

Description

BACKGROUND OF THE INVENTION

Technical Field

[0001] The present invention relates to a washer bending device for bending a washer to stop the rotation of a screw-attaching work screw-attached to a screw-attaching portion through the washer.

Description of the Related Art

[0002] The rotation of the screw-attaching work is formerly stopped to prevent loosening of a screwing state to the screw-attaching portion and detachment from the screw-attaching portion with respect to the screw-attaching work such as a bolt or the like screw-attached to the screw-attaching portion through the washer. As one example for stopping the rotation of the screw-attaching work, an engaging pawl for engagement with an engaging portion or the like of the screw-attaching portion in advance is first arranged in the washer, and the rotation of the screw-attaching work is stopped with respect to the screw-attaching portion. On the other hand, one portion of the washer nipped between the screw-attaching portion and the screw-attaching work is bent along a flat portion located in a hexagonal head portion of the bolt or the like. Thus, the rotation of the washer is stopped with respect to the screw-attaching portion, and the rotation of the screw-attaching work such as the bolt or the like is stopped by the bent one portion of the washer, and a screw-attaching state of the screw-attaching work to the screw-attaching portion is maintained.

[0003] However, when a bending operation of the washer with respect to the screw-attaching work is made, there is a case in which the screw-attaching state of the screw-attaching work to the screw-attaching portion becomes insufficient. Therefore, a fastening state is confirmed prior to the bending of the washer, and it is necessary to retighten the screw-attaching work to the screw-attaching portion when the screw-attaching work is loosened. The confirming operation of a fastening degree of the screw-attaching work screw-attached to the screw-attaching portion through the washer, and the bending operation of the washer for stopping the rotation of the screw-attaching work must be made by respective independent operations. Therefore, there is a disadvantage in that operation efficiency is low.

SUMMARY OF THE INVENTION

[0004] The present invention dissolves such disadvantages and its object is to provide a washer bending device able to continuously make the confirming operation of the fastening degree of the screw-attaching work screw-attached to the screw-attaching portion through the washer and the bending operation of the washer for stop-

ping the rotation of the screw-attaching work for a short time, and improve working operation.

[0005] To achieve such an object, the present invention is characterized in a washer bending device in which a screw-attaching work having a screw portion and a projecting-out portion projected out and formed at a base end of the screw portion and having a flat face in its outer circumference is screw-attached to a screw-attaching portion corresponding to the screw portion through a washer of a shape projected out in a flange shape; and, from a state in which rotation of the washer is stopped as a result of one portion of an outer circumference of the washer being engaged with an engaging portion arranged in the screw-attaching portion, another portion of the outer circumference of the washer is bent along the flat face of the projecting-out portion so that the rotation of the screw-attaching work with respect to the screw-attaching portion is stopped through the washer; the washer bending device comprising a work storing member of a sleeve shape storing the screw-attaching work of a state screw-attached to the screw-attaching portion; a washer bending member arranged on an outer circumferential side of the work storing member, and bending a portion projected out in a flange shape from a portion between the screw-attaching portion of the washer and the projecting-out portion of the screw-attaching work along the flat face of the projecting-out portion of the screw-attaching work; and a support frame supporting a base end portion of the work storing member; the work storing member has a storing chamber storing the screw-attaching work except for the screw portion; an opening portion formed on one side of the storing chamber and freely passing the screw-attaching work; and a fitting portion arranged at a tip of the storing chamber and detachably fitted to the projecting-out portion of the screw-attaching work; the washer bending member has a mounting portion of a sleeve shape mounted to the outer circumference of the work storing member; an arm portion extending along the storing chamber of the work storing member from the mounting portion; and a washer abutting portion arranged at a tip of the arm portion and abutting against a face of a screw-attaching portion side of a position corresponding to the flat face in a portion projected out in a flange shape from a portion between the screw-attaching portion of the washer and the projecting-out portion of the screw-attaching work; and the support frame has a handle rotating and operating the screw-attaching work through the projecting-out portion of the screw-attaching work fitted to the fitting portion of the work storing member; and a pressing device which relatively retreats the washer bending member and the work storing member by pressing the screw-attaching work stored in the work storing member toward the screw-attaching portion.

[0006] The washer bending device of the present invention is used with respect to the screw-attaching work screw-attached to the screw-attaching portion. Here, if a screw-attaching state of the screw-attaching work will

first be explained, the screw portion of the screw-attaching work is screwed to the screw-attaching portion. In the screw-attaching work, the projecting-out portion projected out of the base end of the screw portion is formed, and the flat face is formed in the outer circumference of the projecting-out portion. For example, a hexagonal portion seen from a plane such as the head of a bolt is used as this projecting-out portion. The flat face of the projecting-out portion may have a shape able to fit a spanner, a wrench or the like when the screw portion is screwed to the screw-attaching portion. The screw portion is screwed to the screw-attaching portion in a state inserted into the washer. Thus, the screw-attaching portion and the projecting-out portion attain a state screw-attached through the washer. When the washer is located between the screw-attaching portion and the projecting-out portion, one portion of its outer circumference is engaged with the engaging portion arranged in the screw-attaching portion. Thus, the rotation of the washer is stopped with respect to the screw-attaching portion.

