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MACHINERY BASE STABILIZER

2,200,859

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Fig. 1

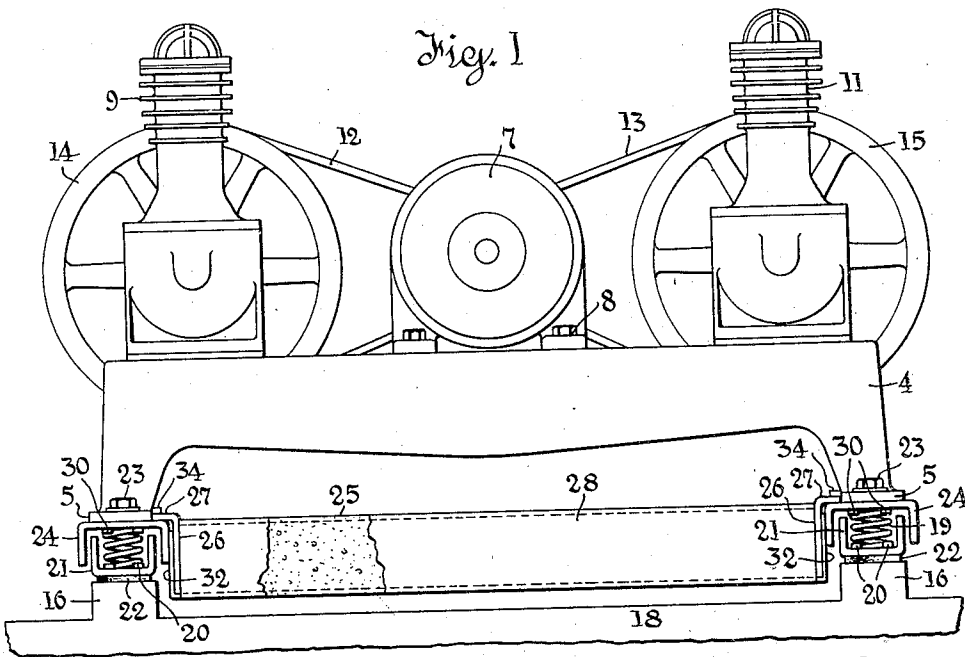


Fig. 2

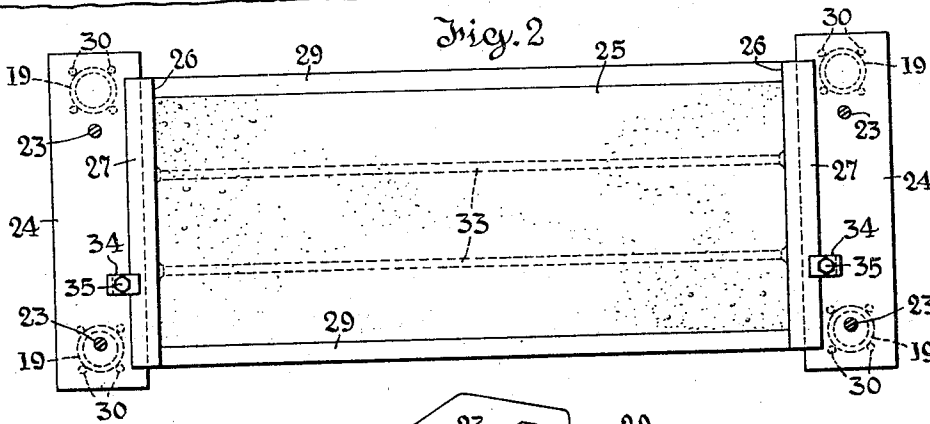
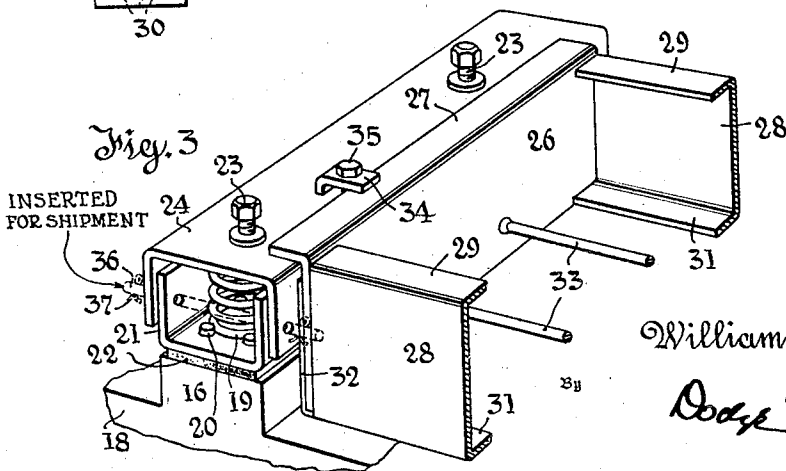


