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(54) Hydraulic impact hammer.

(57) The invention relates to a hydraulic impact hammer, particularly to the housing structure of a hydraulic impact hammer, which structure comprises a hydraulically operated piston (7, 19) and a member (1, 11) for guiding the piston, an impact member (8, 20) and a member (2, 12) for guiding the impact member, the said structure being encased in a protective casing (6, 18). According to the invention, the piston-guiding member (1, 11) and the member (2, 12) guiding the impact member are made separate (3, 15) with respect to each other in order to prevent the proceeding of the tension wave reflected from the impact member (8, 20). However, the piston-guiding member (1, 11) and the member (2, 12) guiding the impact member are interconnected so that the piston-guiding member (1, 11) and the member (2, 12) guiding the impact member are both connected to at least one attenuating element (4, 5; 14, 16, 17).

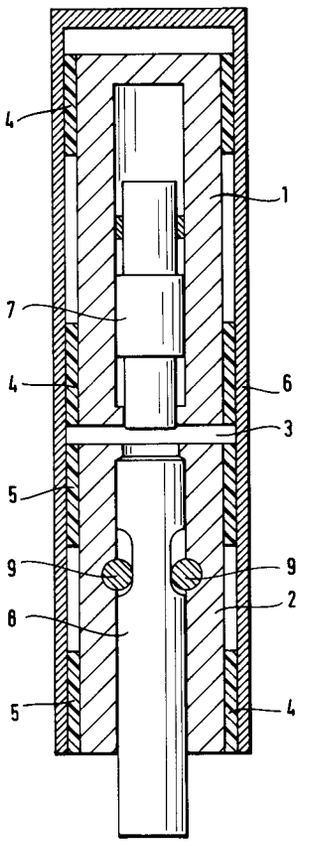

Fig. 1

EP 0 522 344 A2

The present invention relates to a hydraulic impact hammer, particularly to the frame structure of an impact hammer, where the housing guiding the piston of the impact hammer is separated from the housing surrounding the impact member, so that the tension wave reflected from the impact member is prevented from proceeding to other parts of the hammer.

Impact hammers are divided, on the basis of their operating power for instance, to two groups, e.g. pneumatic and hydraulic impact hammers. The power of pneumatic impact hammers is essentially lower than that of hydraulic impact hammers. Likewise, pneumatic impact hammers are normally manually operated, whereas hydraulic impact hammers are generally used in connection with various machines. However, a tension wave is reflected to other parts of the device with pneumatic impact hammers as well. The DE patent 805,268 suggests an arrangement for reducing the effect of this tension wave. In the DE patent 805,268, the guide ring of the impact member is made of elastic material. Moreover, the collar supporting the impact member is made of attenuating material. A similar structure is described in the DE patent 805,748.

In known structural arrangements of hydraulic impact hammers, the housing elements of the impact hammer, including a control valve system and valve housings of hydraulic fluid, a piston and a member guiding the piston, various sealing rings and a member guiding the impact member, are permanently interconnected with either long binding screws or with several shorter bolts. The obtained structure is further suspended by means of attenuating elements and arranged inside a casing provided around the impact hammer. The joining of the housing elements to each other causes various heavy strains on the whole impact hammer. Thus the masses to be attenuated are large, which charges heavy loads on the various housing elements, and particularly to the joining members of the housing elements. In similar fashion, in operation the junction surfaces of the impact hammer slide with respect to each other and are subjected to wearing. Moreover, the tension wave reflected from the impact member hits the housing structure, which causes extra strains to other housing elements, as well as vibration and noise. The use of binding screws as the coupling members of the housing elements also causes transformations in the said elements and makes the maintenance of the impact hammer difficult, because the interconnected elements must be taken apart.

The object of the present invention is to achieve a new housing structure for a hydraulic impact hammer, which is more secure in operation and simpler in structure, and wherein the member guiding the piston of the impact hammer is separated from the member guiding the impact member of the impact hammer, and where these both are advantageously separately attenuated with respect to the impact hammer casing. The essential novel features of the invention are apparent from the appended patent claims.

According to the invention, the member guiding the piston of the impact hammer and the member guiding the impact member are both separately suspended by means of at least one attenuating element, so that there is no essential metallic contact between these two housing elements. An immediate contact between the piston and the impact member is only created at the moment of striking, when the piston hits the impact member.

