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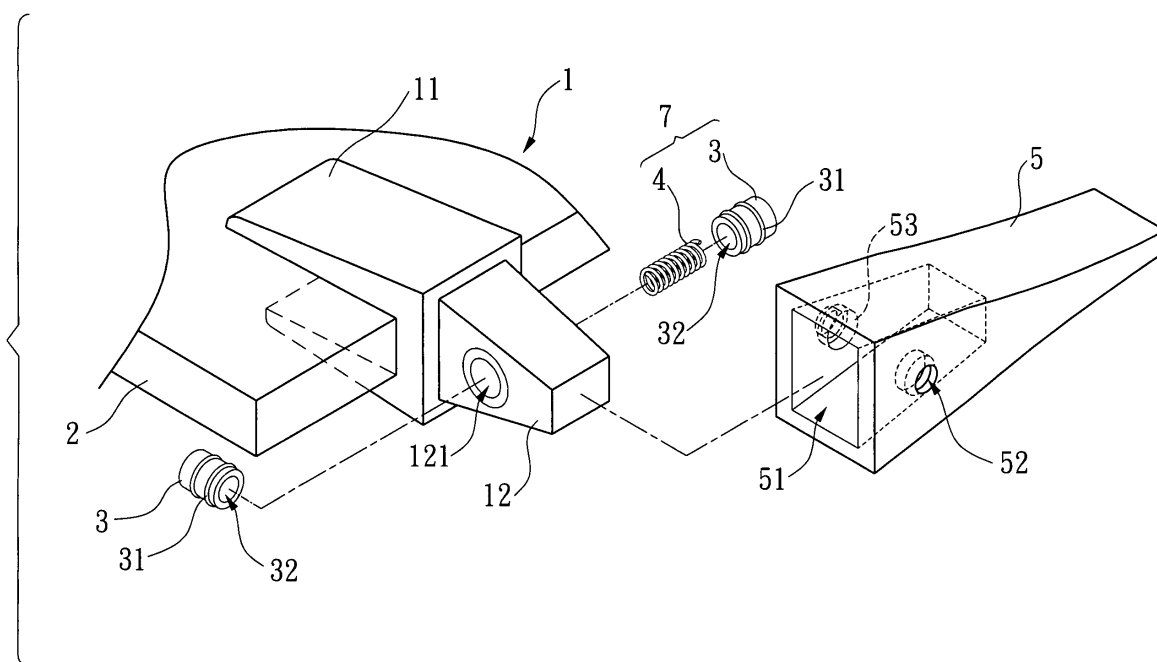
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(54) **A tooth assembly for the bucket teeth of an engineering construction machine**

(57) A replacement and urging device for the bucket teeth of an engineering construction machine is disclosed. An adaptor (1) is mounted with a bucket tooth (5). A first through hole (121) goes horizontally through the adaptor (1). Both sides of the bucket tooth (5) are formed with a second through hole (52), respectively. An

engaging unit (7) is interposed between the first through hole (121) and the second through holes (52) to slide between them. This enables the bucket teeth (5) to be mounted and positioned on the adaptor (1). The invention thus prevents the bucket tooth (5) from constantly hitting the adaptor (1).



**FIG. 2**

## Description

### BACKGROUND OF THE INVENTION

#### Field of Invention

**[0001]** The invention relates to a replacement and urging device for the bucket teeth of an engineering construction machine and, in particular, to a replacement and urging device for the bucket teeth of an engineering construction machine that fixes the bucket teeth on the adaptor of a bucket to prevent the bucket teeth from hitting the adaptor repeatedly.

#### Related Art

**[0002]** FIG. 14 shows a conventional excavator bucket tooth structure. A bucket is formed with several equally spaced bucket teeth 9. Each of the bucket teeth 9 includes a adaptor 90 and a bucket teeth 91. The adaptor 90 has a horizontal first through hole 901. The bucket teeth 91 is mounted on the adaptor 90. Both sides of the bucket teeth have respectively a second through hole 911 corresponding to the first through hole 901 of the adaptor 90. A hammer 93 hits a pin 92 from the second through hole 911 on one side of the bucket teeth 91 into the first through hole 901. A C-shaped buckle 902 positions the pin 92 in the first through hole 901. Both ends of the pin 92 protrude from the second through holes 911, restricting and positioning the bucket teeth 91 on the adaptor 90.

**[0003]** The above-mentioned conventional excavator bucket tooth structure has the following problems:

**[0004]** 1. As seen in FIGS. 15 and 16, the spacing between the bucket teeth 9 of the bucket is limited. When the pin 92 is hit into the predetermined position of the first through hole 901, there is no sufficient hitting distance and appropriate hitting angle. Therefore, the hammer has to be disposed inside a tiny space for hitting. Only after the pin 92 penetrates via the second through hole 911 into an appropriate depth of the first through hole 901 can the user hold the hammer 93 at an angle and further hit the pin 92 with the help of an auxiliary hitting rod. The pin 92 is then completely disposed and positioned between the first through hole 901 and the second through holes 911 of the adaptor 90 and the bucket teeth 91. In this case, the local structure of the pin 92 may be deformed or the entire structure is curved because of the hitting. This causes troubles in replacing the bucket teeth 9 in the future.

**[0005]** 2. When the bucket performs a digging process, objects inevitably get into the gap between the pin 92 and the first through hole 901 and the second through holes 911. If the object is a pebble or metal block, it may lock the pin 92 in the through holes 901, 911. If the object is mud, then it may clog the pin 92 in the through holes 901, 911. Therefore, when taking the pin 92 off of the through holes 901, 911, one has to remove those objects

first. In the worst case, one has to destroy the bucket teeth 9 (e.g., cutting the bucket teeth 9 using a hydrogen flare).

**[0006]** 3. FIG. 17 is a schematic view of taking off the pin 92. A tube 95 goes through the first through hole 901 of the adaptor 90 on the outermost side. One end of the tube 95 urges against the pin 92 to be taken off. The user then uses a hammer 93 to hit so that the pin 92 escapes from the C-shaped buckle 902, departing from the first through hole 901 and the second through holes 911. The reason for doing this is because the space between the bucket teeth 9 is limited. The hitting strength of the hammer 93 has to be such that the pin 92 escapes from the C-shaped buckle 902. This causes inconvenience in replacements. Moreover, when the pin 92 is locked or clogged by objects inside the through holes 901, 911 and the C-shaped buckle 902, it becomes even more difficult.

**[0007]** 4. Please refer to FIGS. 18 and 19. After the adaptor 90 and the bucket teeth 91 are assembled, there is still a gap A between them. There is also a gap between the second through holes 911 and the pin 92. Therefore, when the bucket teeth 91 urges against the adaptor 90 during a digging process, the two ends of the pin 92 protruding from the first through hole 901 are not directly hit by the bucket teeth 91 because the gap B is larger than the gap A.

**[0008]** However, if there is a gap between the adaptor 90 and the bucket teeth 91, it provides a buffer space for the bucket teeth 91 to hit back the adaptor 90, which is likely to deform the colliding parts of them. Besides, the hitting strength is larger for a larger gap, causing more damages to the adaptor 90 and the bucket teeth 91. Moreover, the second through holes 911 of the bucket teeth 91 erode with the pin 92 to become larger. As shown in FIG. 20, when the second through holes 911 of the bucket teeth 91 become larger and the gap A is larger than the gap B because of the constant collisions between the adaptor 90 and the bucket teeth 91, the bucket teeth 91 urges against the pin 92, but not the adaptor 90, during a digging process. Therefore, the pin 92 is constantly hit by the bucket teeth 91 during the digging process. The pin 92 thus often breaks so that the bucket teeth 91 falls off. In addition to causing troubles in digging, the bucket teeth 91 may even hurt somebody if it falls from a high place.

**[0009]** To replace the bucket tooth structure of a conventional excavator, one requires about 10 minutes or even half an hour to simply take off the pin 92. The replacement process for the conventional bucket teeth 9 is very inconvenient. Moreover, the conventional bucket teeth 9 are likely to break due to collisions during a digging process. It is therefore the objective of the invention to solve the above-mentioned problems.

### SUMMARY OF THE INVENTION

**[0010]** An objective of the invention is to solve the above-mentioned problems by providing a replacement

and urging device whose bucket teeth can be quickly removed and assembled. It is convenient to replace the bucket teeth on the bucket.

[0011] Another objective of the invention is to prevent the adaptor and bucket teeth from developing a shifting gap during uses. This prevents the pins from being hit by the bucket teeth and breaking.

[0012] To achieve the above-mentioned objectives, the invention includes:

[0013] a adaptor, which has a fixing part fixed on a bucket, an inserting part protruding from the end of the fixing part that is far from the bucket, a first through hole being formed between its two sides and horizontally through the fixing part, a limiting part being disposed at the center of the first through hole;

[0014] a bucket teeth, which has a slot corresponding to the inserting part on its one end, and has a second through hole of both sides, respectively, each of the second through holes being disposed opposite to each other and in communications with the slot, the bucket teeth being mounted on the inserting part of the adaptor by the slot;

[0015] an engaging unit, which is disposed between the first through hole of the adaptor and the second through holes of the bucket teeth and slides between them for the bucket teeth to be mounted and positioned on the adaptor.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The invention will become more fully understood from the detailed description given herein below illustration only, and thus is not limitative of the present invention, and wherein:

[0017] FIG. 1 is a three-dimensional schematic view of the disclosed bucket teeth;

[0018] FIG. 2 is an exploded view of the disclosed bucket tooth;

[0019] FIG. 3 is a cross-sectional view showing how the disclosed bucket tooth is taken off;

[0020] FIG. 4 is a schematic view showing the assembly of the disclosed bucket tooth;

[0021] FIG. 5 is a schematic view showing the assembled bucket tooth;

[0022] FIG. 6 is a cross-sectional view of the second embodiment of the invention;

[0023] FIG. 7 is a cross-sectional view of the third embodiment of the invention;

[0024] FIG. 8 is a three-dimensional exploded view of the fourth embodiment of the invention;

[0025] FIG. 9 shows the initial positioning of the disclosed bucket tooth;

[0026] FIG. 10 illustrates the collision of the disclosed bucket tooth during a digging process;

[0027] FIG. 11 is a schematic view of adjusting the stopping posts;

[0028] FIG. 12 is a schematic view of positioning the disclosed bucket tooth after the adjustment;

[0029] FIG. 13 is a cross-sectional view of the fifth embodiment of the invention;

[0030] FIG. 14 is a three-dimensional exploded view of a conventional bucket tooth;

5 [0031] FIG. 15 is a top view of positioning a pin in the conventional bucket tooth;

[0032] FIG. 16 is a side view of positioning a pin in the conventional bucket tooth;

10 [0033] FIG. 17 is a top view of taking off a pin from the conventional bucket tooth;

[0034] FIG. 18 is a cross-sectional side view of the conventional bucket tooth;

15 [0035] FIG. 19 is a schematic view showing the gap between the adaptor and the bucket teeth of the conventional bucket tooth; and

[0036] FIG. 20 shows that a pin in the conventional bucket tooth breaks due to collisions.

