

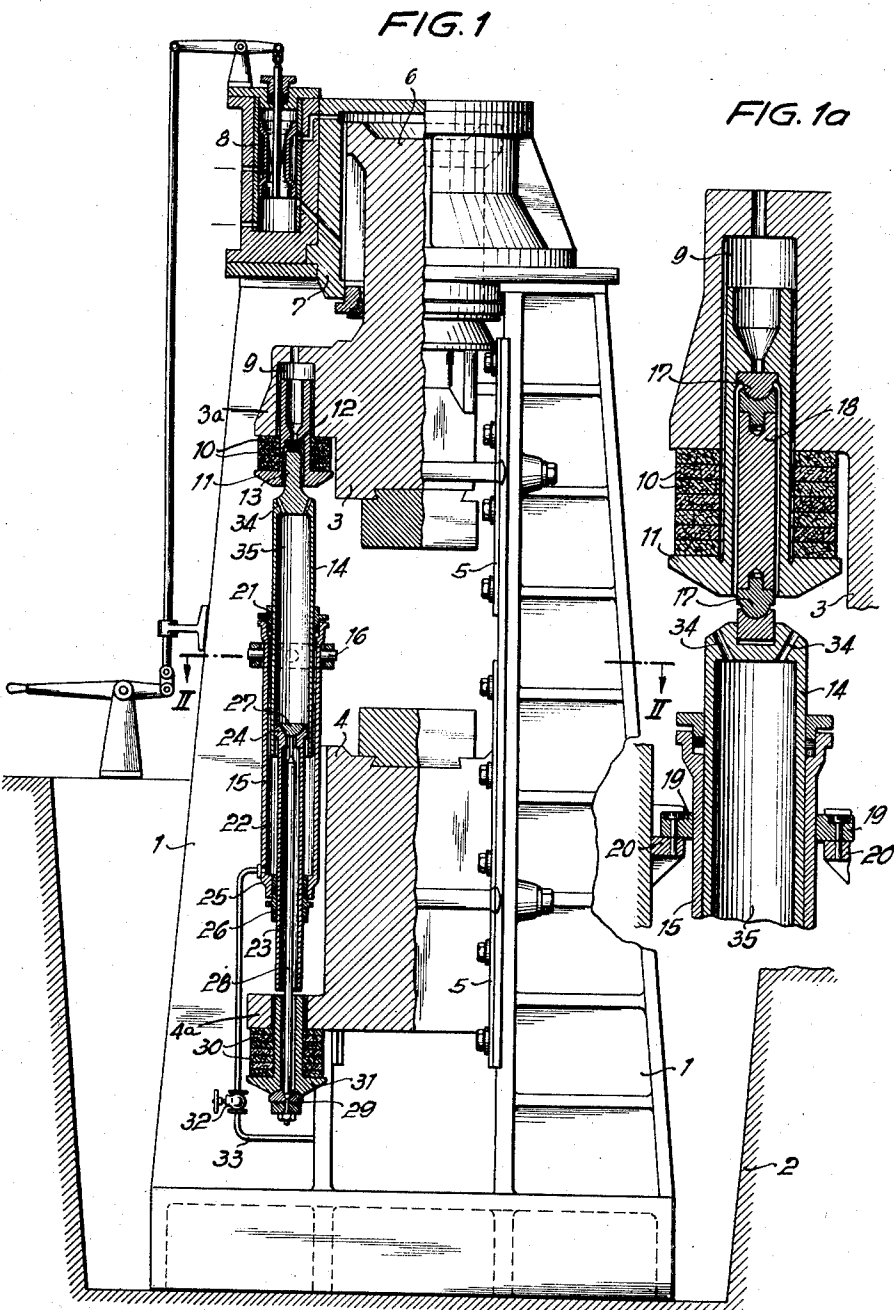
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COUNTERBLOW HAMMERS

