(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 335 032 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88308152.3**

(51) Int. Cl.4: **B25B 21/02**

(22) Date of filing: **02.09.88**

(30) Priority: **26.03.88 JP 72931/88**

(43) Date of publication of application:
04.10.89 Bulletin 89/40

(84) Designated Contracting States:
DE FR GB IT SE

(71) Applicant: **SHINANO PNEUMATIC INDUSTRIES INC.**
325-2, Ooaza Mure Mure-mura
Kamiminochi-gun Nagano-ken(JP)

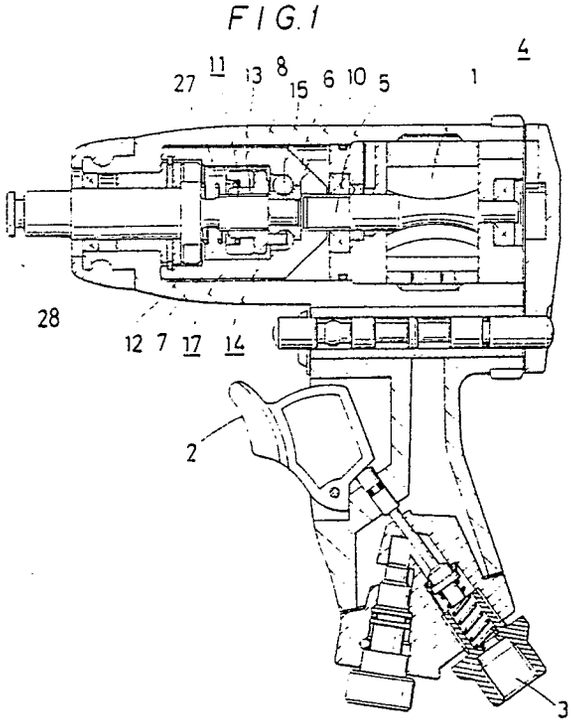
(72) Inventor: **Izumisawa, Osamu Shinano Pneumatic Industries Inc.**
325-2, Ooaza Mure Mure-mura
Kamiminochi-gun Nagano-ken(JP)

(74) Representative: **Gold, Tibor Zoltán et al**
T.Z.GOLD & COMPANY 9, Staple Inn
London WC1V 7QH(GB)

(54) An impact clutch.

(57) An impact clutch used to fix and tighten bolts, nuts and other parts in appropriate positions on objects, or to loosen and remove such previously fixed and tightened parts. The reliability of operation and the durability of such a clutch has been enhanced through a construction in which the hammer which strikes the striking collar of the impact spindle has been better positioned so that the hammer operates properly within the clutch case, and further, so that the striking force of the hammer on the striking collar is not concentrated on one area only.

FIG.1



EP 0 335 032 A1

AN IMPACT CLUTCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention concerns an impact clutch which is used to tighten and fix bolts, nuts and other appropriate parts in the positions where they are to be fixed using a certain tightening force, and also in reverse, to loosen and remove such members previously tightened and fixed.

2. Description of the Prior Art

An impact clutch for tightening and fixing bolts, nuts and other appropriate parts, and for loosening and removing such members has been described previously, in for example Japanese Patent Laid-Open Gazette Sho 62-246480. However, such prior art was defective and lacked durability because of its construction in which the hammer which struck the striking collar of the impact spindle was unstably positioned in the clutch case, making the impact clutch liable to fail and become inoperable depending on the inclination of the impact clutch and the timing of the strike; since the hammer and the striking collar were in linear contact at the time of the strike, the force of impact was partially concentrated, and the clutch was easily broken.

BRIEF SUMMARY OF THE INVENTION

This invention solves the afore-mentioned problems, by providing an impact clutch which is more durable and less easily broken, through the positioning of the hammer in a stable position in the clutch case, thus making operation more reliable by ensuring that the hammer's striking surface strikes the striking collar across its whole contact surface.

These and other objects, advantages, features and uses will become more apparent from the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings show one embodiment of this invention.

Fig. 1 is a section view.

