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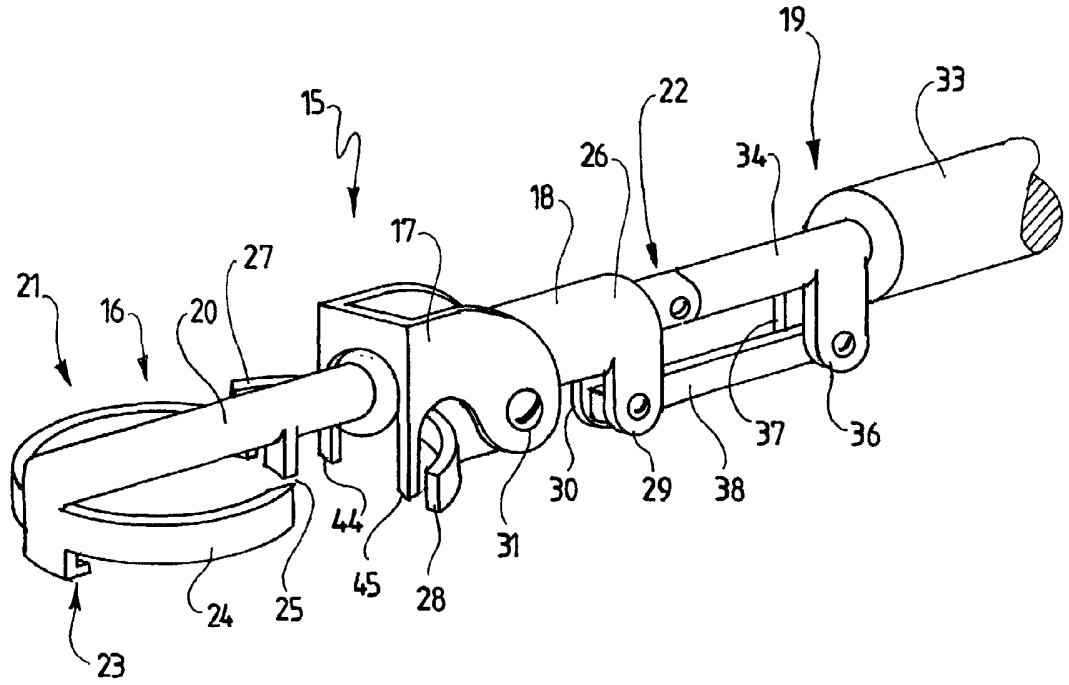
(54) Title: A TOOL FOR MANIPULATING CIRCLIPS



(57) Abstract: A circlip removing and inserting tool (15) is described which is particularly suited for removing large circlips (13) from the teeth of a road grader.

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A TOOL FOR MANIPULATING CIRCLIPS

FIELD OF THE INVENTION

This invention is directed to a tool which can remove (and also insert) circlips about a mount. The invention will be described with reference to removing and inserting circlips on the teeth which are used on the mull board of a road grader. It should however be appreciated that no limitation is meant thereby.

BACKGROUND ART

Road graders are provided with a mull board which extends transversely across the direction of travel of the road grader. The mull board is typically formed of steel and is provided with an array of openings. Large steel teeth are fitted to the mull board. The steel teeth have a top cylindrical mount which passes through the openings in the mull board (see for example figure 5). The mount is slightly longer than the depth of the hole which allows the top of the mount to project through the hole. A strong steel circlip is then attached to the mount to lock the tooth to the mull board.

Normally, the circlips that retain these teeth are hammered into place using a hammer and a screwdriver. This is a dangerous practice, as injury can result. If the tooth is to be replaced, the circlip must be initially removed from the mount. Great care must be taken to avoid the circlip from springing out and causing injury.

OBJECT OF THE INVENTION

The present invention is directed to a tool which has a specific use in removing, and optionally also attaching, a circlip to a mount and which does

not require the use of a hammer or screwdriver, and where the circlip can be removed in a manner which is safer than previously used techniques.

It is an object of the invention to provide a tool which may overcome the abovementioned disadvantages or provide the public with useful or commercial choice.

In one form, the invention resides in a tool for removing a circlip which is attached to a mount, the tool comprising a first member which is attachable to the mount, and a second member which is movable between a circlip engaging position and a free position, and which, when in the circlip engaging position is also moveable between a forward position where the second member engages the circlip attached to the mount, and a retracted position where the second member pulls the circlip free from the mount, and drive means to drive the second member from the forward position to the retracted position.