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2 Sheets-Sheet 1



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FIG. 2

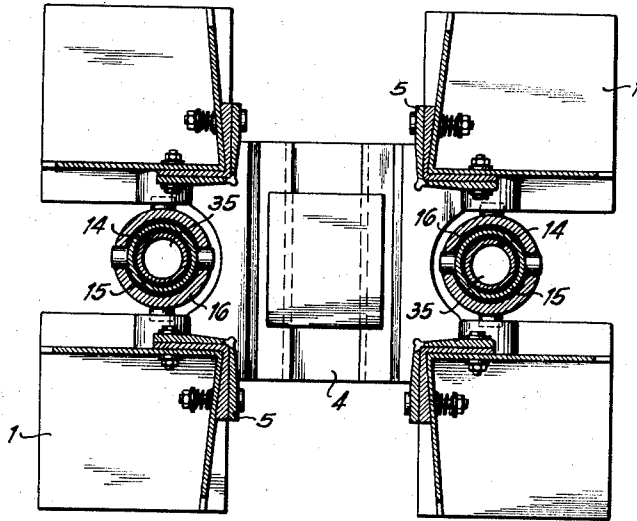


FIG. 3

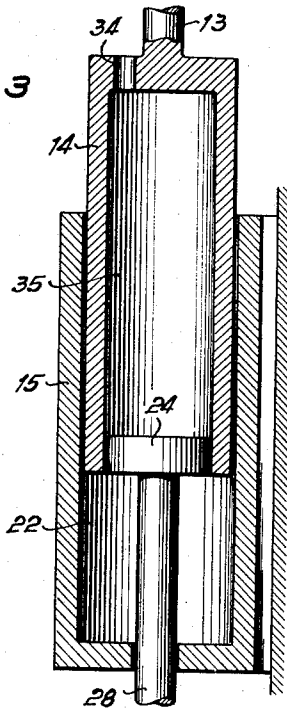
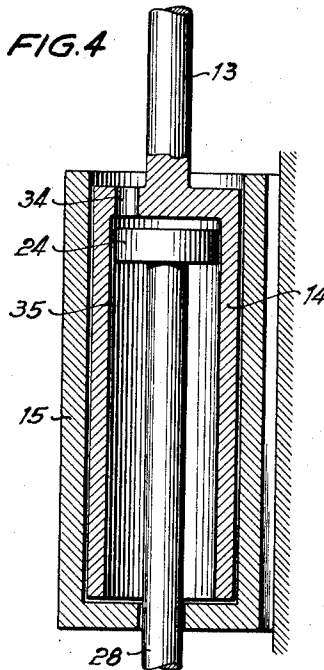


FIG. 4



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## COUNTERBLOW HAMMERS

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3 Claims. (Cl. 78—42)

The invention relates to counterblow hammers with counteracting upper and lower rams, such as are frequently used in the production of die forgings. The upper ram is rigidly connected to the driving piston. In order to obtain the counteracting movements of the upper and lower rams they can be connected in various ways.

Thus counterblow hammers are known in which the upper and lower rams are connected by steel bands guided over pulleys. In the case of counterblow hammers with medium blow strength, this manner of connecting the upper and lower rams has proved satisfactory. However in the case of counterblow hammers for heavier blows, for example exceeding 40 mts. the use of steel bands is no longer advantageous, because these are then too wide and the coupling of the ends of the steel bands with the upper and lower rams becomes too heavy.

Consequently, the upper and lower rams are, according to another suggestion, coupled by hydraulic means. In this case two pistons are fitted on the upper ram from which the operation emanates, each of which pistons descends into a lateral cylinder charged with pressure medium. These lateral cylinders communicate with another middle cylinder arranged below the lower ram and accommodating a piston acting on the lower ram. When the upper tup descends, the pistons mounted thereon displace the pressure medium in the lateral cylinders and press it into the middle cylinder with the result that the piston mounted on the lower ram rises as the upper ram descends. However, the arrangement of the middle cylinder underneath the lower ram adds considerably to the overall height and therefore to the weight of the weight of the counterblow hammer. Moreover the cost of the foundation is greater because the counterblow hammer extends very deeply below the floor of the shop.

Now the object of the invention is to produce a hydraulically coupled counterblow hammer, the constructional height and weight of which are as small as possible.