Fig. 2 is an enlarged section view of the clutch case part.

Fig. 3 is a section view drawn across line A-A in Fig. 2.

Fig. 4 is a section view drawn across line B-B in Fig. 2.

Fig. 5 is a perspective view of the hammer.

Fig. 6 is a perspective view of the cam, and

Fig. 7 is a section view of another embodiment, viewed as in Fig. 2 and across line B-B.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will now be described with reference to the accompanying drawings, where reference numeral 1 denotes an air motor or electric motor, in this embodiment an air motor 1. Further, this air motor 1 is rotatable within the body 4 by the action of pressurized air which is introduced from an air inlet portion 3 through the operation of the opening/closing lever 2. The main driving shaft 5 of the air motor 1 is connected and fixed to the clutch case 6. This clutch case 6 is constructed internally of a receiving chamber 7 which has a cross-section C shape, and further the clutch case 6 is mounted rotatably within the casing 8 which is connected to the body 4. An impact spindle 11 is provided in a central axial direction on the inside of the receiving chamber 7 via a bearing 10 which is designed to prevent the transmission of the rotation of the clutch case 6. On one of the outer surfaces of this impact spindle 11 are projected, at right-angles, two striking collars 12, while on another outer surface a spline 13 is constructed in an axial direction, so that the spline 13 engages slidably and axially with a cam 14. Further, the tapered cam surface 16 of the cam 14 is normally in contact with multiple rotatable balls 15 which are positioned against the outside surface of the bearing 10. A hammer 17 is also positioned on the outside of this cam 14. As indicated in Figs. 4 and 5, this hammer 17 is divided into two parts, with each part constructed of a supporting part 20 which is rotatable in relation to the outside surface of the annular projection 18 of the cam 14, and a striking part 21 for striking the striking collar 12 of the impact spindle 11. This striking part 21 is constructed of a greater thickness than the supporting part 20, and also part of the striking part 21 projects externally and axially from the supporting part 20. This "projecting part" becomes a mating pin 23 which engages retractably with the grove 22 provided axially on the inner surface of the clutch case 6. The striking

surface 24 which strikes the striking collar 12 is constructed with a flat surface so that it strikes the striking collar 12 across its entire surface. Further, in the axial direction, the bias face 25 at the opposite end of the hammer 17 from the striking collar 12 is pressed against the annular collar 26 of the cam 14 by the pressure of the bias spring 27, while the cam surface 16 of the cam 14 is normally pressed against the balls 15.

The fore-end face 28 of the impact spindle 11 which is struck and caused to rotate by the hammer 17 protrudes externally from the casing 28, and has connected to it other working parts (not shown in the drawings) such as a screw-driver or a wrench.

In the construction described above, the working members attached to the fore-end part 28 of the impact spindle 11 are placed in contact with the bolts and nuts to be tightened. In order to tighten or loosen such bolts or nuts, the opening/closing lever 2 is operated to introduce pressurized air and start the air motor 1. The clutch case 6 connected to the main driving shaft 5 will rotate with the shaft, thereby causing the bearing 10, the balls 15 and the hammer 17 to also rotate. The balls 15 slide with respect to the cam surface 16 of the cam 14 which is not rotating, causing the cam 14 to slide axially in accordance with the spline 13 of the impact spindle 11, and at the same time the hammer 17, the mating pins 23 of which are retractably engaged in the groves 22 of the clutch case 6, is pressed against the cam 14, and while continuously rotating together with the clutch case 6, then slides towards the striking collar 12 in reaction to the recovery force of the bias spring 27. Thus the hammer 17, rotating, slides towards the striking collar 12, and the ball 15 reaches the protruding end of the cam surface 16, the hammer 17 strikes the striking collar 12 of the impact spindle 11. Immediately before or immediately after the said strike, the end of the cam surface 16 and the balls 15 are disengaged , so that the recovery force of the bias spring 27 makes the cam 14 slide in the direction of the air motor 1; the hammer 17 simultaneously slides away from the rotating surface of the striking collar 12, releasing the hammer 17 from its state of striking the striking collar 12. The impact spindle 11 rotates, and when the cam 14 is next pushed out by the contact between the end of the cam surface 16 and the balls 15, the hammer 17 once again strikes the striking collar 12.

