Oct. 10, 1939. S. ROSENZWEIG 2,175,784

VIBRO-ISOLATOR

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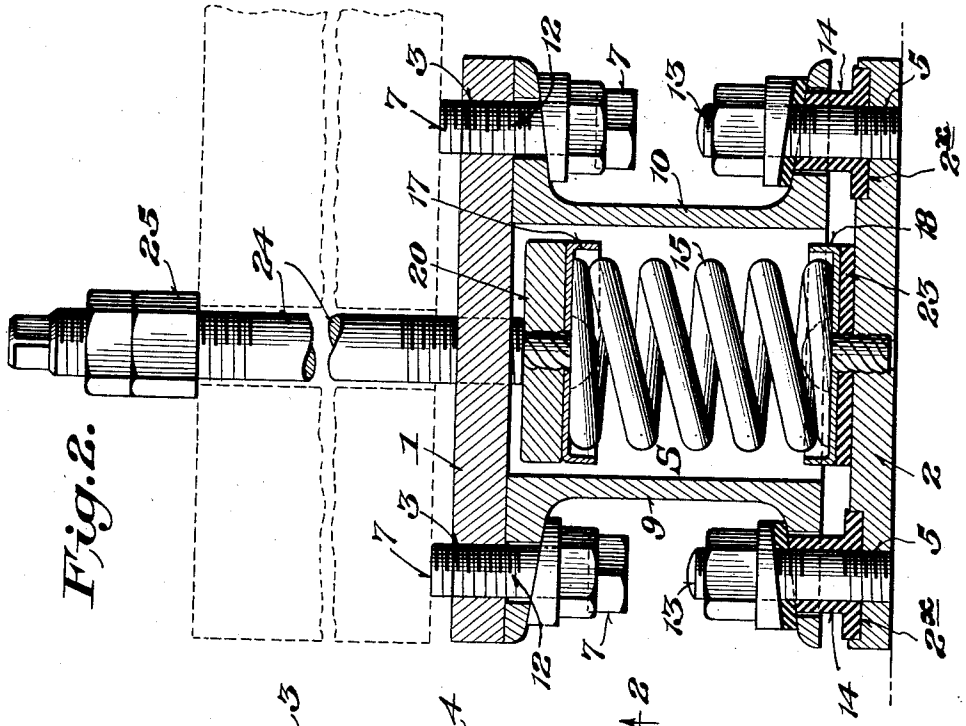


Fig. 2.

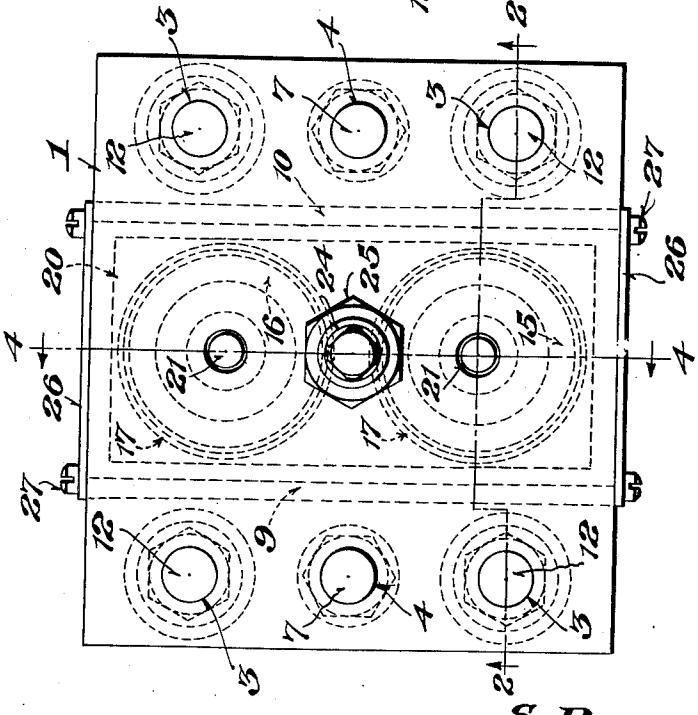


Fig. 1.

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Fig. 3.