In another form, the invention resides in a tool for attaching a circlip to a mount, the tool comprising a first member which is attachable to the mount, and a second member which is slidable along the first member between a retracted position where a circlip can be positioned between the second member and the mount, and a forward position where the second member pushes the circlip onto the mount, and drive means to drive the second member from the retracted position to the forward position.

In a preferred form, the invention resides in a single tool which can remove and attach a circlip to a mount.

The tool is preferably a hand tool and is preferred that the tool uses

only mechanical components to allow it to attach and remove circlips. That is, it is considered undesirable that the tool is electrically powered, hydraulically powered or otherwise powered. Of course, for large scale uses, it may be necessary to provide electrical or hydraulic power to the tool.

The tool has a first member which is attachable to the mount. It is preferred that the first member attaches over the top of the mount. To achieve this, the first member may comprise a portion which extends over the top of the mount, and a projection, or locating dowel which extends against the mount such that while the tool can be lifted off the mount, it cannot be pulled away from the mount by a sideways action.

The first member may be in the form of an elongate rod or shaft. The length and diameter of the shaft may vary to suit. Typically, the first member has a length of between 10 to 40 cm, and a diameter of between 5 to 30 mm. This can of course vary to suit.

The first member may have a means to locate it about the mount. In one form, the means may be in the form of an annular collar which is dimensioned to extend about the side wall of the mount. The collar may be continuous or may have discontinuities in it.

The tool has a second member which is movable between a circlip engaging position and a free position. The second member may be provided with a pair of spaced apart fingers which can pass through or into an opening in the circlip to engage with the circlip. It is envisaged that engaging members other than a pair of spaced apart fingers may also be suitable. The second member may be pivotally mounted for pivoting movement between the circlip

engaging position and the free position. It is preferred that the second member can be manually operated (for instance by pushing) it to move between its engaging position and free position.

The second member may be mounted to a slide member, and is preferably pivotally mounted to the slide member. The slide member may be mounted to or relative to the first member for sliding movement. Preferably, the slide member has a cylindrical body which extends about the first member and can slide along the first member.

By being attached to the slide member, the second member can move between a forward position and a retracted position as the slide member moves along the first member. As the second member can also move between a circlip engaging position, and a circlip free position, the second member can engage with the circlip and then be retracted by retraction of the slide member which will cause the circlip to be removed from the mount.

A drive means is provided to drive the second member from the forward position to the retracted position. It is preferred that the drive means is in the form of a mechanical or manual drive means. The drive means may operate to drive the slide member between a forward position and a retracted position. If the second member is attached to the slide member, this will also make the second member move between a forward position and a retracted position.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will be described with reference to the following drawings in which:

Figure 1 is a perspective view of a tool according to an embodiment of the invention and with the second member in the circlip engaging position.

Figure 2 is a close-up view of the second member in the free position.

Figure 3 is a side elevation view of the tool of figure 1.

Figure 4 is a bottom view of the tool of figures 1 and 3.

Figure 5 is a view showing the attachment of an upper part of a tooth to a mull board of a road grader.

BEST MODE

Referring initially to figure 5, there is illustrated an upper part of a grader tooth 10. Grader tooth 10 comprises a curved steel tooth which can rip through a ground surface. The tooth typically has a length of between 30 to 60 cm. The upper part of the tooth is formed with a mount 11. Mount 11 typically comprises a solid steel cylinder. The mount is provided with an annular recess 12 to accommodate a strong steel circlip 13. Mount 11 passes through an opening 14 which extends through the mull board 15 of a road grader. Mount 11 is slightly longer than the length of opening 14 which allows the upper part of the mount (that is containing the annular recess 12) to extend past the opening, thereby allowing circlip 13 to be attached into recess 12. This arrangement is well-known and the form is no part of the invention per se.

Referring to figures 1 - 4, there is illustrated in a tool 15 which can be used to remove and attach circlip 13 to mount 11. Tool 15 comprises a first member 16 which is attachable to the mount, and a second member 17 which is movable between a circlip engaging position and a free position. In figure

1, second member 17 is shown in a circlip engaging position while in figure 2, second member 17 is shown in a free position.

