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ENGINE FOUNDATION STRUCTURE

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Fig. 1

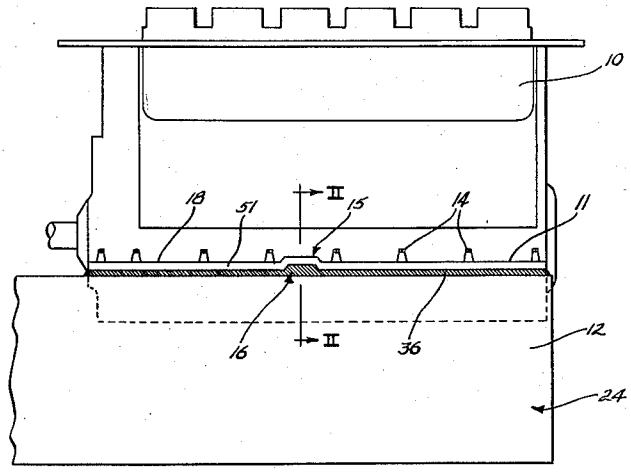


Fig. 2

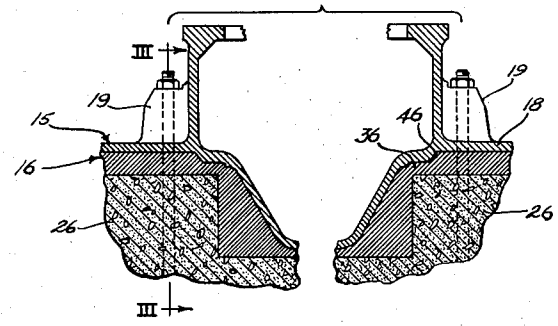
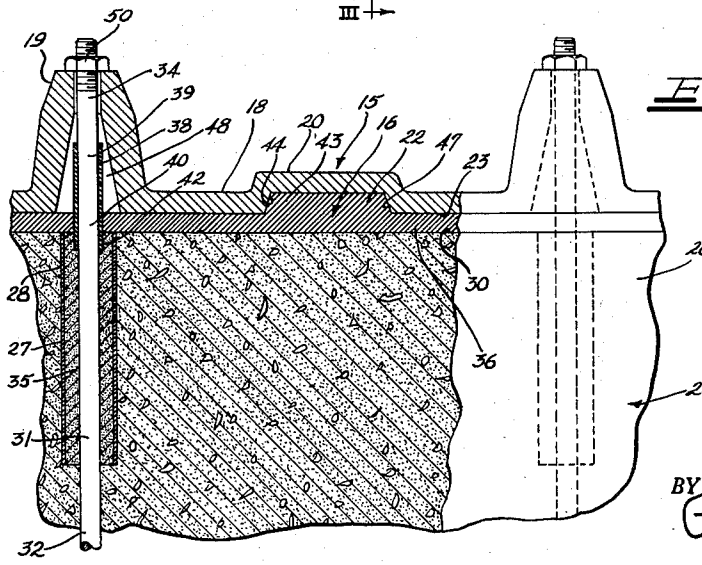


Fig. 3



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ENGINE FOUNDATION STRUCTURE

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1 Claim. (Cl. 72—77)

This invention relates to improvements in foundation mounting of operating mechanism or apparatus as internal combustion engines, and has particular reference to improvements in the mounting location and mounting securement of such mechanisms as engines, on foundation structures provided therefor.

In stationary mounting of internal combustion engines for example, it is the usual practice to provide a foundation structure usually of suitable concrete material, to receive the bed frame or base member of the engine to be mounted thereon. In such foundation structures, the engine frame member is secured to the foundation as by suitable bolts or stud elements which are anchored in the foundation by embedment in the concrete at the time of foundation formation. It is also known to seat the frame member on the concrete foundation through an intervening finish layer of so-called grouting material which is an aggregate including iron particles, suitable for bonding with concrete. As has been found in practice, particularly in connection with relatively large foundation structures, where the major length of the stud elements is confined by rigid engagement with the surrounding concrete material and grouting layer of the foundation, not only the stud elements but the foundation structure is subject to very considerable stressing in consequence of appreciable relative expansion and contraction of the base member and the foundation structure. This has resulted in a loosening of the stud nuts in engagement with the base member, and at times in breakage of stud elements and cracking of the foundation. Accordingly, it is the principal purpose of the present invention to afford an improved foundation mounting arrangement which will avoid the foregoing disadvantages.

