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(54) **HYDRAULIC IMPACT HAMMER.**

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Description

The present invention relates to an impact hammer, particularly to the noise attenuation of a hydraulic hammer, so that the structure-borne noise is insulated in between the impact member and the side plates of the impact hammer.

A hydraulic hammer is used for instance in breaking frozen earth's crust, or in tunnel extraction in areas where the earth is softer than the bedrock. The practical applications of the hydraulic hammer lead to the fact that while using the hammer, the created noise causes problems to the environment, and particularly to the users of the hammer. Therefore various solutions have been suggested for reducing noise. One of the suggested arrangements comprises vibration-restricting rubber bits in between the protective casing and the impact member, which bits are installed in longitudinal direction with respect to the axis of the impact member. The rubber bits are so shaped that one part thereof is attached to the protective casing and the other part to the impact member. Thus the rubber bits are subjected to relatively great shearing strengths during the impact stroke, and consequently the working age of such rubber bits cannot be very long.

From the EP-A-144,282 there is known a hydraulic impact hammer where separate attenuation elements are used for eliminating noise during the use of the hammer. The attenuation elements are made of some elastic material. In order to install these attenuation elements, the protective casing of the hammer must be provided with special installation openings, or the impact member must be fitted within over-sized attenuation elements. Thus the installation of the attenuation elements is cumbersome and requires special tools. Moreover, while using the hammer, bending strains are directed to the protective casing, so that the bending also causes defective extra strain to the hammer housing.

The EP patent 191,336 describes a hydraulic impact hammer where the noise caused by the use of the hammer is reduced by means of the installation arrangements of the working unit. A special feature of the hammer is that the employed attenuation elements are arranged transversally with respect to the axis of the impact member, around fastening bolts connecting the different parts of the protective casing. The employed attenuation elements are rubber collars, which, however, take up a lot of space and make the hammer rather large in size.

The object of the present invention is to eliminate some of the drawbacks of the prior art and to create a hydraulic impact hammer which is more ecological, structurally more durable and easier on

its assembly and advantageous in size, with reduced noise and vibration, so that the structure-borne noise caused by the hammer can in all essential respects be insulated within a closed casing formed by side plates, in between the impact hammer and the side plates. The essential novel features of the invention are apparent from the appended patent claims.

This object is accomplished by the fact that the casing of the hydraulic impact hammer of the invention is formed of two separate side plates, which are metallicity interconnected for instance by means of a screw, a bolt or a catch joint. An attenuation element is supported against each side plate, so that the bottom part of the housing of the impact hammer remains in between the attenuation elements when the plates are attached to each other. Then a metallic contact between the impact hammer and the side plates can be advantageously avoided, and the noise caused by the operation of the hammer is essentially reduced.

Further the attenuation elements are located at the bottom part of the side plates, and their contact surfaces are shaped essentially to conform to the walls formed by the side plates of the hammer casing, so that when the side plates are connected to each other, the attenuation elements are wedged to remain compressed both in the longitudinal and the transversal direction of the impact hammer. Moreover, the bottom part of the housing of the hammer is pressed in the direction of the connecting members, with respect to the attenuation elements. Thus the impact hammer is easily supported at the bottom part of the housing, in three different directions at the attenuation elements, which means that strain is not directed to other parts of the hammer. At the same time it means, from the point of view of the operation of the hammer, that the vibration and noise of the hammer are essentially reduced.

The attenuation elements of the impact hammer of the invention are advantageously made of some elastic material, such as cellular polyurethane or rubber or some rubber compound. Thus the attenuation elements can easily be made oversized, so that while fastening the side plates of the hammer casing to each other, they are precompressed 15 - 40%, advantageously 20 - 30% of that measure of the attenuation element which it had prior to the installation of the side plates. While using an impact hammer, the moment strains directed to the attenuation elements are greater than the precompression, in which case the attenuation elements may be subjected to strains that surpass the limit of elasticity of the material, which possibly cuts the working life of the attenuation elements. Therefore there can, when necessary, be arranged restricting members in connection with the attenu-

ation elements, which restricting members are advantageously made of metal. These restricting members receive the charge when the predetermined maximum compression is surpassed. The maximum compression is 50 - 70% of the measure which the attenuation element had prior to the fastening. The restricting members can be advantageously located either inside the attenuation elements, or independent of the attenuation elements, outside thereof.