[0007] The washer bending device of the present invention is then used as follows. First, a portion except for the screw portion of the screw-attaching work screw-attached to the screw-attaching portion is stored to the storing chamber from a side through the opening portion of the work storing member. At this time, the projecting-out portion of the screw-attaching work stored in the storing chamber is fitted to the fitting portion. Further, the washer abutting portion of the washer bending member simultaneously abuts against the face of the screw-attaching portion side of a portion projected out in a flange shape from a portion between the screw-attaching portion of the washer and the projecting-out portion of the screw-attaching work. At this time, the washer abutting portion abuts against the washer in a position corresponding to the flat face.

[0008] In this state, the handle of the support frame is rotated and operated and rotation torque is given to the screw-attaching work in a screwing direction to the screw-attaching portion. The support frame supports the work storing member, and the projecting-out portion of the screw-attaching work is fitted to the fitting portion of the work storing member. Accordingly, the rotation torque can be easily given to the screw-attaching work through the work storing member by merely rotating and operating the handle. A fastening degree of the screw-attaching work to the screw-attaching portion can be confirmed by the handle operation at this time, and fastening is again performed if the screw-attaching work is loosened with respect to the screw-attaching portion.

[0009] Thereafter, the screw-attaching work is pressed toward the screw-attaching portion by the pressing device along its axial direction. Thus, the support frame, the work storing member and the washer bending member are relatively integrally retreated with respect to the screw-attaching work screw-attached to the screw-attaching portion. At this time, the washer abutting portion of the washer bending member is retreated while bending

the projecting-out portion of the washer, and the projecting-out portion of the washer is bent along the flat face of the projecting-out portion of the screw-attaching work. Thus, the rotation of the screw-attaching work is stopped

5 with respect to the washer by the bent portion of the washer, and the rotation of the washer is stopped with respect to the screw-attaching portion by the engaging portion of the screw-attaching portion as mentioned above. Accordingly, screw loosening of the screw-attaching work
10 with respect to the screw-attaching portion is prevented. **[0010]** Thus, in accordance with the washer bending device of the present invention, just after the confirming operation of a fastening degree of the screw-attaching work screw-attached to the screw-attaching portion through the washer, the washer can be bent by merely operating the pressing device. Accordingly, the confirming operation of the fastening degree and the bending operation of the washer can be continuously made for a short time, and working operation can be improved.

15 **[0011]** Further, in the present invention, it is preferable that the washer bending member is rotatably arranged along the outer circumference of the work storing member. In accordance with this construction, after the screw-attaching work is stored to the storing chamber from a side through the opening portion of the work storing member, the washer bending member is rotated and the washer bending member is rotated and the arm portion of the washer bending member is aligned with a position corresponding to the opening portion so that dislocation of
25 the screw-attaching work from the storing chamber can be reliably prevented.

30 **[0012]** Further, it is preferable that the work storing member is supported by the support frame so as to be freely advanced and retreated with respect to the washer abutting portion of the washer bending member, and the support frame has a biasing device which biases the work storing member toward the washer abutting portion of the washer bending member.

35 **[0013]** In accordance with this construction, the work storing member can be elastically retreated at a stage at which the washer is being bent by the washer abutting portion. Accordingly, the washer can be smoothly and precisely bent without unnecessarily deforming the washer.

45 BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

50 Fig. 1 is a perspective view showing a washer bending device of one embodiment of the present invention.

Fig. 2 is an explanatory sectional view of the washer bending device of this embodiment.

55 Fig. 3 is a perspective view showing a work storing member.

Fig. 4 is a perspective view showing a washer bending member.

Fig. 5 is a perspective view showing a support frame. Fig. 6 is a sectional explanatory view taken along line VI-VI in Fig. 1. Fig. 7(a) is an explanatory side view showing a screw-attaching state of a screw-attaching work to a screw-attaching portion. Fig. 7(b) is an explanatory side view showing a bending state of a washer in the screw-attaching portion. Fig. 8(a) is an explanatory perspective view showing the screw-attaching work, the washer and the screw-attaching portion. Fig. 8(b) is an explanatory perspective view showing the screw-attaching state of the screw-attaching work to the screw-attaching portion.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] One embodiment of the present invention will be explained on the basis of Fig. 1 to Fig. 8. Fig. 1 is a perspective view showing a washer bending device of this embodiment. Fig. 2 is an explanatory sectional view of the washer bending device of this embodiment. Fig. 3 is a perspective view showing a work storing member. Fig. 4 is a perspective view showing a washer bending member. Fig. 5 is a perspective view showing a support frame. Fig. 6 is a sectional explanatory view taken along line VI-VI in Fig. 1. Fig. 7 is an explanatory side view showing a screw-attaching state of a screw-attaching work to a screw-attaching portion. Fig. 8 is an explanatory perspective view showing the screw-attaching work, the washer and the screw-attaching portion.

