

Dec. 15, 1936.

C. HUSSMAN

2,064,751

RESILIENT MACHINERY BASE

Filed Nov. 27, 1933

4 Sheets-Sheet 1

FIG. 1

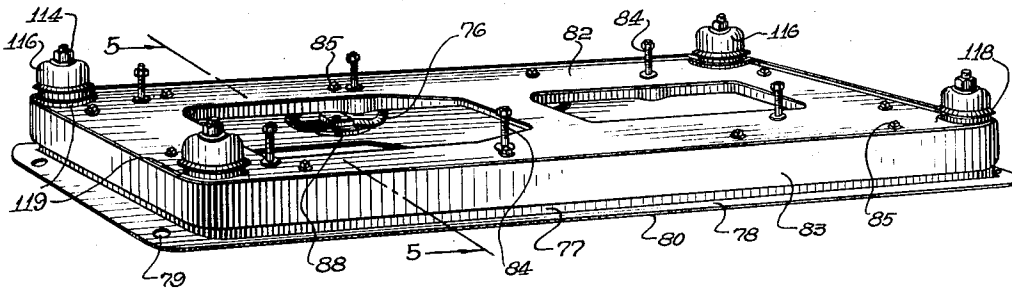


FIG. 5

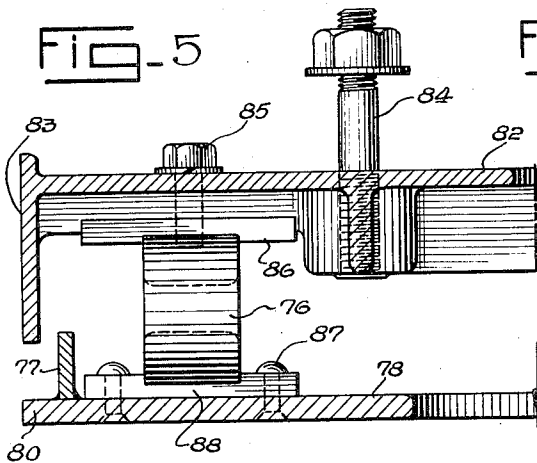


FIG. 7

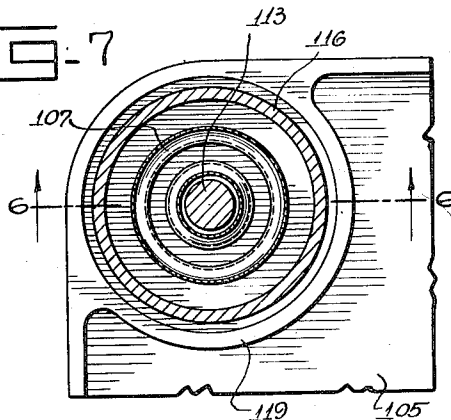


FIG. 6

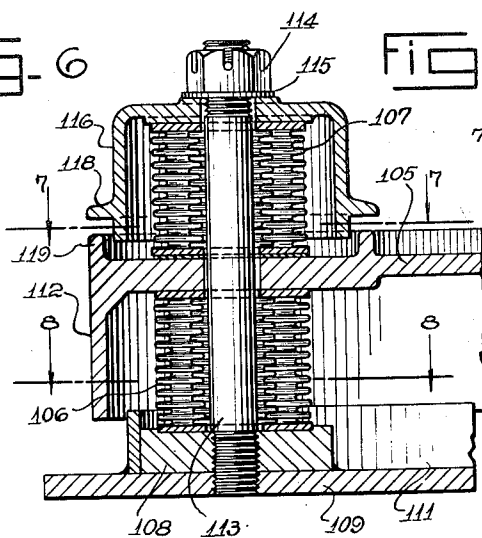
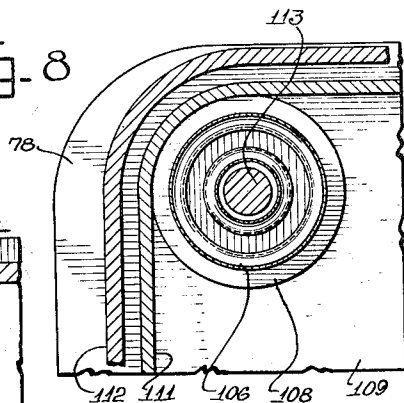