As mentioned above, because the hammer 17 immediately retracts from the striking surface 24 of the striking collar 12 after striking it, if external torque over and above the present torque value is applied to the impact spindle 11, the striking action is merely repeated; no shock is applied to the hand of the operator holding the body 4, and the device is not caused to rotate in the reverse direction.

As well, the hammer 17, as described above, retracts into a state where the mating pin 23 is fitted into the grove 22 in the clutch case, and can be maintained in a stable position without failing; further, there is no chance of the device becoming inoperable, or of the striking collar 12 striking inaccurately. The hammer 17 is constructed flat so that it strikes the striking surface 24 and the striking collar 12 across its contact surface, rather than in the previous construction using hammer pins in which the striking part 21 of the hammer 17 struck the striking collar 12 linearly. Thus it has been possible to construct a device with improved shock resistance and superior durability.

Further although the above embodiment is constructed with two hammers 17 and two striking collars 12 respectively, other embodiments may be constructed as shown in Fig. 7 with three hammers and three striking collars respectively, or with only one hammer and one striking collar (not shown in a drawing).

This impact clutch, when constructed as described above with a hammer which retracts into a grove in the clutch case, can normally maintain stable operation without failing and becoming inoperable, or inaccurately striking the striking collar. Further, because the hammer is constructed flat so that its striking surface can strike the striking collar along the whole surface, there is no danger of linear contact between the striking part of the hammer and the striking collar, thus providing a device with excellent shock resistance and durability.

Claims

1. An impact clutch characterized by a construction in which an impact spindle is inserted in a clutch case which is rotates via a connection to an air motor, where the impact spindle is designed so that the rotational force of the air motor is not transmitted, with a cam which is axially retractable engaged with a spline provided on one part of the outside surface of the impact spindle, the action and retraction which accompanies the forwards-backwards action of this cam causing a hammer to strike a striking collar on the impact spindle, the hammer then being retractable into a grove provided axially in the internal circumference of the clutch case, and while being rotatable in a body with the clutch case, the striking surface of the hammer being of a flat construction so that it can have surface contact with the striking collar.