Second member 17 is attached to a slide member 18. Slide member 18 can slide along first member 16. A drive means is provided to drive the second member from the forward position to the retracted position. In the embodiment, the drive means is in the form of a pivoting handle and link arrangement showing generally as 19 which will be described in greater detail below.

Referring to the various components in greater detail, first member 16 comprises a cylindrical shaft 20. Shaft 20 has a forward end 21, and a rearward end 22. Forward end 21 has a depending projection or locating dowel 23. Attached to projection 23, is a means which assists in locating the first member about the mount. The means is in the form of an annular collar 24 which is better illustrated in figure 4. Collar 24 has a diameter to allow it to pass over the outside wall of mount 11. Collar 24 is not entirely continuous and instead has two gaps 25 (better illustrated in figure 4) the reason for which will be described in greater detail below, but which are required to allow the second member to function efficiently.

A slide member 18 is slidably attached to shaft 20. Slide member 18 has a cylindrical body portion 26. The forward part of the body portion 26 incorporates a pair of opposed arcuate arm members 27, 28, which function to push circlip 13 onto mount 11 in a manner which will be described in greater detail below. The rear portion of body portion 26 has a pair of depending spaced apart brackets 29, 13 which form part of the link assembly

19 in which will be described in greater detail below.

Second member 17 is pivotally attached to slide member 18 via a pivot pin 31 which extends through the body portion 26. This allows second member 17 to be pivoted between a retracted position shown in figure 2, and an extended circlip gripping position illustrated in figure 1 and figure 3. Second member 17 can be simply pushed by a persons thumb or finger between the retracted and the extended positions.

Slide member 18 (and therefore attached second member 17) is pushed and pulled along shaft 20 via a pivoting handle and linkage arrangement 19. Arrangement 19 is best illustrated in figure 3. Arrangement 19 comprises a hand grippable handle 33. Extending from a forward part of handle 33 is a short arm member 34 which is pivotally attached to the rear part of slide member 18 via a pivot pin 35. Arm member 34 has a depending spaced apart pair of brackets 36, 37 which are aligned with brackets 29, 30 which depend from the bottom of body portion 26 of slide member 18. A rigid link member 30 is pivotally attached to both sets of brackets via two pivot pins 39, 40.

When handle 33 is in line with the rest of the tool (as illustrated in figure 3 and 4), slide member 18 is in the retracted position. Handle 33 can be in pushed down in the direction of the arrow 41 illustrated in figure 3. As this occurs, handle 33 will pivot about pivot pin 35 and link member 30 will cause slide member 18 to be pushed forwardly along shaft 20. Handle 33 can then be pulled up in the direction opposite to the pushing direction and this will again cause slide member 18 to move to its retracted position illustrated in

figures 3 and 4.

If it is necessary to insert circlip 13 into recess 12 (see figure 1) , tool 15 is initially configured as illustrated in figure 1 with slide member 18 in the retracted position. Second member 17 is pivoted to the free position illustrated in figure 2. A circlip 13 can either be loosely attached to recess 12 or held in place by a persons fingers and handle 33 is then pushed down to cause slide member 18 to move forwardly. At some stage, the rear of circlip 13 will engage with and be located between arm members 27 and 28. Further downward movements of handle 33 will then cause arm members 27 and 28 to push about the rear portion of circlip and to push circlip into recess 12. The tool is also positioned such that collar 24 sits about and just above recess 12 of mount 11. Projection 23 is positioned on the opposed side wall of mount 11, and projection 23 and collar 24 holds the tool in place while opposed arm members 27 and 28 push circlip 13 into recess 12.

When the circlip has been fully pushed into engagement into recess 12, handle 33 can then be pulled upwardly to pull back slide member 18 and the entire tool can be lifted away.

If it is designed to remove circlip 13 from its recess 12, tool 15 is again positioned such that projection 23 and collar 24 sits about mount 11. Handle 33 is then push downwardly to move slide member 18 to sit against the back of circlip 13. At this stage, second member 17 is moved from the normally retracted position illustrated in figure 2 to the forward position illustrated in figures 1, 3 and 4. Second member 17 is provided with a pair of spaced apart fingers 44, 45 and the fingers extend into openings 46, 47 in the rear portion

of circlip 13. Handle 33 is then pulled upwardly to cause slide member 18 to be pulled back. As second member 17 is now in the circlip engaging position, circlip 13 is also pulled away from engagement with recess 12. Continued pulling of handle 33 will cause circlip 13 to be pulled away from the mount. The two spaced apart fingers 44, 45 will hold circlip 13 to the tool which reduces or eliminates any injury which can be caused if the circlip suddenly springs loose. Collar 24 has the two gaps 25 to allow all fingers 44, 45 to move back without striking collar 24.

