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(71) Applicant: **NIPPON PNEUMATIC MANUFACTURING CO. LTD.**
11-5 Kamiji 4-chome Higashinari-ku
Osaka(JP)

(72) Inventor: **Hiromu, Terada**
13-22, Higashimatsugaoka Ikoma-shi
Nara(JP)
Inventor: **Takehide, Miyazaki**
1-1-7, Tomiomotomachi Nara-shi
Nara(JP)
Inventor: **Shogo, Akechi**
6-4-2, Umamikita Koryo-cho
Kitakatsuragi-gun Nara(JP)

(74) Representative: **Glawe, Delfs, Moll & Partner**
Patentanwälte
Postfach 26 01 62
D-8000 München 26(DE)

(54) Cushioning device for impact tool.

(57) A cushioning device for use with an impact tool including a pair of brackets (4) between which the impact tool (1) is mounted, cushioning rubber members (21) mounted between the brackets (4) and the impact tool (1), and restricting members (22, 23) fixedly mounted on the opposed inner wall of the brackets to restrict the forward and backward movements of the impact tool (1). The impact tool is formed with grooves (24) in both sides thereof. Each bracket (4) is formed with mounting holes (25) at position opposite to the grooves (24). A seating plate (26) is secured to one side of each cushioning rubber member (21) and a mounting plate (27) is secured to the other side thereof. The cushioning rubber members (21) are inserted through the mounting holes (25) so that the seating plate (26) will be received in the groove (24). Then the mounting plate (27) is secured to the outer surface of the bracket (4).

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CUSHIONING DEVICE FOR IMPACT TOOL

The present invention relates to a cushioning device for use in an impact tool, specifically an impact tool adapted to be mounted on the tip of an arm of a mobile carriage such as a power shovel.

As shown in Fig. 5, a large-sized hydraulic or pneumatic impact tool 1 (what is called a breaker) is mounted on the tip of an arm 3 of a carriage 2 such as a power shovel by means of brackets 4. It is used for a wide range of applications including crushing and demolishing work at a quarry or a construction site.

The impact tool 1 vibrates up and down violently during operation. If it were rigidly coupled to the arm 3, its vibration would be transmitted to the carriage, thus causing bad effects on the operator and carriage.

One effective measure to solve this problem is to interpose cushioning rubber members 5 between the impact tool 1 and the brackets 4 as shown in Fig. 6 (hereinafter referred to as the first prior art). The cushioning rubber members 5 are column-shaped and fixedly mounted between the impact tool 1 and the brackets 4 by screwing washers 6 and 7 fixed to both ends thereof into the tool 1 and the brackets 4, respectively.

Fig. 7 shows another prior art (second prior art) in which annular cushioning rubber members 8 are employed. The cushioning arrangement in the second prior art comprises plates 10 received in grooves 9 formed in both sides of the impact tool 1 and fixed to mounting seats fixed to the impact tool, column-shaped protrusions 11 fixed to the plates 10, and the annular cushioning rubber members 8 held between cylindrical members 13 and 14 and mounted on the brackets 4 through rings 15.

The cylindrical cushioning rubber members 5 in the first prior art can absorb and dampen the vertical vibrations of the tool 1. But if external forces act on the chisel 16 in a back-and-forth direction (direction of arrow X in Fig. 5) owing to oblique striking or scratch work, the rubber members 5 will be subjected to torsional stress. This will prompt aging of the rubber. Another problem with the first prior art is that the rubber members tend to be deformed markedly, thus making difficult the operation of the impact tool 1.

If external forces act on the chisel 1 in the side-to-side direction (direction of arrow Y in Fig. 6) owing to wrenching work, the brackets 4 will be subjected to such a force as to widen the distance therebetween. Thus the cushioning rubber members 5 interposed therebetween will be subjected to a large tensile force, which is another cause of premature aging of the rubber member.

Each cushioning rubber member 5 is required to have a thickness a larger than a predetermined value to obtain a predetermined dampening effect. On the other hand, the distance b between the brackets 4 should be as small as possible, for the case where the tool 1 is used in a limited working space. Since the distance b is determined by the thickness a in this arrangement, the above two requirements contradict each other.