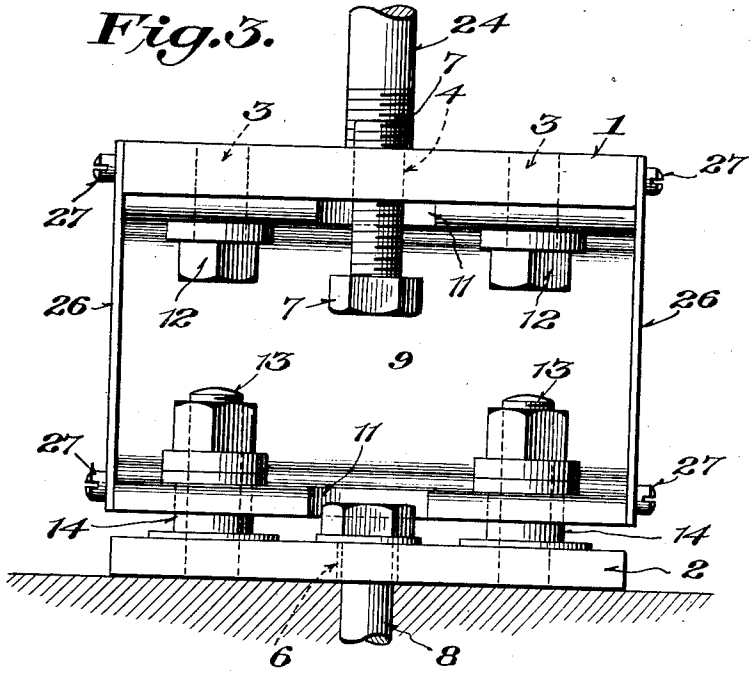
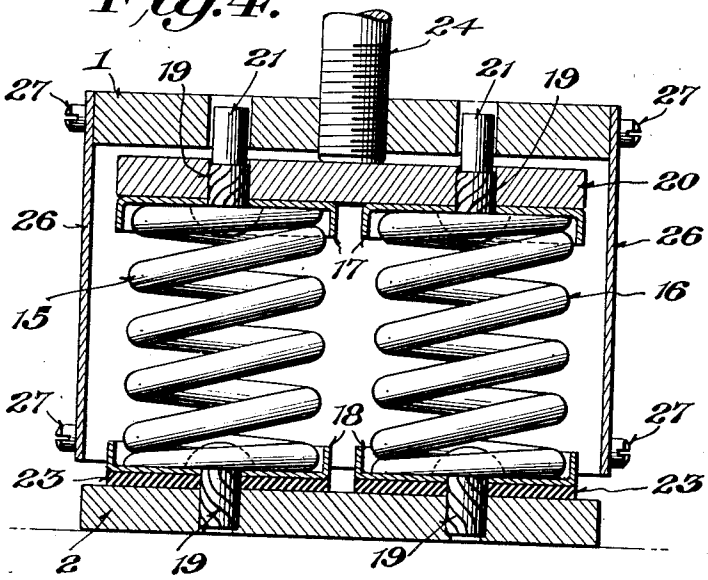


Fig. 4.



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Fig.5.