In the impact hammer of the invention, an essentially good vibration and noise attenuation is achieved together with a light structure. The hammer also is easy to maintain, because the casing is formed of two parts, which are interconnected with simple connecting members. Moreover, the working life of the attenuation elements can be extended by using restricting members, which prevent the predetermined maximum compression of the attenuation elements from being surpassed. By means of the attenuation elements, the bottom part of the impact hammer is easily supported, which essentially prevents any extra charges against the housing of the hammer for instance when the casing is being bent.

The invention is explained in more detail below, with reference to the appended drawing where figure 1 illustrates a preferred embodiment of the invention, seen in a partial side-view cross-section, figure 2 represents a partial side-view cross-section the embodiment of figure 1, when the embodiment of figure 1 is turned 90° around the vertical axis, and figure 3 illustrates the embodiment of figure 1, seen from the direction B-B.

In the drawing the protective casing of the impact hammer is formed of two side plates 1 and 2, which can be attached to each other by means of the screws 3. In addition to this, the housing of the impact hammer is indicated in figures 1 and 2 by the dotted line 4. At the bottom part of the housing 4 of the hammer, in the side plates 1 and 2, there are provided the attenuation elements 5 and 6. The side plates 1 and 2 are so designed, that when the side plates 1 and 2 are being attached to each other, the attenuation elements 5 and 6 are compressed both in the transversal direction Y of the housing 4, and in the transversal direction X and longitudinal direction Z. Thus the contact surfaces of the attenuation elements 5 and 6 advantageously and essentially conform to the side plates 1 and 2. Figures 1 and 3 also describe metallic restricting members 7 and 8, which prevent the attenuation elements 5 and 6 from being subjected to compressions greater than the predetermined maximum compression.

Claims

1. A hydraulic impact hammer comprising a protecting casing (1,2) with a lining of attenuation elements (5,6) for eliminating the noise and vibration caused by the impact hammer, the contact surfaces of the attenuation elements being shaped essentially to conform to the casing and to the impact hammer (4) in that the impact hammer (4) is supported in between the attenuation elements with the attenuation elements being compressed in three directions (X,Y,Z) of the hammer, **characterized** in that
 - a) the casing of the hydraulic impact hammer is formed of two separate side plates (1,2) which are metallically interconnected to each other,
 - b) the attenuation elements (5,6) are located at the tool end only of the side plates, and
 - c) are wedged to remain compressed both in the longitudinal and the transversal direction of the impact hammer, when the side plates are connected to each other, to easily support the impact hammer at the bottom part thereof, which means that strain is not directed to other parts of the hammer.
2. The impact hammer of claim 1, **characterized** in that the attenuation elements (5, 6) are made of polyurethane.
3. The impact hammer of claim 1, **characterized** in that the attenuation elements (5, 6) are made of rubber or rubber compound.
4. The impact hammer of any of the claims 1-3, **characterized** in that the compression of the attenuation elements (5, 6) is 15 - 40% of the measure that the attenuation element had prior to the installation.
5. The impact hammer of any of the claims 1-4, **characterized** in that in connection with the attenuation elements (5, 6), there are provided restricting members (7, 8) receiving the charge of the impact hammer when the predetermined maximum compression is surpassed.
6. The impact hammer of claim 5, **characterized** in that the restricting members (7, 8) are located inside the attenuation elements (5, 6).
7. The impact hammer of claim 5, **characterized** in that the restricting members are located apart from the attenuation elements (5, 6).