In accomplishing this purpose, it is an object of the invention to provide a foundation structure having stud elements anchored in the concrete foundation and having an intermediate length of each stud element between its anchored end portion and the end thereof projecting beyond the grouting layer, laterally supported by means characterized by limited yieldability, whereby to permit a correspondingly limited flexure of the stud element to accommodate relative expansion and contraction of the base member and the foundation structure.

A further important object of the invention is to provide in an improved foundation structure as above characterized, means for determining the desired location of the base member on the foundation and for maintaining the base member in such location. In the present embodiment, this objective is accomplished by cooperating or interengaging means provided partly in the base member and partly in the grouting layer of the foundation, serving in interengagement, to properly locate the base member on the foundation and to anchor the base member against inordinate displacement longitudinally on the foundation.

These and other objects and advantages afforded by the present invention, will appear readily from the following description of a presently preferred embodiment as exemplified in the accompanying drawings wherein:

Fig. 1 is a view in longitudinal elevation at one side of an internal combustion engine, showing the engine on a foundation mounting structure incorporating the present improvements.

Fig. 2 is an enlarged sectional elevation transversely through the engine base member and the foundation structure, the section being taken along line 2—2 in Fig. 1.

Fig. 3 is a longitudinal sectional view as taken along the line 3—3 in Fig. 2.

While the presently improved base mounting foundation construction is here illustrated in Fig. 1, as applied to the mounting of an internal combustion engine designated generally by the numeral 10, it is to be understood that the foundation construction is fully applicable to the foundation support of bed plate or base mounted machinery and apparatus generally.

Referring first to Fig. 1, the engine 10 provides a crankcase structure including a crankcase bottom or base member 11 for mounting on the foundation structure generally indicated by the reference numeral 12. The engine base member 11 is secured to the foundation at a plurality of points, as at 14, longitudinally on each side of the base member and in a presently improved manner hereinafter to be described. Importantly also, the base member 11 is located in desired mounted position on the foundation and constrained to such position by cooperating elements 15 and 16 at each side of the base member, provided respectively, on the base member and on the foundation. These locating elements will be described presently.

As shown by Figs. 2 and 3, the base member 11 which may be of suitable metallic material, as a cast iron member, is formed to provide mounting flanges 18 longitudinally of the member on opposite sides thereof, and a plurality of apertured mounting stud bosses 19 relatively spaced along each flange 18. On each flange and preferably near the longitudinal center of the flange is a flange de-formation or off-set portion 20 defining a recess 22 in the flange open to the underside 23 thereof. The off-set 20 and recess 22 provided thereby, constitute the locating element 15 hereinbefore mentioned.

The foundation structure 12 includes a formed foundation block 24 which may be of suitable concrete material, providing opposite raised sections 26 extending longitudinally of the block and suitably spaced apart in accordance with the spacing of the flanges 18 transversely of the base member 11. In forming the block 24, a plurality of tubular or pipe elements 27 are vertically set in each concrete section 26, with the top edge 28 of each pipe substantially flush with the top side 30 of the section. At the same time, mounting rods or studs 31 are arranged vertically in centered relation through the tubes 27, with the lower ends 32 thereof embedded in the concrete below the tubes, as shown. The opposite ends 34 of the studs project upwardly from the block sections 26 for base securing connection. When the concrete block is set, the tubes 27 are filled about the studs therein, with suitable granular material 35 as sand, and then a finish or grouting layer 36 of suitable grouting material capable of firm bonding to the top surface 30 of the concrete block, is applied on each block section 26 to provide a base flange receiving surface in the mounting of the base number 11 on the block. The material of the grouting layer may be a suitable aggregate including iron particles, known in the art. Before forming the finish layer 36, each stud 31 is supplied with a sleeve 38 of relatively soft material, extending along the stud shank over a part of its exposed length, as along the portion 39, and over the stud shank portion 40 to be

surrounded by the finish layer **36**, terminating on the shank slightly inwardly of the end **28** of stud tube **27**, as at **42**. The sleeve **38** may be provided as a wrapping on the shank, of material such as burlap, asbestos, soft rope or the like.

