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HYDRAULIC CUSHION BLOCK AND IMPACT TYPE PILE DRIVING HAMMERS

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Fig. 1.

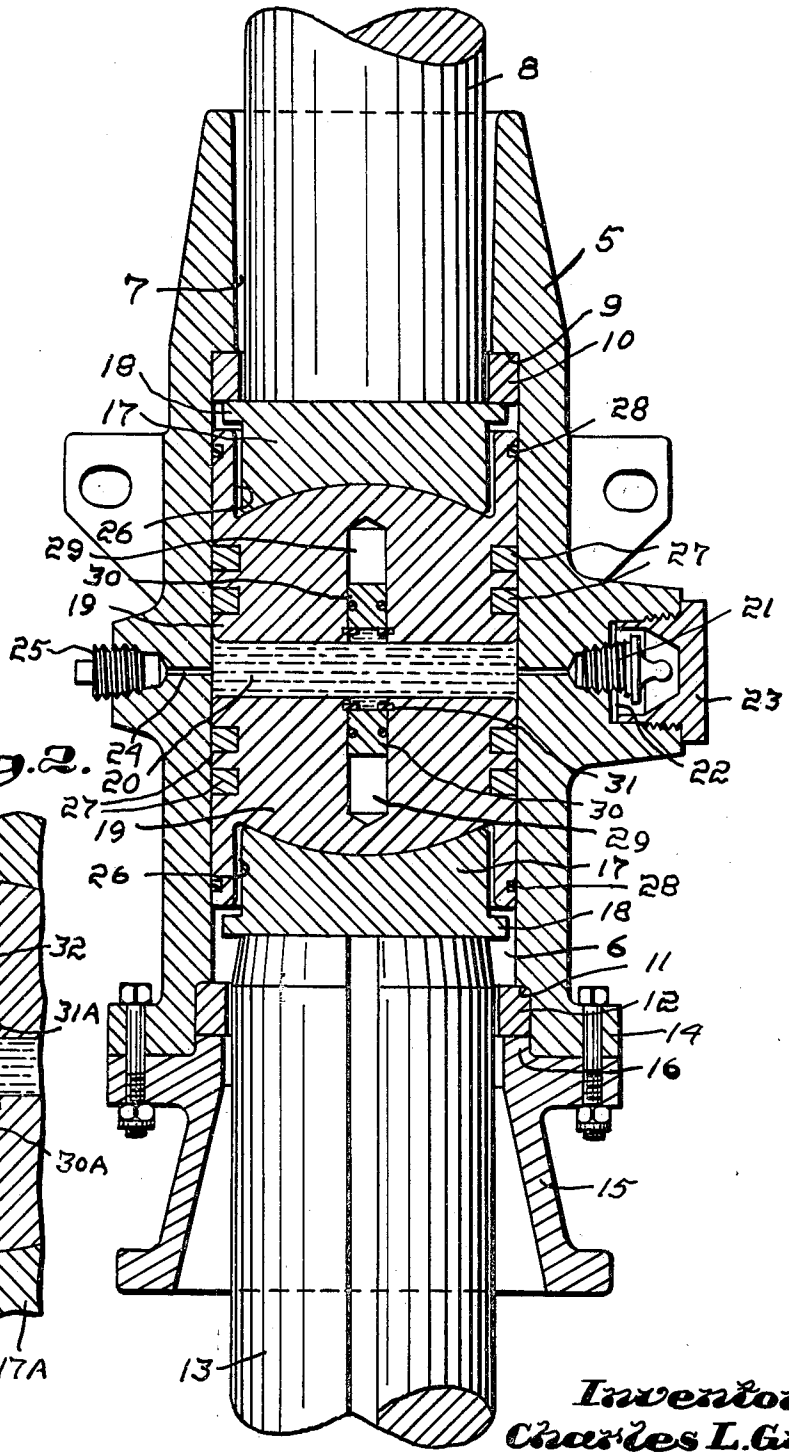
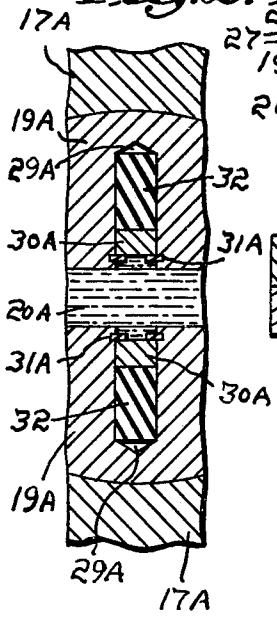



Fig. 2.




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# HYDRAULIC CUSHION BLOCK AND IMPACT TYPE PILE DRIVING HAMMERS

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## ABSTRACT OF THE DISCLOSURE

Hydraulic cushion blocks for pile driving hammers of the impact type are disclosed, each block having a cylinder in which upper and lower heads are slidably confined, the upper head for engagement by the ram point, the lower head for engagement with the pile. A pair of anvils are slidably sealed in the cylinder and confine a fluid body between them. The outer face of each anvil is in engagement with the inner face of an appropriate one of the heads, one engaged face being concave and the other convex.

The present invention relates to hydraulic cushion blocks for pile driving hammers of the impact type.

While impact type pile driving hammers are satisfactory in use, their use sometimes results in damage to the pile making it desirable to limit the velocity of the ram with corresponding loss in the capability of the hammer.

