Oct. 25, 1966 T. W. SHOE ET AL 3,281,125

VIBRATOR MECHANISM

Filed Oct. 21, 1965

Fig.1

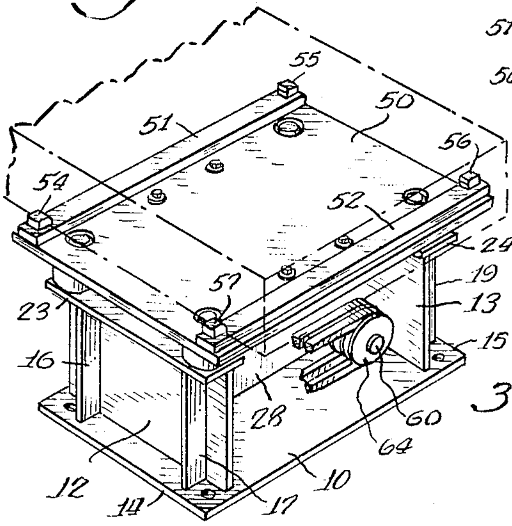


Fig.2

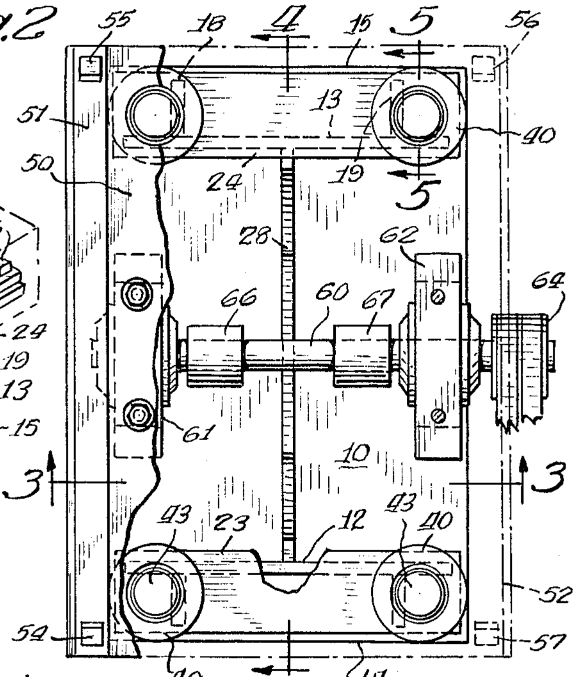


Fig.5

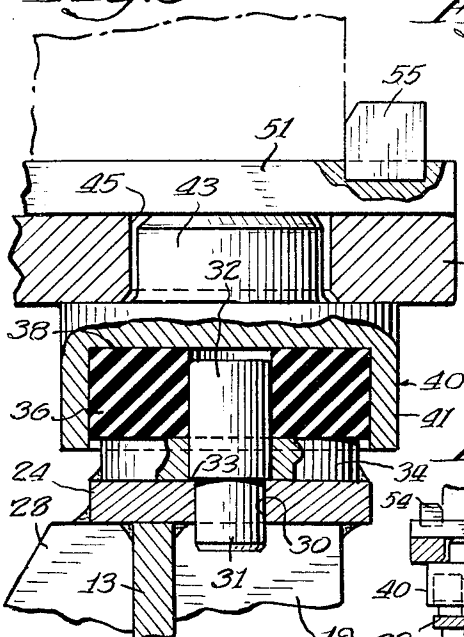


Fig.3

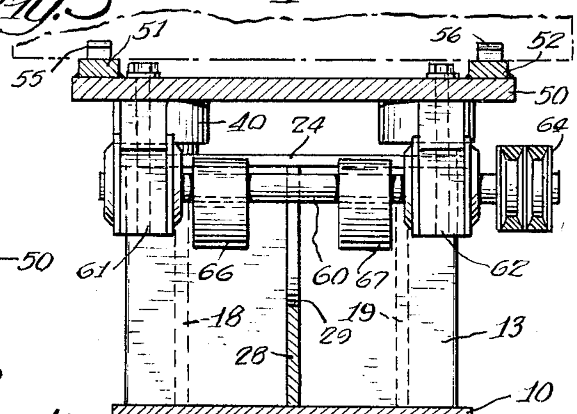
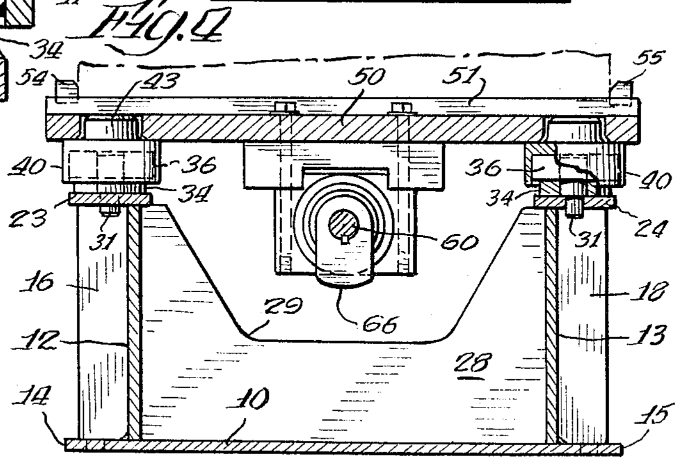