Fig. 3



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MACHINERY BASE STABILIZER

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8 Claims. (Cl. 248—20)

This invention relates to stabilizers for machinery bases and more particularly for machinery bases carrying units of the motor driven type. Such a unit of the condensing type suitable for use in refrigeration, air conditioning units, and the like, has been illustrated although the invention is obviously not limited to this particular type.

Units of this character are subject to considerable vibration, especially during the frequent starting and stopping, which is inherent in their operation. Inasmuch as they include one or more flywheels which tend to unbalance the structure, they are prone to be noisy and to transmit vibrations through the pipe lines to which they are connected. This is particularly true where the units are installed on upper floors which are inherently subject to vibration disturbances.

The problem presented by this noise and vibration has heretofore been approached with the idea of assembling the electric motor, the compressors, and the like at the factory, in a perfect balanced relation on their base, and then providing flexible connections in the pipe lines connecting the unit with the system which it supplies when installed. Obviously no one adjustment could meet all conditions, hence the problem remained unsolved.

Further efforts have been made to reduce the vibrations by providing the base of the units with spring mountings. Regardless of the care with which units of this type are designed and mounted, the diversity of systems in which such units are used is so great that no factory assembled unit can produce perfect results in the field. Hence serious difficulties have developed with such units, particularly where installed in the upper floors of buildings. The problem is further made difficult by the fact that units of this character vary in size and capacity, and necessitate the carrying in stock of numerous types and sizes of anti-vibration equipment so that no satisfactory solution of the problem has heretofore been obtained.

The object of the present invention is to provide a relatively cheap and satisfactory mounting that can be adapted to different sized units without requiring numerous types of spare parts, which permits adjustment upon final assembly of the unit to produce a balanced stable structure substantially free from vibration, and a unit which is so well balanced and stable that it may be connected directly to solid pipe lines which it serves without the use of flexible connections.

In this way objectionable noise transmission is avoided in units, even when they are installed in locations inherently subject to vibration difficulties.

The invention has been illustrated in the drawing as applied to one typical form of condensing unit. In the drawing:

Figure 1 is a side elevation of one type of machinery base with a condensing unit thereon, and employing one type of stabilizer of the present invention, a portion of the stabilizing means being shown broken away;

Fig. 2 is a plan view of the stabilizer shown separate from the condensing unit; and

Fig. 3 is a perspective view of a portion of a stabilizer unit before the stabilizing mass has been applied to it.

In Fig. 1 of the drawing, reference character 4 designates a machinery base with a typical condensing unit now in extensive commercial use mounted thereon. This base has depending legs terminating in base flanges 5. As here shown this base may conveniently consist of cast iron and carry centrally disposed thereon an electric motor 7 bolted in position at 8 and in driving relation to two compressors 9 and 11 by means of belts 12 and 13. The compressor 9 has a flywheel 14, and compressor 11 has a flywheel 15, both of these flywheels, as shown, being on the far side of the base 4 and tending to cause the base 4 to list slightly toward that side of the base. While in practice the location of the compressors and the motor on the base 4 will be carefully chosen in an effort to produce a symmetrical balanced structure, the inherent tendency of the flywheels 14 and 15 when in motion, and particularly upon starting and stopping, is to produce the list just mentioned. This list is also frequently accentuated by the weight of attached pipe lines, as it will be understood that in practice the compressors 9 and 11 are connected to suitable suction and discharge lines of a refrigerating or air conditioning system. These lines will vary in location, position, and weight, thus tending to disturb the carefully balanced relation of the parts which has been chosen in their initial factory assembly.