Further, since the washers 6 and 7 fixed to the rubber members 5 are screwed to the impact tool 1 and the brackets 4, respectively, it would be difficult to replace or repair the rubber members 5.

In the second prior art, the cushioning action is carried out by the forces which act on the annular cushioning rubber members 8 in the direction of compression. But since the deformation of each rubber member 8 is limited by its thickness, it cannot deform sufficiently. Thus its cushioning effect is small compared with the column-shaped cushioning rubber members 5 in the first prior art which are subjected to such a force as to act in the direction of shear. Also, since the cushioning rubber members 8 are fitted between the column-shaped protrusion 11 and the rings 15, the heat generated in the rubber member is difficult to dissipate. This will cause premature aging of the rubber. Further, the assembly of the cushioning device of the second prior art is very difficult and troublesome, because it includes bolting the plates 10 to the seats provided on the impact tool 1 and then fitting the brackets 4 having cushioning rubber members 8 received therein through the rings 15 on the protrusions 11 on the plates 10. If any annular cushioning rubber member 8 is broken, all the rubber members 8 have to be removed from the column-shaped protrusions 11 together with the brackets 4, and then they have to be mounted back in position after replacing the broken one.

It is an object of the present invention to provide a cushioning device which obviates the abovesaid shortcomings, which increases the durability of its cushioning rubber members, which allows a smaller distance between brackets, and which facilitates mounting of an impact tool and replacement of cushioning rubber members.

Other features and objects of the present invention will become apparent from the following description taken with reference to the accompanying drawings, in which:

Fig. 1 is a partially cutaway side view of the embodiment of the present invention;

Fig. 2 is a partially cutaway front view of the same;

Fig. 3 is an enlarged vertical sectional view of a

portion of the same;

Fig. 4 is a similar view of the second embodiment;

Fig. 5 is a side view showing how an impact tool is used;

Fig. 6 is a front view of a prior art arrangement; and

Fig. 7 is an enlarged sectional view of another prior art arrangement.

The cushioning device embodying the present invention shown in Figs. 1 to 3 supports an impact tool 1 in the shape of a square pole between the end portions of an opposed pair of brackets 4. It has rectangular cushioning rubber members 21 interposed between the tool 1 and the brackets 4. Restricting members 23 for restricting the backward motion of the tool 1 are welded to the opposed inner surfaces of the brackets 4. The tool 1 is inserted into between the brackets 4 from their front end until it abuts the restricting members 23 through resilient sheets 28 such as plastic plates.

The tool 1 is formed in each side at two different levels with grooves 24. Each bracket 4 is formed with mounting holes 25 at locations opposite to the respective grooves 24.

Each cushioning rubber member 21 has a rectangular sectional shape with its top and bottom surfaces concaved in the middle and has plates 26 and 27 secured as by baking to both side faces thereof. The plate 26 is complementary in shape to each groove 24, whereas the plate 27 has a surface larger in area than each mounting hole 25.

The cushioning rubber members 21 are inserted into the holes 25 of the brackets 4 with the plates 26 inside so that the plates 26 will engage in the respective grooves 24. Then the plates 27 are secured to the outer surface of the brackets 4 at portions surrounding the mounting holes 25 by means of bolts 29. Each mounting hole 25 has an area sufficiently large compared with the cushioning rubber members 21 so as to prevent the rubber members 21 from touching the inner peripheral wall of the mounting holes 25 even when the former is deformed.

Restricting members 22 for restricting the forward motion of the tool 1 are secured to the brackets 4 by bolts 30 (Fig. 1) so as to be in contact with the front surface of the tool 1 through resilient sheets 31 at locations opposite to the restricting members 23.

The resilient sheets 28 and 31 are provided to prevent the restricting members 23 and 22 from coming into direct contact with the tool 1. Numeral 32 designates a pin hole for mounting the brackets 4 to a carriage 2.

To assemble the cushioning device, the restricting members 23 are secured to the brackets 4 beforehand and the plates 27 on the cushioning rubber members 21 are secured to the outer surface of the brackets 4 so that their inner ends protrude into the brackets 4.