[0016] The washer bending device 1 of this embodiment shown in Fig. 1 bends a washer 3 as shown in Fig. 7(b) to stop the rotation of a screw-attaching work 4 screw-attached to a screw-attaching portion 2 through the washer 3 as shown in Fig. 7(a). Here, the screw-attaching work 4, the washer 3 and the screw-attaching portion 2 will first be explained. As shown in Fig. 8(a), the screw-attaching work 4 is constructed by a screw portion 5 of a bolt shape having a screw thread formed in its outer circumference, a hexagonal portion 6 (projecting-out portion) of a bolt head shape projected out and formed in a base end portion of the screw portion 5 and having six flat faces 6a in its outer circumference, and a shaft portion 7 extending in an opposite direction of the screw portion 5 from the hexagonal portion 6. An unillustrated tool such as a spanner or the like can be mounted to the hexagonal portion 6. The screw-attaching work 4 adopted in this embodiment is a part forming an oil injection port of an unillustrated engine, and one end of the shaft portion 7 is enlarged in diameter and the interior is formed in a hollow. Further, the outside diameter of a portion enlarged in diameter in the shaft portion 7 is formed so as to be smaller than the outside diameter of the hexagonal portion 6. The washer 3 is a metallic plate of a disk shape, and an insertion hole 8 for inserting the screw portion 5 is formed, and an engaging pawl 9 is formed in one portion of its outer circumference. In the

engaging pawl 9, a convex portion is formed in a diametrical direction and is then bent downward. The screw-attaching portion 2 has a circumferential wall 10 projected and formed in one portion of the unillustrated engine, a screw hole 11 having a screw thread formed in an inner circumference of the circumferential wall and a concave portion 12 (engaging portion) formed on outside surface of the circumferential wall.

[0017] The screw-attaching work 4 is screwed into a screw hole 11 of the screw-attaching portion 2 in a state in which its screw portion 5 is inserted into the insertion hole 8 of the washer 3. As shown in Fig. 8(b), the screw-attaching work 4 is screw-attached such that the washer 3 is nipped by a lower face of the hexagonal portion 6 and an upper edge of the circumferential wall 10 of the screw-attaching portion 2. At this time, the engaging pawl 9 is engaged with the concave portion 12 of the screw-attaching portion 2 and the rotation of the washer 3 is stopped with respect to the screw-attaching portion 2.

[0018] The outer circumference of the washer 3 is formed so as to be larger than the hexagonal portion 6 and the screw-attaching portion. An outer circumferential side except for a portion forming the engaging pawl 9 of the washer 3 is projected out in a flange shape in a state in which the screw-attaching work 4 is screw-attached to the screw-attaching portion 2.

[0019] The washer bending device 1 of this embodiment is used with respect to states shown in Figs. 7(a) and 8(b), i.e., a state in which the screw-attaching work 4 is screw-attached to the screw-attaching portion 2 through the washer 3. The washer bending device 1 performs confirmation of the screw-attaching state of the screw-attaching work 4 to the screw-attaching portion 2, retightening in a loosening case, and bending of the washer 3 as shown in Fig. 7(b).

[0020] The construction of the washer bending device 1 of this embodiment will be explained. As shown in Figs. 1 and 2, the washer bending device 1 has a cylindrical support frame 13, a work storing member 14 extending on a tip side of the support frame 13, a washer bending member 15 located in the outer circumference of the support frame 13 and the work storing member 14 and extending on the tip side along the work storing member 14. An air cylinder 16 (pressing device) is connected and supported by a worm screw 17 on a rear end side of the support frame 13, and an attachment 20 for detachably connecting a connecting shaft 19 (a shaft for outputting torque) of a torque wrench 18 (handle) is attached to a rear end of the air cylinder 16. In this embodiment, one portion of the air cylinder 16 is exposed from the support frame 13, and the attachment 20 is attached to the air cylinder 16. However, the rear end side of the support frame 13 may be further extended out and the air cylinder 16 may be internally included and the attachment 20 may be also integrally formed.

[0021] As shown in Fig. 2, the work storing member 14 has a base portion 21 with a rear end thereof inserted into the support frame 13, and a storing chamber 22 ex-

tended out of a tip of the base portion 21 and storing the hexagonal portion 6 and the shaft portion 7 of the screw-attaching work 4. As shown in Fig. 3, an opening portion 23 for opening one side of the storing chamber 22 is formed in the storing chamber 22, and a fitting portion 24 for fitting the hexagonal portion 6 of the screw-attaching work 4 is formed in an inner circumference of its tip portion. The opening portion 23 is formed so as to have a size able to pass the screw-attaching work 4 and is also formed such that the screw-attaching work 4 can be mounted and stored to the storing chamber 22 through the opening portion 23 from a direction crossing an axis of the screw-attaching work 4.

[0022] Further, the base portion 21 of the work storing member 14 is formed in a sleeve shape, and a long hole 25 extending in an axial direction is formed in the base portion 21. As shown in Fig. 2, the tip of a rotation stopping screw 26 attached to the support frame 13 is inserted into the long hole 25. The rotation of the base portion 21 is stopped by the rotation stopping screw 26 with respect to the support frame 13, and the base portion 21 is connected to the support frame 13 in a slidable state in the axial direction. Further, the work storing member 14 is biased in a tip direction from the base portion 21 side by a spring 27 (biasing device) built in the support frame 13.

