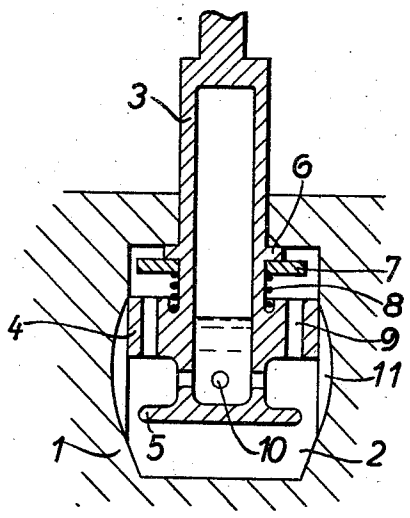
Jan. 3, 1933. J. URBANEK ET AL 1,893,187

CUSHIONING MECHANISM FOR POWER HAMMERS

Filed May 10, 1928



Julius Urbanek
Arthur Schneider
INVENTORS
By Otto Munk
their ATT'Y.

Patented Jan. 3, 1933 1,893,187

UNITED STATES PATENT OFFICE

JULIUS URBANEK, OF VIENNA, AUSTRIA, AND ARTHUR SCHNEIDER, OF DUSSELDORF, GERMANY

CUSHIONING MECHANISM FOR POWER HAMMERS

Application filed May 10, 1928, Serial No. 276,577, and in Austria May 31, 1927.

This invention relates to a hydraulic brake for the tup rod of drop hammers.

Drop hammers are known in which the tup rod, for example, board, toothed rack, piston rod together with the piston and the like are movable relative to the tup, and in which the momentum of the rod accumulated during the drop is dissipated by a brake. Drop hammers are further known in which the momentum of the rod movable relatively to the tup is accumulated in a steam or air chest of the tup cylinder, and in which the upward movement of the rod is checked by a hydraulic brake in the tup, which brake is only effective during said upward movement.

Both of these constructions have disadvantages. The first mentioned construction leads by the use of elastic driving medium such as, for example, steam, compressed air or the like to undesired high relative speeds between rod and tup causing the carrier owing to its violent stoppage to be adversely effected, whilst the last mentioned construction requires a very long path of retardation which mechanically is unsatisfactory.

The present invention consists in an appropriate combination of features of both constructions, in which a double hydraulic brake is employed, one braking action being chiefly effective during the downward movement of the tup, whilst the other is effective during the upward movement.

The invention is illustrated in the accompanying drawing in which the figure is a fragmentary vertical sectional view of one form of the invention.

A hydraulic cylinder 2 is arranged in the tup 1 and contains disc pistons 4 and 5 of a plunger piston 3. The tup rod of any desired construction, for example, a piston rod is fixedly connected to the plunger 3. In the drawing the piston is illustrated in its highest position. In this position the tup is supported by means of the cylinder cover on a collar 6 formed on the plunger piston 3. Ports 9 are formed in the piston 4 for the free passage of the braking liquid as a plate 7 for controlling them is held by a spring 8 in its highest position.

The illustrated position of the piston remains unchanged during the fall of the tup. When the tup delivers its blow and is retarded, then the piston moves downward and the braking fluid is introduced around the piston 5 and also through and around the piston 4. As in the usual distance of drop, the speed of the tup end is about 6.5 metres per second, and the liquid is forced at a great speed up through the ports 9. If the plate valve 7 were displaced on its seat against the piston 4, then simultaneously it would be forced upwardly at a great speed and thereby receive injury by forceful contact with the collar 6 or other limiting arrangement. This danger is avoided however by holding the plate valve 7 off its seat against the piston 4 by means of the spring 8, thereby rendering the raising of the valve by the liquid unnecessary.

The breaking liquid in its passage round and through the pistons is considerably throttled, so that the necessary super-pressure for retardation of the rod and dissipation of energy is produced.

The liquid displaced by the plunger piston 3 passes through holes 10 into the air reservoir provided in the interior of said piston.