When attaching circlip 13 to mount 11, the circlip 13 passes under collar 24 which minimises or eliminates the possibility of the circlip suddenly springing free or becoming loose and causing an injury.

The tool provides a safe an efficient mechanism for attaching and removing circlips from a mount. The front part of the tool attaches over the mount and is braced by the mount and therefore does not require support from other components. The circlip 13 is held and guided and the tool can reduce or eliminates the possibility of injury from circlip suddenly springing loose.

Various other changes and modifications can be made to the tool. For instance, a safety lock may be provided on second member 17 to lock the member in the forward position. A biasing means may be provided to naturally bias handle 33 into the position illustrated in figures 3 and 4.

It should be appreciated that various other changes and modifications may be made to the tool without departing from the spirit and scope of the invention.

CLAIMS:

1. A tool for manipulating a circlip which is attached to a mount, the tool comprising a first member which is attachable to the mount, and a second member which is movable between a circlip engaging position and a free position, and which, when in the circlip engaging position is also moveable between a forward position where the second member engages the circlip attached to the mount, and a retracted position where the second member pulls the circlip free from the mount, and drive means to drive the second member from the forward position to the retracted position.

2. The tool of claim 1, for attaching a circlip to a mount, wherein the second member is slidable along the first member between a retracted position where a circlip can be positioned between the second member and the mount, and a forward position where the second member pushes the circlip onto the mount, the drive means driving the second member from the retracted position to the forward position.

3. The tool as claimed in claim 2, wherein the tool is able to remove a circlip from the mount, and to attach a circlip to the mount.

4. The tool as claimed in claim 3, which comprises only mechanical components to allow it to attach and remove circlips.

5. The tool as claimed in claim 4, wherein the first member attaches over the top of the mount.

6. The tool as claimed in claim 5, wherein the first member has a portion which extends over the top of the mount, and a projection, or locating dowel which extends against the mount such that while the tool can be lifted

off the mount, it cannot be pulled away from the mount by a sideways action.

7. The tool as claimed in claim 6, wherein the first member is in the form of an elongate rod or shaft.

8. The tool as claimed in claim 7, wherein the first member has a length of between 10 to 40 cm, and a diameter of between 5 to 30 mm.

9. The tool as claimed in claim 8, wherein the first member has a means to locate it about the mount.

10. The tool as claimed in claim 9, wherein the means is in the form of an annular collar which is dimensioned to extend about the side wall of the mount.

11. The tool as claimed in claim 10, wherein the collar is continuous or has discontinuities in it.

12. The tool as claimed in claim 3 wherein the second member is provided with a pair of spaced apart fingers which pass through or into an opening in the circlip to engage with the circlip.

13. The tool as claimed in claim 12, wherein the second member is pivotally mounted for pivoting movement between the circlip engaging position and the free position.

14. The tool as claimed in claim 13, wherein the second member is operated manually (for instance by pushing it) to move between its engaging position and free position.

15. The tool as claimed in claim 14, wherein the second member is mounted to a slide member.

16. The tool of claimed 15, wherein the second member is pivotally

mounted to the slide member.

17. The tool as claimed in claim 16, wherein the slide member is mounted to or relative to the first member for sliding movement.

18. The tool as claimed in claim 17, wherein the slide member has a cylindrical body which extends about the first member and can slide along the first member.

19. The tool as claimed in claim 18, wherein the drive means is in the form of a mechanical or manual drive means.

20. The tool as claimed in claim 19, wherein a safety lock is provided on second member.

21. The tool as claimed in claim 20, wherein a biasing means is provided to naturally bias the handle into the position illustrated in figures 3 and 4.