[0023] Further, as shown in Fig. 2, a pressing member 28 connected to the tip of a piston rod 16a of the air cylinder 16 is slidably arranged in the interior of the base portion 21 of the work storing member 14. A tip of the pressing member 28 abuts against the shaft portion 7 of the screw-attaching work 4 stored in the storing chamber 22 of the work storing member 14, and the screw-attaching work 4 is pushed out in its axial direction from the tip of the work storing member 14 by extension of the piston rod 16a.

[0024] As shown in Figs. 2 and 4, the washer bending member 15 is constructed by a mounting sleeve 29 (mounting portion) mounted to the outer circumference of a tip side of the support frame 13, and the outer circumference of a portion extended out of the support frame 13 of the base portion 21 of the work storing member 14, an arm portion 30 extended along the outside of the storing chamber 22 of the work storing member 14 from a tip of the mounting sleeve 29, and a pair of washer abutting pawls 31 (washer abutting portions) formed at a tip of the arm portion 30.

[0025] As shown in Fig. 2, a plurality of connecting members 32 are screw-fastened and fixed to the mounting sleeve 29 of the washer bending member 15 by bolts 33. As shown in Fig. 2, the connecting member 32 has a convex portion 35 projected toward the support frame 13 through a notch portion 34 of a rear end portion of the mounting sleeve 29 shown in Fig. 4. As shown in Fig. 5, this convex portion 35 is slidably inserted and attached to a guide groove 36 formed in the entire outside circumference of the support frame 13. Thus, as shown in Fig. 2, the washer bending member 15 is rotatably supported in a state latched in the support frame 13.

[0026] Further, as shown in Fig. 6, a ball plunger 37 is arranged in the washer bending member 15, and a hollow 38 detachably engaged with the ball plunger 37 is formed in one portion of the guide groove 36 of the support frame 13. This hollow 38 is formed in a position for detachably engaging the ball plunger 37 when the arm portion 30 of the washer bending member 15 is located on an opposite side of the opening portion 23 of the work storing member 14.

[0027] As shown in Fig. 1, both the washer abutting pawls 31 of the washer bending member 15 abut against two opposed portions of the washer 3 projected out in a flange shape from the hexagonal portion 6 of the screw-attaching work 4, from an opposite side of the hexagonal portion 6.

[0028] When a bending operation of the washer 3 is made by the washer bending device 1 constructed above, as shown in Fig. 7(a), the screw-attaching work 4 screw-attached to the screw-attaching portion 2 is first inserted and stored in the storing chamber 22 of the work storing member 14 from a side of the screw-attaching work 4 through the opening portion 23. At this time, with reference to Fig. 1, the shaft portion 7 of the screw-attaching work 4 is stored in the storing chamber 22 and the hexagonal portion 6 of the screw-attaching work 4 is fitted to the fitting portion 24. Simultaneously, both the washer abutting pawls 31 of the washer bending member 15 abut against the washer 3 from the opposite side of the hexagonal portion 6.

[0029] Subsequently, the washer bending member 15 is rotated and the arm portion 30 is located outside the opening portion 23 of the work storing member 14 (the washer bending member 15 is normally rotated about 180°). Thus, unexpected dislocation of the screw-attaching work 4 from the storing chamber 22 of the work storing member 14 is prevented by the arm portion 30 of the washer bending member 15, and a storing state of the screw-attaching work 4 to the storing chamber 22 can be reliably maintained.

[0030] Next, a screw-attaching state (fastening degree) of the screw-attaching work 4 to the screw-attaching portion 2 is confirmed by operating the torque wrench 18. Since the hexagonal portion 6 of the screw-attaching work 4 is fitted to the fitting portion 24 and the work storing member 14 is stopped in rotation and supported by the support frame 13, rotation torque provided by the torque wrench 18 is transmitted to the screw-attaching work 4 through the attachment 20, the air cylinder 16, the support frame 13 and the work storing member 14. If the screw-attaching work 4 is screw-attached to the screw-attaching portion 2 in a loosening state, the torque wrench 18 is further operated and retightened.

[0031] The piston rod 16a of the air cylinder 16 is then extended by operating an unillustrated switch of the air cylinder 16 from this state, or the like, and the screw-attaching work 4 is pushed so as to move out of the storing chamber 22 by the pressing member 28. Since the screw-attaching work 4 is screw-attached to the screw-attaching

portion 2, no screw-attaching work 4 is moved. However, the washer bending device 1 is thus relatively retreated in the axial direction. In this case, both the washer abutting pawls 31 of the washer bending member 15 are retreated while bending the washer 3 along the two opposed flat faces 6a of the hexagonal portion 6 of the screw-attaching work 4. At this time, as shown in Fig. 2, the work storing member 14 is elastically further retreated without obstructing the bending of the washer 3 since the work storing member 14 is freely advanced and retreated in a state biased by the spring 27. As shown in Figs. 7 (b) and 8(b), the washer 3 can be thus reliably bent.

[0032] Thus, in accordance with the washer bending device 1 of this embodiment, just after the confirming operation of a fastening degree of the screw-attaching work 4 to the screw-attaching portion 2 using the operation of the torque wrench 18, the washer 3 can be bent by merely operating the air cylinder 16. Accordingly, the confirmation of the fastening degree and the bending of the washer 3 can be continuously performed, and operation efficiency is improved.