In applying the finish or grouting layer **36** on each foundation portion **26**, the layer is thickened at **43** intermediate its length, to provide a raised portion or boss constituting the base locating element **16** hereinbefore indicated. The boss elements **16** on the opposite finish layers **36** of the foundation, are so located longitudinally thereon that in mounting disposition of the base member **11** to seat the base flanges **18** on the foundation surface layers **36**, these bosses are received in the recesses **22** of flange elements **15** and cooperate therewith to determine the proper or desired mounted position of the base member on the foundation. Thus the co-acting elements **15—16** on the opposite sides of the base member, serve not only as locating means for assuring proper positionment of the base member on the foundation, but as anchor means preventing misalignment or other bodily displacements of the base member both longitudinally and laterally relative to the foundation portions **26**. In order to facilitate full cooperating engagement of the elements **15—16**, each boss **16** is marginally tapered as indicated at **44** in Fig. 3 and at **46** in Fig. 2, while the cooperating recess **22** of flange element **15** has its marginal side wall **47** tapered in matching relation to the taper of the boss. The tapering of the locating elements permits wedge-seating of the base elements **15** on the bosses **16**, to enhance the anchoring function of these elements.

The relative spacing of the studs **31** is related to the relative spacing of the apertured bosses **19** on the flanges **18** of base member **11**, such that in mounting the base on the foundation, the exposed ends **34** of the studs extend freely through the boss apertures **48** and upwardly beyond the bosses for threaded reception of the securing or hold-down nuts **50**, the latter when drawn up firmly bearing on the bosses to clamp or secure the base member in place on the foundation.

Thus the engine **10** or other apparatus, through its base member **11**, is positioned on and secured in place upon the foundation structure of the improved character now described. It will appear now that the base mounting studs **31** are arranged so that each over an intermediate length thereof, as from the concrete-anchored end **32** upwardly through the tube **27** and through the layer **36**, is spaced from the foundation material including layer **36**, and is laterally supported by material having limited yieldability. The latter material in the example shown, is constituted by the sand **35** and the soft sleeve **38**, which permit limited flexure of the stud laterally relative to the foundation structure to accommodate relative expansion and contraction of the base member **11** and the foundation structure including the raised portion **26** and finish layers **36** thereof. By affording such limited flexure of the studs, the disadvantages hereinbefore mentioned, are practically avoided or eliminated.

By providing a single set of co-acting base locating elements, as **15** and **16**, at each side of the base member **11** as shown in the present example, and locating the sets near the longitudinal center of the base flanges, proper mounting location of the base member relative to the foundation may be more readily and easily obtained, particularly in instances of foundation mounting of comparatively large engines or the like. Nevertheless, it is

to be understood that the two sets of locating elements may be disposed near either end of the base member or anywhere intermediate the base ends, and that more than one set may be employed on each side of the base member, if desired or as particular installation conditions may require. However, it may be pointed out here that the presently preferred provision of but two sets located near the center of the base member as herein shown and described, offers the advantage of center-anchoring of the base member which tends to constrain base expansion and contraction to the base lengths on each side of the anchoring and positioning sets, thus reducing flexing strain on the several studs. It is to be noted further and as indicated in Fig. 1, that each flange element **15** may extend to the outer or exposed longitudinal margin **51** of the flange with the recess **22** of the element open at the margin **51** as shown, so that firm base locating interengagement of the elements **15** and **16** may be observed.

Having shown and described one embodiment of the present invention, what it is desired to claim and secure by Letters Patent is:

In combination a metal base member for base mounted apparatus as an internal combustion engine, the base member being provided with oppositely disposed longitudinal mounting flanges and each of said flanges having a transversely directed recessed portion near the longitudinal center of each flange and a longitudinally disposed downwardly tapered portion along the inner edge of each of said flanges, a formed concrete foundation block structure providing mounting portions receiving the mounting flanges of said base member, each such mounting portion of the block including a projection extending inwardly of the recessed portion of each associated base member mounting flange cooperating therewith, aligning the base member on the block structure and constraining the same against relative longitudinal and outwardly transverse movement in the horizontal plane, said metal mounting base further including a plurality of integral upstanding apertured bosses spaced along said flange, a plurality of stud elements each having one end portion anchored in the block structure and each having the other end extending from the block and through the aperture of a corresponding upstanding boss of the mounting flange of the base member, means engaging the protruding end of said stud elements and securing said base member to the block structure to preclude movement of said base member vertically of the longitudinal dimension of said block and to thereby cooperate with said recessed flange means to hold said base member to the block member against movement longitudinally and outwardly, and yieldable spacing means comprised partly of granular material and partly of fibrous material between the block structure and each stud element along an intermediate length of said stud elements to permit limited flexure of the stud element to compensate for relative expansion and contraction of the base member and said foundation block structure.

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