2. An impact clutch according to Claim 1 characterized by having two hammers and two striking collars respectively.

3. An impact clutch according to Claim 1, characterized by having three hammers and three striking collars respectively.

4. An impact clutch according to Claim 1, characterized by having an air motor as a motor.

5. An impact clutch according to Claim 1, characterized by having an electric motor as a motor.

FIG.1

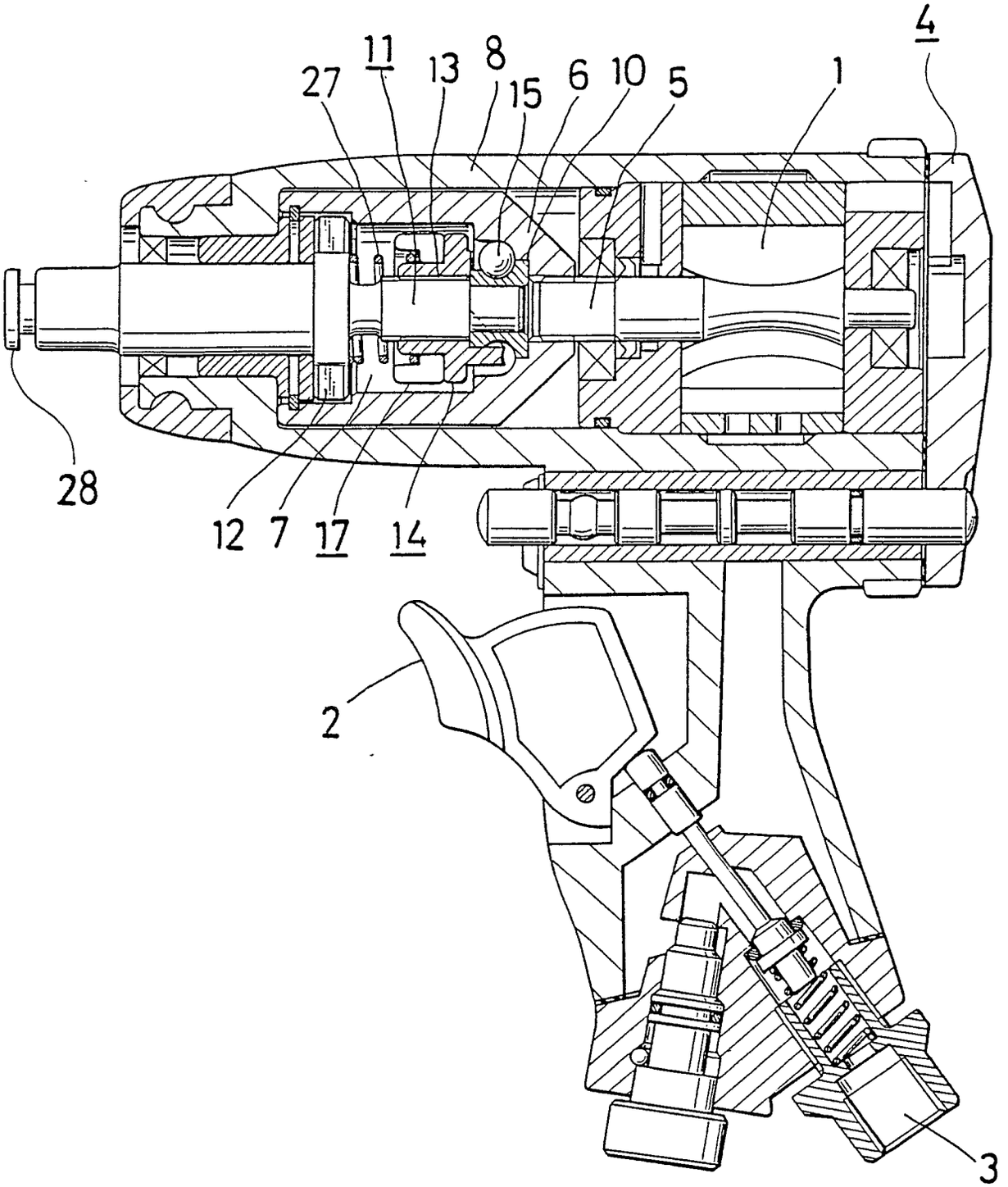


FIG. 2

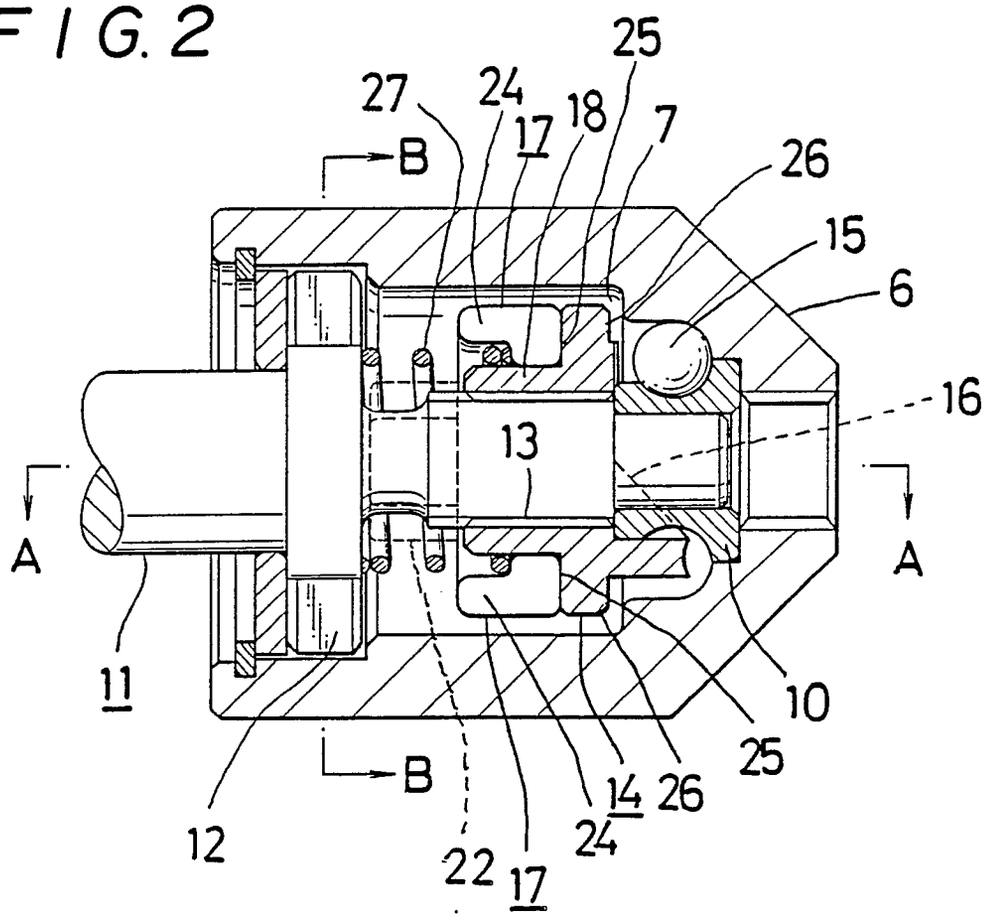

25
27
24
17
18
7
B
26
15
6
16
13
A
A
11
10
25
B
14
26
12
24
22
17

FIG. 3

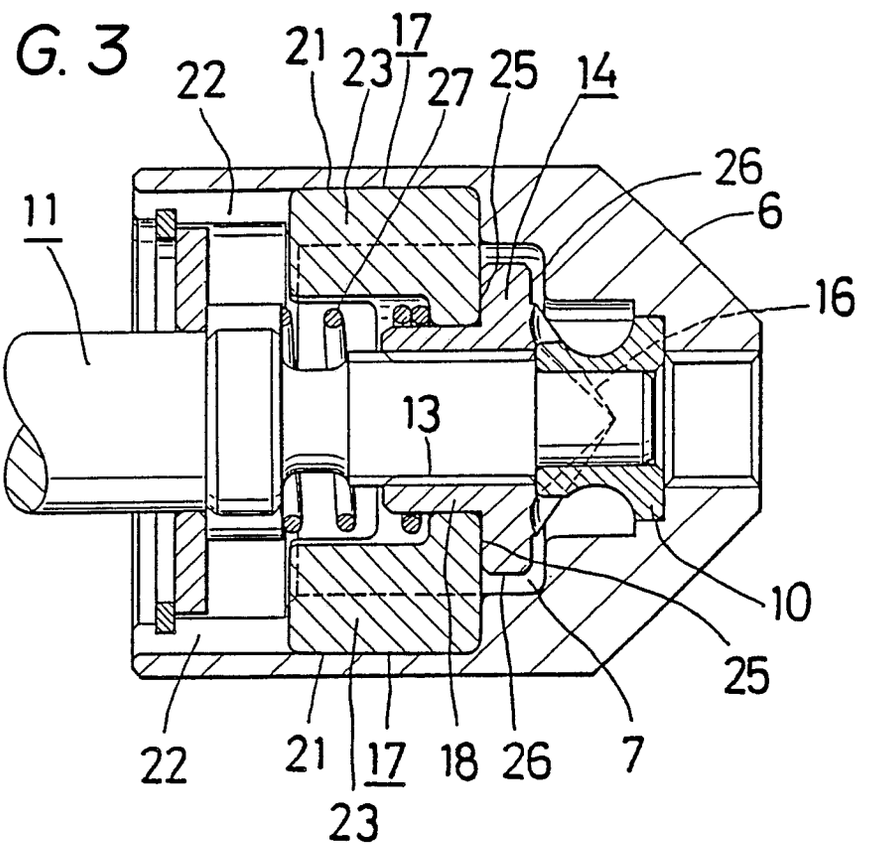

17
21
23
22
27
25
14
26
11
6
16
13
10
25
22
21
17
18
26
7
23

FIG.4

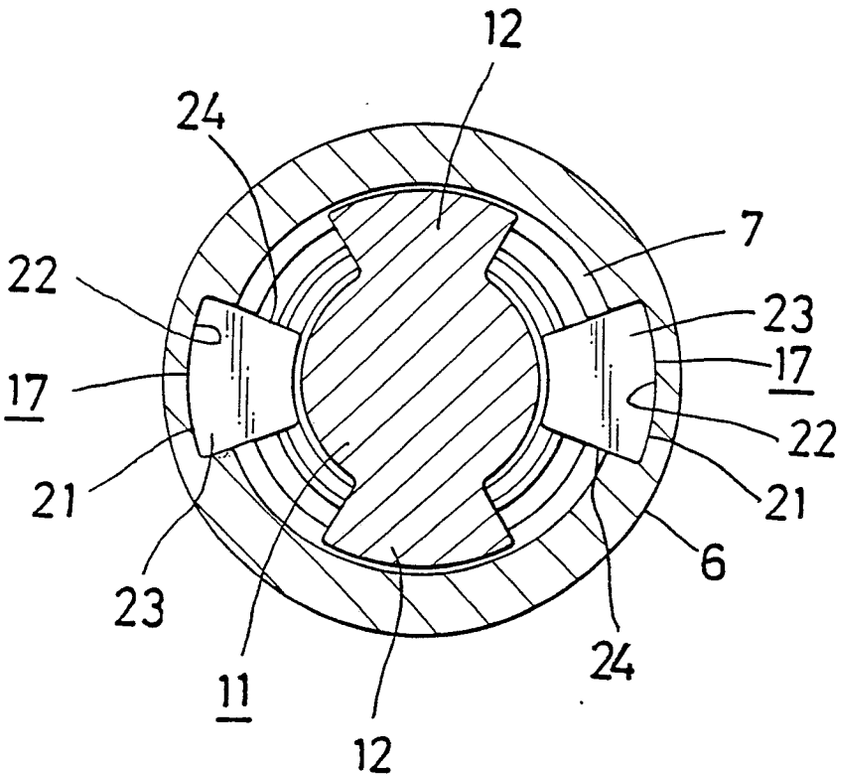