Fig.4



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VIBRATOR MECHANISM
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4 Claims. (Cl. 259—72)

This invention relates to a vibrator mechanism and particularly to a mechanism which is normally disposed beneath a form in which concrete products are being cast. The vibrator mechanism is particularly useful for casting forms of the type in which long concrete slabs are cast.

Vibrators in connection with concrete casting means are widely used. Such vibrators perform a number of functions among which are distributing and compacting a concrete mix throughout a casting form, expelling air bubbles and the like. Vibrators used for such purposes function to convert substantial power into vibrations ranging from about 1,000 cycles per minute up to as much as 8,000 cycles per minute and, in some cases, even more. As a rule, the amplitude of vibration is of the order of about 1/64 of an inch.

The power level at which such devices generally operate, together with the amplitude, results in creation of such high stresses in the vibrator mechanism as to reduce substantially the normal operating life of such vibrators or important components thereof. A further and serious problem is created by the transmission of vibratory energy from the vibrator mechanism to supporting and foundation structures and adjacent structures. Such undesired vibration not only represents a waste of vibratory energy, since such energy is only desired for the casting form and its contents, but also induces and creates undesired stresses and strains in such adjacent and supporting structures and thus tends to reduce the life of such structures.

Because of the above characteristics of such vibrator mechanism, it has been necessary to weld or integrate metal (or steel) parts which are normally made or manufactured separately. In general, it is desirable to use steel in the form of cold, rolled strip or bars as against cast iron or cast steel. The latter material generally develops cracks in the metal. The use of cold rolled steel thus entails welding various parts together. It is important in connection with such welds that the welds are strong and withstand the vibration present in such mechanisms.

In addition to the above, vibrators of this general character frequency include as parts thereof heavy springs. To accommodate the latter, the vibrator mechanism requires metal clamps and other metal parts for anchoring such springs. Such various metal parts must be welded. A conventional vibrator mechanism thus involves a relatively large number of welds and provides a fertile field for fractures to develop.

An additional disadvantage of such conventional mechanisms resides in the fact that the head room for the mechanism between the floor or other support and the bottom of the casing from or load is quite substantial. The greater the head room required, the more difficult becomes the problem of insuring that the various component parts of the mechanism are not overstressed.

The present invention makes possible a vibrator mechanism wherein the number of separate parts required is reduced to a minimum and wherein the necessity for welds is reduced even further than would normally be warranted by the reduction in the number of parts. In addition to the above, the invention makes possible a vibrator mechanism wherein effective and efficient vibra-

tory isolation is provided to prevent undesired transmission of vibratory energy to foundations and adjacent structures. A further advantage of the new structure embodied in the present invention resides in the compact and comparatively short overall structure which is rendered possible and thus permits of a comparatively low support plane for the vibrator load.

The invention involves a heavy steel vibrator plate which is supported at a number of places on heavy rubber or other resilient elastic material which functions not only to support the vibrator plate but also to shield or isolate the support plate from the basic vibrator frame upon which the entire vibrator frame is carried. Directly supported below such vibrator plate is a shaft carrying unbalanced weights which creates the desired vibratory energy. The last named shaft is connected through a pulley and belt to an electric motor or other source of power.

By virtue of the structure generally set forth above, very short paths for transmitting vibratory energy to the vibrator plate are provided. As many vibration absorbing support means as desired for the vibrator plate can be provided to effectively suppress the leakage of vibratory energy away from the vibrator plate and downwardly to the general vibrator support structure. The vibrator plate itself is adapted to carry the load to be vibrated.