FIG. 8



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FIG. 2

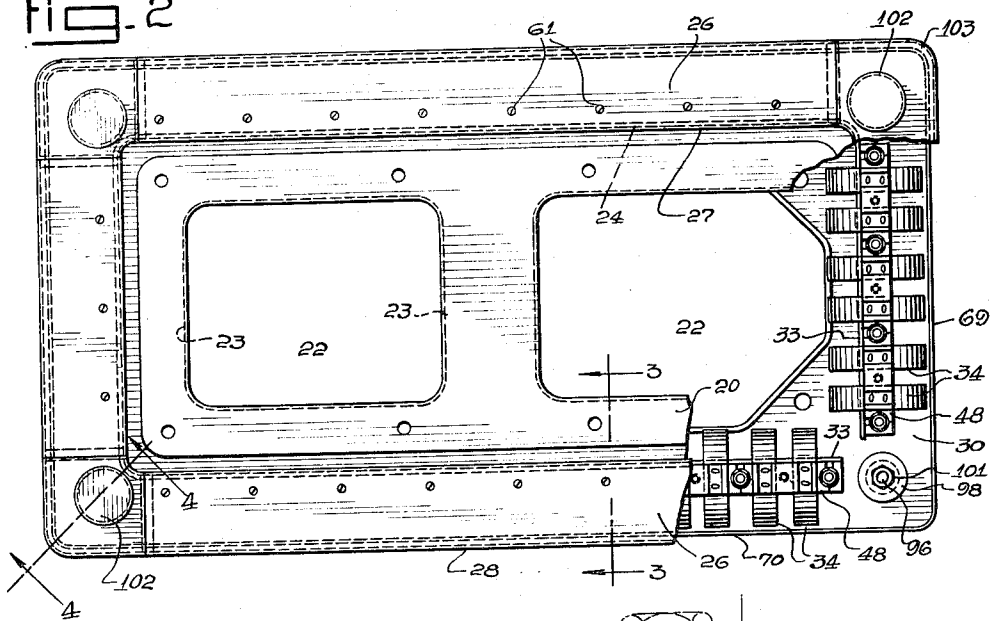


FIG. 3

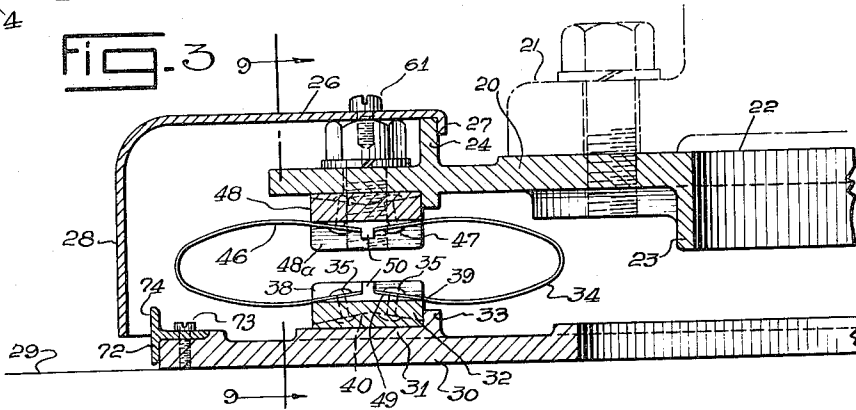
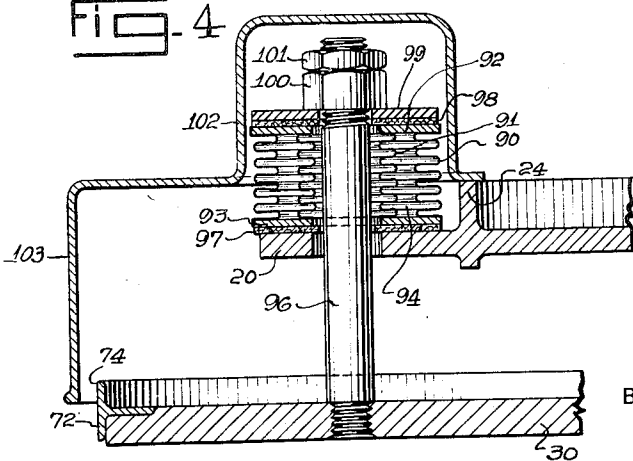