Patentansprüche

1. Hydraulischer Schlaghammer mit einem Schutzgehäuse (1, 2), das mit Dämpfungselementen (5, 6) zur Beseitigung des Lärms und der Schwingungen ausgekleidet ist, die durch den Schlaghammer erzeugt werden, wobei die Kontaktflächen der Dämpfungselemente im wesentlichen so geformt sind, daß sie sich dem Gehäuse und dem Schlaghammer (4) anpassen, indem der Schlaghammer (4) zwischen den Dämpfungselementen gehalten wird, wobei die Dämpfungselemente in drei Richtungen (X, Y, Z) des Hammers komprimiert werden, dadurch gekennzeichnet, daß
 - a) das Gehäuse des hydraulischen Schlaghammers von zwei getrennten Seitenwangen (1, 2) gebildet wird, die metallisch miteinander verbunden sind,
 - b) die Dämpfungselemente (5, 6) nur an dem werkzeugseitigen Ende der Seitenwangen angeordnet sind und
 - c) verkeilt sind, um sowohl in Längs- als auch in Querrichtung des Schlaghammers komprimiert zu bleiben, wenn die Seitenwangen miteinander verbunden sind, damit der Schlaghammer leicht an ihrem unteren Ende gehalten wird, wodurch Belastungen auf andere Teile des Hammers vermieden werden.
2. Schlaghammer nach Anspruch 1, dadurch gekennzeichnet, daß die Dämpfungselemente (5, 6) aus Polyurethan bestehen.
3. Schlaghammer nach Anspruch 1, dadurch gekennzeichnet, daß die Dämpfungselemente (5, 6) aus Gummi oder einer Gummimischung bestehen.
4. Schlaghammer nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Kompression der Dämpfungselemente (5, 6) 15 bis 40 % des Maßes beträgt, das das Dämpfungselement vor dem Einbau hatte.
5. Schlaghammer nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß in Verbindung mit den Dämpfungselementen (5, 6) Begrenzungselemente (7, 8) vorgesehen sind, welche die Last des Schlaghammers aufnehmen, wenn die vorbestimmte Höchstkompression überschritten wird.
6. Schlaghammer nach Anspruch 5, dadurch gekennzeichnet, daß die Begrenzungselemente (7, 8) innerhalb der Dämpfungselemente (5, 6)

angeordnet sind.

7. Schlaghammer nach Anspruch 5, dadurch gekennzeichnet, daß die Begrenzungselemente getrennt von den Dämpfungselementen (5, 6) angeordnet sind.

Revendications

1. Marteau à percussion hydraulique comportant un boîtier protecteur (1, 2) muni d'un revêtement d'éléments d'atténuation (5, 6) pour éliminer le bruit et les vibrations entraînés par le marteau à percussion, les surfaces de contact des éléments d'atténuation étant mises en forme pour se conformer pratiquement au boîtier et au marteau à percussion (4), le marteau à percussion (4) étant supporté entre les éléments d'atténuation, les éléments d'atténuation étant comprimés dans trois directions (X, Y, Z) du marteau, caractérisé en ce que
 - a) le boîtier du marteau à percussion hydraulique est formé de deux plaques latérales séparées (1, 2) qui sont reliées métalliquement l'une à l'autre,
 - b) les éléments d'atténuation (5, 6) sont situés au niveau de l'extrémité pour outil uniquement des plaques latérales, et
 - c) sont coincés pour rester comprimés à la fois dans la direction longitudinale et dans la direction transversale du marteau à percussion, lorsque les plaques latérales sont reliées l'une à l'autre, pour supporter facilement le marteau à percussion au niveau de la partie formant fond de celui-ci, ce qui signifie qu'une contrainte n'est pas dirigée vers les autres parties du marteau.
2. Marteau à percussion selon la revendication 1, caractérisé en ce que les éléments d'atténuation (5, 6) sont constitués de polyuréthane.
3. Marteau à percussion selon la revendication 1, caractérisé en ce que les éléments d'atténuation (5, 6) sont constitués de caoutchouc ou de composé à base de caoutchouc.
4. Marteau à percussion selon l'une quelconque des revendications 1 à 3, caractérisé en ce que la compression des éléments d'atténuation (5, 6) est de 15 à 40% de la dimension que l'élément d'atténuation avait avant l'installation.
5. Marteau à percussion selon l'une quelconque des revendications 1 à 4, caractérisé en ce qu'en liaison avec les éléments d'atténuation (5, 6), sont agencés des éléments de restric-

tion (7, 8) recevant la charge du marteau à percussion lorsque la compression maximale prédéterminée est dépassée.