An additional substantial advantage of the new structure resides in the ready accessibility of bearings for supporting the shaft. This feature is highly desirable since bearings in such vibrator mechanism must frequently be renewed.

For a more complete description of the invention reference is now made to the drawing wherein:

FIG. 1 is a perspective view of one of the vibrators employing the present invention, this view illustrating in dotted line a part of a casting form disposed thereon.

FIG. 2 is a plan view of the vibrator mechanism of FIG. 1 wherein the vibrator plate is broken away to illustrate the vibrator mechanism structure.

FIG. 3 is a section on line 3—3 of FIG. 2.

FIG. 4 is a section on line 4—4 of FIG. 2.

FIG. 5 is an enlarged sectional detail on line 5—5 of FIG. 2.

The new vibrator mechanism has base supporting plate **10** of any desired shape and size. Base plate **10** is of steel and should be sufficiently thick for the required purpose. As an example, forms for casting concrete slabs having a width of the order of 2 or 3 feet and a length ranging up to as much as 50 or 60 feet and having a depth or thickness of the order of about 10 or 12 inches are very heavy so that base plate **10** in such a case may be as much as 3/4" or 1" in thickness. The remaining dimensions of such a base plate would be about 3 feet by about 2 feet or 2½ feet. These dimensions are exemplary and the invention is not limited thereto. As a rule, vibrators are disposed at about 10 foot intervals along a casting form.

Rigidly secured to the top of base plate **10** are end plates **12** and **13** extending parallel to ends **14** and **15** of base plate **10** and set inwardly therefrom a short distance. Supported on base plate **10** and rigidly secured thereto are additional plates **16** and **17**. Additional plates **16** and **17** extend outwardly from the outer face of said plate **12** and cooperate therewith to provide a firm support structure.

End plate **13** is similarly provided with additional plates **18** and **19**. Rigidly secured to the top edges of side plate **12** and additional plates **16** and **17** is one connecting plate **23**. A second connecting plate **24** is provided for the top edges of plates **13**, **18** and **19**. It is understood that these various plates are of steel and of suitable thickness.

The thickness of the various plates may be of the order of about ½" or ¾". These plates are preferably welded together to form a rigid strong support structure. For a vibrator mechanism to be used with a casting form having the dimensions as described above, the height of the framework thus formed may be of the order of about one foot. This support frame is bolted to a floor by bolts passing through apertures at the four corners of base plate **10**. The support structure so far described is reinforced by support plate **28** extending between side plates **12** and **13** rigidly secured thereto as by welding. Support plate **28** is disposed substantially midway between side plates **12** and **13** and has a substantial portion of the plate between the edges undercut at **29** to clear the vibration generating means.

Top plates **23** and **24** are each provided with apertures at each end thereof. The location of these apertures is illustrated in FIG. 2 together with the support structure. The construction for supporting the remainder of the mechanism is similar insofar as the corners are concerned and accordingly the structure illustrated in FIG. 5 will be described in detail as representative. Thus, support plate **24** is apertured at **30** adjacent an end thereof for accommodating reduced end **31** of pin **32**. Reduced end **31** of pin **32** provides an annular shoulder **33** which rests upon the top surface of cross-plate **24**. Resting on top of cross-plate **24** and surrounding a part of enlarged portion **32** of the pin is thick washer **34**.

Washer **34** has a diameter which is about equal to the width of cross-plate **24** and fits snugly about the enlarged portion of pin **32**. Washer **34** is rigidly secured by welding to cross-plate **24**. The thickness of washer **34** may, as an example, be of the order of about ½" or even somewhat greater. Inasmuch as no great precision is required in the manufacture of the vibrator mechanism, the diameter given here is on the generous side. Pin **32** extends upwardly above the top of washer **34** and functions as a guide to hold in position heavy rubber washer **36**. The diameter of washer **36** is somewhat greater than the diameter of washer **34** and the thickness of rubber washer **36** is substantially greater than washer **34**. As an example, the rubber washer **36** may have a thickness of the order of about 1½" to about 2" and, in any event, the thickness of washer **36** is sufficiently great so that the top of pin **32** will be substantially below the level of top surface **38** of the rubber washer.

The difference in elevation between the top surface of rubber member **36** and the top of pin **32** should be well beyond the amplitude of vibration to be generated and may, for example, be about ¼" in the specific structure described as an example of the embodiment of the invention. Rubber washer **36** is of solid rubber of the type used for mounting presses and may have a hardness of between about 55 and about 60 on the durometer scale. Such rubber is used widely in absorbing the shock of punch presses and similar mechanisms and this grade of rubber is generally known in the trade as press rubber.