FIG. 4



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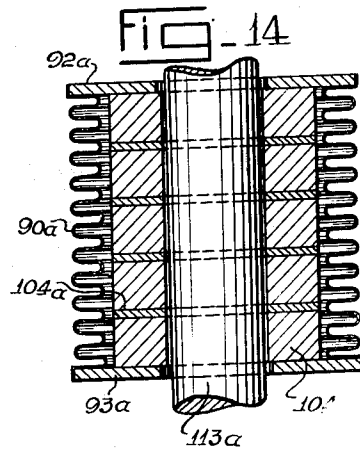
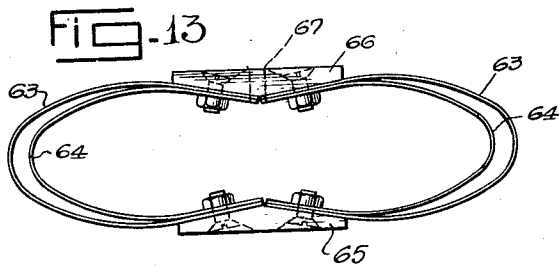
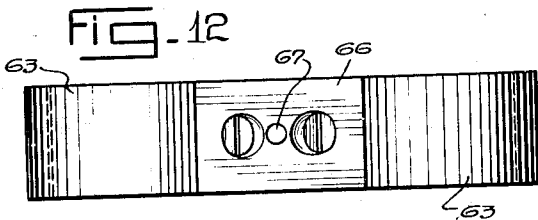
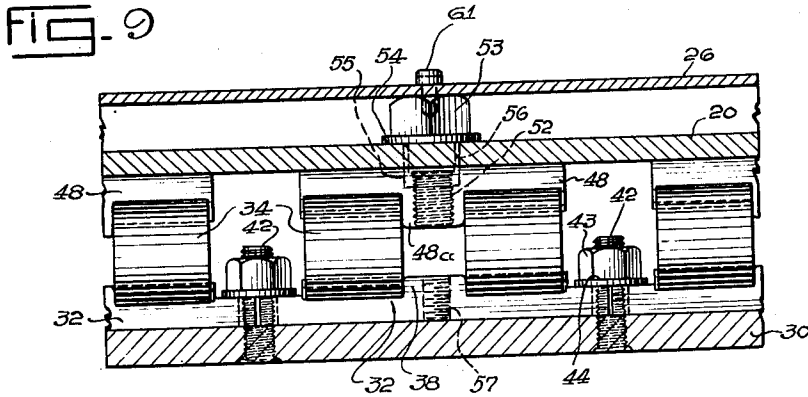
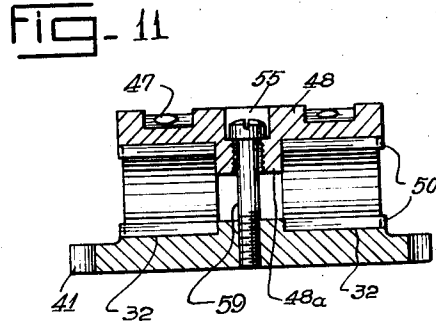
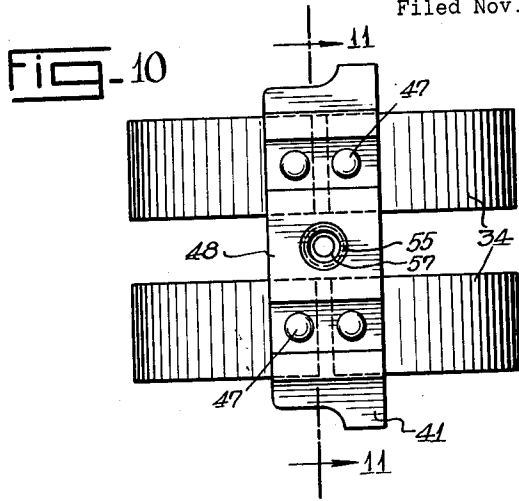
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FIG-15