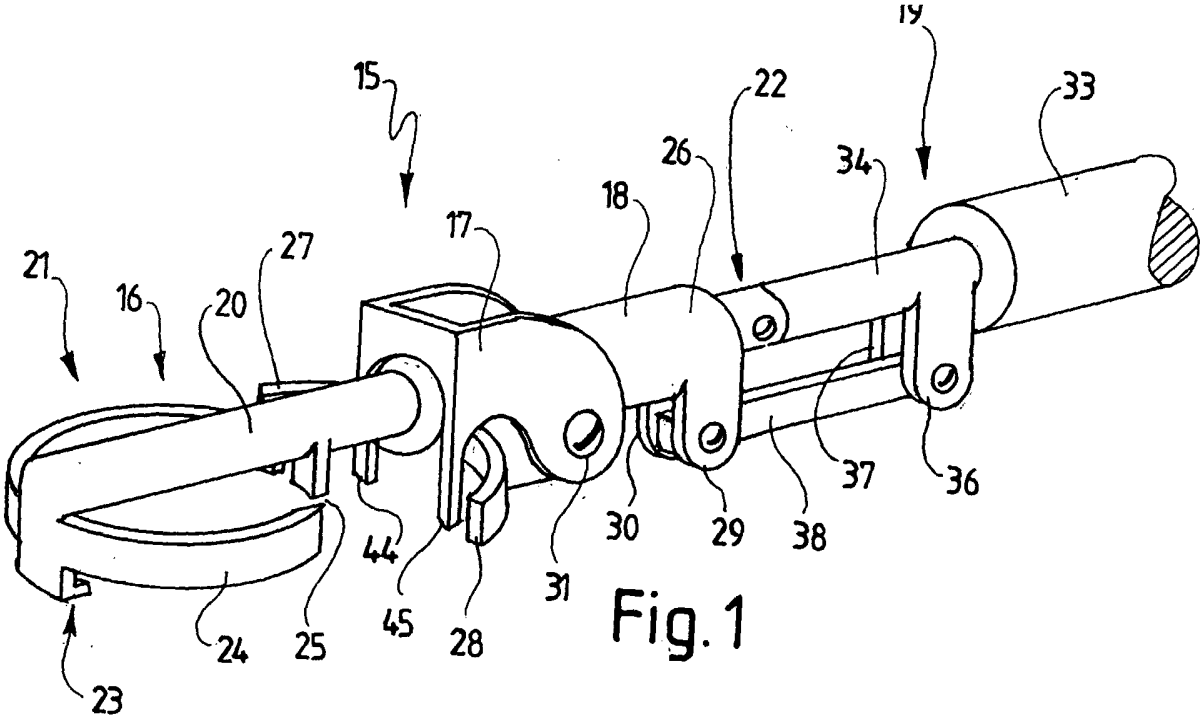
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Fig. 1

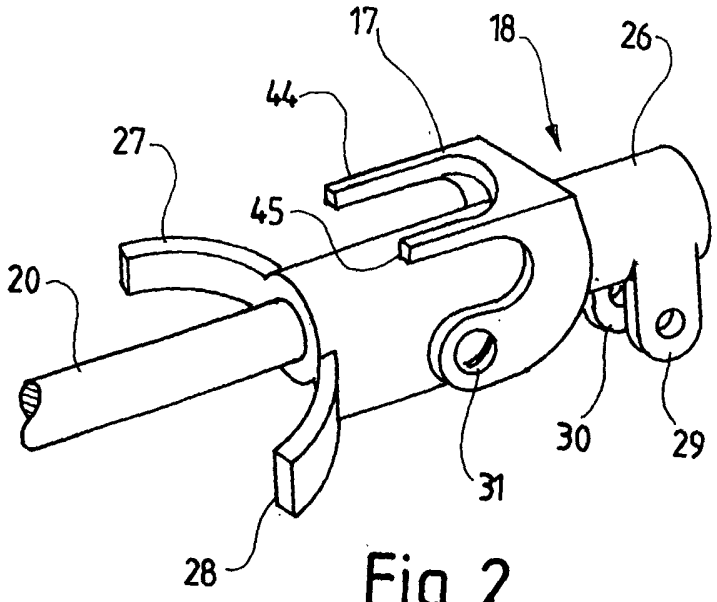
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Fig. 2