12
24
7
22
23
17
17
22
21
21
6
23
24
11
12

FIG.5

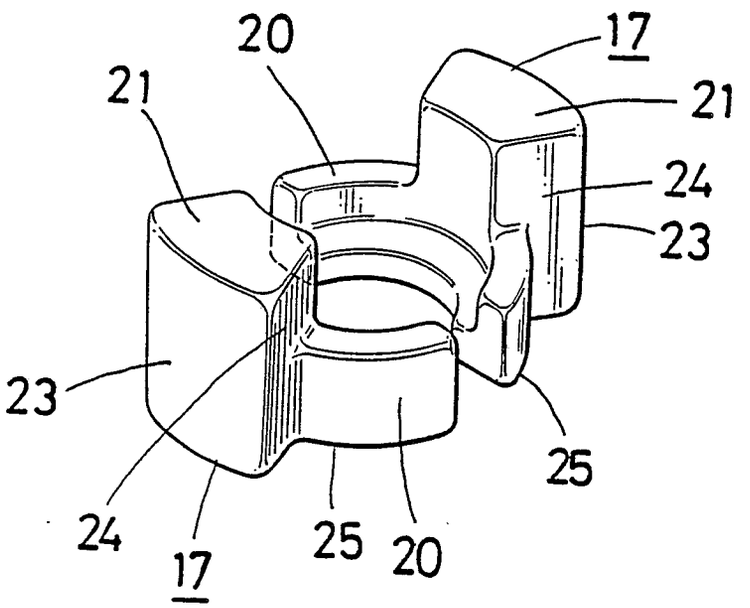

20
17
21
21
24
23
23
25
24
17
25
20

FIG.6

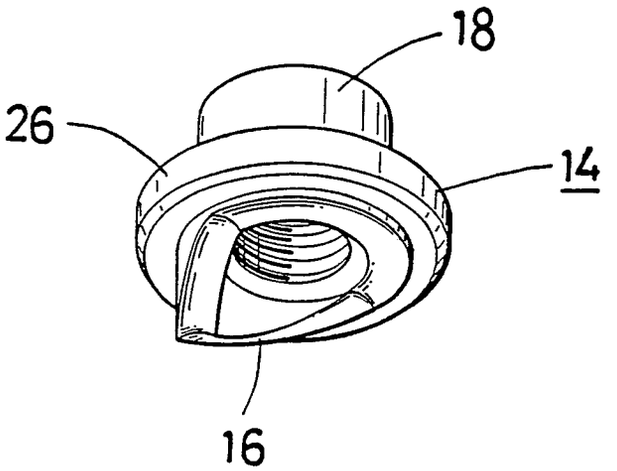
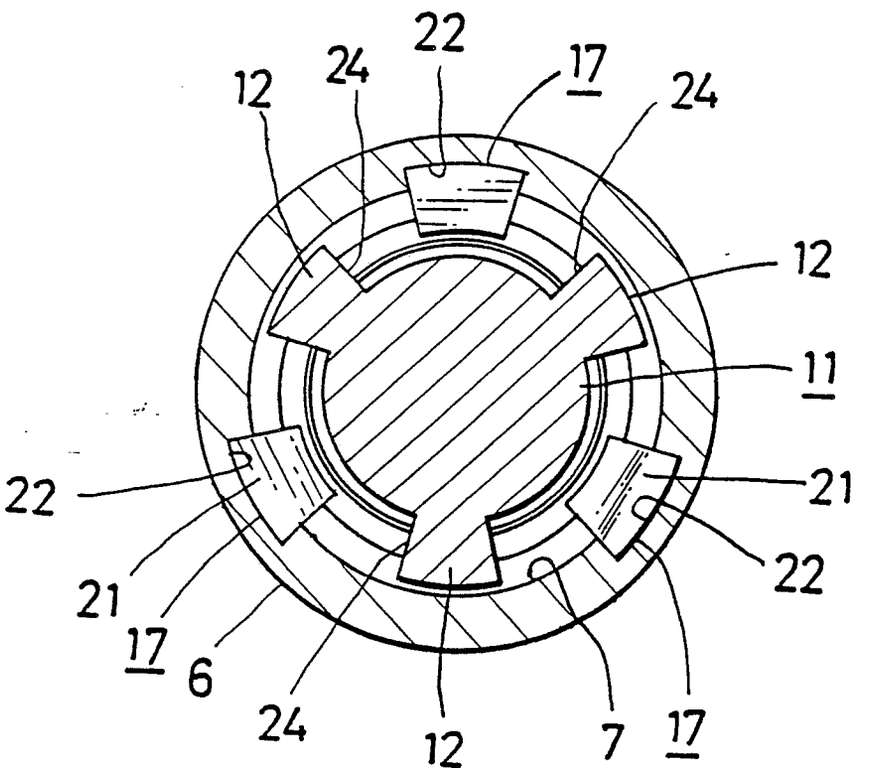


FIG.7



European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 88308152.3

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE - A1 - 3 007 630 (RODAC) * Fig. 2,3 * --	1,2,4	B 25 B 21/02
A	US - A - 2 881 884 (AMTSBERG) * Fig. 8 * --	1,2,3,4	
D,X	JP - A - 62-246 480 (SHINANO KUATSO) * Fig. 1,2 * ----	1,2,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 B 21/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	06-06-1989	BENCZE

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

EPO Form 1503. 03.82