## DETAILED DESCRIPTION OF THE INVENTION

[0037] The present invention will be apparent from the following detailed description, which proceeds with reference to the accompanying drawings, wherein the same references relate to the same elements.

25 [0038] Please refer to FIGS. 1 to 5 for a first embodiment of the invention. This embodiment provides a replacement and urging device for the bucket teeth of an engineering construction machine. It includes: a adaptor 1, a bucket teeth 5, and an engaging unit 7.

30 [0039] The adaptor 1 has a fixing part 11. As shown in FIGS. 1 and 2, the adaptor 1 uses its fixing part 11 to hold onto the front edge of a bucket 2. The fixing part 11 is further soldered onto the bucket 2.

35 [0040] An inserting part 12 protrudes from one end of the fixing part 11 that is far from the bucket 2. A first through hole 121 is formed between its two sides, horizontally through the fixing part 11. A limiting part 122 is provided at the center of the first through hole 121.

40 [0041] One end of the bucket teeth 5 has a slot 51 corresponding to the inserting part 12. Both sides of the bucket teeth 5 have a second through hole 52, respectively. The second through holes 52 are disposed opposite to each other and in communications with the slot 51. The bucket teeth 5 is mounted on the inserting part 12 of the adaptor 1 by the slot 51.

45 [0042] The engaging unit 7 is disposed between the first through hole 121 of the adaptor 1 and the second through holes 52 of the bucket teeth 5 and can slide between them. It allows the bucket teeth 5 to mount and position on the bucket teeth 1. In this embodiment, the engaging unit 7 includes two stopping posts 3 and an elastic element 4.

50 [0043] The stopping posts 3 are inserted into both ends of the first through hole 121 of the inserting part 12, respectively. One end of each of the stopping posts 3 protrudes from the first through hole 121 and correspondingly into the second through hole 52. In this embodiment, the diameter of the second through holes 52 is smaller

than the outer diameter of the stopping posts 3. The two opposite sidewalls of the bucket teeth 5 inside the slot 51 have a notch 53 in communications with the second through holes 52, respectively. The diameter difference between the second through holes 52 and the notch 53 forms a stopping wall 54. Each of the stopping walls 54 stops the corresponding stopping post 3 inside the corresponding notch 53. This prevents the stopping posts from escaping the corresponding second through holes 52.

**[0044]** Each of the stopping posts 3 has a groove 32 on one end of inside the first through hole 121. The grooves 32 are disposed facing each other. An elastic element 4 is interposed between the two grooves 32. Both ends of the elastic element 4 are inside the corresponding grooves 32 to urge against the stopping posts 3. The elastic element 4 in this embodiment is an urging spring.

**[0045]** Besides, when each of the stopping posts 3 retracts into the first through hole 121, the limiting part 122 inside the first through hole stops so that the two stopping posts slide the same distance therein. The purpose of this is to average the urging force of the elastic element 4 on the two stopping posts 3. Moreover, each of the stopping posts 3 is mounted with at least one stopping ring 31 to prevent alien objects from entering the grooves 32 of the stopping posts 3 via the gap between the stopping posts 3 and the inserting part 12.

**[0046]** As described above, during a digging process, the pebbles or metal objects may fall into the gap between the stopping posts 3 and the second through holes 52 of the bucket teeth 5. Therefore, the current embodiment uses the two stopping rings 31 mounted around the stopping posts 3 to stop the alien objects. So no pebbles or metal objects fall into the second through holes 52 of the bucket teeth 5 and the stopping posts 3. The invention thus prevents the stopping posts 3 from locking or jamming the first through holes 121.

**[0047]** When the disclosed adaptor 1 and the bucket teeth 5 are assembled, as shown in FIG. 4 to FIG. 5, a holding tool 6 (a C-shaped clamp in the drawings) can be used to press the two stopping posts 3 into the first through hole 121 of the inserting part 12 of the adaptor 1. The slot 51 of the bucket teeth 5 is mounted on the inserting part 12. The part of the stopping posts 3 next to the inner edge of the slot 51 of the bucket teeth 5 first urges against the inner front edge of the slot 51 of the bucket teeth 5. After releasing the holding tool 6, the slot 51 of the bucket teeth 5 is directly mounted onto the inserting part 12 of the adaptor 1. In this case, the two stopping posts 3 correspond to the stopping walls 54 of the second through holes 52 on both sides of the bucket teeth 5. The elastic urging force of the elastic element 4 pushes and goes into the stopping walls 54 of the corresponding second through holes 52, thereby positioning the bucket teeth 5 on the adaptor 1. On the other hand, to take off the bucket teeth 5 from the adaptor 1, one uses the holding tool 6 to first press the two stopping

posts 3 into the first through holes 121 of the inserting part via the second through holes 52. Afterwards, the two stopping posts 3 inside the slot 51 urge against the inner edge of the slot 51 of the bucket teeth 5. After releasing the holding tool 6, one can readily remove the bucket teeth 5 from the adaptor 1.

**[0048]** From the above description, it is easy to see that the invention has the following advantages:

**[0049]** 1. When the bucket teeth 5 is to be assembled onto the adaptor 1, one only needs to use a holding tool 6 to press the two stopping posts 3 into the first through hole 121. Afterwards, the bucket teeth 5 is mounted on the adaptor 1 so that the two stopping posts 3 protrude from the second through holes 52. This completes the assembly. Therefore, even if the spacing between adjacent two bucket teeth is very limited, it still does not affect the assembly. The user does not need to hit with much efforts. Therefore, it is timesaving and convenient.

**[0050]** 2. Since each of the stopping posts 3 is mounted with a stopping ring 31, alien objects can be blocked so that no pebbles or metal objects will fall between the stopping posts 3 and the second through holes 52 of the bucket teeth 5. This ensures that the two stopping posts 3 encounter no resistance while sliding.

**[0051]** 3. To take the bucket teeth 5 off of the adaptor 1, one only need to press the two stopping posts 3 into the first through hole 21. Therefore, it is fairly easy to take off the bucket teeth 5 for replacement.

**[0052]** Of course, the invention has many other embodiments that differ from the current one only in minor bucket teeth. Please refer to FIG. 6 for a second embodiment of the invention. In this embodiment, the elastic element 4A is urethane that also achieves the same urging effect as in the first embodiment.

**[0053]** Please refer to FIG. 7 for a third embodiment of the invention. The engaging unit 7 consists of two stopping posts 3A, each of which is a magnet. The facing ends of the two stopping posts 3A in the first through hole 121 are of the same polarity. In this embodiment, the elastic element 4 in the first embodiment is replaced by the magnetic property of the stopping posts 3. Since the stopping posts 3A are made of a metal, they can become magnets through magnetization. As shown in FIG. 7, the end of each of the stopping posts 3A inside the first through hole 121 is the S pole. After the two stopping posts 3A retract into the first through hole 121, they can automatically spring out due to the repulsive force between them. They can also adhere onto the stopping walls 54 and stop at the grooves 53. So they stop between the first through hole 121 of the adaptor 1 and the second through holes 52 of the bucket teeth 5. Therefore, they still achieve the same urging and positioning effects as the elastic element 4 and the stopping posts 3 in the first embodiment.

**[0054]** Please refer to FIG. 8 for a fourth embodiment of the invention. The bucket teeth 5 has an inner guiding angle 55 on the side that the second through holes 52 open towards the slot 51. The end of each of the stopping

posts 3 protruding from the first through hole 121 has an outer guiding angle 33 towards the fixing part 11. The outer guiding angle 33 attaches the bucket teeth 5 to the inner guiding angle 55 of the second through hole 52. The depth of the outer guiding angle 33 is smaller than the inner guiding angle 55. This keeps a gap so that the adaptor 1 and the bucket teeth 5 do not have collisions.

**[0055]** FIG. 9 shows that the outer guiding angle 33 of the two stopping posts 33 initially urges against the inner guiding angle 55 of the bucket teeth 5 when the bucket teeth 5 is mounted on the adaptor 1. As shown in the drawing, the adaptor 1 and the bucket teeth 5 are urged by the two stopping posts 3. Therefore, there is no sliding gap.

**[0056]** However, as shown in FIGS. 10 to 12, when the bucket teeth 5 has collisions during a digging process, it retreats towards the adaptor 1 (FIG. 10). In this case, the two stopping posts 3 extend outwards under the push of the elastic element 4 (FIG. 11). The bucket teeth 5 uses its inner guiding angle 55 to urge against the outer guiding angle 33 of the stopping posts 3. The bucket teeth 5 is blocked so that there is still no sliding gap between the adaptor 1 and the bucket teeth 5.

**[0057]** Besides, there is a flexible space 8 between the side of the stopping post 3 other than the outer guiding angle 33 and the inner wall of the second through hole 52 of the bucket teeth 5. The flexible space 8 prevents the bucket teeth 5 from directly hitting the stopping posts 3 during the digging process as the outer guiding angle 33 of the stopping posts 3 slide along the inner guiding angle 55 of the bucket teeth 5.

**[0058]** Therefore, when there are collisions between the adaptor 1 and the bucket teeth 5 during the digging process, the two stopping posts 3 push outwards. The inner guiding angle 33 attaches to the outer guiding angle 53 to stop the bucket teeth 5. Therefore, there is no sliding gap between the bucket teeth 5 and the adaptor 1. There is then no buffer space for the adaptor 1 and the bucket teeth 5 to hit against each other. This prevents them from damages due to collisions. Also, using the design of the flexible space 8 between the bucket teeth 5 and the stopping posts 3, the bucket teeth 5 does not hit the stopping posts 3 and break them. Therefore, the disclosed bucket teeth have a very safe structure.

**[0059]** Please refer to FIG. 13 for a fifth embodiment of the invention. Each of the stopping posts 4 protrudes from one end of the first through hole 121. The other side of the outer guiding angle 33 has another corresponding outer guiding angle 33.