Then the tool 1 is inserted into between the brackets 4 from front thereof so that the plates 26 on the cushioning rubber members 21 will be received tightly in the respective grooves 24 formed in the tool 1. The tool 1 is pushed in until its rear end face abuts the restricting members 23. Finally, the restricting members 22 are pressed against the front end face of the tool 1 to restrict the back-and-force movement of the tool 1.

The cushioning rubber members 21 may be inserted through the mounting holes 25 after mounting the tool 1 in between the brackets 4 and the restricting members 22 and 23 so that the plates 26 are engaged in the grooves 24 in the tool 1. The plates 27 are secured to the outer surface of the brackets 4 by the bolts 29 thereafter.

With this arrangement, when the tool 1 vibrates vertically, a shearing force will act on the cushioning rubber members 21. Thus the vibration of the tool 1 is damped. The restricting members 22 and 23 only restrict the back-and-forth movement of the tool 1 through the resilient sheets 28 and 31. Its up-and-down movement will not be restricted nor transmitted to the brackets 4 through the restricting members 22 and 23.

Even if an external force in the direction of X acts on the chisel 16, the relative movement between the brackets 4 and the tool 1 will be restricted by the restricting members 22 and 23. Thus no tensile force will act on the cushioning rubber members 21.

If an external force in the direction of Y acts on the chisel, a compressive load will act on the cushioning rubber members 21 at one side of the tool 1, because the distance between the brackets 4 are kept uniform by the restricting members 22 and 23. This will restrain the tool 1 from shaking violently.

Fig. 4 shows another embodiment in which plates 26′ and 37 are secured to both sides of the cushioning rubber member 21 as by baking. The inner plate 26′ has its outer surface 38 bonded to the rubber member 21. The surface 38 is oblique with respect to the axis of the impact tool 1 because the inner plate 26′ widens toward the bottom. The outer plate 37 widens toward the top, so that the inner surface 39 of the plate 37, too, is oblique with respect to the axis of the impact tool. The mounting plate 27, integral with the outer plate 37, is secured to the bracket 4 by the bolts 29. The outer plate 37 is received in the mounting hole 25 formed in the bracket 4 and the inner plate 26′ is engaged in the grooves 24 formed in the impact tool 1.

The embodiment of Fig. 4 is the same as the

first embodiment in the other points. In this embodiment, since the cushioning member 21 is mounted so as to have their surfaces oblique with respect to the axis of the impact tool, the vibrations of the impact tool 1 in a vertical direction act on the cushioning member 21 as compressive and shearing loads. This reduces the possibility of the cushioning rubber member peelng off and increases the durability of the entire cushioning device.

According to the present invention, the restricting members 22 and 23 abut the front and rear sides of the tool 1 through the resilient sheets 28 and 31, so that the tool 1 can vibrate in one direction only and the cushioning rubber members 21 will be subjected not to a torsioning force or a tensile force but to a shearing force only. This will increase the cushioning effect and the durability of the cushioning rubber members 21 and improve the operability of the tool 1.

Since the cushioning rubber members 21 have a substantial part of their surface exposed to the atmosphere, the heat generated in the rubber member can dissipate. This will retard aging of the rubber owing to increase in the rubber temperature.

Since the plates 27 on the cushioning rubber members 21 are secured to the outer surface of the brackets 4, the distance between the brackets 4 can be narrowed by the length equal to twice the sum of thickness d1 of each bracket 4 and the thickness d2 of each plate 27, compared with the prior art arrangement shown in Fig. 6 in which the cushioning rubber members 21 are secured to the inner surfaces of the brackets 4 through the washers. Further, since the cushioning rubber members have a square sectional shape, they can be bonded to both plates 26 and 27 with increased bond areas. Thus the cushioning rubber members 21 can be made lower in height than the column-shaped cushioning rubber members 5 in Fig. 6. This will make it possible to further reduce the distance between the brackets 4.