Claims

1. A washer bending device (1) in which a screw-attaching work (4) having a screw portion (5) and a projecting-out portion (6) projected out and formed at a base end of the screw portion (5) and having a flat face in its outer circumference is screw-attached to a screw-attaching portion (2) corresponding to the screw portion (5) through a washer (3) of a shape projected out in a flange shape; and, from a state in which rotation of the washer (3) is stopped as a result of one portion of an outer circumference of the washer (3) being engaged with an engaging portion arranged in the screw-attaching portion (2), another portion of the outer circumference of the washer (3) is bent along the flat face of the projecting-out portion (6) so that the rotation of the screw-attaching work (4) with respect to the screw-attaching portion (2) is stopped through the washer (3);
the washer bending device (1) comprising:

a work storing member (14) of a sleeve shape storing the screw-attaching work (4) of a state screw-attached to the screw-attaching portion (2);
a washer bending member (15) arranged on an outer circumferential side of the work storing member (14), and bending a portion projected out in a flange shape from a portion between the screw-attaching portion (2) of the washer (3) and the projecting-out portion (6) of the screw-attaching work (4) along the flat face of the projecting-out portion (6) of the screw-attaching work (4); and
a support frame (13) supporting a base end por-

tion of the work storing member (14);
the work storing member (14) has a storing chamber (22) storing the screw-attaching work (4) except for the screw portion (5); an opening portion (23) formed on one side of the storing chamber (22) and freely passing the screw-attaching work (4); and a fitting portion (24) arranged at a tip of the storing chamber (14) and detachably fitted to the projecting-out portion (6) of the screw-attaching work (4);
the washer bending member (15) has a mounting portion of a sleeve shape mounted to the outer circumference of the work storing member (14); an arm portion extending along the storing chamber (22) of the work storing member (14) from the mounting portion; and a washer abutting portion (31) arranged at a tip of the arm portion and abutting against a face of a screw-attaching portion (2) side of a position corresponding to the flat face in a portion projected out in a flange shape from a portion between the screw-attaching portion (2) of the washer (3) and the projecting-out portion (6) of the screw-attaching work (4); and
the support frame (13) has a handle rotating and operating the screw-attaching work (4) through the projecting-out portion (6) of the screw-attaching work (4) fitted to the fitting portion (24) of the work storing member (14); and a pressing device (16) which relatively retreats the washer bending member (15) and the work storing member (14) by pressing the screw-attaching work (4) stored in the work storing member (14) toward the screw-attaching portion (2).

2. The washer bending device (1) according to claim 1, wherein the washer bending member (15) is rotatably arranged along the outer circumference of the work storing member (14).
3. The washer bending device (1) according to claim 1 or 2, wherein the work storing member (14) is supported by the support frame (13) so as to be freely advanced and retreated with respect to the washer abutting portion (31) of the washer bending member (15), and
the support frame (13) has a biasing device which biases the work storing member (14) toward the washer abutting portion (31) of the washer bending member (15).