**[0060]** Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternative embodiments, will be apparent to people skilled in the art. Therefore, it is contemplated that the appended claims will cover all modifications that fall within the true scope of the invention.

## Claims

1. A replacement and urging device for the bucket teeth of an engineering construction machine, **characterized in** having:

a adaptor (1), which has a fixing part (11) fixed to a bucket (2) and having an inserting part (12) protruding from the end far from the bucket (2), has a first through hole (121) formed between its two sides and horizontally going through the fixing part (11), and has a limiting part (122) at the center of the first through hole (121);  
a bucket teeth (5), which has a slot (51) corresponding to the inserting part (12) on its one end and has a second through hole (52) on both sides thereof, each of the second through holes (52) being disposed opposite to each other and in communications with the slot (51) and the bucket teeth being mounted on the inserting part (12) of the adaptor 1 by its slot (51); and  
an engaging unit (7), which is interposed and slides between the first through hole (121) of the adaptor 1 and the second through holes (52) of the bucket teeth (5) so that the bucket teeth (5) is mounted and positioned on the adaptor (1).

2. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 1 **characterized in that** the engaging unit (7) includes two stopping posts (3) and an elastic element (4); that each of the stopping posts (3) are inserted into both ends of the first through hole (121) of the inserting part (12), respectively; that one end of the stopping posts (3) protrudes from the first through hole (121) into the corresponding second through hole (52); that each of the stopping posts (3) has a groove (32) on the end inside the first through hole (121); that each of the grooves (32) are formed opposite to each other; and that an elastic element (4) is interposed between the two grooves (32) with both ends thereof located inside the grooves (32) to urge against the corresponding posts (3).

3. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 2 **characterized in that** the elastic element (4) is an urging spring.

4. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 2 **characterized in that** the elastic element (4) is urethane.

5. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 2 **characterized in that** each of the stopping posts is mounted with at least one stopping ring (31)

around it so that no alien objects fall via the gap between the stopping posts (3) and the inserting part (12) into the grooves (32) of the stopping posts (3).

6. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 2 **characterized in that** the diameter of each of the second through holes (52) is smaller than the outer diameter of the stopping posts (3); that the two opposite sidewalls inside the slot (51) of the bucket teeth (5) have a notch (53) in communications with the second through holes (52); and that a stopping wall (54) is formed between each of the second through holes (52) and the corresponding notch (53) by the diameter difference, the stopping walls (54) stopping the stopping posts (3) in the corresponding notches (53). 5
7. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 1 **characterized in that** the engaging unit (7) consists of two stopping posts (3), each of which is a magnet and inserted into both ends of the first through hole (121) of the inserting part (12), respectively; that each of the stopping posts (3) protrudes from the first through hole (121) into the corresponding second through hole (52); and that the ends of the two stopping posts (3) facing each other inside the first through hole (121) have the same polarity. 10
8. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 7 **characterized in that** each of the stopping posts (3) is mounted with at least one stopping ring (31) around it to prevent alien objects from falling into the stopping posts (3) via the gap between the stopping posts (3) and the inserting part (12). 15
9. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 7 **characterized in that** the diameter of each of the second through holes (52) is smaller than the outer diameter of the stopping posts (3); that the two opposite sidewalls inside the slot (51) of the bucket teeth (5) have notches (53) in communications with the second through hole (52); that a stopping wall (54) is formed between the second through holes (52) and the notches (53) due to the diameter difference; and that each of the stopping posts (3) adheres into the corresponding stopping wall (54) and stops at the corresponding notch (53). 20
10. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 1 **characterized in that** the engaging unit includes two stopping posts (3) and an elastic element (4); each of the stopping posts (3) is inserted into both ends of the first through hole (121) of the insert-

ing part (12), respectively; that one end of the stopping posts (3) protrudes from the first through hole (121) into the corresponding second through hole (52); that the bucket teeth (5) has an inner guiding angle (55) on the side that the second through holes (52) face the slot (51); that each of the stopping posts (3) has an outer guiding angle (33) on the end protruding from the first through hole (121) and facing towards the fixing part (11); that the outer guiding angle (33) attaches onto the inner guiding angle (55) of the second through holes (52) of the bucket teeth (5); that the depth of the outer guiding angle (33) is smaller than the inner guiding angle (55); and that a flexible space (8) is formed between the side of each of the stopping posts (3) other than the outer guiding angle (33) and the inner wall of the second through hole (52) of the bucket teeth (5). 25

11. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 10 **characterized in that** the end of the stopping posts (3) protruding from the first through hole (121) has another outer guiding angle (33) on the other side of the outer guiding angle (33). 30
12. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 10 **characterized in that** the elastic element (4) is an urging spring. 35
13. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 10 **characterized in that** the elastic element (4) is urethane. 40
14. The replacement and urging device for the bucket teeth of an engineering construction machine as in claim 10 **characterized in that** each of the stopping posts (3) is mounted with at least one stopping ring (31) around it to prevent alien objects from falling into the grooves (32) of the stopping posts (3) via the gap between the stopping posts (3) and the inserting part (12). 45

#### **Amended claims in accordance with Rule 137(2) EPC.**

1. A tooth assembly for the bucket of an engineering construction machine, comprising:

a adaptor (1) having a fixing part (11) fixed to the bucket (2) and an inserting part (12) protruding from the end far from the bucket (2), the inserting part (12) having a first through hole (121) formed between its two sides and a limiting part (122) at the center of the first through hole (121); the bucket tooth (5) having a recess (51) corre-

sponding to the inserting part (12) on its one end and a second through hole (52) on both sides thereof, the second through holes (52) being disposed opposite to each other and in communication with the recess (51); and  
 an engaging unit (7) including two stopping posts (3) and an elastic element (4), either stopping post (3) being inserted into an end of the first through hole (121) of the inserting part (12) and being urged by the elastic element (4) to protrude therefrom into the corresponding second through hole (52),

**characterised in that**

either stopping post (3) has a recess (32) at its end inside the first through hole (121), the two recesses (32) facing each other, and the elastic element (4) is interposed between the two recesses (32), and

either stopping post (3) is mounted with at least one sealing ring (31) around it to prevent foreign objects from entering via the gap between the stopping post (3) and the inserting part (12) into the recesses (32) of the stopping posts (3).

2. The assembly of claim 1, wherein the elastic element (4) is an urging spring.

3. The assembly of claim 1, wherein the elastic element is a urethane element (4A).

4. A tooth assembly for the bucket of an engineering construction machine, comprising:

adaptor (1) having a fixing part (11) fixed to the bucket (2) and an inserting part (12) protruding from the end far from the bucket (2), the inserting part (12) having a first through hole (121) formed between its two sides and a limiting part (122) at the center of the first through hole (121);  
 the bucket tooth (5) having a recess (51) corresponding to the inserting part (12) on its one end and a second through hole (52) on both sides thereof, the second through holes (52) being disposed opposite to each other and in communication with the recess (51); and

an engaging unit (7) including two stopping posts (3A) inserted into the ends of the first through hole (121) of the inserting part (12) and being urged to protrude therefrom into the corresponding second through hole (52),

**characterised in that**

the stopping posts (3A) are magnets so arranged that their ends facing each other inside the first through hole (121) have the same polarity; and

either stopping post (3) is mounted with at least one sealing ring (31) around it to prevent foreign objects from passing through the gap between

the stopping post (3) and the inserting part (12).

5. The assembly of any preceding claim, wherein the diameter of either second through hole (52) is smaller than the outer diameter of the stopping post (3) and the sidewall inside the recess (51) of the bucket tooth (5) has a recess (53) forming a stopping wall (54) around the second through hole (52) to retain the stopping post (3).

