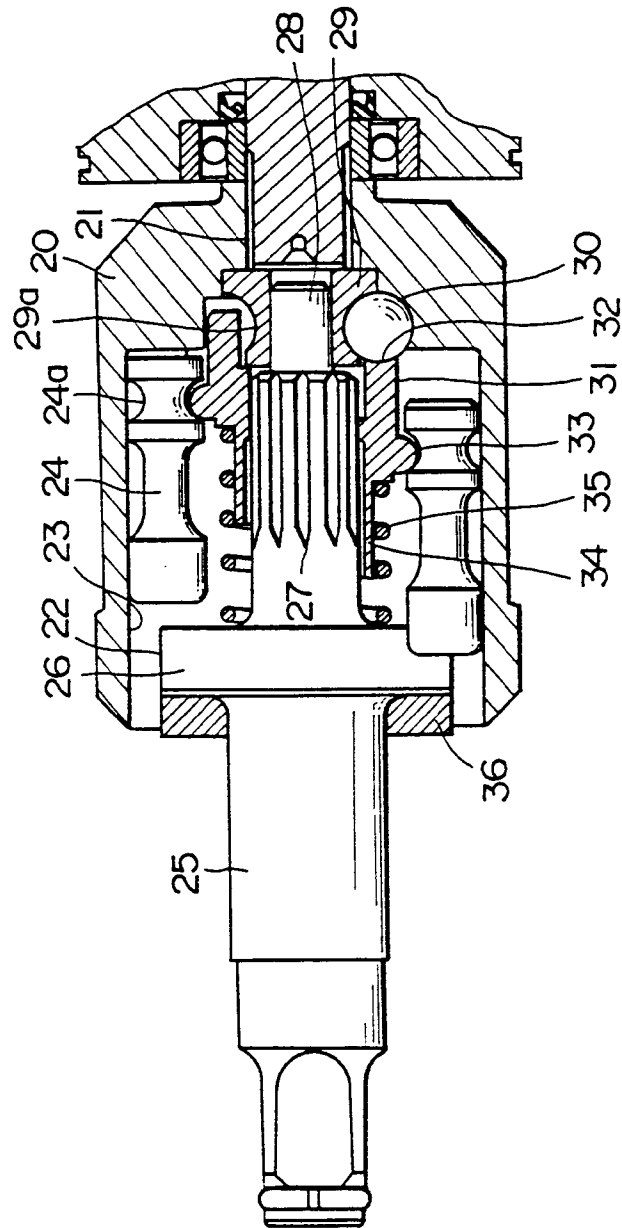


FIG.5

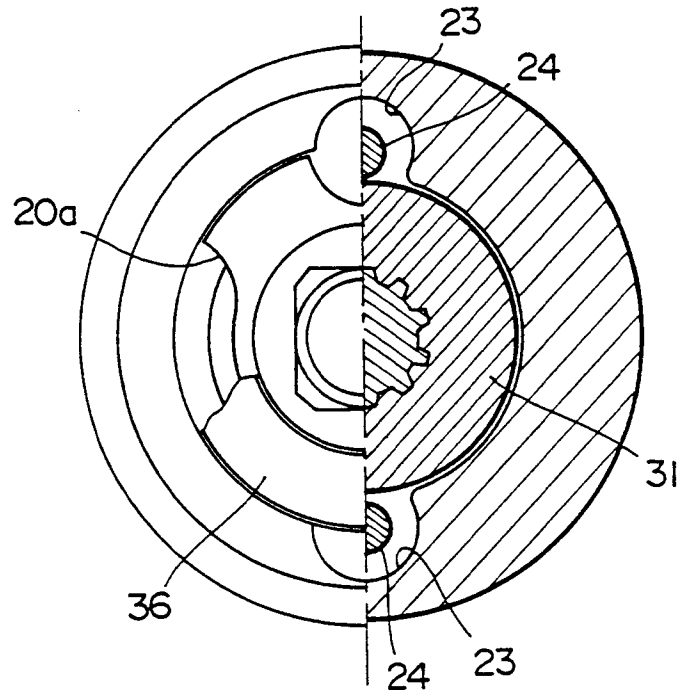


FIG.6

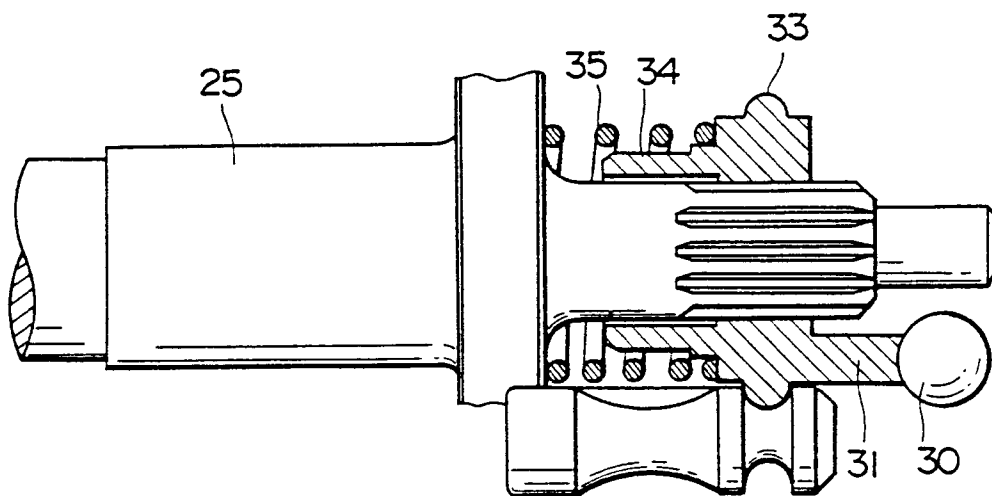
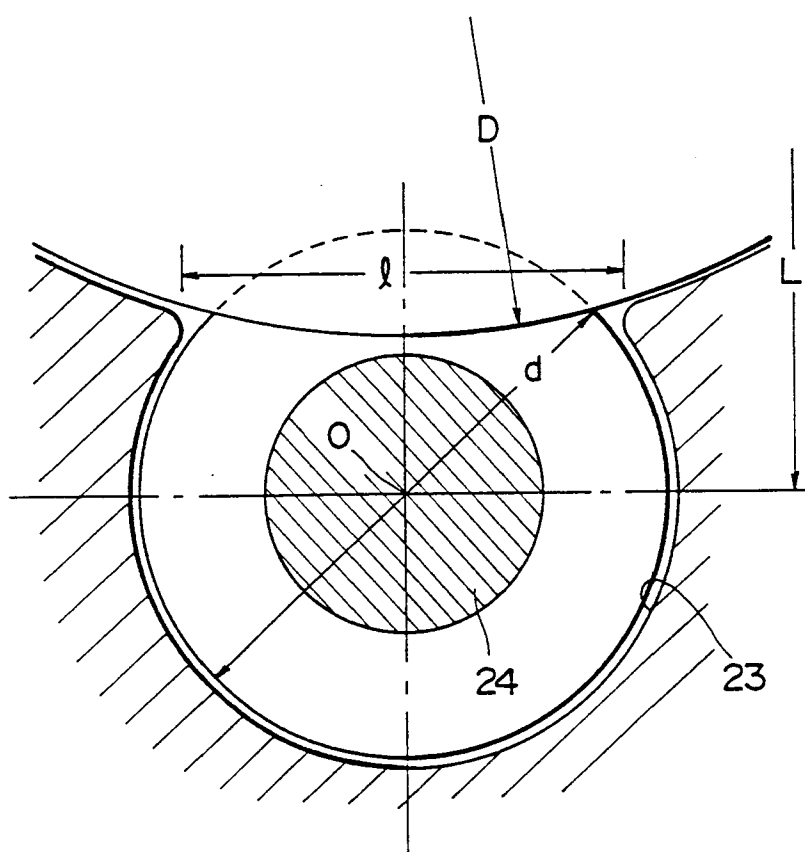


FIG.7





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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 4236

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,Y	US-A-4 313 505 (SILVERN) * figures 1-9 *	1	B25B21/02
Y	US-A-4 811 797 (ANTIPOV) * figures 1-4 *	1	
A	US-A-5 199 505 (IZUMISAWA) * figures 2,3,8 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B25B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 September 1995	Examiner Matzdorf, U
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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