The assemblies each comprising a cushioning rubber member 21 and a pair of plates 26 and 27 are inserted into the brackets 4 from outside and secured to their outer surface. Thus the cushioning device according to the present invention can be assembled with extreme ease in regardless of whether the tool 1 is mounted after the assemblies have been secured to the brackets 4 or the assemblies are secured to the brackets 4 after the tool 1 has been mounted on the brackets 4. If any of the rubber members 21 is broken during use, only the assembly including the broken rubber member 21 can be replaced with a new one by screwing and unscrewing the bolts. Thus the device is easy and inexpensive to repair.

Claims

1. A cushioning device for use with an impact tool, comprising a pair of brackets between which the impact tool is mounted, and cushioning rubber members mounted between said brackets and the ends of the impact tool, characterised in that restricting means for restricting the forward and backward movements of the impact tool are fixedly mounted on the opposed inner walls of said brackets, that the impact tool is formed with grooves in both sides thereof, that said each bracket is formed with mounting holes at position opposite to said grooves, that a seating plate is secured to one side of said each cushioning rubber member and a mounting plate is secured to the other side thereof, said cushioning rubber members being inserted through said mounting holes so that said seating plate will be received in said groove, and said mounting plate being secured to the outer surface of said bracket.

2. A cushioning device as claimed in claim 1, wherein said cushioning rubber member is mounted so that at least one of both sides thereof is at an angle with respect to the axis of the impact tool.