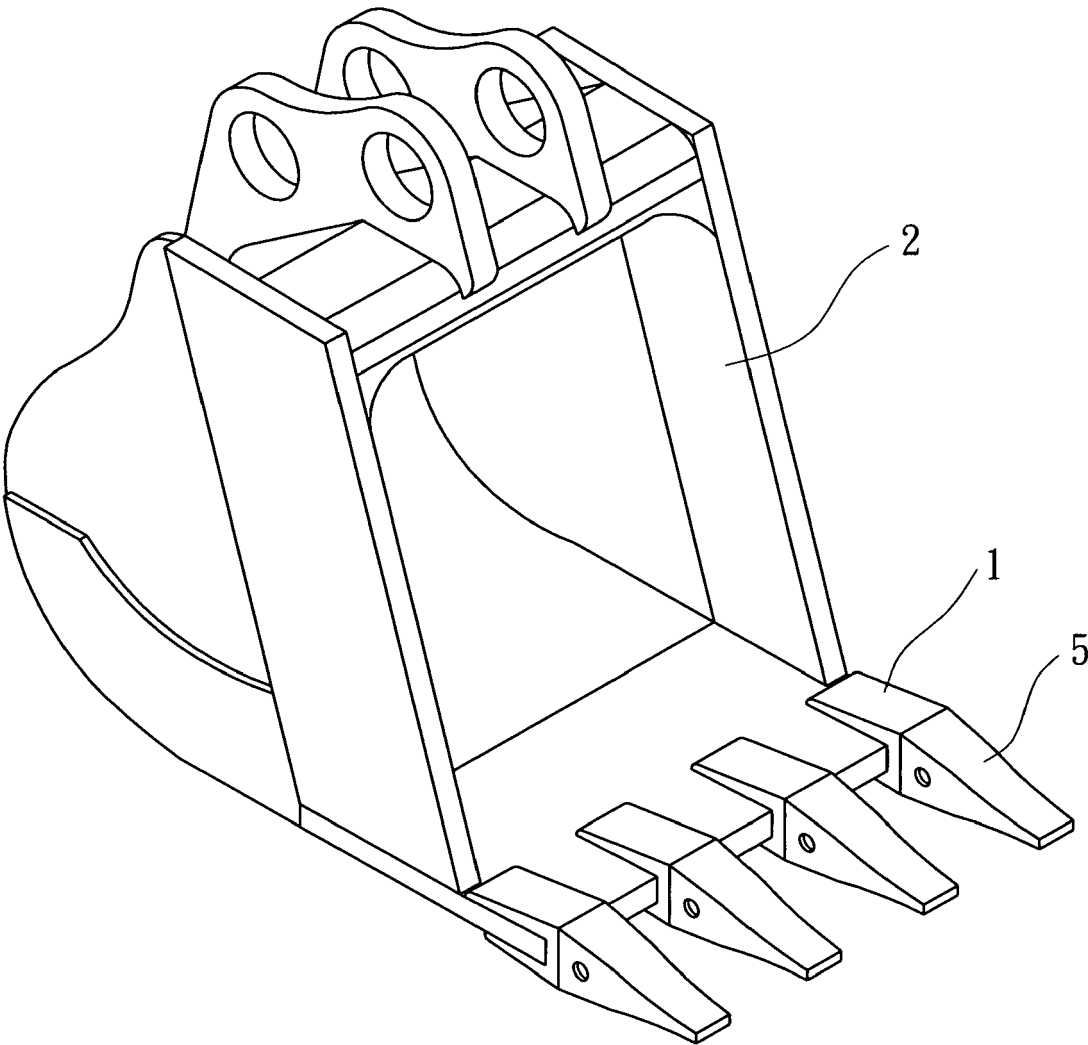


FIG. 1



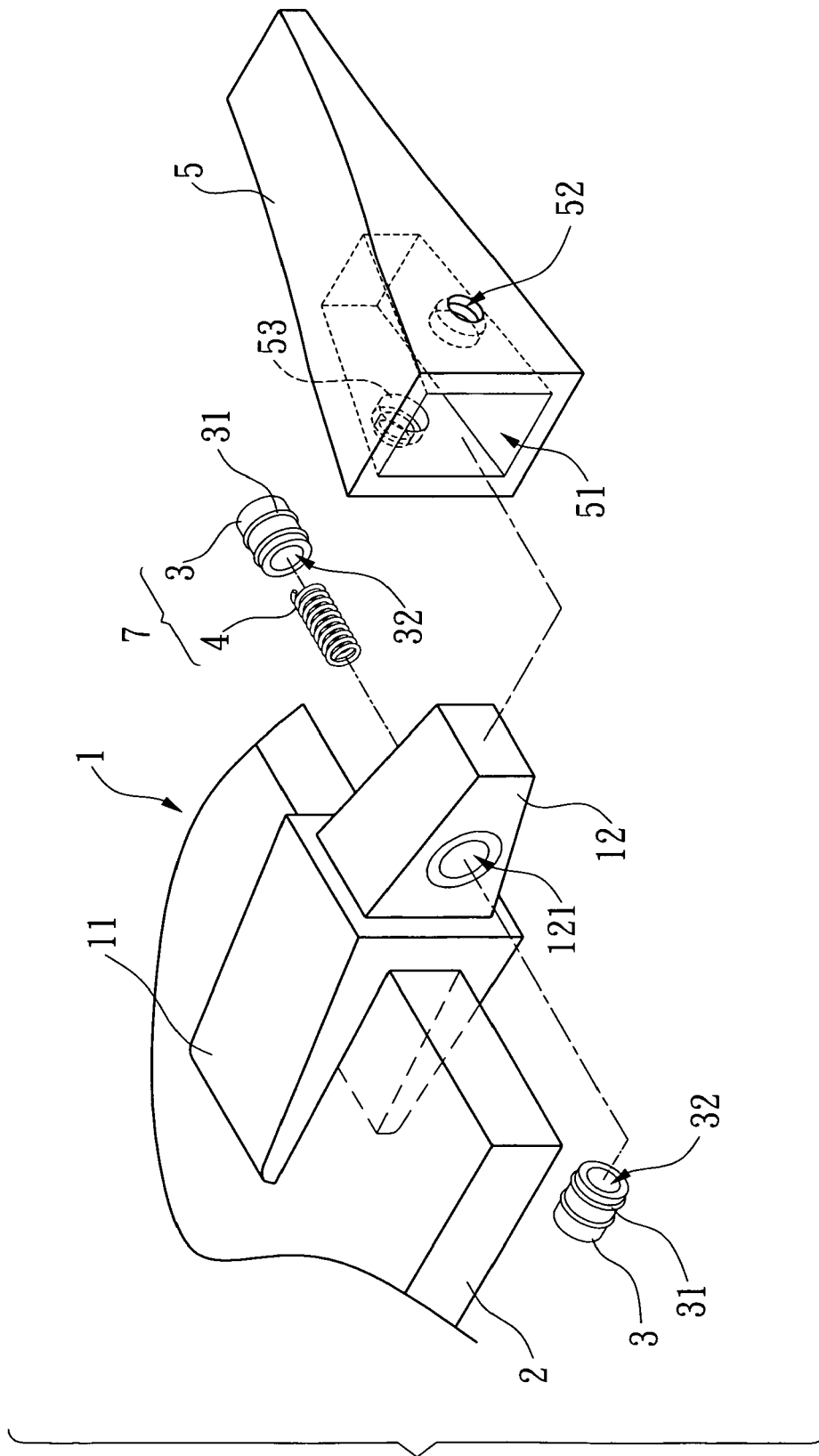


FIG. 2

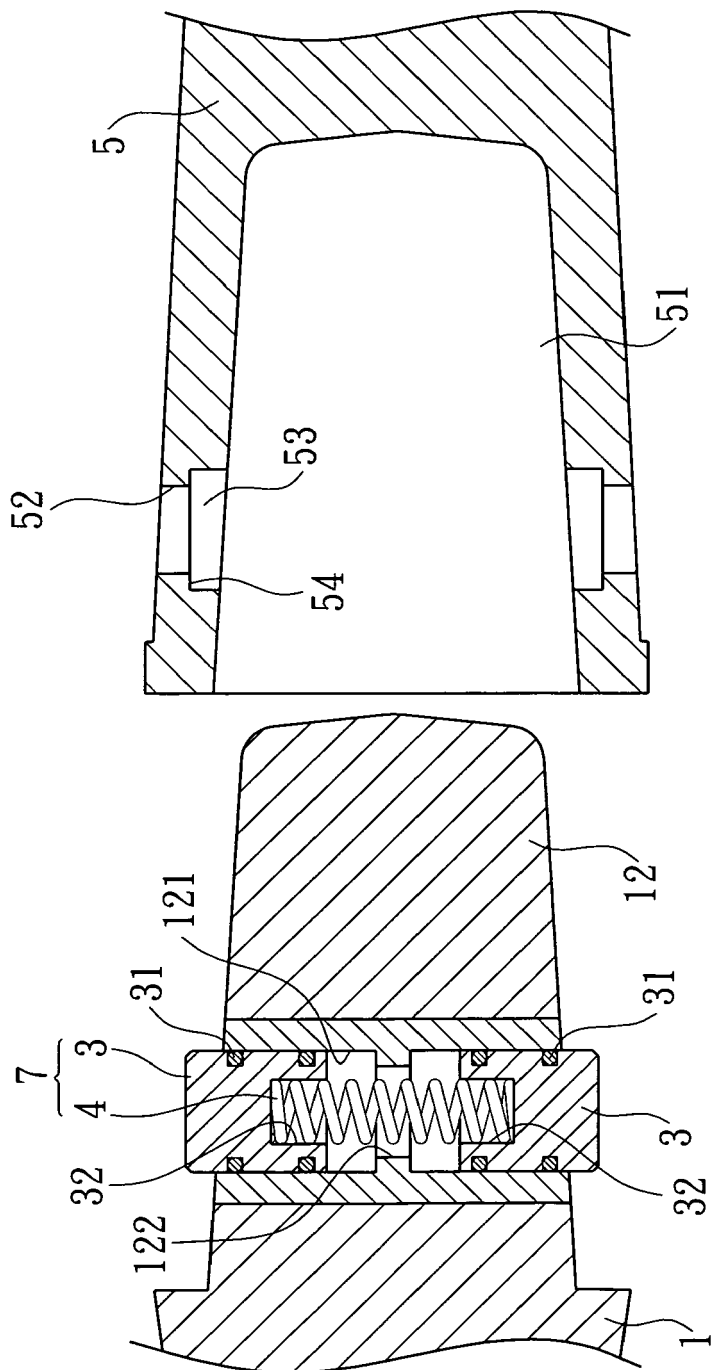


FIG. 3

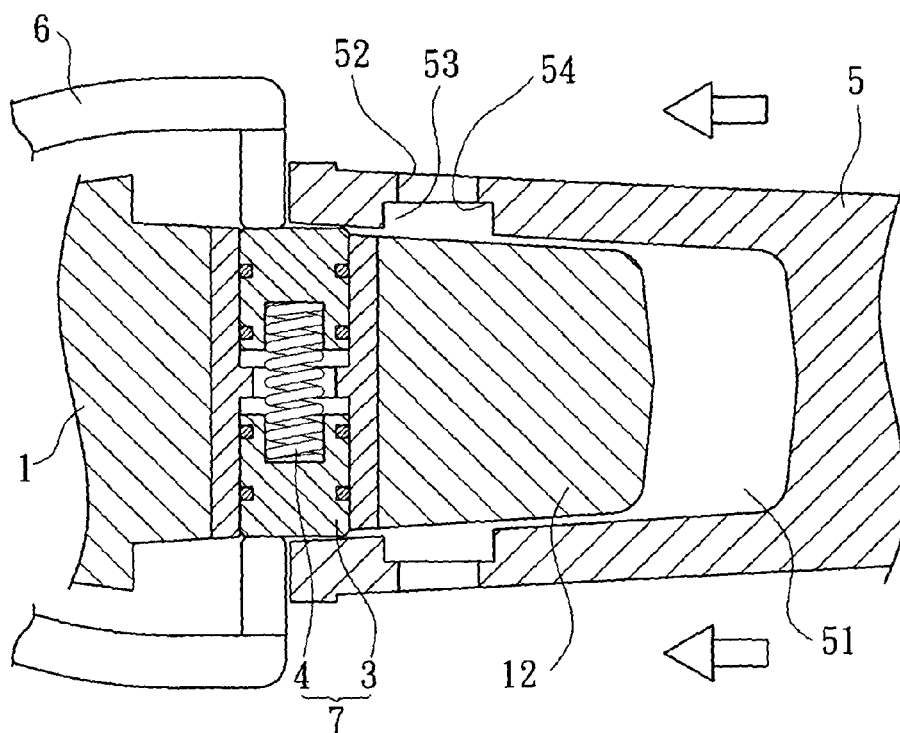


FIG. 4

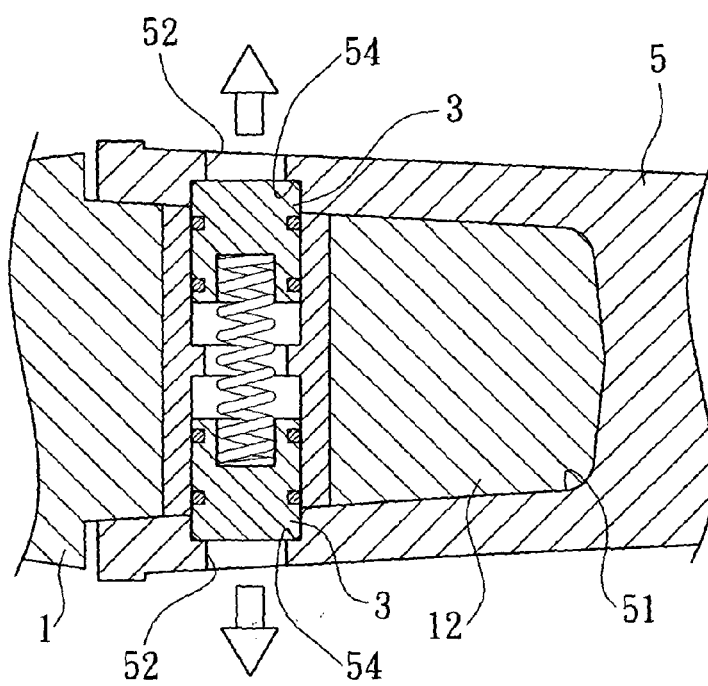


FIG. 5

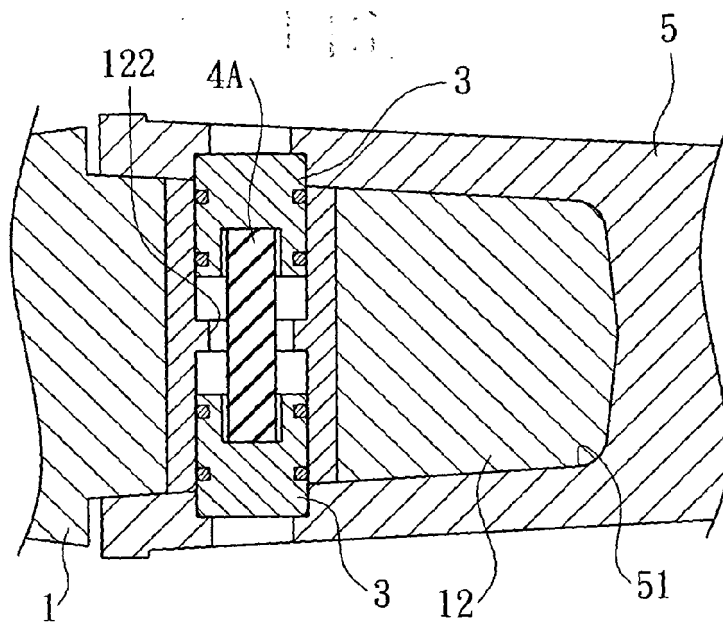


FIG. 6

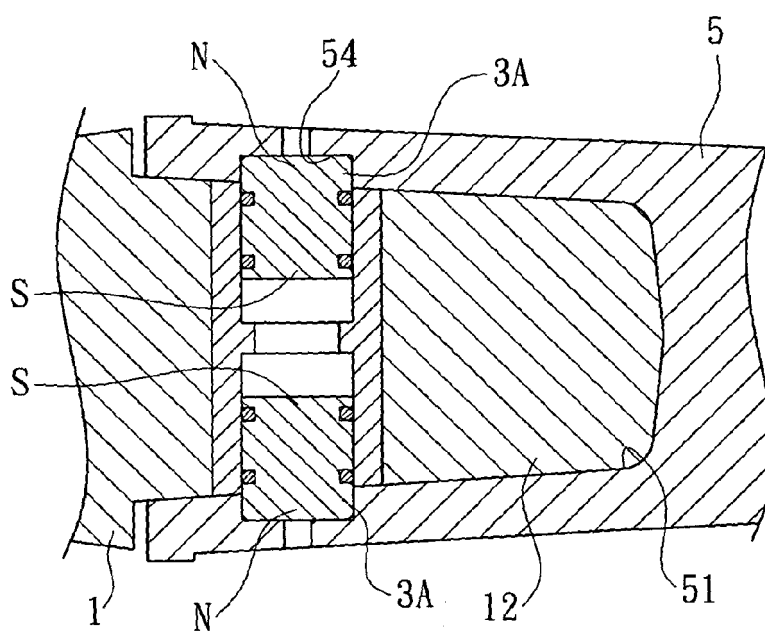


FIG. 7

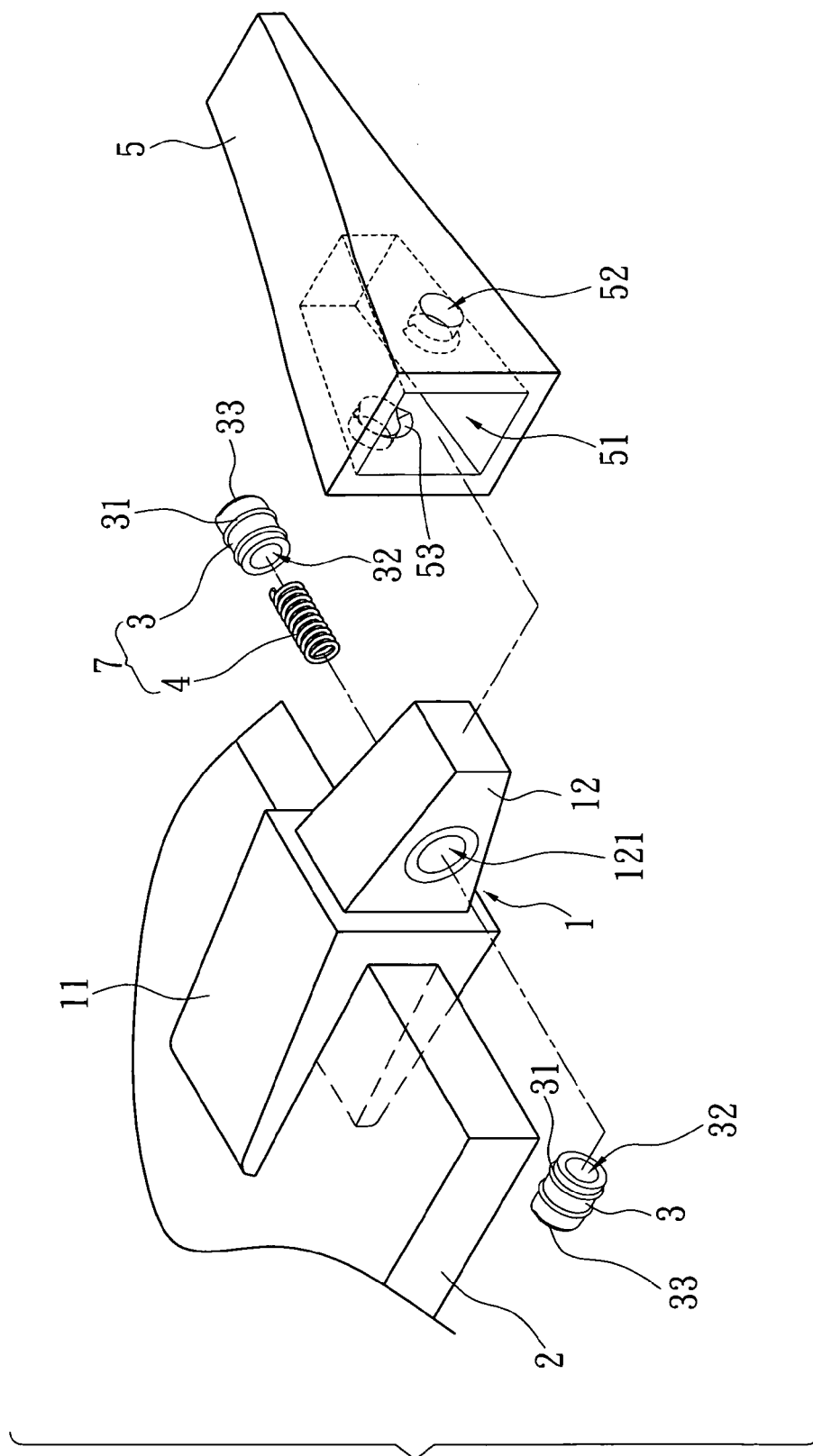


FIG. 8

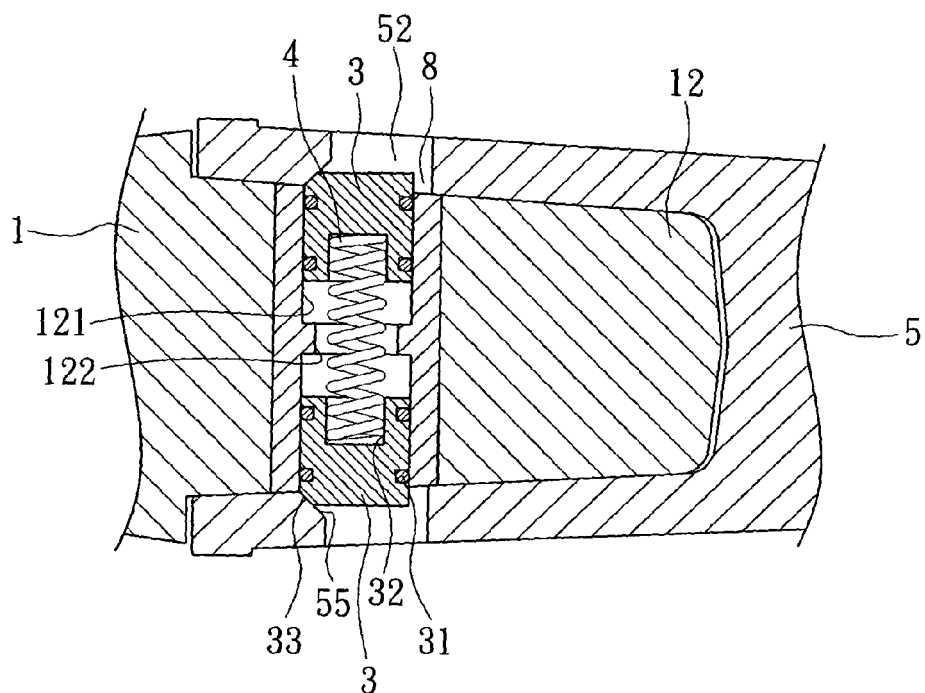


FIG. 9

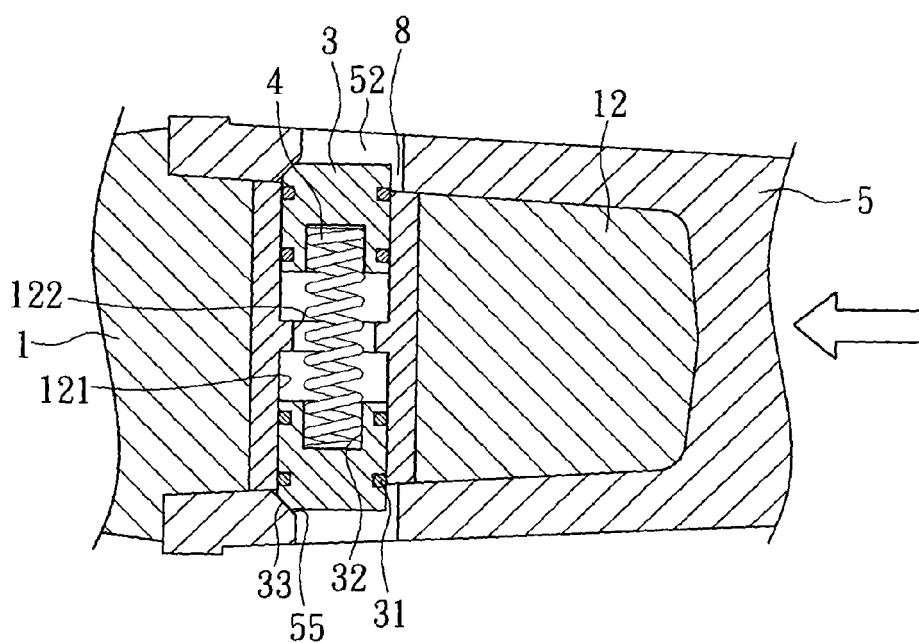


FIG. 10

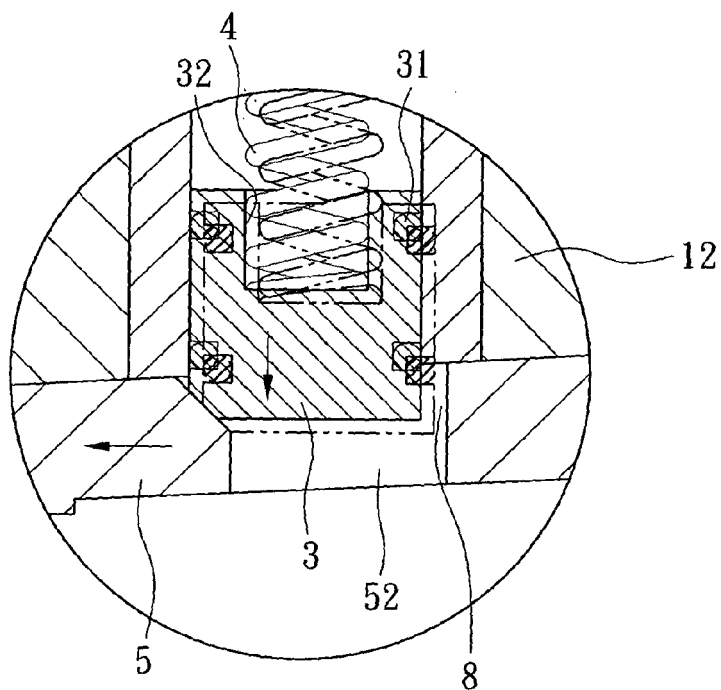


FIG. 11

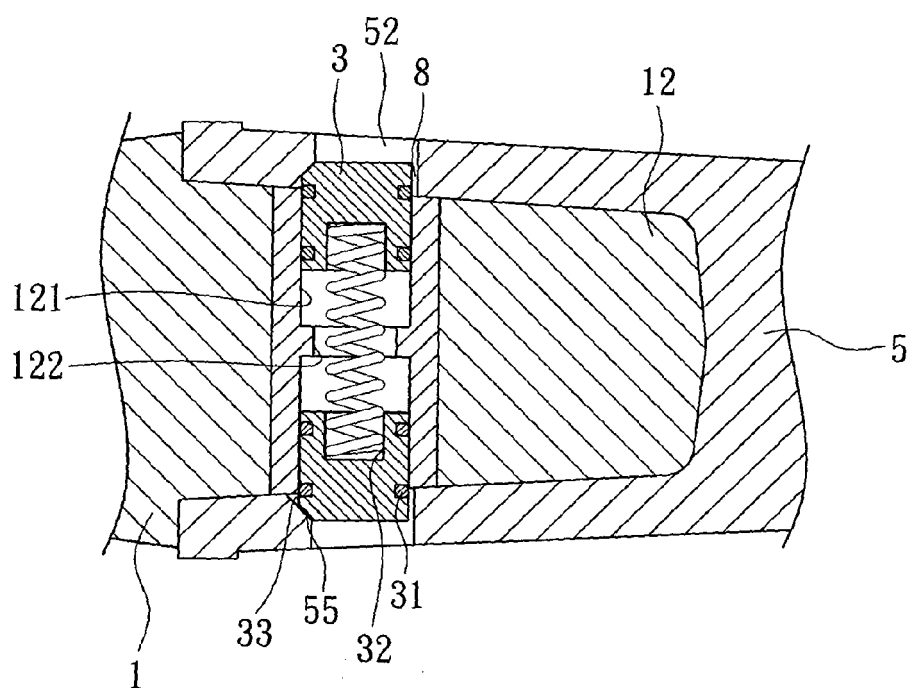