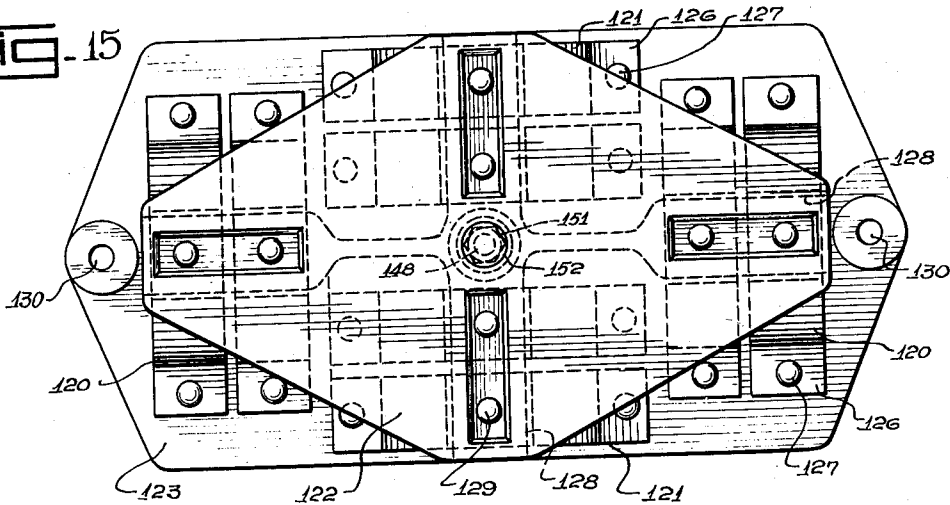


FIG-16

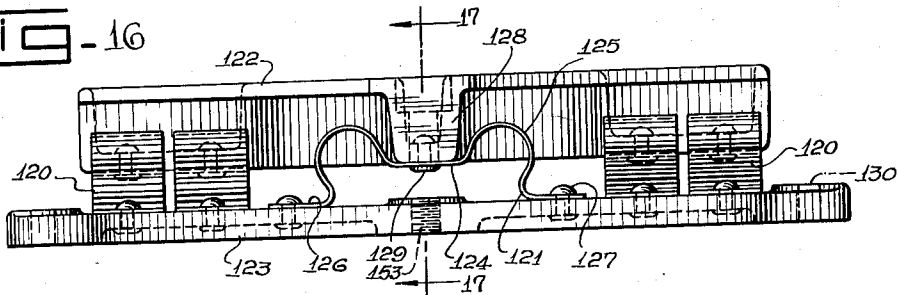
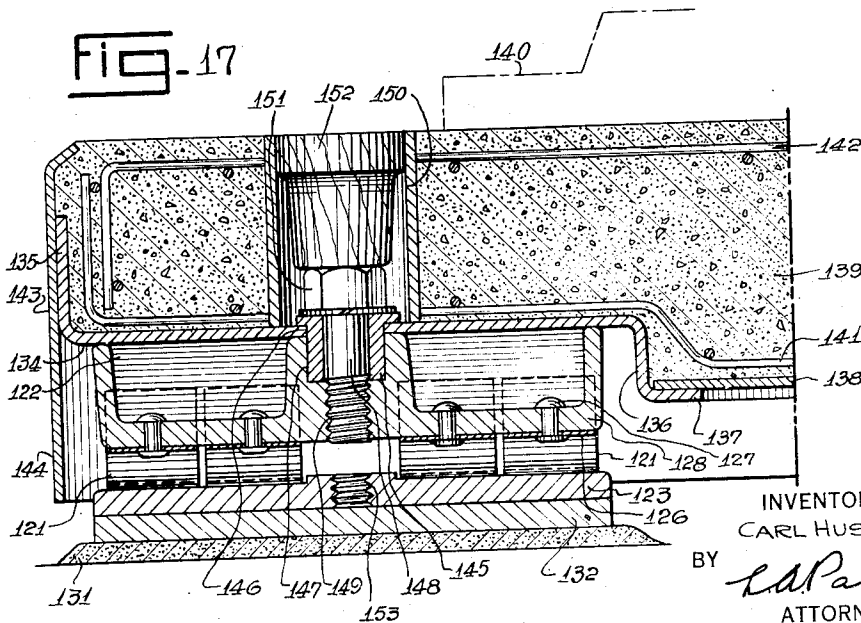


FIG-17



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UNITED STATES PATENT OFFICE

2,064,751

RESILIENT MACHINERY BASE

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Application November 27, 1933, Serial No. 699,861

5 Claims. (Cl. 248—21)

This invention relates to anti-vibration bases for supporting moving machinery or the like, and has reference more particularly to spring held machinery bases adapted to prevent the transmission of vibration and sound from a moving machine to a supporting structure.