FIG.1

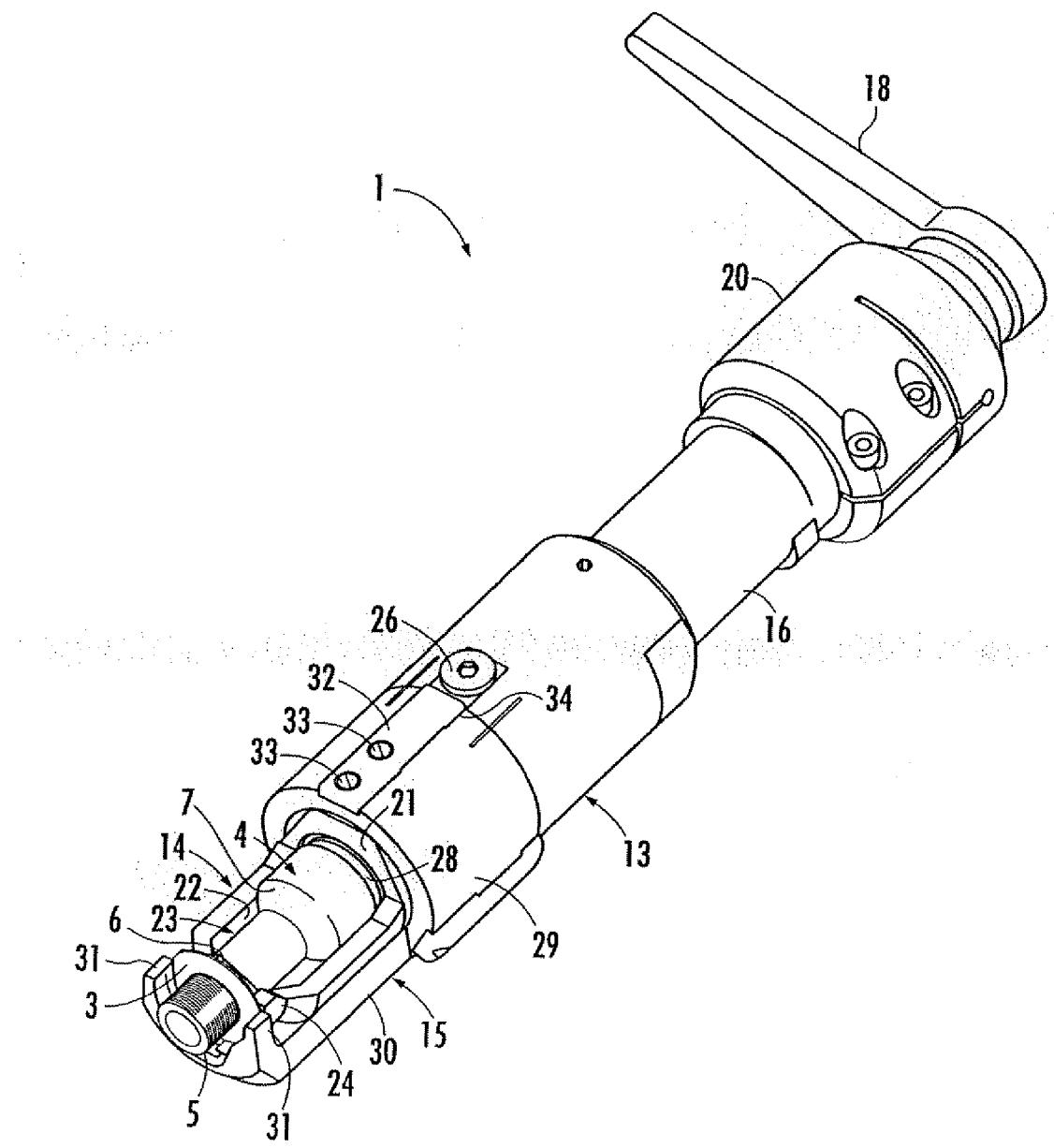


FIG.2

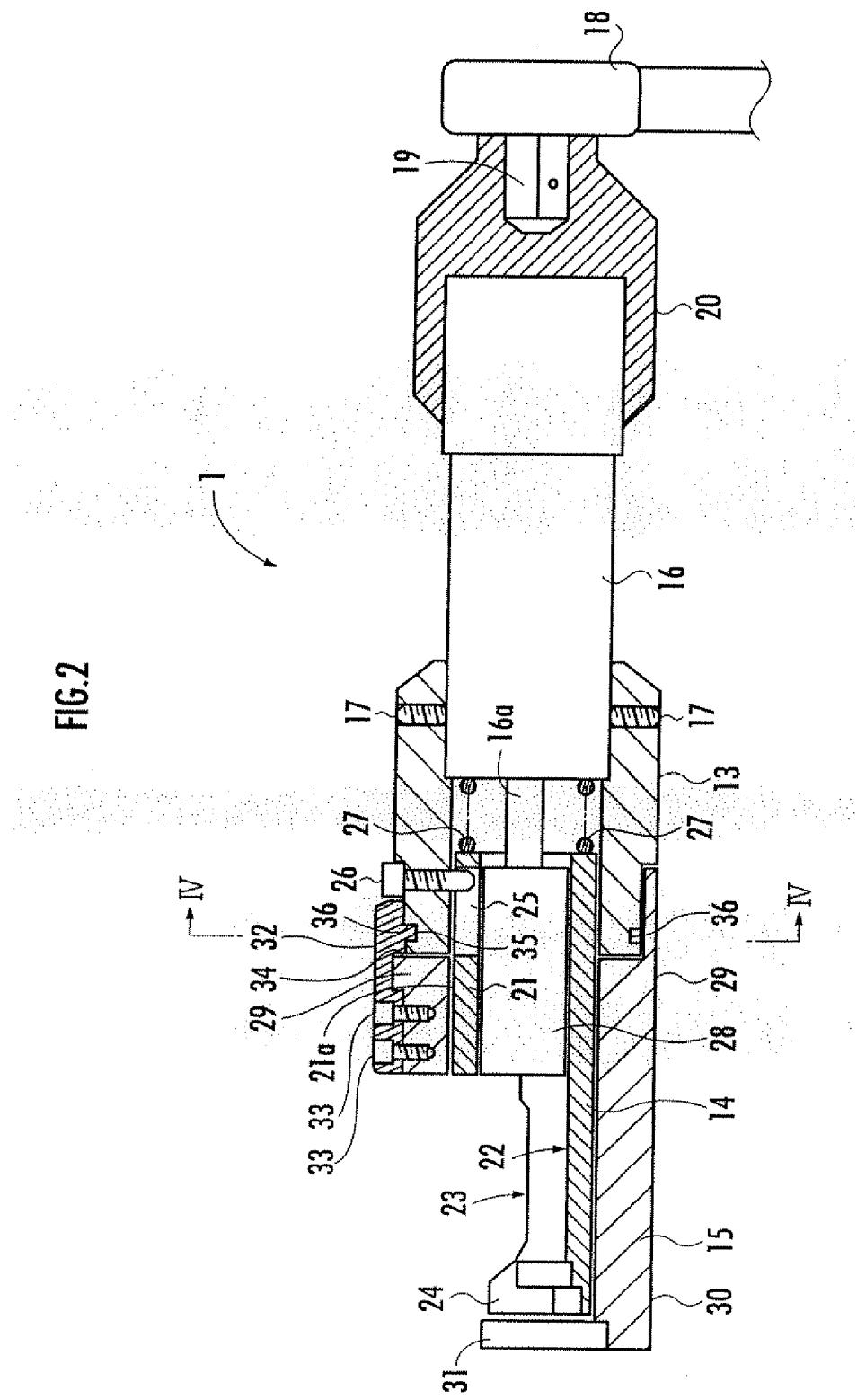


FIG.3

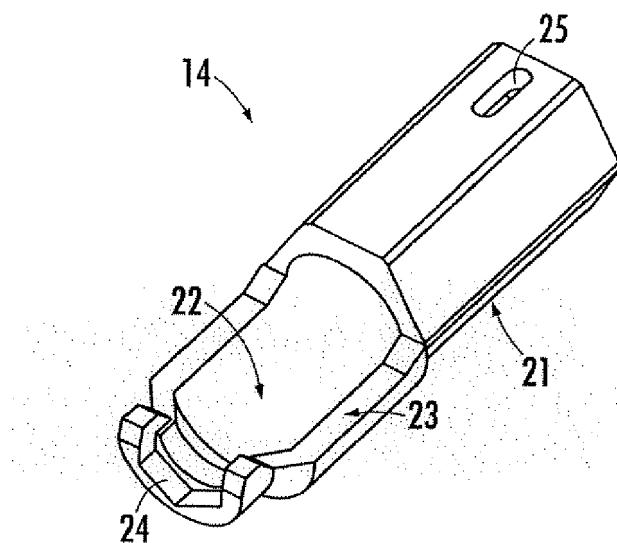


FIG.4