FIG. 12

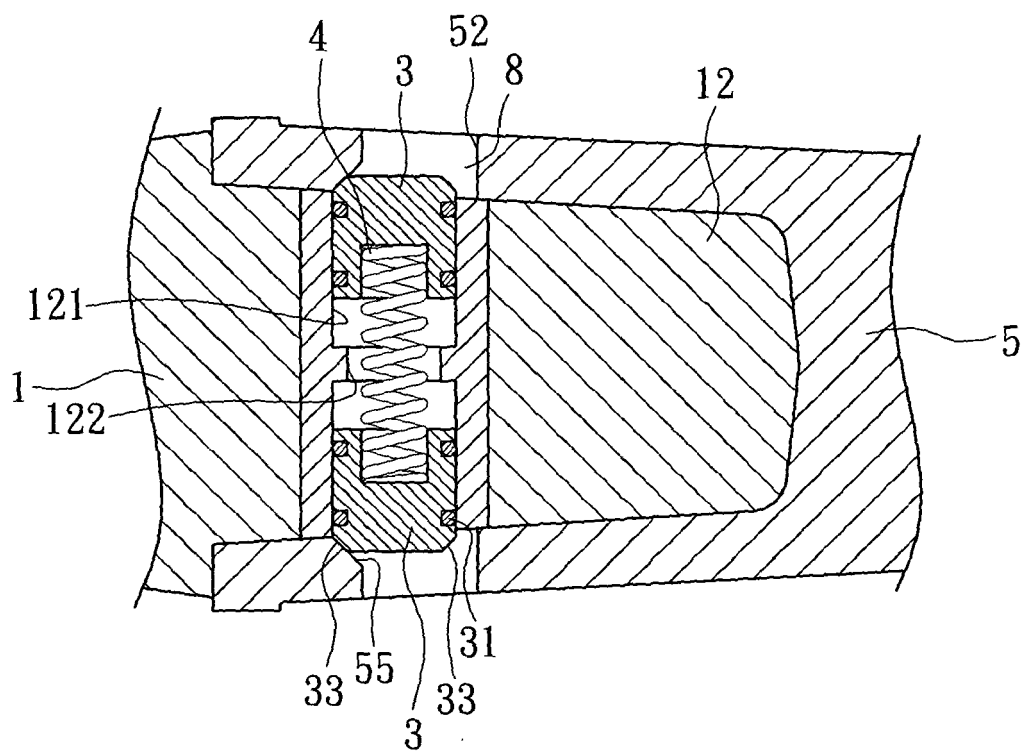


FIG. 13



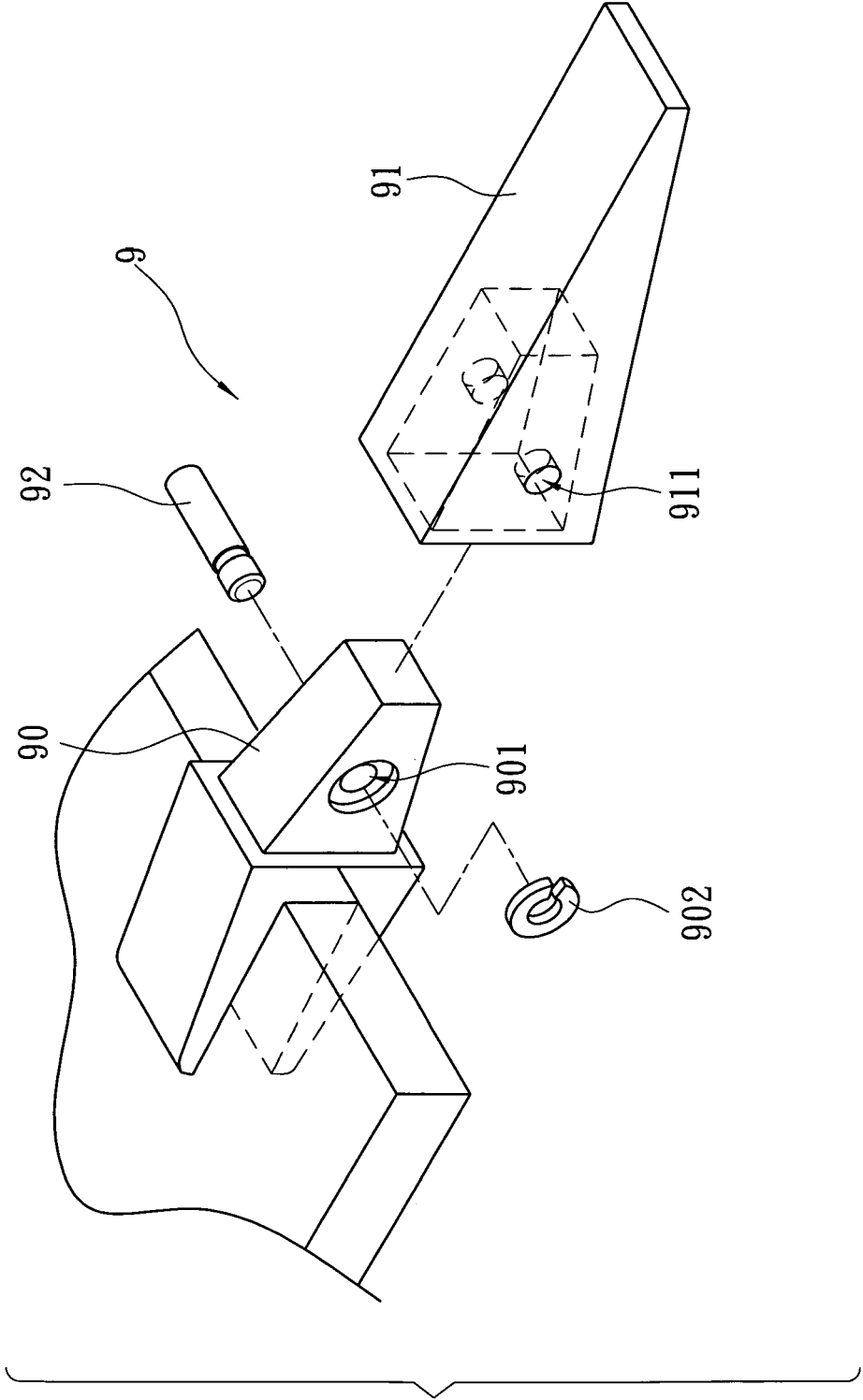


FIG. 14  
PRIOR ART

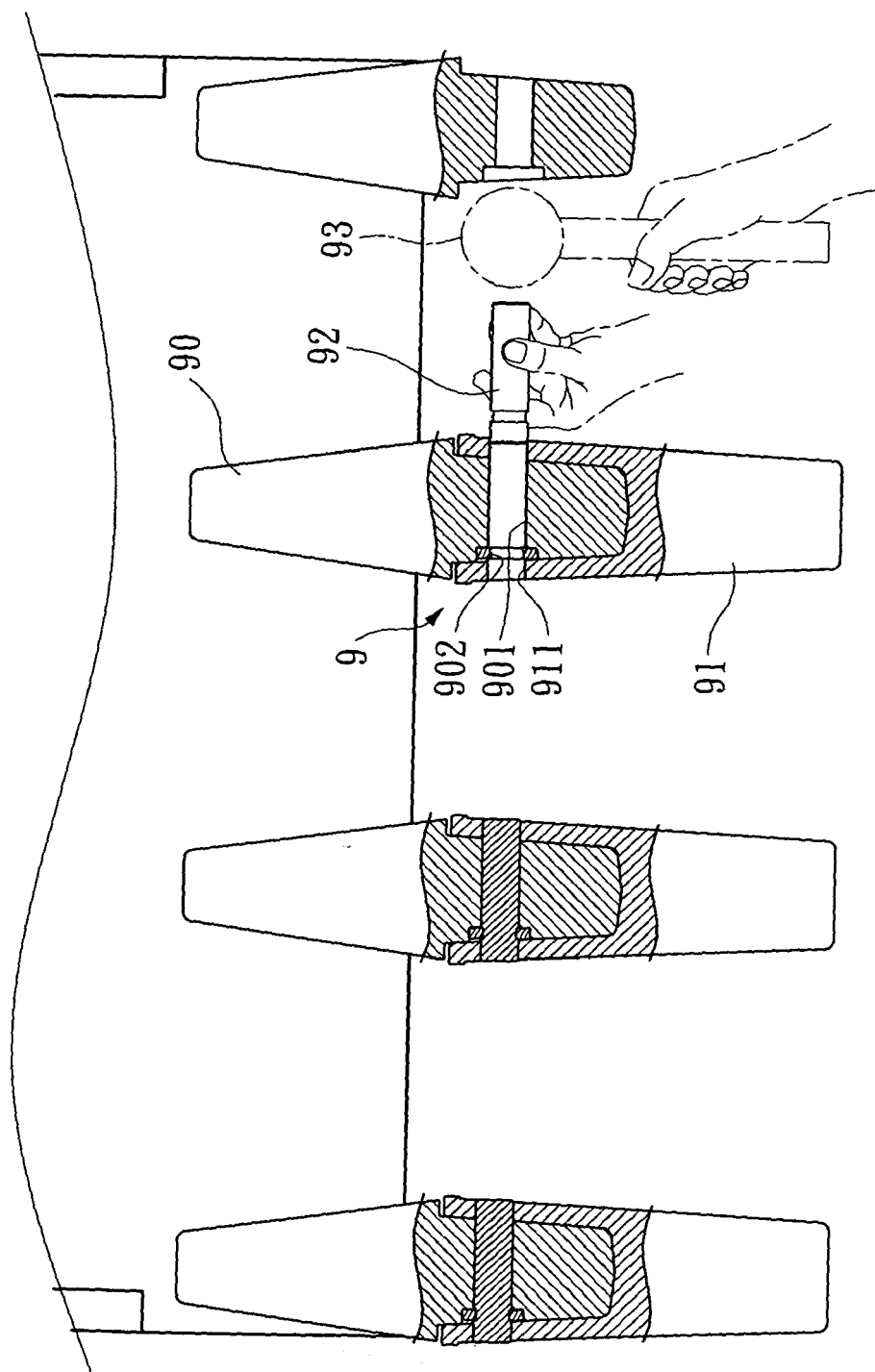


FIG. 15  
PRIOR ART

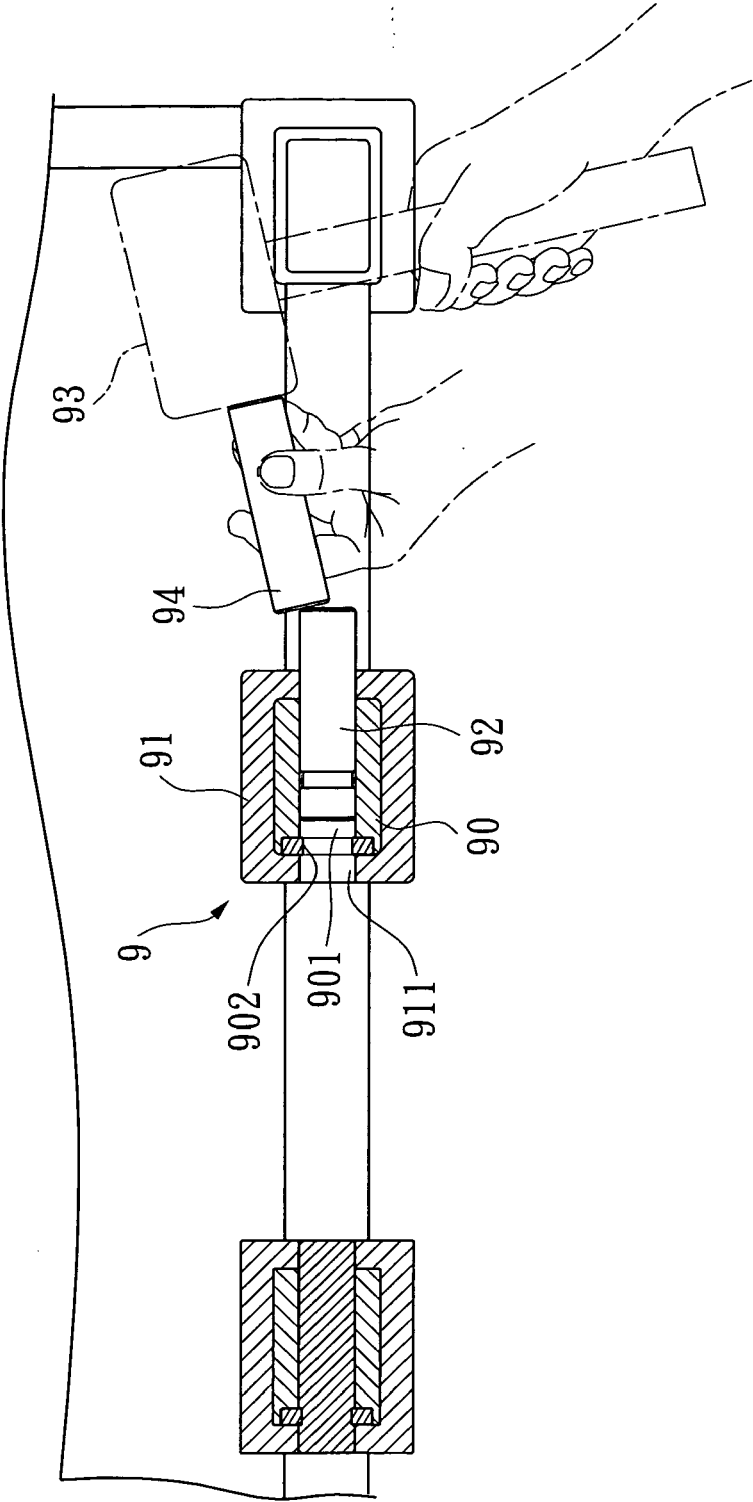


FIG. 16  
PRIOR ART

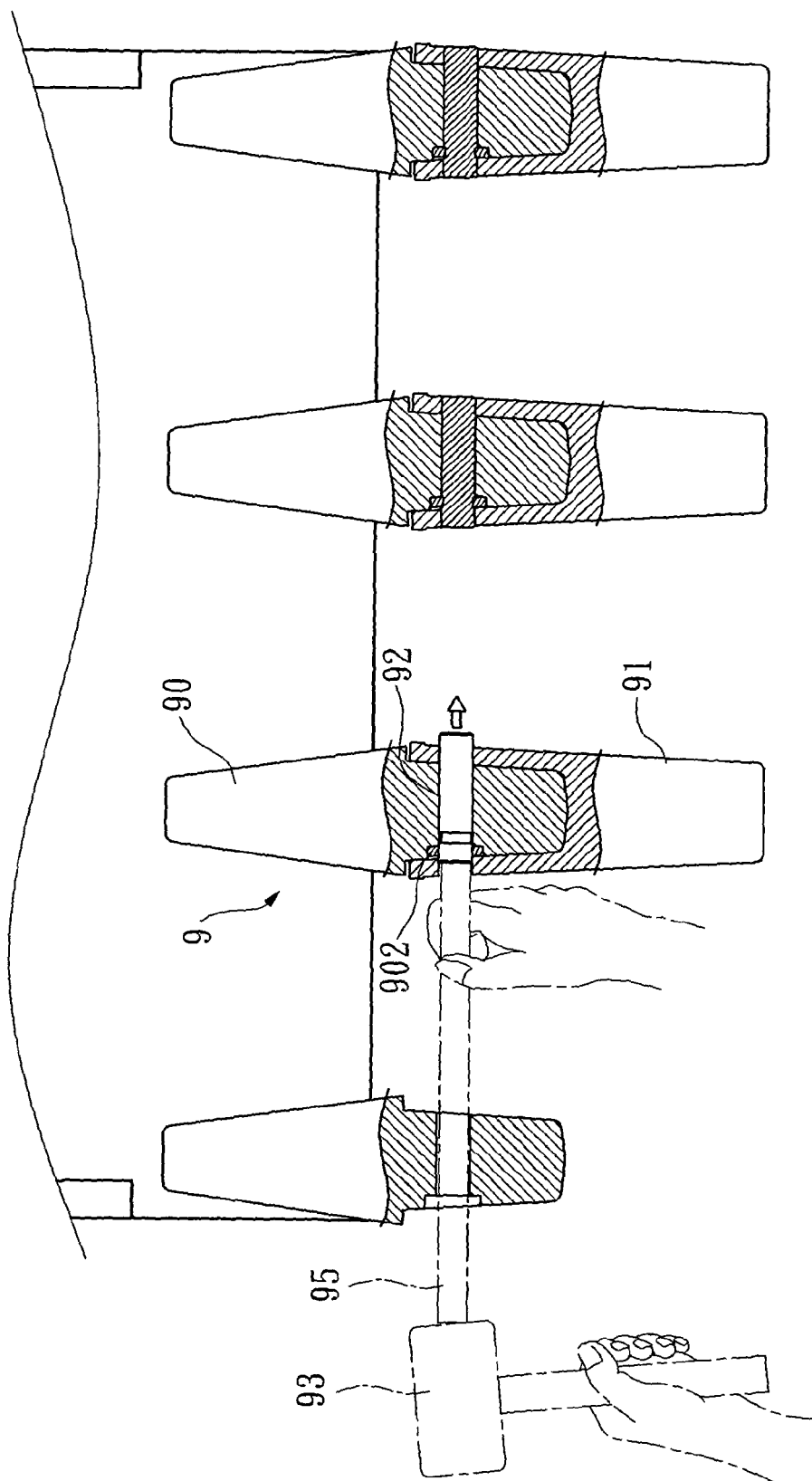


FIG. 17  
PRIOR ART

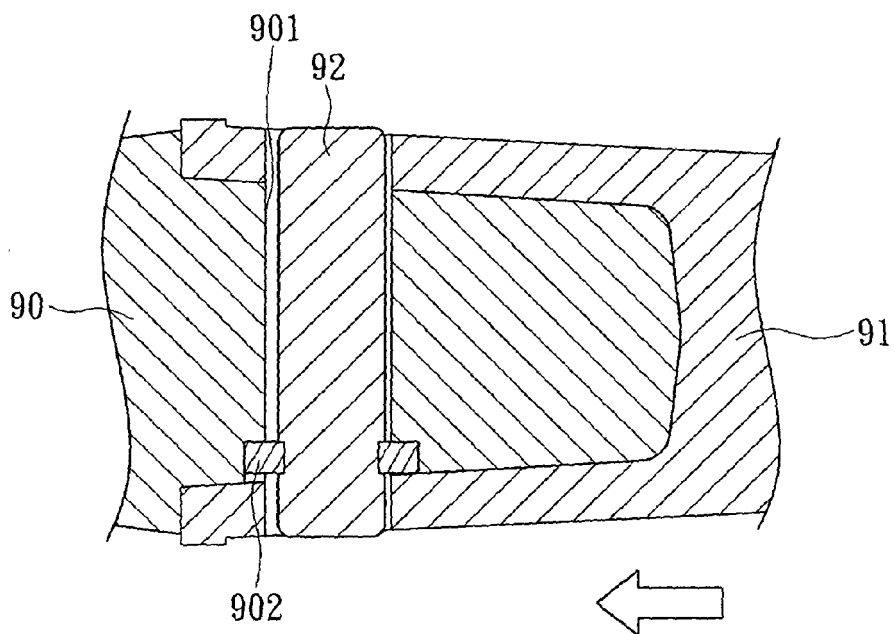


FIG. 18  
PRIOR ART

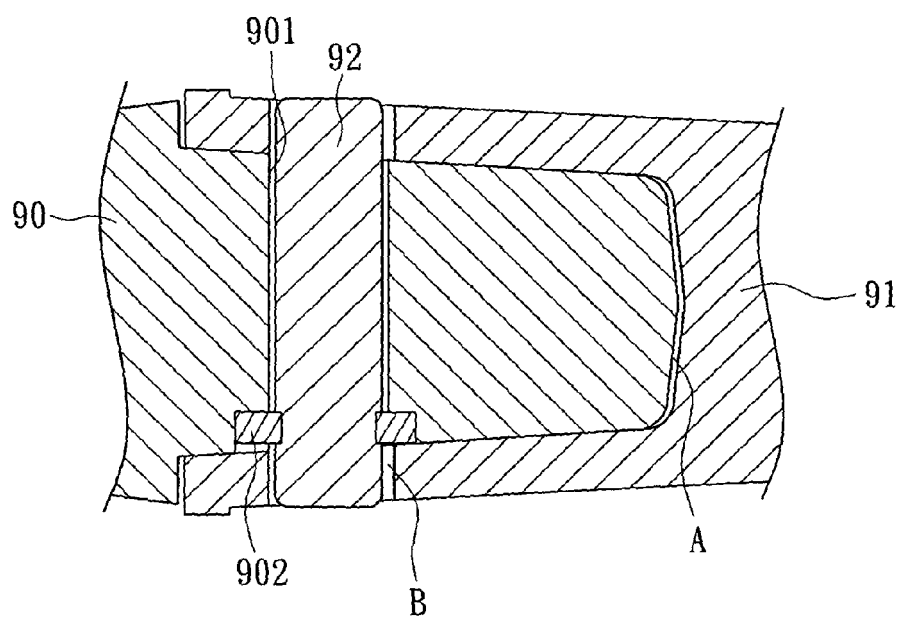


FIG. 19  
PRIOR ART

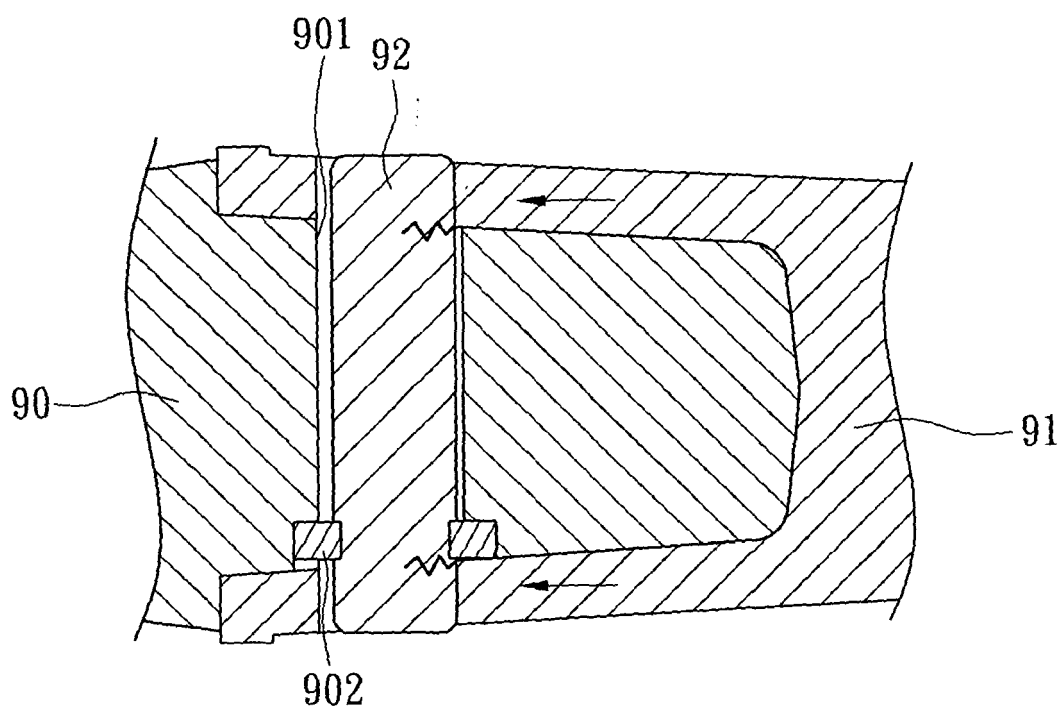


FIG. 20  
PRIOR ART



## EUROPEAN SEARCH REPORT

Application Number  
EP 09 00 5321

