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ARRANGEMENT FOR COUNTERBALANCING THE FORCES
IN CRANKSHAFT DRIVEN MACHINES
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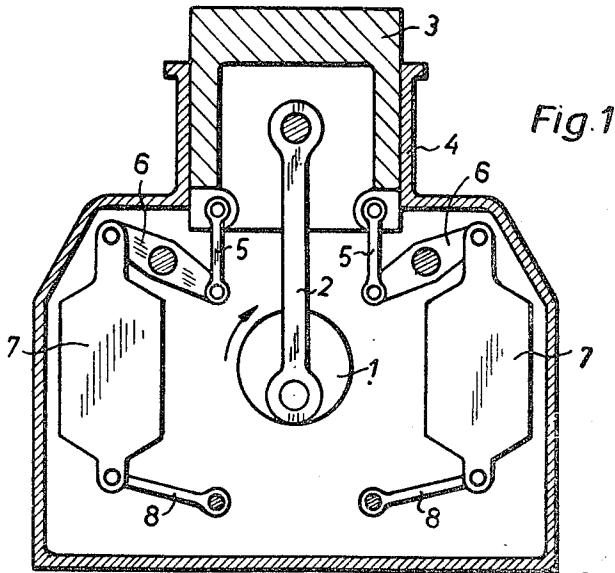


Fig. 1

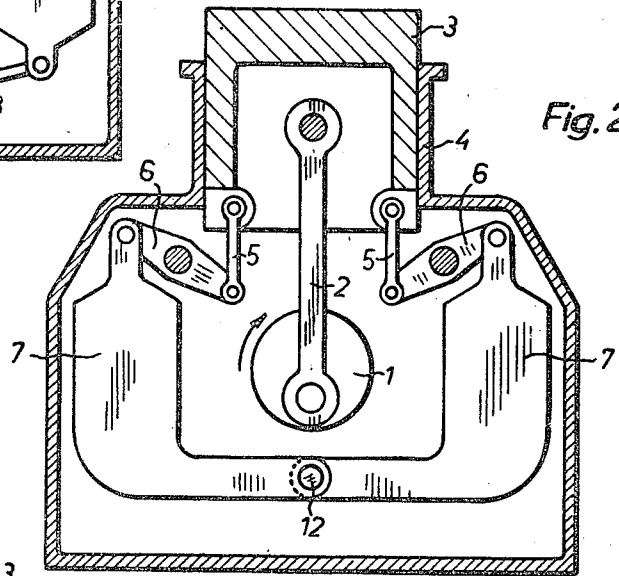


Fig. 2

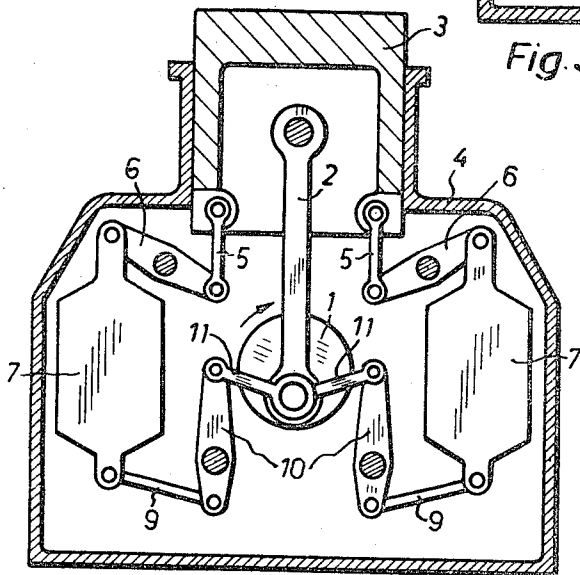


Fig. 3

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ARRANGEMENT FOR COUNTERBALANCING THE FORCES IN CRANKSHAFT DRIVEN MACHINES

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5 Claims

ABSTRACT OF THE DISCLOSURE

An arrangement in which the reciprocating parts of a crankshaft driven machine are counterbalanced by an assembly including two spaced counterweights each connected by a lever and a rod to one side of a reciprocating part such that the counterweights undergo reciprocation in opposition to such part. The counterweights are connected to pivotal levers which prevent uncontrolled swinging of the counterweights.

In order to have quiet operation and to avoid heavy and strong supporting surfaces, it is necessary with crankshaft driven machines, such as crank and punch presses or embossing machines, to counterbalance the heavy reciprocating parts.

An object of the invention is to provide arrangements for effecting a relatively simple, yet effective, counterbalancing of the reciprocating parts in a crankshaft driven machine.