In the impact hammer of the invention, the attenuating elements allow the housing elements of the impact hammer to move within the protective casing both axially and radially, depending on the load. The attenuating elements guiding the impact member receive the forces caused by the actuator of the impact hammer, the forces reflected from the tension waves of the impact member and the forces created when the impact member hits, by intermediation of the holding pins, the member guiding the impact member in a so-called empty stroke, when there is no material to be crushed under the impact hammer. The attenuating elements of the member guiding the piston receive for instance the forces created while accelerating the piston of the impact hammer.

In the impact hammer of the invention, the attenuating elements of both the member guiding the piston and of the member guiding the impact member are advantageously installed so that the attenuating elements centralize the housing elements with respect to each other when there is no external load. Under external load, the housing elements can be arranged radially with respect to each other, if necessary by means of a separate guiding surface. Moreover, the transmission of vibration and noise to the casing surrounding the impact member of the invention is advantageously prevented by using attenuating elements, which arrangement leads to a simple and effective attenuation of vibration and noise.

In the impact hammer of the invention, the employed attenuation elements can be made of solid, gaseous or liquid materials. In a simple form, the attenuating elements are advantageously made of some elastic material, such as rubber, plastic, polyurethane or other similar material. In that case the attenuating elements advantageously contain straight or curved surfaces.

The attenuating elements of the invention can also be for instance spring-like, in which case they are advantageously made of metal. Further, the attenuating effect of the attenuating elements can

advantageously be created for example by means of levitation caused by an air cushion or a magnet. In order to create the attenuating effect, hydraulic fluid can also be used. In the impact hammer of the invention, the attenuating elements of the member guiding the piston and of the member guiding the impact member can be either of a similar type, in which case the attenuating effect is obtained in a similar fashion, or of two different types, in which case different sources of materials are used for creating the attenuating effect. Advantageously the attenuating elements are, however, so installed, that there are no wearing parts located in between the protective casing of the impact hammer of the invention and the housing elements of the impact hammer.

According to the invention, by essentially flexibly separating the piston-guiding member of a hydraulic impact hammer from the housing element guiding the impact member, the access of tension waves reflected from the impact member, and the access of the forces caused by bending the impact member, to the piston-guiding part and to the valve system guiding the hydraulic fluid, is advantageously prevented. Thus the valve system controlling the hydraulic fluid, which system is needed for operating the piston, is subjected to lower external forces, so that the valve system can be made simpler and more reliable. Moreover, the control and bearings of the piston can be measured for a smaller load. This simplifies the structure, and the risk of seizure in the piston and the cylinder is reduced.

The invention is explained in more detail with reference to the appended drawings, where

figure 1 illustrates a preferred embodiment of the invention in a side-view cross-section while the piston is in its top position,

figure 2 illustrates the embodiment of figure 1 in a side-view cross-section, at a moment when the impact hammer is striking, and

figure 3 illustrates another preferred embodiment of the invention in a side-view cross-section, when the housing elements are guided with a radial attenuator.

According to figures 1 and 2, the member 1 guiding the piston and the member 2 guiding the impact member are separated from each other by the interval 3. The connection between the members 1 and 2 is achieved so that member 1 is, by means of at least one elastic attenuating element 4, and member 2 is by means of at least one elastic attenuating element 5, centralized and supported inside the protective casing 6. Thus the piston 7 hits the top end of the impact member 8, advantageously owing to the centralizing achieved by means of the atteanuating elements 4 and 5. The downwardly motion of the impact member 8 is restricted by means of holding pins 9.

In figure 3, in between the piston-guiding member 11 and the member 12 guiding the impact member, there is installed an attenuating element 14 of the connecting surface 13, by means of which element the members 11 and 12 are radially guided also during charge, i.e. during the impact. Figure 3 also contains reference numbers for the interval 15 in between the members 11 and 12, for the attenuating element 16 guiding the piston, for the attenuating element 17 of the member 12 guiding the impact member, for a common protective casing 18 of members 11 and 12, for the piston 19, for the impact member 20 and for the holding pin 21 of the impact member. The parts illustrated in figure 3 are operated in similar fashion as the respective parts of figures 1 and 2.

Claims

1. A hydraulic impact hammer, particularly a housing structure for a hydraulic impact hammer, which structure comprises a hydraulically operated piston (7, 19) and a piston-guiding member (1, 11), an impact member (8, 20) and a member (2, 12) guiding the impact member, the said structure being encased in a protective casing (6, 18), **char ac-terized** in that the piston-guiding member (1, 11) and the member guiding the impact member (2, 12) are made separate (3, 15) with respect to each other in order to prevent the proceeding of the tension wave reflected from the impact member (8, 20).