The base flanges 5 are supported on piers 16 of wood, stone, concrete, or the like, and supported on any suitable foundation 18, preferably of cement or other non-compressive massive material. Interposed between each of the piers and one of the base flanges 5, at each corner of the base 4, are cushioning springs 19. These springs are supported at their lower ends by U-shaped

might result from imperfect contact between the pier and the channel member.

15 Bolted to the flanges 5 as by bolts 23 are second channel members 24 in telescopic relation to the members 21, and having depending flanges so proportioned as to avoid frictional contact with the lateral flanges of channel members 21, the 20 two members being so spaced by means of the cushioning springs 19 as to ensure the entire absence of metallic contact at all times. The springs 19 at their upper ends engage the channel members 24, and are held against undesired 25 shifting by the centering lugs 30 similar to the lugs 20 on members 21.

Upon reference to Figs. 2 and 3 it will be seen that the bolts 23 are unsymmetrically located on the channel members 24. In the finished installation it is essential for proper operation that all 30 four of the cushioning springs be under equal stress. This unsymmetrical mounting of base 4 on the channel members 24 displaces the main body of the unit toward the front of the assembly as it appears in Fig. 1. Since the flywheel or back side of the unit is heavier than the front 35 side the result is to cause all of the springs to be under approximately equal stress before the stabilizer of the invention is adjusted.

40 The structure so far described is known in the prior art and is subject to the difficulties and inadequacies which have already been mentioned. In addition to the faults enumerated, the unit 45 so far described is particularly objectionable because of the location of the center of gravity. Since the base is mounted on legs and the compressors and motor are very heavy, the result of this arrangement is to place the center of gravity 50 so high that it has a marked tendency to encourage vibration, oscillation, and noise.

The present invention not only tends to reduce vibration and noise, but it provides a very much lower center of gravity for the unit and 55 affords a ready adjustability of the location of that center of gravity with respect to the unit proper. This location and adjustability of the center of gravity is taken care of by means of a mass 25 preferably of concrete or other material, 60 which may be cast on location without the expense of shipping from the factory. This mass of concrete 25 is preferably carried in a metallic frame comprising vertical end members 26 terminating in horizontal lips 27 extending over 65 each of the channel members 24, under the base 4 so as to support the mass in any position to which it may be moved laterally.

Cooperating with the end members 26 and secured thereto as by welding are channel members 70 28, which form with the end members 26 a box open at top and bottom, but capable when placed on a flat surface of receiving and holding a mass of concrete which may be cast in position. The bottom flanges 31 of the channel sides 28 preferably 75 carry overhanging end flanges 32 which are

channel members 28. When this concrete hardens the complete stabilizer unit is ready for assembly on the base. The channel members 24 15 each carry clamps 34 held in position by bolts 35, which may be tightened in order to hold the lips 27 in fixed relation to the channel members 24. It thus becomes possible to shift the stabilizer 20 25 back and forth parallel to the shaft of motor 7, and thus to vary the horizontal location of the center of gravity until the entire unit is balanced and stable, and each of springs 19 is under the same tension, and then to tighten the clamps 34 25 to hold the stabilizer in fixed position relative to the members 24.

In practice it will be found preferable to ship units of this type unassembled and without the concrete. In shipment, since the cushion springs 30 19 are fragile and their tension is a critical factor in satisfactory operation, pins 36 (shown in dotted lines) may be provided, passing through the mating flanges of the channel members 21 and 24, so as to maintain uniform stresses on all of the cushion springs as indicated 35 in Fig. 3, and to prevent them from being overstressed. The pins 36 are held in position by cotter pins 37, one of which may be removed to permit withdrawal of the pin when the unit is 40 placed in operation.