The present invention has, for its objective, a block to be disposed between a ram point and the pile to be driven and provide a hydraulic cushion to suitably cushion the hammer impacts thus to avoid pile damage. In accordance with the invention, this objective is attained with a hydraulic cushion block having a cylindrical chamber in which upper drive and lower driven heads are slidably retained. A pair of anvils are slidably sealed in the cylinder and confine a fluid body between them and the outer face of each anvil is in engagement with the appropriate one of the heads with one engaged face being concave and the other convex.

While such a cushioned block meets most requirements, it may be desirable to further modify peak stresses. In accordance with the invention, this objective is attained by providing additional means in communication with the interior of the chamber in the zone of the fluid body and resiliently yieldable to pressure exerted thereon to dampen peak stresses thus to permit higher ram velocities to be safely used.

In the accompanying drawings, there are shown embodiments of the invention illustrative of these and other of its objectives, novel features, and advantages.

In the drawings:

FIG. 1 is a section taken vertically through a hydraulic cushion block in accordance with the invention, and

FIG. 2 is a fragmentary, vertical section illustrating another embodiment of the invention.

A hydraulic cushion block **5** in accordance with the invention has a cylindrical chamber **6** opening through its lower end. At the other end of the block **5**, there is an axial passage **7** of a somewhat reduced diameter for the ram point **8** and defining an internal shoulder **9** against which a yieldably resilient ring **10**, desirably of nylon, is seated. At the lower end of the chamber **6**, there is an external shoulder **11** for a yieldably resilient ring **12**, also desirably of nylon, and dimensioned to protrude as a flange into the chamber **6** and to receive within it the upper end of the pile **13**. At the lower end of the block **5**, there is a flange **14** to which an outwardly and downwardly flared receiver **15** is clamped to facilitate the positioning of the block **5** on the upper end of the pile **13**. The receiver **15** is provided with an annular projection **16** for holding the ring **12** seated against the shoulder **11**.



Within the chamber **6**, there are identical upper and lower drive heads **17** each having a marginal, ring-engaging flange **18** adjacent to its outer end and its inner face concave. The outer face of the upper drive head is in engagement with the ram point **8** and the outer face of the lower drive head is in engagement with the upper end of the pile **13**. Identical upper and lower anvils **19** are positioned in the chamber **6** between the heads **17** with their proximate faces spaced apart by a fluid body **20**, typically grease, admitted through a conventional, self-closing nipple **21** located in a socket **22** into which a plug **23** is threaded. An air vent **24** has a removable plug **25** to permit venting when grease is being introduced into the chamber **6**. The outwardly disposed ends of the anvils **19** having axial seats **26**, each receiving an appropriate one of the heads **17** and having its bottom convex for complemental engagement with the concave head face. In order to ensure stability in use, the center of curvature of the engaged faces of each head and anvil is located along the axis of the other anvil. Each anvil has fluid pressure sealing rings **27** and, adjacent its outer end, a wiping ring **28**.

When the block **5** is operatively positioned between the ram point **8** and the pile **13**, not only are misalignment problems eliminated but also possible damage to the pile **13** is prevented because of the cushioned impact of the hammer blows.

As such cushioned hammer blows may still exert such high impact forces, particularly when ram velocities are high that pile damage might ensue, means are provided enabling peak stresses to be lowered. To achieve that result the anvils **19** are provided with axial bores **29** in their proximate faces. A sealed piston **30** is slidably confined in each bore by a retainer **31** with the entrapped air providing a resiliently yieldable backing therefor.

In FIG. 2, a similar effect is attained by providing each anvil **19A** with an axial bore **29A** in which a piston **30A** is slidably retained with a rubber body **32** resiliently, yieldably backing it.

With such additional pressure responsive means, peak stresses may be lowered to permit the rams to be operated safely at maximum velocities without risk of pile damage.

We claim:

**1.** A hydraulic cushion block for pile driving hammers of the impact type, said block including a cylinder, upper drive and lower driven heads slidably retained within said cylinder at opposite ends thereof, a pair of slidably sealed anvils within said cylinder, and a fluid body confined in said cylinder between the proximate faces of said anvils, the outer face of each anvil being in engagement with the cover face of the appropriate one of said heads, one engaged face being concave and the other convex.

**2.** The cushion block of claim **1** in which the outer faces of the anvils are convex and the faces of the heads in engagement therewith are complementally concave, the center of curvature of the convex face of each anvil being within the other anvil when the anvils are spaced apart by the fluid body.

**3.** The cushion block of claim **1** and resiliently yieldable means in communication with the fluid body and operable to lower peak stresses developed by hammer impacts.

**4.** The cushion block of claim **1** in which at least one of the anvils has an axial bore, a piston in said bore, and a rubber body in said bore backing said piston.

**5.** The cushion block of claim **1** in which at least one of the anvils has an axial bore, a piston is slidably sealed

in said bore with the air entrapped in said bore functioning as a resiliently yieldable backing for said piston.

**6.** The cushion block of claim **1** in which each anvil includes an axial recess in which the appropriate head is entered.

**7.** The cushion block of claim **6** in which the cylinder includes an internal shoulder adjacent one end and an external shoulder adjacent the other end, an annular cushioning member is seated on each shoulder, and each head includes a marginal flange confined between the appropriate one of the annular members and the proximate end of the anvil in engagement with that head.



**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 886,193 | 4/1908 | De Witt | 173—131 |
| 1,622,896 | 3/1927 | Lowenstein | 173—131 X |
| 3,446,293 | 5/1969 | Guild et al. | 173—131 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 257,805 | 3/1913 | Germany. |

ERNEST R. PURSER, Primary Examiner