In the copending application of B. E. Balduf, Serial No. 545,707, filed June 20, 1931, entitled "Resilient machinery bases", resilient flat spring clips or springs are used in series to support a platform or base for a piece of moving machinery. These spring clips are rigidly attached to the base supporting the machine and also to the supporting structure for the springs. Due to the peculiar shape of the springs in which a central saddle member is connected to outstanding integral resilient loops, it has been found that under severe conditions of vibration, as when extremely heavy machinery is supported, or where the springs are improperly tempered, the springs sometimes break under repeated flexing. The broken springs are difficult to remove without entirely dismantling the machinery base. The type of snubbers disclosed in the aforesaid co-pending application have also been improved upon especially for use with machinery having massive moving parts serving to rock the machinery base.

An object of this invention, therefore, is to provide an improved type of resilient supporting clip for machinery bases, which is less liable to break under extreme vibration conditions. Another object of the invention is to provide springs which may be removed from the machinery base without stopping the operation of the machine in case a spring becomes broken.

A further object of the invention is to provide an improved type of snubber for machinery bases; also to improve resilient machinery bases in other respects hereinafter specified and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which—

Fig. 1 is a perspective view of the assembled machinery base,

Fig. 2 is a plan view of a modified form of the machinery base with parts broken away to disclose the construction,

Fig. 3 is a sectional view through the machinery base taken on line 3—3 of Fig. 2,

Fig. 4 is a sectional elevation through the machinery base taken on line 4—4 of Fig. 2,

Fig. 5 is a sectional elevation through the machinery base taken on line 5—5 of Fig. 1,

Fig. 6 is a sectional elevation through a form of

snubbing device for the machinery base taken on line 6—6 of Fig. 7,

Fig. 7 is a sectional plan view through the snubbing device taken on line 7—7 of Fig. 6,

Fig. 8 is a sectional plan view through the snubbing device taken on line 8—8 of Fig. 6,

Fig. 9 is a sectional elevation through the machinery base taken on line 9—9 of Fig. 3,

Fig. 10 is a plan view of one of the removable spring clip units,

Fig. 11 is a sectional view through one of the spring clip units taken on line 11—11 of Fig. 10,

Fig. 12 is a plan view of a modified form of multiple leaf spring clips,

Fig. 13 is a side elevation of the clip shown in Fig. 12,

Fig. 14 is a central sectional elevation of a modified form of snubber,

Fig. 15 is a plan view of a modified form of removable resilient unit,

Fig. 16 is an elevation of the unit shown in Fig. 15, and

Fig. 17 is a sectional elevation of a machine base assembly utilizing the resilient unit shown in Figs. 15 and 16.

In constructing my improved machinery base, I provide a machine platform 20 which may be rectangular in shape, or any other desired shape to receive a frame 21 of the machine to be supported. The platform 20 is preferably constructed with openings 22 intermediate its edges, flanges 23 being formed adjacent the opening 22 for the purpose of imparting greater rigidity to the platform. An upstanding flange 24 is formed around the platform 20 spaced inwardly from the outer edge of said platform. An elongated shield 26 has its inner edge resting on top of the flange 24, a downwardly extending flange 27 on the shield 26 serving to provide interlocking engagement of the shield with the flange 24. A downwardly extending flange 28 is formed on the outer edge of the shield 26, said flange 28 serving to reach within a short distance of the floor line 29 on which a stationary base 30 is supported.