2. The hydraulic impact hammer of claim 1, **characte -rized** in that the piston-guiding member (1, 11) and the member (2, 12) guiding the impact member are interconnected so that the piston-guiding member (1, 11) and the member (2, 12) guiding the impact member are both connected to at least one attenuating element (4, 5; 14, 16, 17).

3. The impact hammer of claim 1 or 2, **characteri -zed** in that the attenuating element (4, 5; 16, 17) is connected to the protective casing (6, 18).

4. The impact hammer of one of claims 1-3, **characteri -zed** in that the attenuating element (14) is connected to a radially directed connecting surface (13) in between the piston-guiding member (11) and the member (12) guiding the impact member.

5. The impact hammer of any of the preceding claims, **cha -racterized** in that the attenuating

element (4, 5; 14, 16, 17) is made of some elastic material.

6. The impact hammer of any of the claims 1 - 4, **characterized** in that the attenuating element (4, 5; 14, 16, 17) is a metal spring.

7. The impact hammer of any of the claims 1 - 4, **cha-r acterized** in that the attenuating element (4, 5; 14, 16, 17) is creatable by means of levitation caused by a magnet.

8. The impact hammer of any of the claims 1 - 4, **cha-r acterized** in that the attenuating element (4, 5; 14, 16, 17) is creatable by means of hydraulic fluid.