6. Marteau à percussion selon la revendication 5, caractérisé en ce que les éléments de restriction (7, 8) sont situés à l'intérieur des éléments d'atténuation (5, 6). 5
7. Marteau à percussion selon la revendication 5, caractérisé en ce que les éléments de restriction sont écartés des éléments d'atténuation (5, 6). 10

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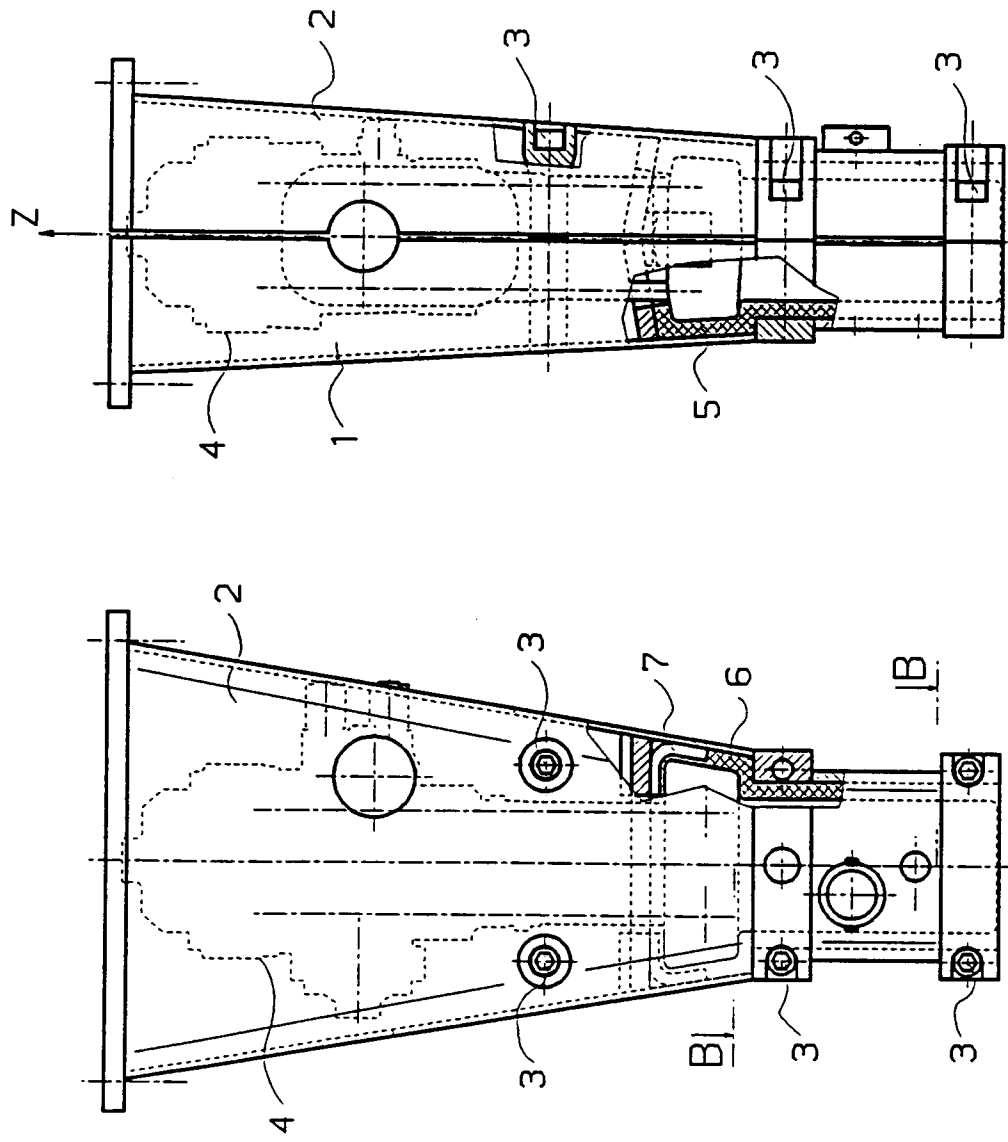


Fig. 1

Fig. 2

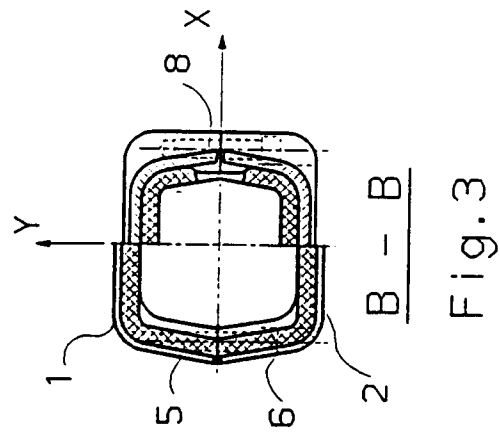


Fig. 3