It will be apparent from the above that the base 4 may be of standard construction and that a single form may be employed for several sizes of stabilizer. In other words, the weight of the 45 stabilizer can be calculated for each style and size of unit and then the frame entirely filled with concrete for one size, half-filled for another size, and one-fourth filled for still another size 50 of unit. The weight of concrete is well known and the exact specifications can be given for the amount required for each particular style and size of unit. The concrete after casting may be painted or otherwise covered to give it a satisfactory pleasing appearance, or one which 55 harmonizes with its surroundings.

It will be apparent from the above that the present invention affords means for avoiding 60 troublesome vibrations in units of this character, particularly when installed in structures which are inherently unstable and subject to vibration difficulties. Whereas, heretofore, it has been necessary to predetermine what problems were to 65 be met in any particular installation and to attempt to meet those problems by factory adjustment, the present invention makes it possible to avoid almost entirely such precalculation and to take care of the variations in pipe line locations and other varying factors by adjustment of the 70 stabilizer after all the installation has been completed. In this way, not only is the center of gravity of the unit placed low, but the parts may be so handled that all supporting and cushioning springs are subjected to equal stresses, thus providing ideal conditions for substantial elimination 75

of noise and vibration under all conditions of location and operation.

What is claimed is:

1. A resilient support for machinery units sub-
 5 ject to vibration, comprising a base; a plurality
 of resilient means for supporting said base; and
 an adjustable weighty mass for varying the lo-
 cation of the resultant center of gravity of said
 mass and the base with the unit thereon to cause
 10 each of said resilient means to be placed under
 equal stress and to support equal shares of the
 weight of said mass, said base and said unit.
2. A resilient support for machinery units com-
 15 prising a base; at least one machine on said base
 and subject to vibration by its own operation;
 coiled springs for supporting said base; and a
 weighty mass carried by said base and supported
 by said springs, said mass being adjustable to
 20 vary the resultant position of the center of grav-
 ity of said base, said machine and said mass to
 cause each of said springs to be subjected to the
 same stresses.
3. A stabilizing support for machinery units
 25 comprising a base; a plurality of resilient mem-
 bers for supporting said base; a weighty mass
 carried by said base and adjustable laterally
 thereof to vary the location of the center of
 gravity of said base, said mass and said unit and
 to cause uniform distribution of the stresses im-
 30 posed upon said resilient members by said base,
 said mass and said unit.
4. In a stabilizing support for machinery units,
 a base having two spaced members; a plurality
 of resilient means for supporting said base at
 35 spaced points; a box-like weight supporting frame
 having an extended lip at each end thereof, one
 of said lips cooperating with each of said spaced
 members to permit lateral adjustment of said

frame with respect to said base; and means for
 securing said lips to said members to hold said
 frame in fixed relation to said base.

5. In a stabilizing support for machinery units,
 a base having two spaced inverted channel mem- 5
 bers secured to the bottom thereof; a plurality of
 resilient members extending into said channel
 members for supporting said base; two ground-
 supported channel members in telescoping rela-
 tion to said inverted channel members and coop- 10
 erating with them to house said resilient mem-
 bers; a box-like form adapted to contain a mass
 of cast material and having a lip extending from
 each end thereof and adjustably resting upon the
 inverted channel members; and means for secur- 15
 ing said form in fixed relation to said base.

6. In a stabilizing mechanism for machinery
 units, a ground support; a machinery base resil-
 iently mounted on said support; and adjustable
 weight means carried by said base for varying 20
 the position of the center of gravity of said means
 with relation to the center of gravity of said base.

7. A stabilizing support for machinery units,
 comprising a ground support; a machinery base;
 resilient means for supporting said base in sub- 25
 stantially symmetrical relation to said support;
 and an adjustable counterbalancing frame mov-
 ably mounted on said base and adapted to act
 as a form for a congealable weighty mass.

8. In a stabilizing mechanism for machinery 30
 units, a base having mounted thereon a machine
 subject to vibration; resilient means for support-
 ing said base; and counterbalancing means ad-
 justably mounted beneath said base and capable
 by its adjustment of varying the resultant center 35
 of gravity of said base, said machine and said
 counterbalancing means.

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