In order to keep the braking force approximately constant in spite of the decreasing speed of the rod the lower part of the cylinder is reduced, so that the outlet cross section for the liquid displaced by the piston 5 constantly decreases. The rod therefore will from the moment of the blow make an approximately uniformly retarded movement until it comes to rest.

As soon as the operation of the tup takes place, the braking liquid will pass downwardly through the ports 9, and close the valve by overcoming the tension of the spring which is made only slightly more than the weight of the valve. Grooves 11 are provided in the cylinder wall for the overflow. As these grooves however are of small cross section the piston 4 upon its upward movement is met with a powerful resistance, and can only assume a small relative speed against the tup. As, moreover, the grooves merge out at the top, gentle contact of the collar 6 with the cylinder cover is ensured.

Upon the upward movement of the rod the lower piston 5 is non-effective, because the large cross section liberated by it cannot produce any preceptible throttling effect during the small upward speed of the rod.

According as the plunger piston 3 ascends, so does the braking liquid return from the air reservoir into the brake cylinder 2.

When the rod drops there is no need for the piston 4 to fit completely tight owing to its great speed, but it is well for it to do so upon ascent because only then will the relative movement of the rod against the tup be able to be regulated by the longitudinal profile of the grooves 11, or the cross-section of holes 15 or grooves 16 and so forth.

We claim:

1. A cushioning device, comprising a chamber containing a liquid, a plunger movable in said chamber and having a cavity communicating with said chamber, said chamber presenting a steadily decreasing cross sectional area to the plunger in its downward movement, said plunger comprising two flange-like projections dividing the chamber into three sections, the upper projection having ducts to establish communication between the two upper sections and a check valve for said ducts.

2. A cushioning device, comprising a chamber containing a liquid, a plunger movable in said chamber and having a cavity communicating with said chamber, there being ducts to establish communication between the cavity and the end section of the chamber, a collar on said plunger to limit the upward movement thereof within the chamber, said chamber presenting a steadily decreasing cross sectional area to the plunger in its downward movement, said plunger comprising two disc shaped projecting flanges dividing the chamber into three sections, the upper flange having ducts to establish communication between the two upper sections, and a check valve for said last mentioned ducts, said check valve comprising a resiliently supported disc adapted to seal said ducts.

3. A cushioning device, comprising a liquid containing chamber having an upper cylindrical portion of reduced cross sectional area, a lower conical portion of reduced cross sectional area and a mid-portion having grooves in its wall, a plunger movable in said chamber and having a cavity communicating with said chamber, said chamber presenting a steadily decreasing cross sectional area to the plunger in its downward movement, said plunger comprising two flange-like projections dividing the chamber into three sections, the upper projection having ducts to establish communication between the two upper sections, and a check valve for said ducts.

4. A cushioning device, comprising a liquid containing chamber having an upper cylindrical portion of reduced cross sectional area, a lower conical portion of reduced cross sectional area and a mid-section having grooves in its wall, a plunger movable in said chamber and having a cavity communicating with said chamber, there being ducts to establish communication between the cavity and the mid-section of the chamber, a collar on said plunger to limit the upward movement thereof within the chamber, said chamber presenting a steadily decreasing cross sectional area to the plunger in its downward movement, said plunger comprising two disc shaped projecting flanges dividing the chamber into three sections, the upper flange having ducts to establish communication between the two upper sections, and a check valve for said last mentioned ducts, said check valve comprising a resiliently supported disc adapted to seal said ducts.

5. A cushioning device for power hammers, comprising a liquid containing chamber, a plunger movable in said chamber and having a cavity communicating with the chamber, said chamber presenting a steadily decreasing cross sectional area to the plunger in its upward and in its downward movement, said plunger comprising two flange-like projections dividing the chamber into three sections, the upper projection having ducts to establish communication between the upper and mid-chamber sections, and a check valve to seal said ducts.

Signed at Vienna, Austria, this 20th day of April, 1928.

J. URBANEK.

Signed at Cologne, Germany, this 25th day of April, 1928.

ARTHUR SCHNEIDER.