9. The impact hammer of any of the claims 1 - 4, **cha-r acterized** in that the attenuating element is an air cushion.

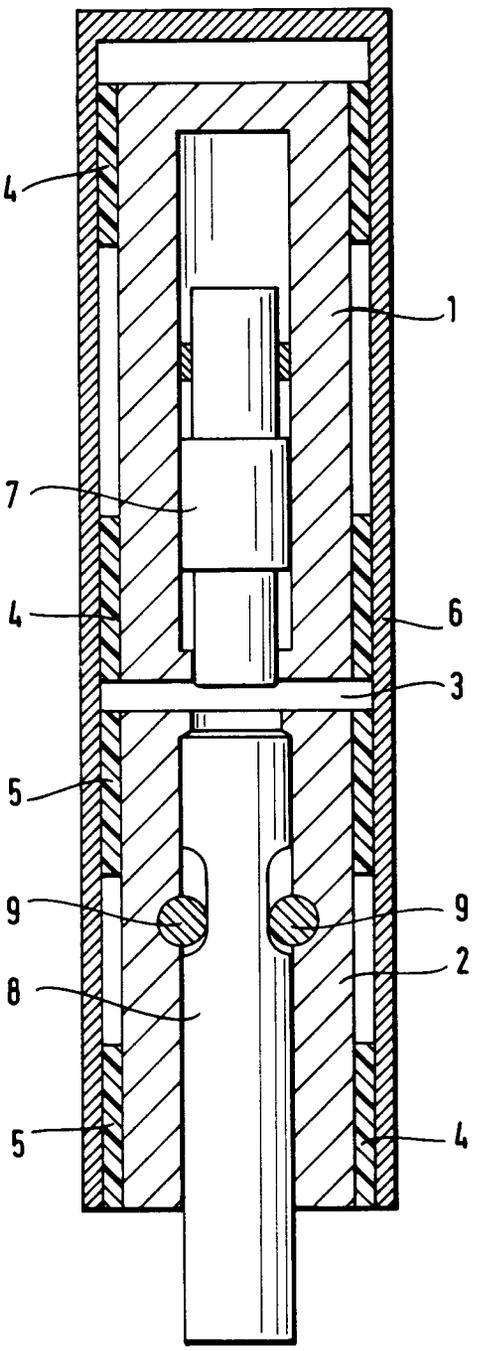

Fig. 1

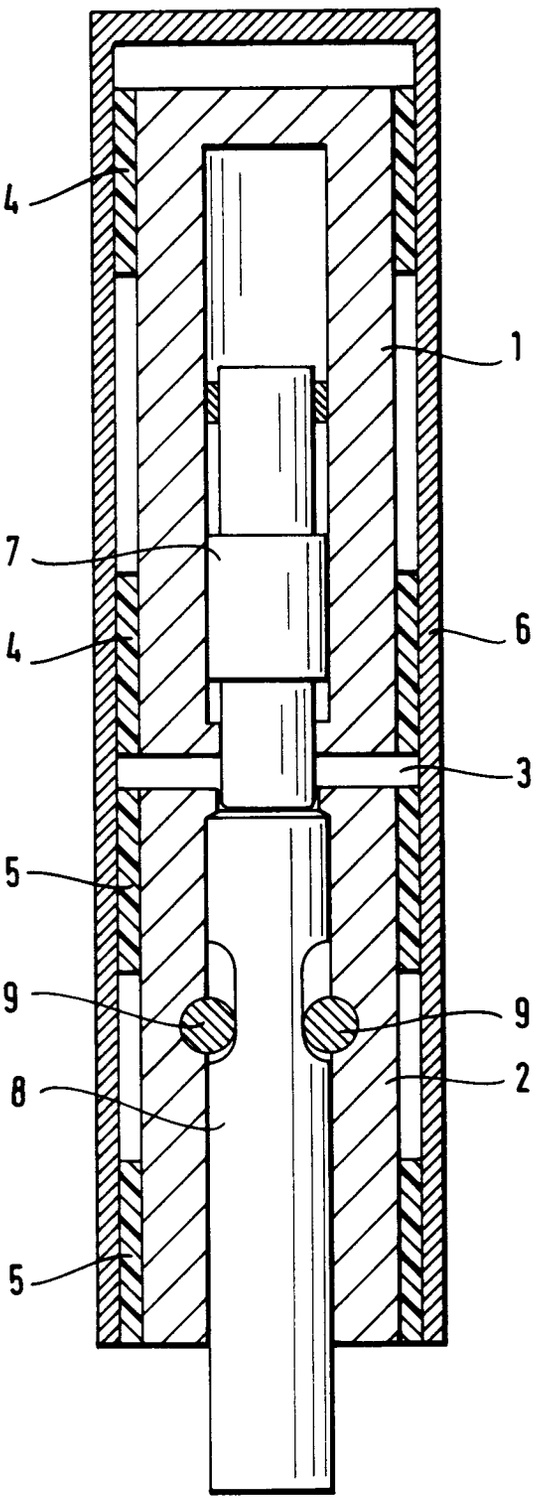

Fig. 2

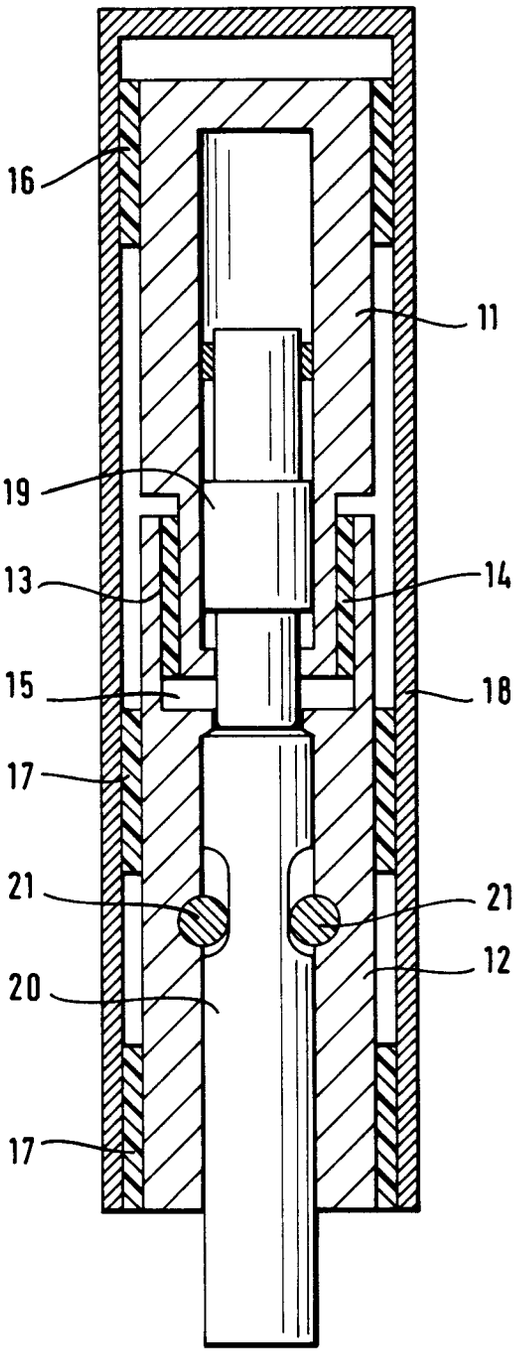

Fig. 3