An elongated pad 31 is formed on the base 30, said pad being adapted to receive a series of spring seats 32, said seats being arranged to contact with limiting stop shoulder 33 adjacent the inner edge of said pad. A pair of semi-elliptical spring clips 34 are arranged with their inner ends mounted on the seats 32 and secured thereto by means of rivets 35. An outstanding flange 38 is provided on the seat 32 to properly position the inner ends 39 of the spring clips 34. Suitable clearance recesses 40 are provided in the bottom

of the seats 32 for receiving the lower heads of the rivets 35. Each of the outer ends of the seats 32 is provided with a stop shoulder 41 which engages against a bolt 42. The bolts 42 pass through the base 30 and are provided with nuts 43 and washers 44 for securing the seats 32 in position on the base 30. The upper ends 46 of the spring clips 34 are secured, as by rivets 47, to a bracket 48 which is elongated in form and is provided with a central rib or shoulder 48a which serves to space apart the two spring clips which form a spring unit. Curved surfaces 49 are provided on the seats 32 and brackets 48 to conform with the shape of the ends of the spring clips 34, and shoulders 50 on the seats 32 and brackets 48 serve to space apart the ends of the spring clips.

In order to secure the bracket 48 to the platform 20, a cap bolt 52 passes through the platform 20 and is threaded into the bracket 48 and shoulder 48a. The cap bolt is provided with a head 53 and a lock washer 54. A hole 55 of larger diameter than an unthreaded section 56 of the bolt 52, passes through the platform 20 and extends for a limited distance into the bracket 48. A tapped hole 57 is formed in the seat 32 and shoulder 38 concentric with the bolt 52 and of smaller diameter than said bolt. When it is desired to remove one of the spring units for the purpose of inspection or repair, the bolt 52 is removed and a fillister head cap screw 59 or a headed bolt adapted to be engaged by a socket wrench is substituted for the bolt 52 and threaded into the hole 57. Upon tightening the screw 59, the two springs comprising the spring unit are compressed so that the bracket 48 is separated from the bottom of the platform 20 to form a clearance space. Upon loosening the nuts 43, the spring units can then be moved laterally out from the machinery base and a new unit can be substituted in its place without stopping the operation of the machine supported upon the machinery base. A cap screw 61 passes through the shield 26 and is threaded into the bolt head 53 to secure the shield 26 in position, but still easily removable for inspection or removal of the spring units.

If desired, as when the machinery is very heavy to support, it may be necessary to employ multiple leaf springs as seen in Figs. 12 and 13. In these views, an outer spring 63 and an inner spring 64 are formed in semi-elliptic shape and have their ends secured at the bottom to a seat 65 and at the top to a bracket 66. A tap bolt opening 67 is provided in the bracket 66 for attachment to the platform 20. By the use of these multiple leaf springs, the springs may be placed very closely together between the platform and the base 30, thus supporting very heavy machinery. Additional leaves may be added to the spring units if desired. In this modified form, a suitable tool may be used to compress the springs for the purpose of removing the spring units from the machinery base for inspection or repair.

It will be noted that (Fig. 2) the spring clips are arranged around the periphery of the machinery base where they are most effective in preventing the rocking of a machine due to heavy vibratory movements of its parts. Furthermore, spring clips at the end 69 of the machinery base are placed at right angles to the springs along the side 70 of the machinery base, giving great lateral stability to the machine and effectually preventing any movement of the platform 20 ex-

cept in a vertical direction. In order to permit easy removal of the spring units, and at the same time prevent water and dirt from working into the interior of the machinery base, I provide a T-shaped runner 72 along the edge of the base 30, the web of said runner being secured by cap screws 73 to said base. The upper edge of the base flange 74 extends above the bottom of the shield flange 28 so as to practically prevent water from entering the interior of the machinery base as when the floors of the building are washed or scrubbed. When removing one of the spring units, the screws 73 are removed and the runner 72 withdrawn to permit easy withdrawal of the spring unit. It is, of course, necessary also to remove the shield 26 by removing the screws 61 when it is desired to inspect the spring units or remove any of them.

The form of machinery base shown in Figs. 1 and 5 is slightly different from that previously described in that fewer spring units 76 are used for lighter machinery, and these spring units may be arranged in parallel relation to the edges of the machinery base instead of at right angles thereto, as shown in Fig. 2. A splash plate 77 may be welded near the periphery of a base 78, bolt holes 79 being provided in the outstanding edge 80 of the base 78 for the purpose of attaching the base to the floor. In this type of machinery base a machinery platform 82 is provided with a peripheral downstanding shield 83, which co-operates with the splash plate 77 to prevent the entry of wash water into the interior of the machinery base. Bolts 84 are provided for attaching the machine to the platform 82. Bolts 85 secure the upper bracket 86 to the bottom of the platform 82, and rivets 87 secure a bottom seat 88 of the spring unit to the base 78.