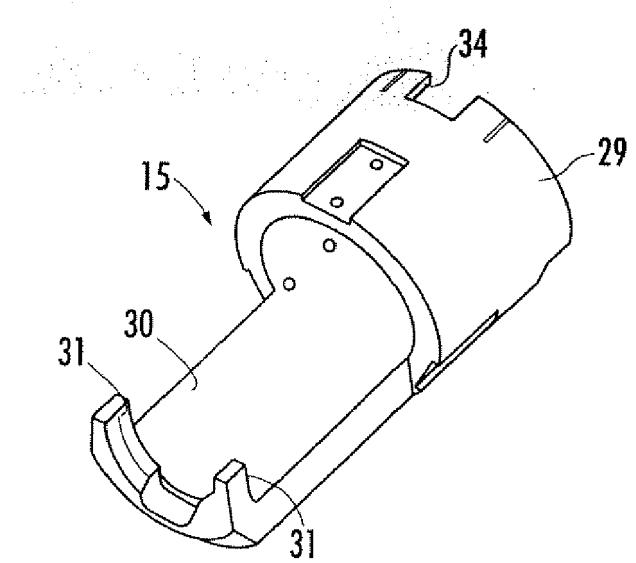


FIG.5

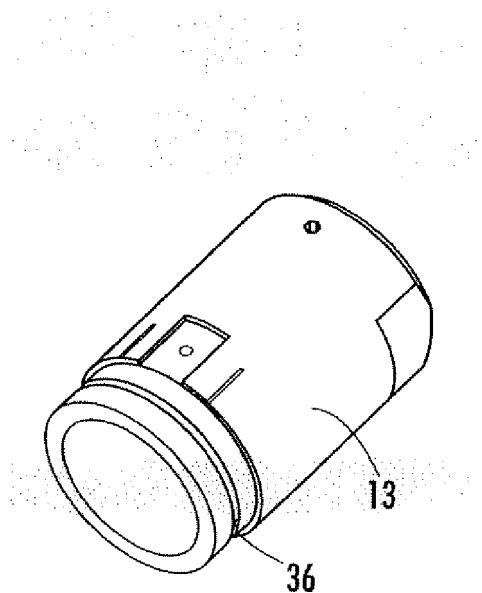


FIG.6

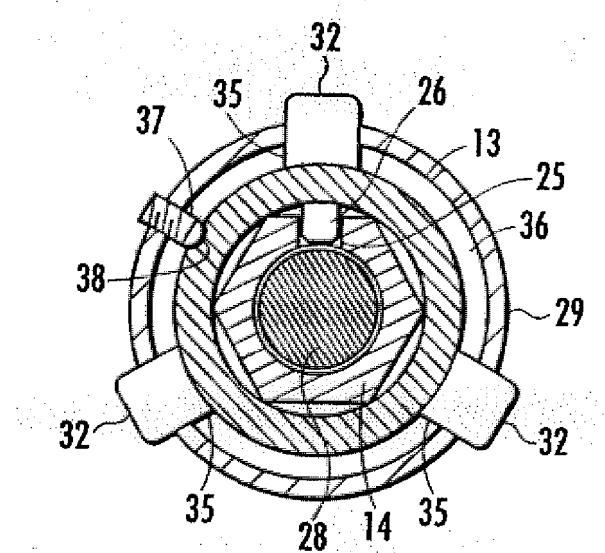


FIG.7 (a)