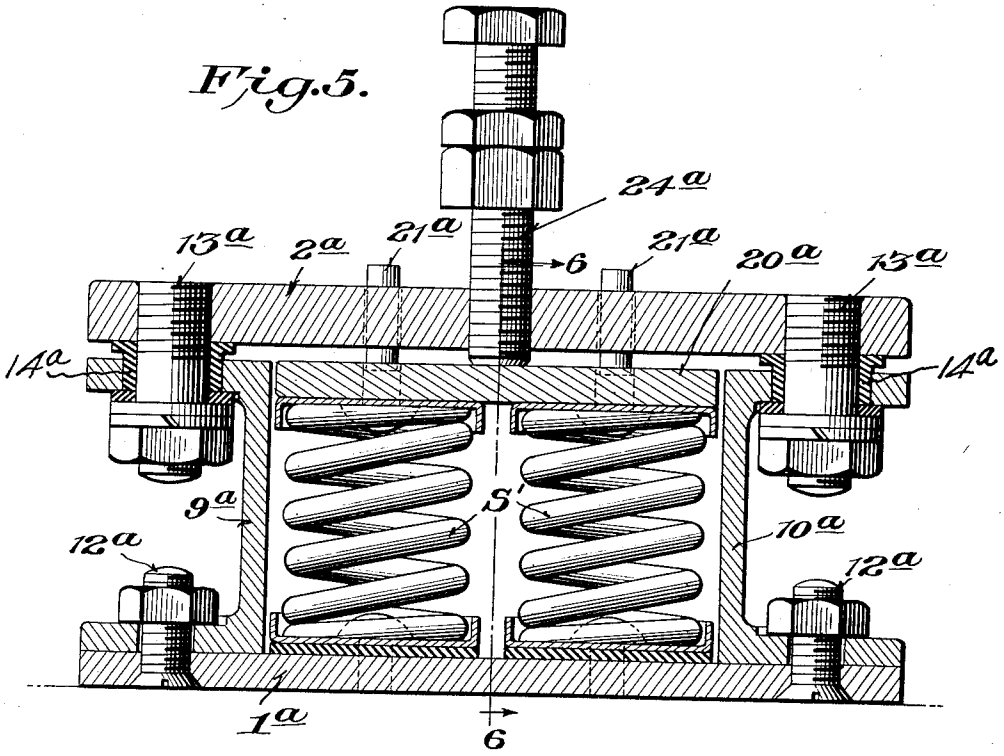
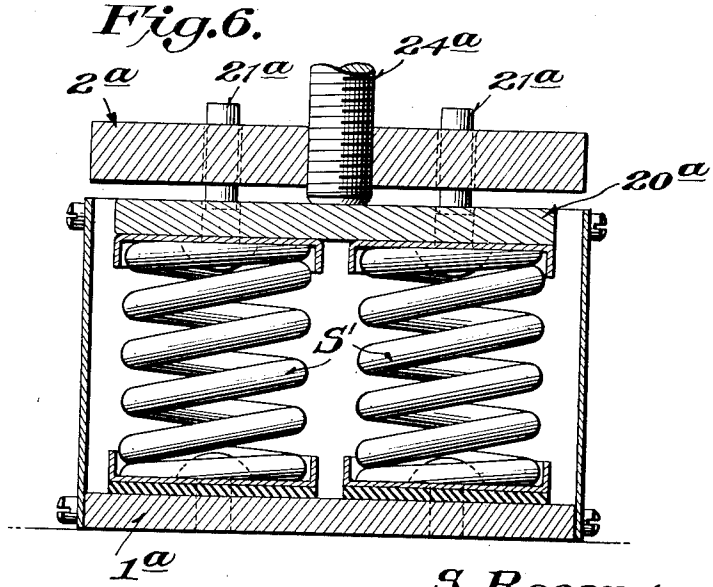


Fig.6.



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UNITED STATES PATENT OFFICE

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VIBRO-ISOLATOR

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Application March 19, 1938, Serial No. 196,991

10 Claims. (Cl. 248—21)

This invention relates to an improved construction for isolating operating machinery from the foundation or base on which it is mounted.

Heretofore, devices for effecting the absorption and control of vibration have been made with the various casing parts formed by castings which not only requires special molds for the various designs, sizes and types, but at the same time produces a casing or housing which is of considerable weight and, therefore, not adaptable to many installations where specifications require light weight as an essential factor.

Accordingly, the invention has generally in view a novel vibro-isolator unit which may be entirely constructed out of steel plates and rolled structural shapes which not only have the advantage of being light in weight but also of greater strength. In that connection while structural steel plates and shapes have been found suitable for the purpose it will of course be understood that the several parts may be made of other metals, for example, Duralumin.

A primary object is to assemble and arrange the structural elements constituting the housing of the device in such a way that by following a novel predetermined general scheme or pattern in constructing the unit, units of various size and capacity may be made up initially from the several constituent structural shapes, or, on the other hand, small units constructed in accordance with the invention may be used in multiple, and, in either case, not only decrease the total weight of the units from 45% to 65% over those heretofore used, but also to effect economy in floor space occupied anywhere from 35% to 60% while at the same time obtaining increased strength over castings equal to approximately 150%, and increasing contact area with the machine base from approximately 40% to 80%.

Another object of the invention is to provide a construction which provides ready access to the vibration isolating means such as springs, or the like, and, at the same time permits of readily mounting the springs in cups or centering devices to not only facilitate installation, but, also to prevent accidental movement or creeping of the springs in use.

A further object of the invention is to provide a construction which includes top and bottom plates and side members which lend themselves to standard preliminary manufacturing operations to prepare them for assembly by suitable fastening members, and, at the same time, permit of readily anchoring the entire unit to a foundation while also enabling the structure to include leveling bolts for leveling the machine base.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangements of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a top plan view of a unit constructed in accordance with the present invention, and wherein the side members are carried by the top plate.

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a side elevation of the figures shown in Figures 1 and 2.

Figure 4 is a longitudinal sectional view taken on the line 4—4 of Figure 1.