In order to prevent excessive rocking of the machine 21, due to massive moving parts of the machine, or due to the movement of the base 30, as would occur on shipboard, or on moving vehicles, such as automobiles, I provide suitable snubbers at the corners of the platform 20. These snubbers (Fig. 4) are preferably in the form of a pair of concentric, resilient bellows 90 and 91, which are made of corrugated metal. The ends of said bellows are sealed, as by soldering, about the inner and outer edges of an upper metal ring 92 and a lower metal ring 93, so as to make a hermetically sealed space 94 which may be filled with air, but is preferably filled with a material such as a mixture of 60% paraffin oil and 40% rosin. For extremely heavy duty, the space 94 is packed with steel wool of about 0.1 mm. thickness of fiber, the top ring 92 is sealed in, and then the voids in the steel wool are filled with the paraffin oil and rosin mixture by means of a pressure gun screwed into an opening not shown in the ring 92. The space 94 may also be filled with rubber, various solids, and various mixtures of solids and liquids.

After the bellows unit is assembled, it is placed over a bolt 96 on a corner of the frame 20 with a cork or lead washer 97 between the ring 93 and the frame 20. A cork or lead washer 98 is placed on top of the ring 92 and a steel washer 99 is then placed in position over the bolt 96. A nut 100 and a lock nut 101 are threaded on to the top of the bolt 96 and sufficient pressure is applied to the bellows unit by means of the nut 100 so as to prevent undue rocking of the platform 20 due to the flexing of the springs 34. A cup-shaped cover plate 102 is then secured over the bellows assembly, the plate 102 being provided

with a downstanding flange 103, similar to the flange 28.

Where desired, the modified form of snubber illustrated in Fig. 14 may be used. This form comprises a resilient, annular bellows 90a, preferably of corrugated metal, secured by soldering, brazing, or the like, to a pair of spaced, flat metallic rings 92a and 93a. The area between rings 92a and 93a is substantially filled with a body comprising rings 104 of resilient material such as rubber separated by spacer rings 104a of lead or other suitable material. Rings 104 are preferably spaced somewhat from the convolutions of bellows 90a so as to allow for compressive, peripheral expansion, and are preferably tightly fitted about the shank of a bolt or rod 113a whereby to exclude air from the interior of the snubber.

In the form of device shown in Fig. 6, I disclose a modified form of machinery base. In this form of machinery base, the spring clips are entirely eliminated and an anti-vibration, supporting unit for the machine is constructed of a bellows unit preferably substantially identical in detail with that described and shown in Fig. 4, except that it may be somewhat greater in length; or the form of Fig. 14 may be used. A machine platform 105 has a bellows unit 106 below said platform and a snubber bellows unit 107 above said platform. The bellows unit 106 rests upon a metal washer 108 which in turn is welded or otherwise secured to base 109. An upstanding flange 111 is also secured to the upper side of the base 109 to keep wash water or dirt out of the inside of the machinery base, said flange cooperating with a downwardly extending flange 112 formed on the platform 105. A stud bolt 113 is screwed into the washer 108 and base 109, said bolt extending upwardly through the bellows units 106 and 107 and being provided at its upper end with a nut 114 and washer 115. A cup-shaped shield 116 is provided between the washer 115 and bellows unit 107, said shield 116 also having an outstanding annular protective flange 118 which fits very loosely over an upstanding annular flange 119 formed on the platform 105. This form of device will be covered more specifically in an application which will be filed.

In the form of device shown in Figs. 15, 16, and 17, a removable spring unit is formed of a number of spring clips 120 and 121, which are arranged between a platform 122 and a base 123. Each of the spring clips has a central saddle member 124 and a pair of outstanding loops 125 terminating in outstanding flanges 126. Rivets or other fastening means 127 serve to secure the spring flanges 126 to the base 123. Ribs 128 are formed on the bottom face of platform 122 and engage the saddle members 124, being connected thereto by rivets 129. The spring clips are preferably arranged in pairs (Fig. 15), some of the pairs of clips 120 being arranged at right angles to other pairs of clips 121 so as to give great lateral stability to the base but still permitting free vibration of the platform 122 vertically under the impulse of a moving machine supported by said platform. Bolt holes 130 are provided in the base 123 for receiving bolts to secure said base to a floor 131 or other supporting structure such as a plate 132.