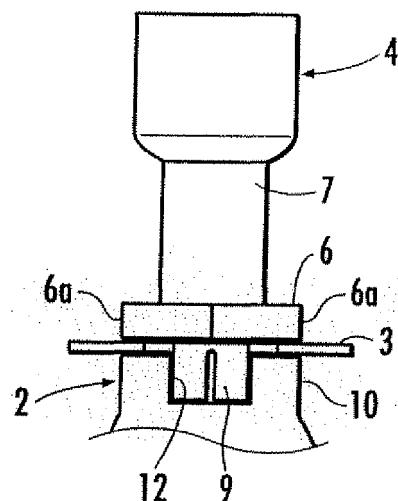


FIG.7 (b)

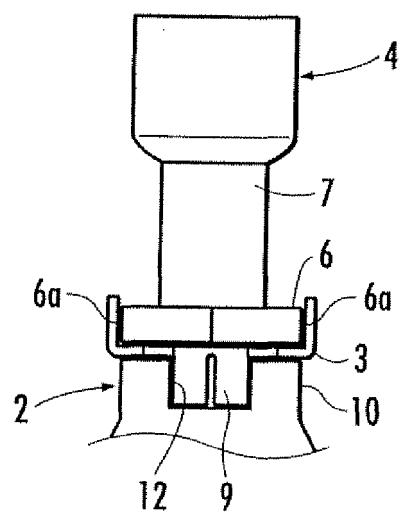


FIG.8 (a)

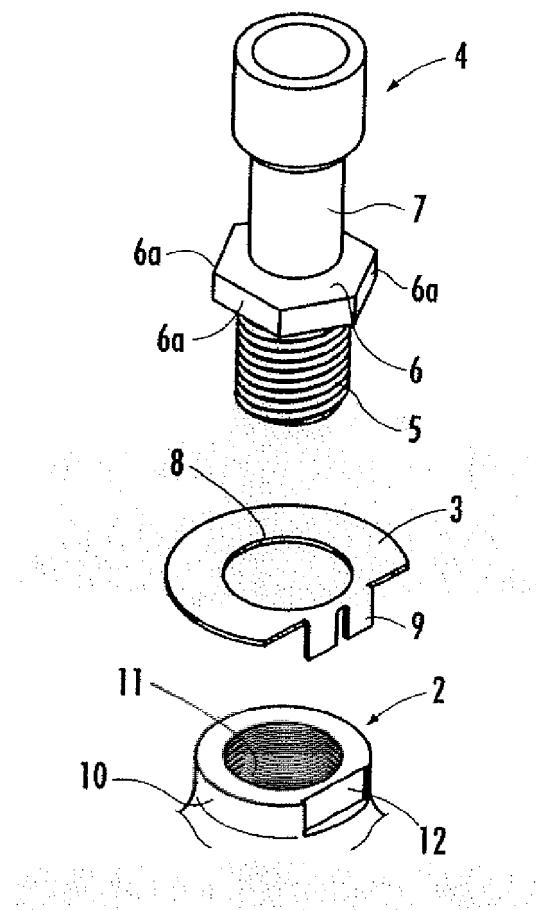
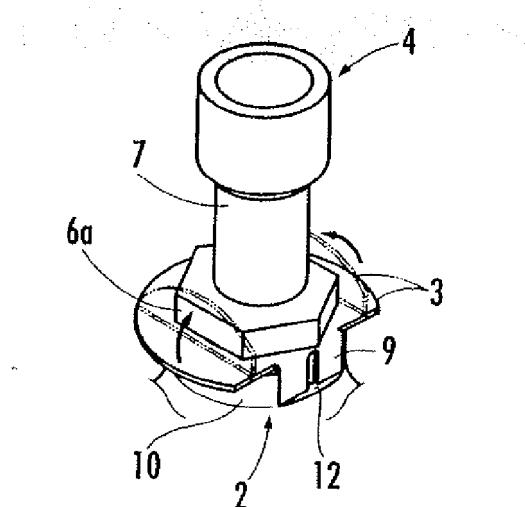


FIG.8 (b)





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US 1 538 347 A (NEWQUIST HARVEY R) 19 May 1925 (1925-05-19) * page 2, line 22 - line 75; figures * -----	1-3	INV. B25B13/06 B25B13/08 B25B13/48 B25B27/00 B25B27/14 ADD. F16B39/10
A	US 2 950 944 A (COONEY JAMES J) 30 August 1960 (1960-08-30) * column 3, line 69 - column 4, line 10; figures * -----		
A	GB 2 138 912 A (BRITISH NUCLEAR FUELS LTD) 31 October 1984 (1984-10-31) * page 1, line 57 - line 66; figures * -----		
A	US 5 893 291 A (SALAZAR JAVIER [US]) 13 April 1999 (1999-04-13) * abstract; figures * -----		
A	US 6 058 759 A (WILSON ANTHONY L [US]) 9 May 2000 (2000-05-09) * abstract; figures * -----		
A	US 1 886 732 A (SPRIGG POLAND) 8 November 1932 (1932-11-08) * the whole document * -----		TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			F16B B25B
4	Place of search	Date of completion of the search	Examiner
	Munich	9 July 2008	Kühn, Thomas
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			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 08 15 2249

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-07-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 1538347	A	19-05-1925	NONE	
US 2950944	A	30-08-1960	NONE	
GB 2138912	A	31-10-1984	NONE	
US 5893291	A	13-04-1999	NONE	
US 6058759	A	09-05-2000	NONE	
US 1886732	A	08-11-1932	NONE	