Figure 5 is vertical sectional view of a modified arrangement wherein the side members are carried by the bottom plate.

Figure 6 is a transverse sectional view taken on the line 6—6 of Figure 5.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

According to the embodiment of the invention shown in the accompanying drawings the same includes in its organization, a housing comprising opposite plates 1 and 2, and side wall forming members 9 and 10 which may be rigidly connected with one of the plates and loosely or slidably connected with the other. The construction first to be described contemplates rigidly connecting the side members with the plate which is uppermost while, the second or alternative construction, shown in Figures 5 and 6, contemplates rigidly connecting the side members with the lowermost plate or the plate which is anchored to the floor.

The plates 1 and 2 are substantially counterparts of each other in the respect that they may be structurally of the same dimension and area and have the common feature that each plate is provided along opposite sides with end and intermediate holes or openings for receiving suitable fastenings. That is to say, each of the plates may be cut from the same stock or from stock of different thickness and punched or drilled with corresponding openings certain of which may be tapped or threaded and utilized for receiving anchoring or leveling bolts, while but minor fur-

ther preparation is required to adapt each plate for its particular location in the finished assembly, that is, whether it is used as a top or bottom plate.

For example, the plate 1 may be provided with the end openings 3—3 and the intermediate openings 4 while the other plate 2 may be provided with the end openings 5—5 and the intermediate openings 6. In the case of the plate 1 (Figs. 1–4) the intermediate openings 4 are tapped or threaded to receive the leveling bolts 7 which may be rotated to level the machine base supported on the plate 1. On the other hand, in the plate 2 the openings 6 are intended to receive the fastenings 8 to secure the entire unit to the foundation, and the end or corner openings 3 and 5 receive coupling bolts or fastenings as will presently appear.

As previously indicated, the plates 1 and 2 are connected by the side members or structural shapes or bars 9 and 10 which constitute in effect the side walls of the housing. As shown, the side members 9 and 10 are preferably provided with offset flanges. These flanges are medially notched or recessed as indicated at 11 where the leveling bolts 7 and the foundation bolts 8 are located. Otherwise, the flanges are provided with openings which correspond to and register with the openings 3 and 4 in one plate and with the openings 5 and 6 in the other plate.

In Figures 1–4 the upper flanges of the members 9 and 10 are rigidly connected with the plate 1 by the fastenings 12 passing through the corner openings 3—3 so that no relative movement occurs between the side members 9 and 10 and the plate 1. However, the lower flanges of the side members 9 and 10 are slidably connected with the bottom plate 2 by the couplings or fastenings fitted in the corner openings 5—5. That is to say, the end or corner openings of the plate 2 and the end openings in the lower flange of the side members 9 and 10 are intended to receive the relatively elongated fastenings 13 which preferably have a threaded engagement with the plate 2 and are provided with a nut and washer at the upper ends, leaving the shank portion of the bolts of the requisite length or depth to permit relative movement between the lower edges of the side members and the surface of the said plate 2 adequately to provide for accommodating the yielding isolation means designated generally as S, as will presently appear.

In connection with the coupling bolts or fastenings 13 it may be pointed out that a distinctive feature thereof resides in encasing the same with suitable cushioning material which serves as a resilient bumper, both vertically and horizontally, to particularly guard against sudden impact between the plate 2 and the superstructure, that is the plate 1 and associated side members. For example, the bolts 13 may be provided with spool-like members 14 which may be made of laminated rubberized fabric or other material which will prevent a metal to metal contact between the lower flanges of the side members 9 and 10 and the base or plate 2 as well as the shanks of the bolts or fastenings 13. It will, of course, be apparent that the sleeve portion and one of the flanges thereof may be made in one piece, or on the other hand, the same result can be obtained by making the sleeve in one piece while the upper and lower flange portions both partake of the nature of washers. In connection with the lower flange or washer element of the members 14 it may be pointed out that the plate 2 may be recessed as indicated at $2x$ to accommodate the same and thereby have the effect of anchoring the lower portions of the members 14 in the base.

The vibration isolating elements S arranged between the plates 1 and 2 are preferably in the form of springs. For example, in the illustration shown the coil springs 15 and 16 preferably have their upper and lower ends mounted in centering cups 17 and 18 respectively, the said cups being provided with knurled or threaded dowel or stud portions 19 adapted to have a driving fit respectively in openings provided in the plate 2 and the compressor strap 20. In the case of the upper cups 17, the knurled dowel portions 19 extend upwardly as indicated at 21 to be guided in suitable openings provided in the upper plate 2. It will thus be apparent under all conditions of installation and use the springs are properly centered.