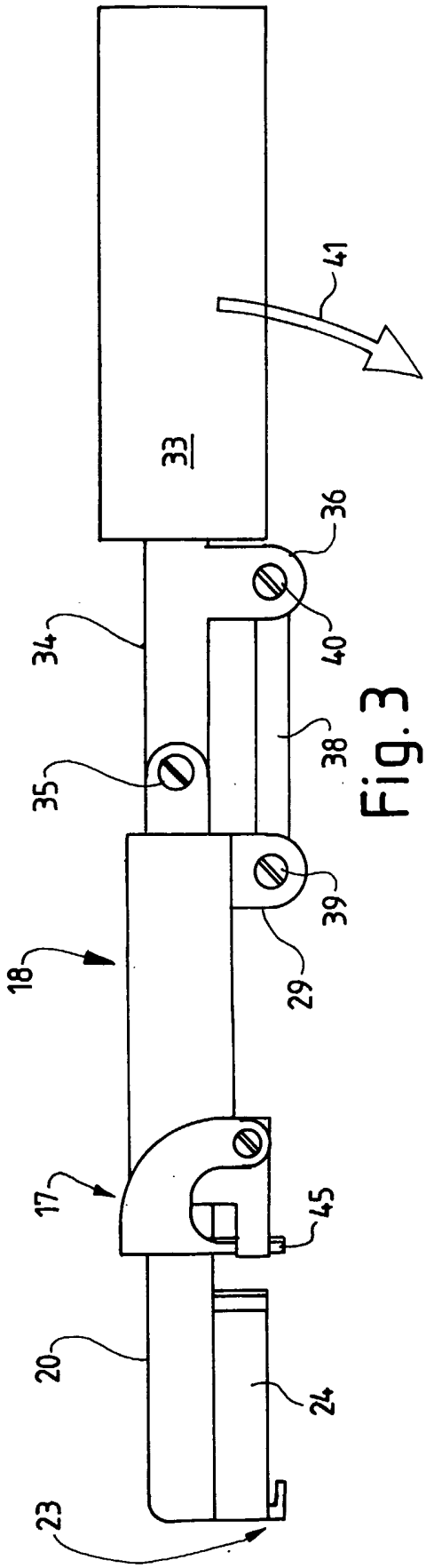
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Fig. 3

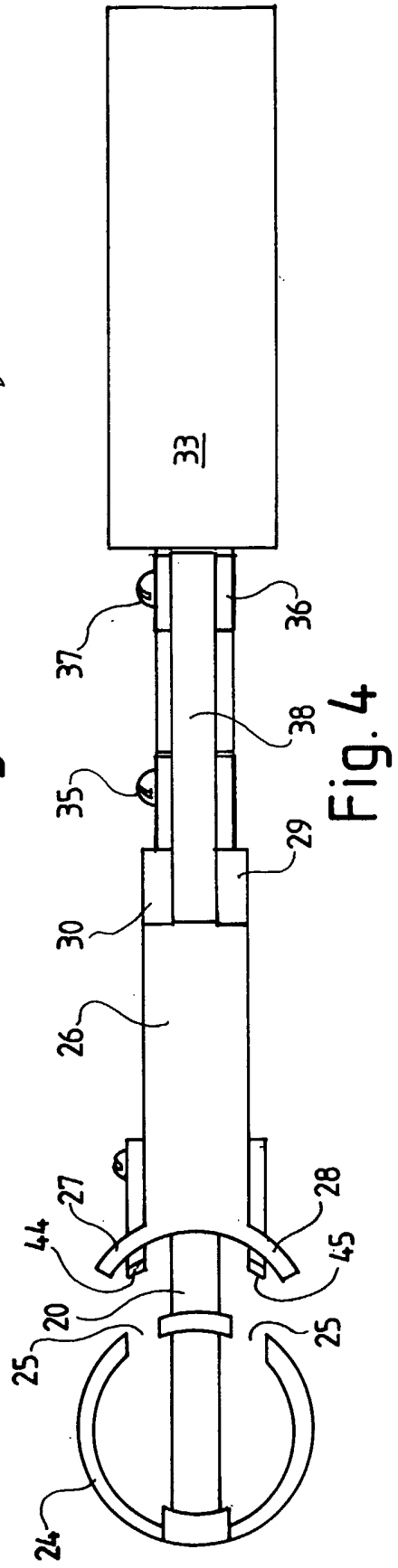
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Fig. 4