In accordance with the invention there is provided an arrangement of the above character which comprises a member mounted for reciprocation; a crankshaft, a connecting rod pivotally connected to said crankshaft and said member for reciprocating the latter when the crank shaft is rotated, two spaced-apart counterweights, one located on each side of said member; an individual pivotally mounted lever pivotally connected on one side of the pivot point thereof to each of said counterweights; an individual rod pivotally connected to said member and to a respective said lever on the other side of the pivot point thereof, whereby reciprocation of said member causes a reciprocation in the opposite sense of said counterweights; and means connected to said counterweights for preventing uncontrolled swinging of said counterweights during reciprocation thereof.

The above and further objects of the invention will be apparent from the following detailed description of three embodiments of the invention, with reference to the accompanying drawing, wherein:

FIGURE 1 is a view in cross section of one embodiment of the invention;

FIGURE 2 is a view similar to that of FIGURE 1 of a second embodiment of the invention; and

FIGURE 3 is a view similar to that of FIGURE 1 of a third embodiment of the invention.

With reference to the embodiment of FIGURE 1, the crankshaft 1 is connected by a pin to the connecting rod 2, which is pivotally connected to a reciprocating member, such as a cross head or piston 3, which reciprocally slides in the machine housing 4. Two rods 5 are pivotally connected to the piston 3. Each rod 5 is pivotally connected to one end of a lever 6 with equal arms and by the lever 6 to one end of a respective counter weight 7 which is pivotally connected to the other end of the corresponding lever 6. The two counter-weights are located on opposite sides of the piston 3 and their broad surfaces extend trans-

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versely to the stroke direction of the piston. The other end of each counter-weight is connected to the housing 4 by respective pivotally mounted rods 8. When the crankshaft 1 rotates, the two counter-weights 7 moves reciprocally in the direction of the piston stroke but in a sense always opposed to the latter, whereby the forces arising from the reciprocating ports are counterbalanced.

In the embodiment of FIGURE 2 the counter-weights 7 are pivotally connected together by a pivot 12, and thereby are prevented from swinging loosely from their pivotal connection to the levers 6.

In the embodiment of FIGURE 3 the rods 8 are replaced by the pivotally mounted rods 9, which are pivotally connected to the shorter arm of respective pivotally mounted levers 10, the longer arms of which are pivotally connected to respective rods 11 which are pivotally connected to the crankshaft 1. The counter-weights 7 move in the direction of the piston stroke but in the opposed sense. They also have a component of movement that is transverse to the piston stroke, whereby the forces arising from rotation of the crankshaft 1 are also counterbalanced.

The arrangement of the counter-weights and their drive from the crankshaft is completely isolated from the main crank assembly of the machine (not shown), in the embodiments described. The counter-weights in no way adversely influence the correct operation of the machine.

With machines having an adjustable-stroke main crank assembly, the stroke of the counter-weights is automatically changed an equal amount.

The invention is not to be construed as limited to the particular forms disclosed herein, since these are to be regarded as illustrative rather than restrictive.

I claim:

1. Arrangement for counterbalancing the reciprocating parts of a crankshaft driven machine, including a member mounted for reciprocation; a crankshaft, a connecting rod pivotally connected to said crankshaft and said member for reciprocating the latter when the crankshaft is rotated, two spaced-apart counter-weights, one located on each side of said member; an individual pivotally mounted lever pivotally connected on one side of the pivot point thereof to each of said counter-weights; an individual rod pivotally connected to said member and to a respective said lever on the other side of the pivot point thereof, whereby reciprocation of said member causes a reciprocation in the opposite sense of said counter-weights; and means connected to said counter-weights for preventing uncontrolled swinging of said counter-weights during reciprocation thereof.

2. The arrangement as defined in claim 1, wherein each said lever has equal arms, and said means for preventing uncontrolled swinging of the counter-weights comprise an individual rod pivotally connected to a respective counter-weight and to a fixed point.

3. The arrangement as defined in claim 1, wherein said means for preventing uncontrolled swinging of the counter-weights comprises a pivot connecting together said two counter-weights.

4. The arrangement as defined in claim 1, wherein said means for preventing uncontrolled swinging of the counter-weights comprises an individual pivotally mounted two-arm lever pivotally connected on one side of the pivot point thereof to each said counter-weight, an individual rod pivotally connected at one end to a respective said two-arm lever and at the other end to said crankshaft at a point eccentric from the center thereof, whereby each counter-weight is caused to have a component of movement that is transverse of the movement of said member, for counterbalancing the forces arising from the rotation of said crankshaft.

5. The arrangement as defined in claim 4, including an

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individual rod pivotally connected to a respective said counter-weight and to the corresponding said two-arm lever on said one side of the pivot point thereof.

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