The resilient unit may be placed beneath a machine platform comprising a metallic box 134 having upturned peripheral flanges 135 and a depressed central flange 136 terminating in a horizontal flange 137. A plate 138 covers the

space between the flanges 137 and a cementitious filling material 139, such as gypsum, concrete or the like is formed in the box 134 on top of the plate 138 so as to form a resilient foundation of considerable mass to support a vibrating machine 140. Reinforcing mats 141 and 142 are embedded in the foundation 139 adjacent its bottom and top respectively. A flange 143 extends around the foundation 139, being secured, as by welding, to the flange 135. The flange 143 extends downwardly to a point somewhat above floor 131 to form a wing 144 for the purpose of keeping wash water, dirt, etc., out of the interior of the machinery base. In order to secure the box 134 and foundation 139 to the platform 122, a shouldered sleeve 145 extends through an opening 146 in the box 134 and into a recess 147 in the platform 122. A tap bolt 148 passes through the sleeve 145 and engages a threaded opening 149 in the platform 122. A tube 150 extends through the foundation 139 around a head 151 of the bolt 148, said tube having an inside diameter sufficient to permit the operation of a socket wrench on the bolt head 151. A plug 152 is loosely fitted inside the tube 150 above the bolt head 151 so as to present a smooth surface flush with the top of the foundation 139, this plug being withdrawn when it is desired to remove the bolt 148. A threaded hole 153 smaller in diameter than the hole 149, is formed in the base 123 concentric with the hole 149 so that when the bolt 148 is removed, a cap screw or bolt of smaller diameter can be substituted and used, as in Fig. 11, to compress the spring clips 121 and permit the removal of one of the spring units for inspection and repair, without removing other spring units or stopping the operation of the machine 140.

Spring clips 34, 63, 64 and 76 are preferably constructed in a shape other than true elliptic, such as parabolic, to begin with, but are arranged to assume as nearly the true elliptical form as possible when placed under the machine load. By experiment, it has been found that in the true elliptic form, internal stresses of the clips under load are more nearly balanced, with a consequent increase in life of the clips under the vibratory movements of the machine base in use.

I would state in conclusion that, while the illustrated examples constitute practical embodiments of my invention, I do not wish to limit myself precisely to these details, since, manifestly, the same may be considerably varied without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a resilient machinery base, a base for rigid attachment to a supporting structure, a machine platform in spaced, parallel relation to said base, flat springs between said platform and base and removably secured thereto, and screw means for compressing certain of said springs to provide for removal of said compressed springs without disturbing the remaining springs.

2. In a resilient machinery base, a base, a machine platform spaced from said base, semi-elliptical springs arranged between said base and platform in pairs and having the free ends thereof in adjoining relation, a bracket connecting the upper ends of said springs, a seat connecting the lower ends of said springs, and bolt means for removably securing said seat and bracket to said base and platform respectively, said bracket bolt being removable to provide for the insertion of a connecting bolt between said bracket and seat,

said connecting bolt being operable from above said platform to compress said springs and to provide for the independent removal of said spring units from said machinery base.

- 5 3. In a resilient machinery base, a metallic platform box, a cementitious slab formed in said box for supporting a moving machine, a plurality of metallic brackets supporting said box, each bracket being secured thereto by a bolt, a sleeve
 70 extending about the head of said bolt through said slab, flat springs supporting said bracket, a base member supporting said springs, and a filler plug in said sleeve having the top surface thereof extending flush with the top of said slab.
- 15 4. The combination with a machinery base having a base and platform in spaced relation, of a plurality of resilient units between said platform and base, each of said units comprising a pair of

oppositely disposed, semi-elliptical flat springs with the free ends thereof positioned in adjoining relation, metallic members for connecting said spring ends together, and screw means for compressing said springs by reducing the distance between said members so as to permit the withdrawal as a unit of a pair of said springs from said machinery base.

5. In a resilient machinery base, a machine platform for supporting a moving machine, a base, a plurality of flat springs removably mounted on said base and supporting said platform, and screw means for compressing certain of said springs to permit the removal thereof from said machinery base independently of the remaining
 15 springs.

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