For this purpose it is proposed, according to the invention, to construct the plunger pistons linked up on the two sides of the upper ram as hollow bodies and to allow them to dip in to the pressure cylinders rigidly connected with the hammer uprights, piston rods being connected to the lower ram by the bottom casing of the pressure cylinders and guided by pistons slidable in the hollow plunger pistons. During the downward movement of the upper ram the plunger pistons entering the pressure cylinders displace the pressure medium in these cylinders so that it has no alternative but to rise in the hollow plunger pistons and force the pistons sliding therein upwards with the lower ram to which they are connected. By this construction the height of the counterblow hammer is reduced by the amount which would have been required for accommodating the pressure cylinder under the lower ram. The weight of the counterblow hammer is also considerably reduced by the elimination of the pressure conduits and the means for sup-

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porting the pressure cylinder, so that the foundation can be made more easily. Stoppages for carrying out repairs on the cylinder system are of considerably shorter duration because each cylinder system can be exchanged as a unit.

All movable parts of the cylinder system are provided with selftightening packings by stuffing boxes or the like. To prevent any misalignment of the plunger pistons on the upper ram and of the piston rods on the lower tup, due to the play of the upper and lower rams in their guides, from causing increased wear resulting in premature leakage of the stuffing boxes on the pressure cylinder, the construction according to the invention is such that the pistons coordinated to the lower ram are coupled with the lower ram by a draw-rod system ball-joint coupled with the pistons and the lower ram, and the plunger pistons coordinated to the upper ram are also connected to the upper ram by a ball joint. Thus the plunger pistons are operatively connected with the upper ram either by a ball joint in the case of cardan suspension of the pressure cylinders, or in the case of unarticulated suspension of the pressure cylinders by shoes coupled to the plunger pistons and to the upper ram by ball joints. To obtain a particularly advantageous form of construction for suspending the lower ram from the pistons, it is proposed, according to the invention, that the draw rod system provided for connecting the lower ram to its pistons and ball-jointed to the lower ram and to the pistons, shall extend through the hollow bored piston rods fitted with selftightening packings in the pressure cylinders with sufficient play on all sides. Now in the event of misalignment of the upper and lower rams in their guides, no detrimental bending stresses act on the cylinder system and its stuffing boxes. However, so as to compensate for any oil leakages, which are unavoidable in continuous service and which may occur to a different extent in the two systems and consequently lead to differences in pressure in the cylinder chambers, the cylinder chambers are interconnected by a conduit provided with a check valve, through which conduit the level of the pressure medium in the cylinder chambers can be equalized from time to time between the strokes.

If the speed of the lower ram is to be different from that of the upper ram, this is rendered possible according to the invention, by varying the wall thicknesses of the plunger pistons and the diameters of the pistons sliding therein. To prevent the driving cylinder of the upper ram from having to act against the force of the air being compressed in the plunger pistons above the pistons, during the upward movement, air escapement vents are provided in the plunger piston heads.

A counterblow hammer according to the invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a side elevation, partly in section;

Fig. 1a is a vertical sectional view of a further form of the invention.

Fig. 2 is a section on line II—II of Fig. 1, and

Figs. 3 and 4 show diametrically in longitudinal section and in two different positions the pressure cylinders, plunger pistons and pistons slidable one within the other.

In Figs. 1 and 2 the four uprights, which are rigidly connected to the foundations 2, are designated by 1. The upper ram 3 and the lower ram 4 are guided in two guide gibs 5 on each of the uprights 1, these conical guide gibs 5 being slidable to compensate for wear. The upper ram 3 is connected to a piston 6 which cooperates with the driving cylinder 7 arranged on the head of the uprights 1. Pressure medium can be brought to act selectively on either side of the piston 6 with the aid of a control valve. Packings 10 are fitted in the bores 9 provided in a lateral lug 3a on the upper ram 3 and bear resiliently against the

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ram 11 supporting the upper ram 3. This ram 11 acts on the extension 13 of the plunger piston 14 as shown in Fig. 1. In this instance the pressure cylinders 15 in which the plunger pistons 14 are guided, are movably mounted on the uprights 1 by means of universal joints 16. The rams 11 may, however, also act on the plunger pistons 14 through the intermediary of shoes 18 supported at both ends by spherical or ball joints 17, as illustrated in Fig. 1a. In this case the pressure cylinders 15 are rigidly connected by means of their flanges 19 to brackets 20 on the uprights 1. Stuffing boxes 21 prevent leakage of pressure medium from the cylinder chambers 22 between the plunger pistons 14 and the pressure cylinders 15. Pistons 24, each provided with a hollow piston rod 23, are slidable in the plunger pistons 14. These piston rods 23 extend each through the bottom casing 25 of its pressure cylinder 15, stuffing boxes 26 being also provided to prevent leakage of the pressure medium. Draw rod systems 28, guided with play in the hollow piston rods 23, are linked to the pistons 24 through the intermediary of ball joints 27, which draw-bar systems 28 couple the pistons 24 by means of additional ball joints 29 with the rams 31 also resiliently supported relatively to a lateral lug 4a on the lower tup 4 by elastic packings 30.