Resting on top of rubber member **36** and forming an inverted cup shaped shield is member **40** having depending skirt portion **41** surrounding the outer face of rubber member **36** and extending downwardly below the bottom face of rubber member **36**. Skirt portion **41** is sufficiently larger in diameter so that it clears the outer face if washer **34**. The space below skirt **41** should be clear for a sufficient distance to accommodate easily the amplitude of vibration to be encountered. Member **40** has pin portion **43** extending above the body thereof and this pin portion is adapted to lie within aperture **45** of one corner of vibration plate **50**. Vibration plate **50** has apertures adjacent the four corners thereof which are adapted to register with the support assembly illustrated and described in connection with FIG. 5.

Pin portion **43** has a diameter which is substantially greater than that of shouldered pin portion **32** and fits loosely in apertures **45**.

Vibration plate **50** is of steel and has substantial thickness of the order of about 1" for the particular size mechanism that has been set forth. Vibration plate **50** has steel strips **51** and **52** rigidly secured there to as by welding. Strips **51** and **52** are disposed along opposite sides of plate **50** and preferably along the long dimension of the plate. The ends of each of strips **51** and **52** have blocks **54** to **57** inclusive rigidly anchored thereto. The distance between the blocks on strip **51** is substantially the width of a casting form shown in dotted line in FIG. 1. The same is true of the distance between block **56** and **57** along strip **52**. Thus, the bottom of a castings form will rest upon strips **51** and **52** and be firmly wedged between the blocks at the ends of these strips.

Means for creating vibration in plate **50** are suspended from this plate below the lower face. Thus, bolted to and suspended from plate **50** substantially midway between end plates **12** and **13** is shaft **60** journalled in bearings **61** and **62**. Shaft **60** has an end portion projecting beyond bearing **62** carrying pulley **64**. Pulley **64** is belt driven from an independently mounted motor not shown. Shaft **60** has rigidly secured thereto eccentric weights **66** and **67**. As illustrated in FIG. 3, weights **66** and **67** are oriented so that the eccentric portions thereof are aligned insofar as rotary position is concerned.

What is claimed is:

1. A vibrator mechanism for use on forms for casting concrete slabs, said mechanism comprising a rigid steel base plate, a plurality of upstanding steel supports rigidly secured to said base plate and forming a rigid support structure, said support structure having at the top thereof a plurality of apertured steel plate portions, a vertical steel pin for each aperture, each pin having a guide portion extending above the top of said support structure, a heavy washer of non-metallic elastic vibration absorbing material disposed about the guide portion of each pin and resting on top of the support structure, an inverted cup shaped steel member disposed over the top of said heavy washer, said inverted cup shaped member having an upwardly extending pin portion, a steel vibrator plate disposed over the support structure, said vibrator plate having apertures each of which registers with the upwardly extending last named pin portion, means on the top face of said vibrator plate for retaining a casting form against lateral movement in normal vibrating position and means supported from the bottom of said vibrator plate for creating vibrations in said plate, said heavy washers serving to substantially suppress the transmission of vibratory energy to the support structure.

2. The construction according to claim 1 wherein said vibration creating means includes a shaft journalled in bearings below said vibrator plate and eccentric weights carried by said shaft.

3. A vibrator mechanism comprising steel support means including steel plate members extending horizontally in the normal operating position of the mechanism, said plate means having apertures, a steel pin for each aperture, said pin having a shoulder resting on top of said apertured plate and having an upwardly extending pin portion, a washer of press rubber disposed about the top portion of said pin, said rubber washer having a substantial thickness, a steel inverted cup-shaped member disposed about said rubber washer and resting on top thereof, said inverted cup-shaped member and the free top end of said pin being separated by a distance which is substantially larger than any amplitude of vibration, said inverted cup-shaped member having an upwardly extending pin portion substantially larger in diameter than said shouldered pin, a vibration plate having a plurality of apertures, each aperture adapted to register with the

upwardly extending pin portion of each inverted cup member, means for supporting the vibratory load on said vibration plate, and means including a shaft and eccentric weights supported from the bottom of said vibration plate for creating vibration, said rubber washer functioning to suppress vibratory energy from going downwardly of said rubber washer.

4. The construction according to claim **3** wherein said vibration plate has a plurality of support strips and support blocks for accommodating the load to be vibrated.

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