FIG. 1

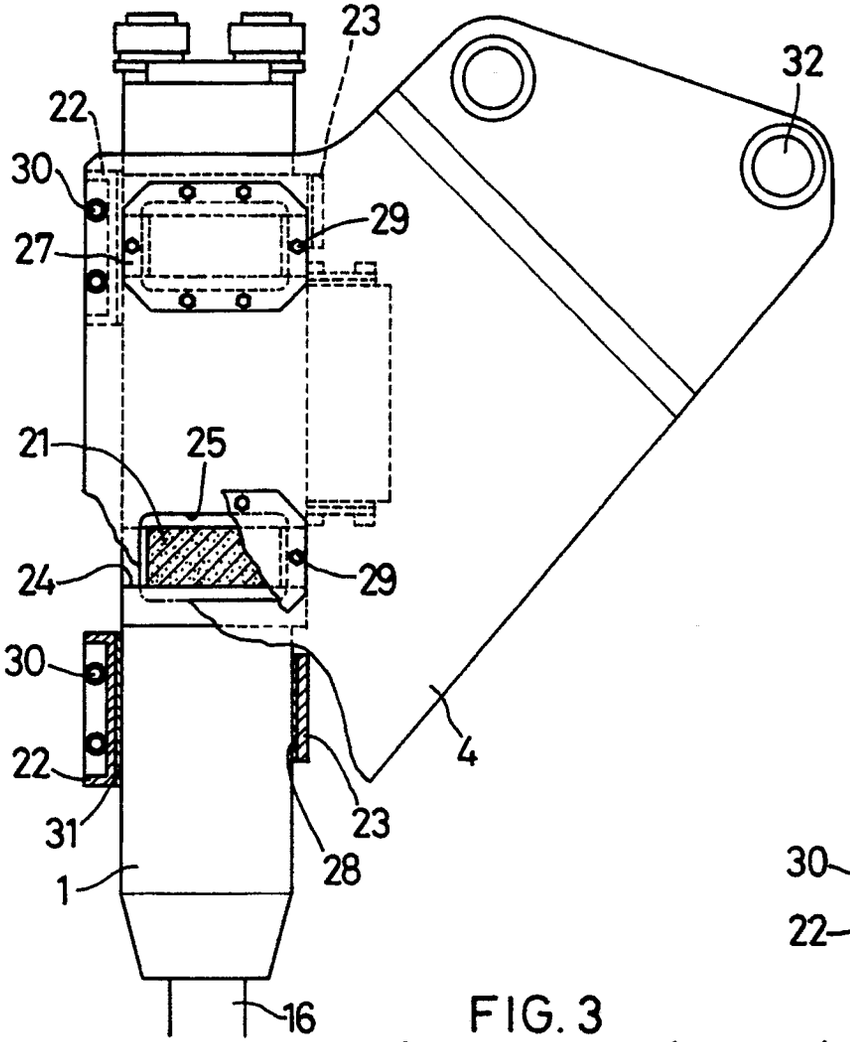


FIG. 2

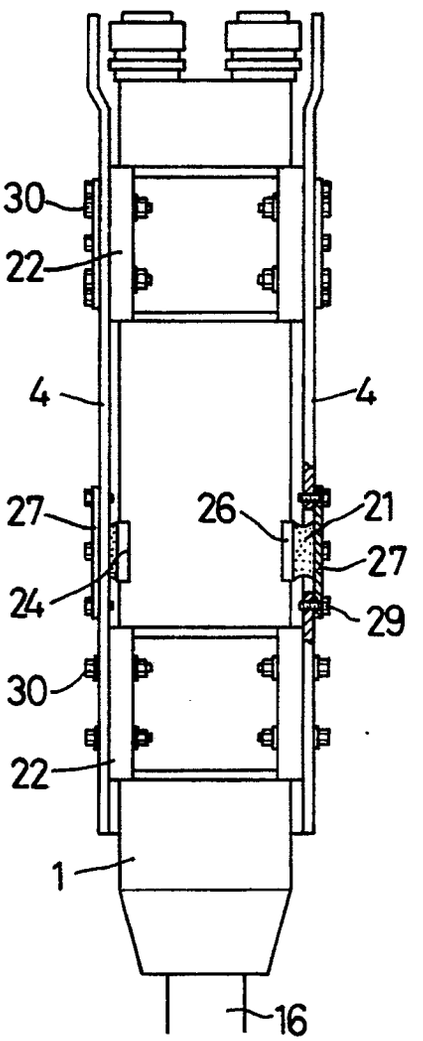


FIG. 3

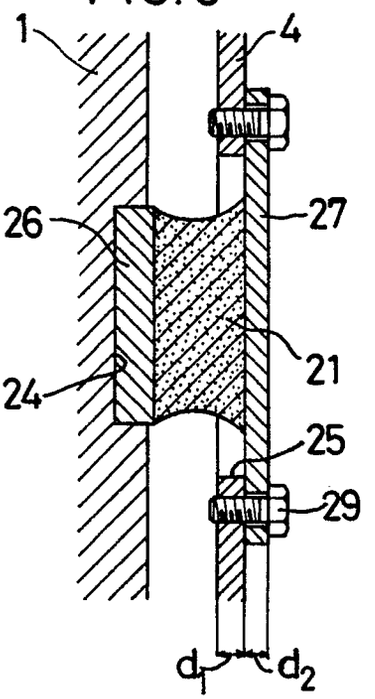


FIG. 4

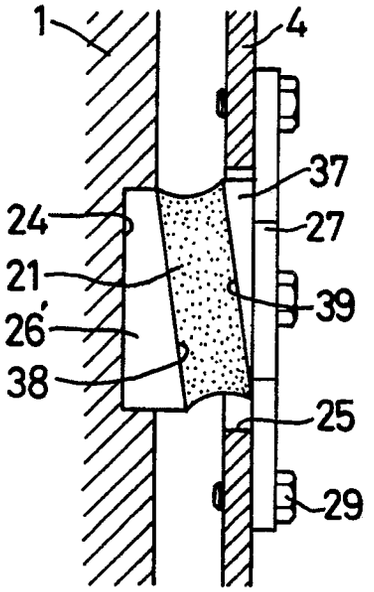


FIG. 6

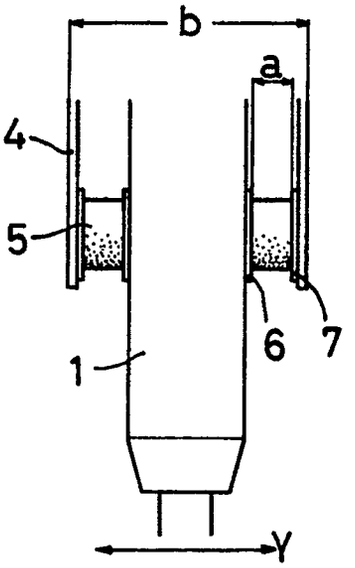


FIG. 7

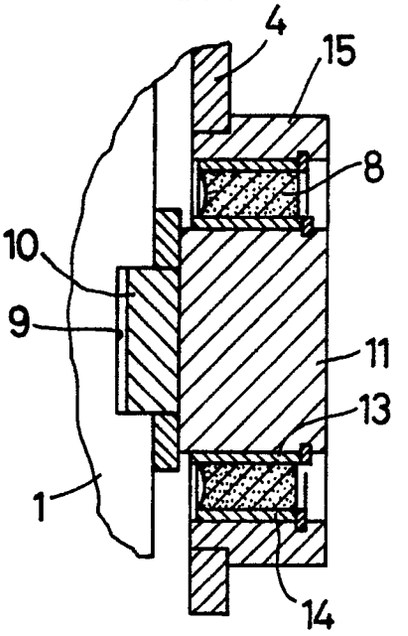
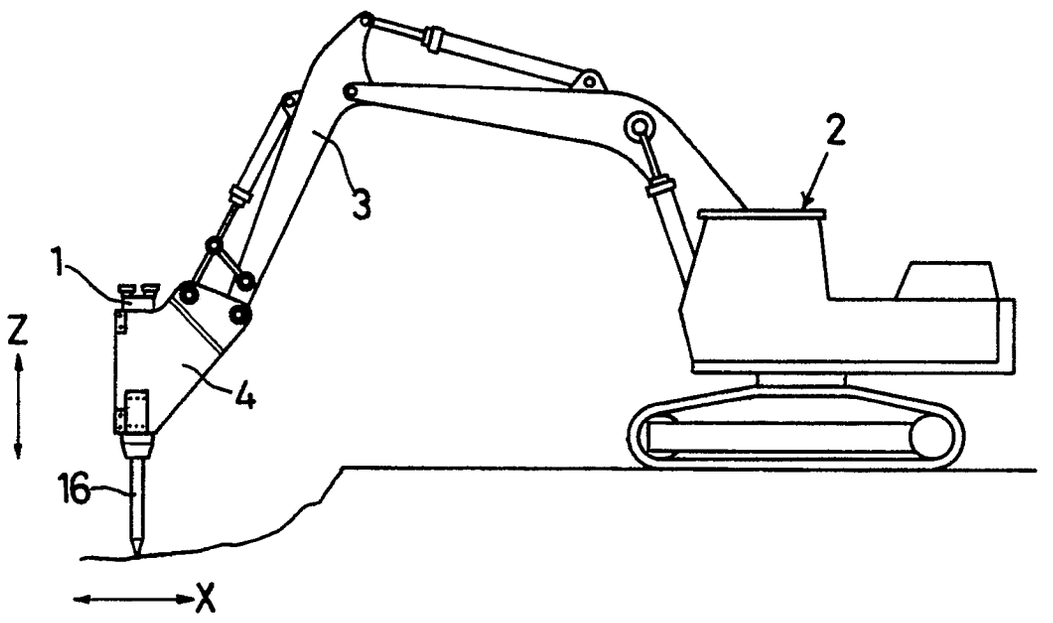


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 4928

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 889 762 (SUMNER) * Abstract; figures *	1	B 25 D 17/24 B 25 D 17/28 E 02 F 3/36
A	GB-A-2 207 880 (DOWDESWELL) * Abstract; figures *	1	
A	US-A-4 087 010 (STORMON) * Figures 6,7; column 3, lines 7-14,26-44 *	1	
A	DE-A- 895 729 (R. HAUSHERR & SÖHNE) * Claim 4; figures *	1	
A	DE-U-1 882 290 (CONTINENTAL) * Figures *	1	
A	US-A-1 948 476 (SAURER) * Figures 9,10 *	1	
A	FR-A-2 383 757 (NIPPON) * Figures 2,3 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 25 D
E 02 F
F 16 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-02-1990	WEIAND T.

CATEGORY OF CITED DOCUMENTS

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