Dec. 11, 1951 M. F. MEINERTZ 2,578,079

FRAME FOR VERTICAL PISTON ENGINES

Filed Aug. 1, 1946

Fig.1

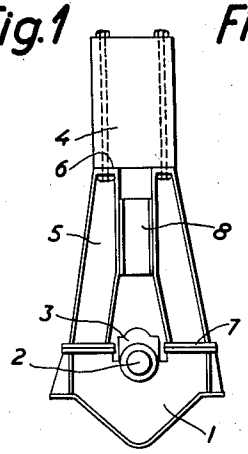


Fig.2

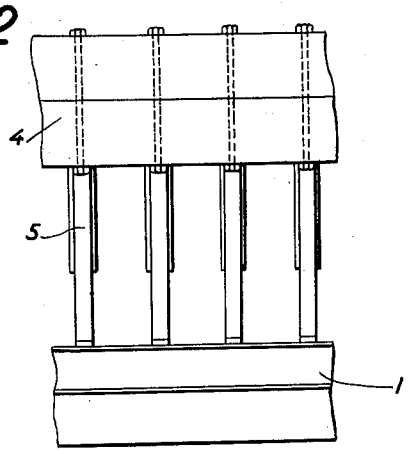


Fig.3

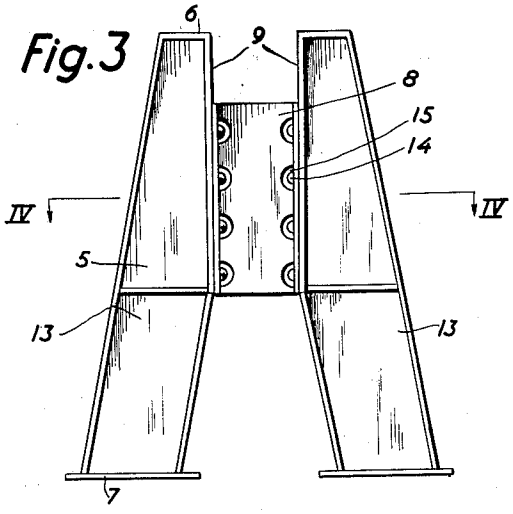
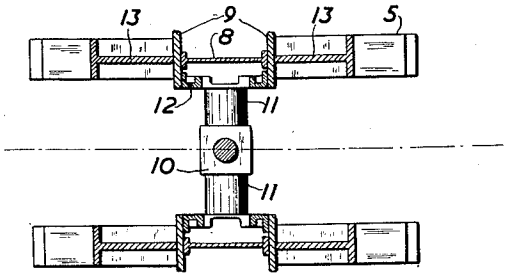


Fig.4



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FRAME FOR VERTICAL PISTON ENGINES

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4 Claims. (Cl. 121—194)

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This invention relates to a frame for vertical piston engines, preferably internal combustion engines with large output per cylinder unit, which frame consists of a bed plate cast of steel or composed of rolled steel elements, such as plates and rolled sections, and the upper side of which is situated at about the level of or preferably somewhat higher than the central line of the crank shaft, and of frame elements erected on this bed plate in line with the main bearings, which frame elements carry the cylinder construction.

In frames of this kind, where the material used—cast or rolled steel—permits the use of rather small thicknesses of plate, it is of great importance to have the large forces occurring during operation distributed as evenly as possible all over the frame construction and over the connection surfaces between the individual elements of the latter, it being hereby possible to obtain the sufficient strength and rigidity with the smallest possible weight. Furthermore it is necessary that the frame construction shall have such a form that it makes the individual parts of the engine easily accessible and especially the main bearings and other members which require frequent overhauls.

For these and other purposes the frame in accordance with the invention is first and foremost characterized in that each of the said frame elements which connect the cylinder construction to the bed plate and transmit the forces between these consists of two cast or welded profiled side pieces of steel. The neutral axis of the side pieces for bending transversely to the longitudinal direction of the engine wholly or mainly coincides with the line of connection between the points of gravity in the upper and lower connections of the side piece with the cylinder construction and the bed plate respectively. The side pieces rest on and are secured to the bed plate on substantially the whole of their cross section area or preferably with an end flange of a larger area than the cross section of the side piece. A connection piece is inserted between the upper parts of the side pieces, which connection piece leaves ample room free above the main bearing and interconnects the side pieces and thereby together with these forms a rigid side girder. This serves at the same time as a precision distance piece between the side surfaces of the side pieces, which side surfaces face each other and serve as crosshead guides.

Due to this construction unimpeded access to the main bearings and the crank shaft is preserved, while at the same time there is attained a completely uniform distribution of the large tensional forces, which during the working stroke are to be transmitted between the cylinder construction and the bed plate, over the full cross section of the frame elements. The material of

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the latter is utilized to the greatest possible extent, and over connections, generally bolt connections, between the frame elements and the cylinder construction and the bed plate, to provide in a simple way, the construction to permit the omission of special guide planes for the crosshead. By the strong connection of the two side pieces of each frame element to a rigid side girder by means of a connection piece which at the same time accurately fixes the surfaces of the side pieces facing each other with the proper mutual spacing and parallel relation, it is possible to guide the crosshead by means of guides which run directly between the surfaces of the side pieces facing each other, whereby the guide pressures are absorbed direct in the frame elements without it being necessary to transmit them to the frame elements by separate heavy and expensive guide planes or other transmission elements.

A considerable economy in weight is gained by the new construction in relation to constructions formerly known, and there is also attained a considerable simplification of the production and mounting of the elements. Also the separately erected frame elements, which in case of an emergency are detachable, give an easy access to damaged parts in case of break-downs and make repairs possible by disconnecting the smallest possible number of parts.