The cylinder chambers 22 of the two pressure cylinders 15 are interconnected by a conduit pipe 33 provided with a check valve 32. The cylinder chambers 22 can, in the event of considerable oil leakage, be topped up through the conduit pipe 33. The cylinder chambers 35 of plunger pistons 14 communicate with the atmosphere by means of bores 34.

The counterblow hammer operates in the following manner:

In its initial position, in which the upper tups 3 and the lower tups 4 are moved apart, the plunger pistons 14 and the pressure cylinders 15 and also the pistons 24 occupy the position shown in Fig. 3. If steam or compressed air is fed into the driving cylinder 7, the upper tups 3 and the plunger pistons 14 connected therewith will first move downwards, compressing the pressure medium in the cylinder chambers 22. The compressed pressure medium has no other alternative than to rise in the plunger pistons 14 and carry with it the pistons 24. As the lower ram 4 is connected to the pistons 24 by means of the piston rods 28, the upper ram 3 and lower ram 4 move towards each other at the same speed. Fig. 4 shows the end position of the plunger pistons 14 and pressure cylinders 15 and also of the pistons 24. When it is desired to move apart the upper ram 3 and lower ram 4, the piston 6 of the driving cylinder 7 is loaded in the opposite sense by reversing the control valve 8. During the upward movement of the upper ram 3 the weight of the bottom or lower ram 4 suspended from the pistons 24, causes the plunger pistons 14 to rise in the pressure cylinders 15. The plunger pistons 14, however, follow the movement of the upper ram 3 until the position shown in Fig. 3 is reached.

By changing the diameters of the pistons 24 and the wall thickness of the plunger pistons 14, the loading can be varied and consequently the speed of the lower ram 4 in relation to the upper ram 3 regulated.

We claim:

1. A counterblow hammer including an upper ram, a

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hydraulic motor for moving said upper ram upwardly and downwardly, a lower ram movable upwardly and downwardly relative to the upper ram, with the weight of the lower ram effecting its downward movement, and means operatively interconnecting said rams, the interconnecting means comprising a lateral lug on each ram, a pressure cylinder arranged between said lugs, pistons movable in the pressure cylinder, a piston rod for each piston and means connecting each rod to each lug whereby the downward movement of the upper ram transmits an upward movement to the lower ram to move the lower ram toward the upper ram.

2. A counterblow hammer including an upper ram, a hydraulic motor for moving said upper ram upwardly and downwardly, a lower ram movable upwardly and downwardly relative to the upper ram, with the weight of the lower ram effecting its downward movement, and means operatively interconnecting said rams, the interconnecting means comprising a lateral lug on each ram, a pressure cylinder arranged between said lugs, pistons movable in the pressure cylinder, a piston rod for each piston, means connecting each rod to each lug whereby the downward movement of the upper ram transmits an upward movement to the lower ram to move the lower ram toward the upper ram, a cardan joint suspension in which the pressure cylinder is mounted, the piston carried by the lower ram being connected to the lower ram by a draw-rod means linked to the piston and to the lower ram by ball joints, and the piston carried by the upper ram being operatively connected to the upper ram by a ball joint.

3. A counterblow hammer including an upper ram, a hydraulic motor for moving said upper ram upwardly and downwardly, a lower ram movable upwardly and downwardly relative to the upper ram, with the weight of the lower ram effecting its downward movement, and means operatively interconnecting said rams, the interconnecting means comprising a lateral lug on each ram, a pressure cylinder arranged between said lugs, pistons movable in the pressure cylinder, a piston rod for each piston, means connecting each rod to each lug whereby the downward movement of the upper ram transmits an upward movement to the lower ram to move the lower ram towards the upper ram, the pressure cylinders being fitted on two mutually opposite sides of supporting uprights and their chambers filled with pressure medium being interconnected by a stand pipe in which a check valve is fitted.

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