If desired, the spring cups, particularly the lower spring cups 18 may be provided with a pad or bearing member of the same material as the members 14. In other words, metal to metal contact of the cups and the parts with which they engage may be prevented by inserting suitable resilient shims or washers to further assist in rendering the operation of the isolator noiseless, and, to a minute degree, absorb or rather prevent the transmission of noise incident to vibration.

The compressor strap 20, as will be apparent from Figure 4, is common to both springs 15 and 16 and its upper face is engaged by an isolator adjusting bolt 24 which is threaded through the upper plate 1. In practice the springs 15 and 16 are first positioned in the cups 17 and 18 and then the adjusting bolt 24 is manipulated through the tool engaging portion at its upper end to compress the springs. As a result the rigidly connected plate 1 and the side plates 9 and 10 are lifted as far as the engagement of the lower flanges of the side members and the upper flanges or washers of the members 14 will permit so that the entire structure above the plate 2 is held yieldingly supported above the same by the vibration isolator. If for any reason the machine is subjected to a sudden vibration or shock which will cause the superstructure to descend relative to the plate, it will be apparent that the lower flanges of the side members 9 and 10 will not come into metallic contact with the plate 2 due to the members 14.

It will, of course, be understood that the base of the machine to be isolated is normally supported on the upper plate 1 which affords a relatively wide area of contact between the isolating device and the base, and, that the nuts 25 on the adjusting bolt 24 may be manipulated to clamp the machinery base to the upper plate. However, before the machine base is clamped in position it will be understood that, if necessary, the leveling bolts 7 may be manipulated to insure that the machine base is properly leveled.

In connection with the side members 9 and 10 it is pointed out that while a distinctive feature thereof is that the upper portions thereof (Figs. 1–4) are rigidly connected with the plate 1, and, bolts 12 are shown for illustrative purposes, it will be understood that the upper portions of the side members may be connected to the plate 1 by welding. However, the bolt type of fastening is preferred.

It will also be apparent that the springs S are accessible through the open ends of the parallel side members 9 and 10. In other words the springs may be inserted into the cups 17 and 18

through the opening provided at each end of the side members. However, for the purpose of closing these openings to keep out foreign matter, it is desirable to provide suitable cover plates 26 as shown in Figure 4 which may be removably held in place by suitable screws or equivalent fastenings 27.

Figures 5 and 6 of the drawings illustrate what may be termed a reversal or inversion of the construction shown in Figures 1–4, inclusive. According to this embodiment of the invention all of the previously described essential characteristics are maintained and preserved but the plate to which the side members are rigidly connected is located at the bottom of the structure instead of the top. That is to say, the plate 1*a* is rigidly connected with the flanges of the side members 9*a* and 10*a* by the fastenings 12*a* while the opposite plate 2*a* is coupled to the side members 9*a* and 10*a* by the elongated coupling bolts 13*a* which loosely guide and connect the plate 2*a* with the side members, and, like the couplings 13, the couplings 13*a* are provided with the cushioning elements 14*a* of the same type as previously described. The plate 1*a* may be anchored to the foundation by fastenings equivalent to the bolts 8 and the plate 2*a* may be provided with the leveling bolts in the same manner as illustrated in connection with the plate 1 in Figures 2 and 3.

The isolating means S′ is mounted between the relatively movable opposite plate members 1*a* and 2*a* in the same manner as the isolation means S previously described. In that connection, however, Figures 5 and 6 illustrate an additional feature, namely, that of providing means for automatically pre-compressing the isolation springs by the mere act of mounting the machinery base on the plate 2*a*. In Figures 5 and 6 the compressor strap 23*a* is primarily controlled by the adjustment bolt 24*a* in the manner previously described in connection with the parts 23 and 24. However, the bolts or dowels 21*a* in these figures are made of sufficient length normally to project entirely through the guiding openings in the plate 2*a* when the springs are first placed in position, thereby to be engaged and depressed by the machinery base which rests on the uppermost plate. That is to say, that since the isolators are initially made up with only a very slight compression of the springs, additional spring compression is provided by the means just referred to to support the weight of the machine before the spring adjusting bolt 24*a* is put into operation.