In an expedient embodiment the side pieces on the upper part of their side facing the middle of the engine have broad flanges to which the connection piece is secured with its edges in such a way that beside the connection piece there will, on the flanges of the side pieces, be room for travelling surfaces for the guides of the adjacent cylinder units. Hereby a fully symmetrical design of the frame elements is attained as well as the smallest possible extension of the latter in the longitudinal direction of the engine. The connection piece will normally be secured to the side pieces by means of bolts or screws or similar clamping means, and in accordance with an expedient embodiment of the invention these may be placed in the vertical central plane of the connection piece, which central plane is situated transversely to the longitudinal direction of the engine e. g. in edge recesses in a central web plate in the connection piece, whereby they occupy the smallest possible space in the longitudinal direction of the engine.

The invention is illustrated on the drawing in a single embodiment.

Fig. 1 shows schematically a section through an internal combustion engine with a frame in accordance with the invention,

Fig. 2 part of the engine shown in Fig. 1 in side elevation,

Fig. 3 a frame element on a larger scale, and

Fig. 4 a section on line IV—IV in Fig. 3.

On the drawing 1 designates a bedplate welded together of rolled plates and rolled sections, in which bedplate the crank shaft 2 of the engine in the usual way is journalled in main bearings 3 which are only indicated in Fig. 1. The cylinder construction 4 of the engine rests on frame elements 5 which are erected on the bedplate in line with the main bearings transversely to the longitudinal direction of the engine, resting with their lower end flanges 7 on corresponding supporting surfaces on the top of the bedplate at a level a little higher than the center line of the crank shaft.

Each frame element 5 is, as appears further from Figs. 3 and 4, composed of two side pieces 13 and a connection piece 8 inserted between them. Each of the side pieces 13 has a supporting surface 6 for the cylinder construction and as mentioned before a lower end flange 7, with which they rest upon and are bolted to the bedplate. The cross section of the side pieces is chosen so that the neutral axis for bending transversely to the engine substantially coincides with the straight line which can be drawn between the points of gravity in the connections of the side piece with the cylinder construction and the bedplate respectively. In the embodiment shown, each individual side piece has the shape of an I with a central web plate and two flanges. There is, however, nothing to prevent the use of any other cross section, e. g. a box-shaped cross section, as long as the condition is fulfilled that the neutral axis should substantially coincide with the point of gravity line.

In the example shown the connection piece 8 is likewise made as an I-beam with a central web plate and two flanges which are planed so as to be accurately plane-parallel. The connection piece is inserted between the upper parts of the side pieces 13 which have broad flanges 9 which face each other and are planed at right angles to the end flanges 7. The connection piece is clamped here by means of bolts 14, the nuts of which are situated in edge recesses 15 in the web plate. By being clamped to the connection piece, the flanges 9 of the side pieces are given an accurate mutual spacing and an accurate parallel position, so that their sections situated beside the connection piece can serve directly as bilateral guide members for a guide 12 on the end of the gudgeon 11 of the crosshead 10.

By this construction a considerable simplification of the necessary precision work in the production and mounting of the parts attained. The frame side pieces are worked separately by a simple planing of the flanges 9 and 7 at planes at right angles to each other, which can be made in one clamping with a great number of side pieces placed side by side. The connection pieces 8 are to be planed or milled to accurate parallel relationship of the surfaces bearing on the side pieces and accurate mutual spacing of the said surfaces, which is likewise a very simple operation which can be performed with many pieces in the same clamping. Next the frame side pieces and the connection pieces are assembled so as to form the necessary number of finished frame elements, and these are erected on the planed supporting surfaces of the bedplate. The frame elements are then aligned with the flanges 9 in exactly the same plane in the longitudinal direction of the engine and are finally clamped with fit-bolts to the bedplate. The guides 12 of the crossheads have previously been adjusted with the necessary tolerance in accordance with the distance between the flanges 9, and with this the precision work is finished.

The clearances between the frame elements can be closed with a light sheathing of sheet metal, which in combination with the underside of the cylinder construction and the bedplate that is closed below forms a completely closed crank case.

The invention is not limited to the single embodiment shown and described by way of example only, the details of which may be varied in different ways. The individual parts of the frame may as already mentioned be composed of cast or rolled or in part cast, in part rolled elements, and these may be connected by welding or by screw or bolt connections or by combinations of these methods of connection. The cross sections of the side pieces and connection piece of the frame elements can be chosen as desired, but it is advantageous that the connection piece is situated in the transverse central plane of the frame element and has its means of connection with the side pieces situated in this plane.

I claim:

1. A frame for vertical piston engines having a cylinder construction supported from the bed plate by means of separate vertical frame members arranged between said cylinder construction and bed plate in the planes of the main bearings and transversely of the longitudinal direction of the engine, each frame member comprising two substantially centrally stressed side pieces having machined opposed surfaces and being united by a detachable connection piece inserted between and attached to said opposed surfaces so as to form in combination with the side pieces a laterally rigid grinder and serving simultaneously as a precision distance and aligning member for said side pieces, sliding surfaces for the crossheads of adjacent cylinders being provided on said opposed surfaces on either side of the connection piece,

2. A frame as claimed in claim 1, wherein said side pieces on the upper part of their sides facing the middle of the engine have broad flanges thereon to which the connection piece is secured with its edges in such a way that on either side of the connection piece there will be room on the flanges of the side pieces for sliding surfaces of the cross-heads.

3. A frame as claimed in claim 1 in which the connection piece is secured to the side pieces by means of clamping means, said clamping means being placed in the vertical central plane of the connection piece which plane is situated transversely to the longitudinal direction of the engine.

4. A frame as claimed in claim 3, said clamping means being located in edge recesses in a central web plate in the connection piece.

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