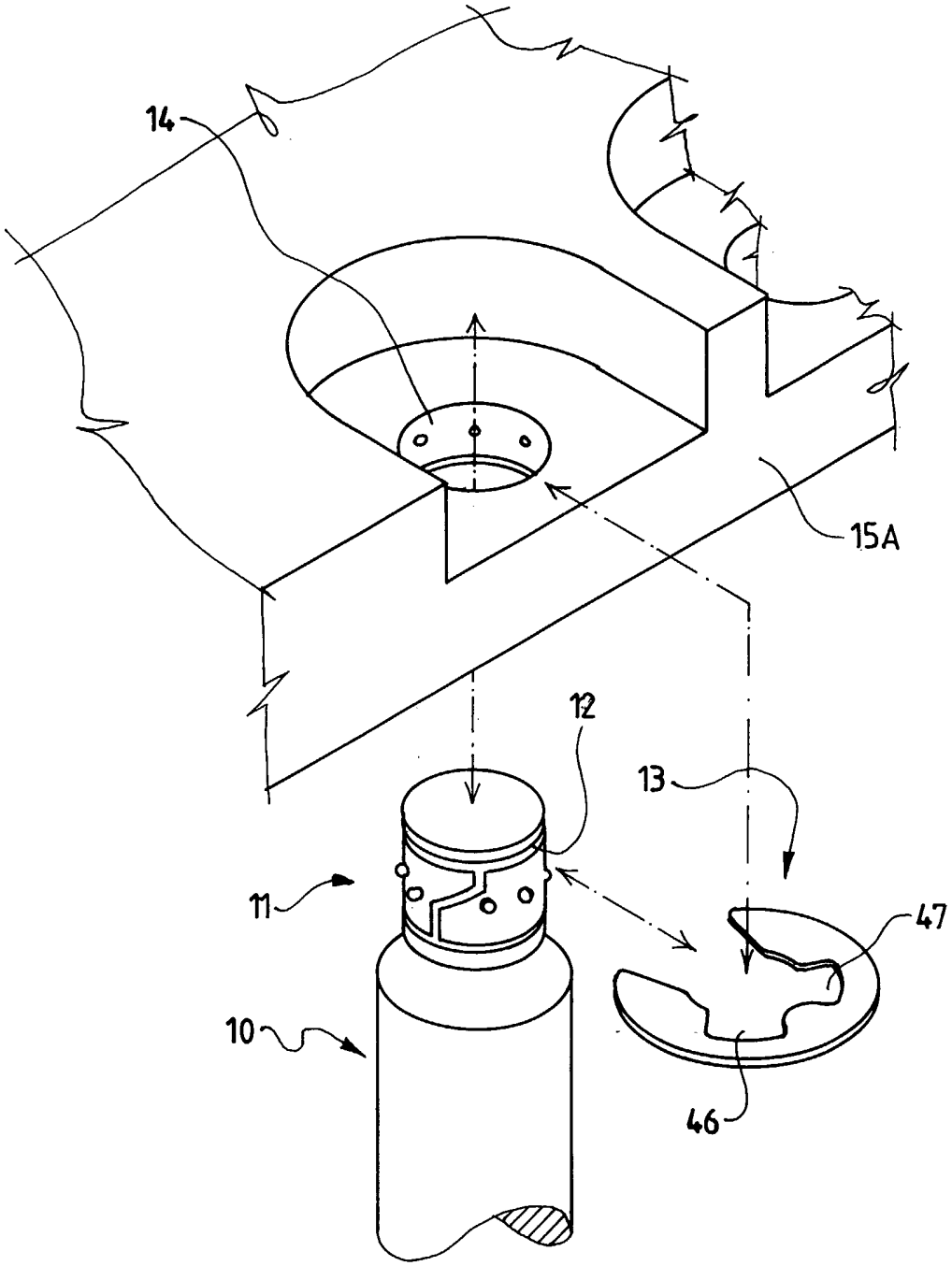

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00129

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: B25B 027/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC B25B 027/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU:IPC AS ABOVE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,681,839 A (Gustav Janecka) 8 August 1972 See figure 1	1,2
A	CA 2,144,613 (Schartinger,Edward J) 15 September 1996 See figures1,2&3	
A	JP 11-019883 (Honda Motor Co.Ltd.) 26 January 1999 See figures 1&2	

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 June 2002	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **BANDULA RAJAPAKSE** Telephone No : (02) 6283 2120

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU02/00129

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	3681839	DE	2138708	US	5666833

END OF ANNEX