From the foregoing it will be apparent that the present invention provides a vibro-isolator whose novel features of construction may be followed regardless of capacity or size. The essential elements and characteristics, which make this possible are that one of the plates and the side members may be rigidly connected while the other plate and the side members are loosely coupled or connected. Moreover, the vibration-isolating means is properly anchored and housed within the side members and between the plates in such a way as to insure operating efficiency.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will, of course, be understood that changes in the form, proportion and minor details of construction may be resorted to, without departure from the spirit of the invention and scope of the appended claims.

I claim:

1. A vibro-isolator including a fabricated housing comprising opposite plates, side members having outwardly projecting spaced flanges, means for rigidly connecting certain of said flanges with one plate, means for slidably connecting other of said flanges with the other plate, vibration isolating means confined between said plates and normally holding the same in separated relation, and a bolt having a threaded engagement with one of said plates for varying the compression of said vibration isolating means, said bolt also constituting a machinery base anchoring member.

2. A vibro-isolator including a housing comprising opposite plates, side members having flanges, means for rigidly connecting certain of said flanges to one plate, means including a non-metallic cushioning element for guiding and loosely connecting other of said flanges with the other plate, and vibration isolating means confined by the said plates for normally supporting one plate yieldingly above the other.

3. A vibro-isolator including a housing comprising opposite plates, side members having flanges, means for rigidly connecting certain of said flanges of said side members to one plate, bolts for slidably interlocking other flanges of the side members with the other plate, non-metallic means arranged between the opposing faces of the bolts, flanges, and plate for preventing metal to metal contact therebetween, and vibration isolating means confined between said plates.

4. A vibro-isolator including a housing comprising opposite plates, side members having flanges, means for rigidly connecting the flanges of one of the side members with one plate, means for guiding and loosely connecting the other flanges of the side members with the other plate, spring means accessible through the open ends of the side members, and detachable cover plates for the openings between the ends of said side members.

5. A vibro-isolator including a housing comprising upper and lower plates, side members having outwardly projecting upper and lower flanges, means for rigidly connecting the upper flanges to the upper plate, means including a cushioning element for slidably guiding and connecting the lower flanges of said side members with the lower plate, and vibration isolating means confined between said upper and lower plates.

6. A vibro-isolator unit including a housing comprising upper and lower plates having end and intermediate openings along opposite edges thereof, vibration isolation elements confined between said upper and lower plates, side members having upper and lower flanges provided with openings for registering with the openings in said upper and lower plates, fastenings in the end openings of the upper plate and the upper flanges of said side members rigidly connecting these parts, fastenings in the end openings of the lower plate and the registering openings of the lower flanges of the side members for slidably connecting these parts, fastenings in the intermediate openings of the lower plate to secure it to a foundation and adjustable bolts in the intermediate openings of the upper plate for leveling the machine base on the isolator unit.

7. A fabricated isolator unit comprising upper and lower plates, side members having upper and lower laterally offset portions, means for rigidly connecting the lower laterally offset portions of said side members with the lower plate, isolating means arranged between the said plates, and

means for slidably connecting the upper laterally offset portions of said side members with the upper plate.

8. A fabricated isolator unit comprising upper and lower plates, side members having upper and lower laterally offset portions, means for rigidly connecting the lower laterally offset portions of the side members with the lower plate, isolating means aranged between said plates, means for slidably connecting the upper laterally offset portions of the upper plate with the side members, and impact absorbing means associated with last said named means to prevent metal to metal contact between the upper plate and said side members.

9. In a vibro-isolator the combination with upper and lower plates interconnected for relative sliding movement, vibration isolating elements confined between said upper and lower plates, centering cups connected with the lower plate for centering and holding the lower ends of the vibration elements, a compressor strap carrying centering cups for the upper ends of said vibration absorbing elements, means for guiding the compressor strap relative to the upper plate, said means projecting above the upper plate to be depressed by the machinery base and, thereby pre-compressing the isolation means, and an isolator adjusting element carried by the upper plate and having one end thereof bearing against said compressor plate.

10. In a vibro-isolator the combination with upper and lower plates interconnected for relative sliding movement, said upper plate having guide openings, vibration isolation elements confined between said upper and lower plates, centering cups secured to the lower plate for centering and holding the lower ends of the vibration elements, a compressor strap carrying centering cups for the upper ends of said vibration absorbing elements, means on the compressor strap cooperating with said guide openings in the upper plate to guide the compressor strap relative to the said upper plate, and an isolator adjusting element carried by the upper plate and having one end thereof bearing against said compressor plate.

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