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 848 013 A (BOWMAN DAVID E [US] ET AL) 18 July 1989 (1989-07-18) * column 2, lines 47-61 * * column 6, lines 23-32,51-53; figures 1-4 *	1,2	INV. E02F9/28
Y	-----	3-9	
Y	US 3 325 926 A (WILSON WILLIAM W) 20 June 1967 (1967-06-20) * figures 8,9 *	3,5,8	
Y	----- US 2008/000114 A1 (BENTLEY NEIL DOUGLAS [CA]) 3 January 2008 (2008-01-03) * paragraph [0060]; figures 1,13,13A *	4,7	
Y	----- US 2009/044435 A1 (BENTLEY NEIL DOUGLAS [CA]) 19 February 2009 (2009-02-19) * paragraphs [0006], [0026], [0027], [0030]; figures 3,4,6,8 *	6,9	
A	----- US 6 439 796 B1 (RUVANG JOHN A [US] ET AL) 27 August 2002 (2002-08-27) * column 5, lines 32-54; figure 5 *		TECHNICAL FIELDS SEARCHED (IPC)
			E02F
<p>1 <del>The present search report has been drawn up for all claims</del></p>			
Place of search		Date of completion of the search	Examiner
Munich		16 June 2009	Papadimitriou, S
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>&amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.02 (P04C01)



Application Number

EP 09 00 5321

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see additional sheet(s)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).





**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 09 00 5321

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2-9

replacement of a worn out tooth of a tooth assembly for a bucket of an engineering construction machine.

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2. claims: 1, 10-14

reduction in the forces acting on the engaging unit of a bucket tooth assembly for the bucket of an engineering construction machine to prevent failure of same.

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

EP 09 00 5321

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.

16-06-2009

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