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W. L. COURSEN
DEADENING MEANS FOR OFFICE MACHINES AND
LIKE SHOCK AND NOISE GENERATING UNITS
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2 Sheets-Sheet 1

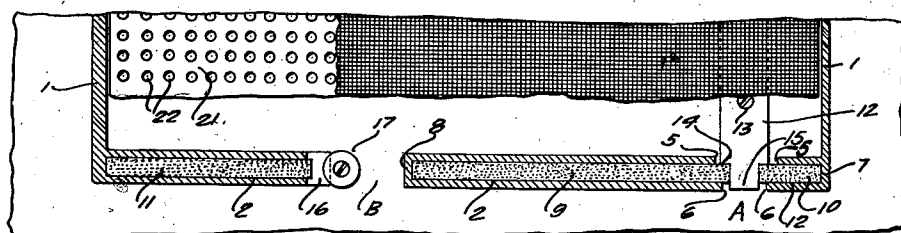
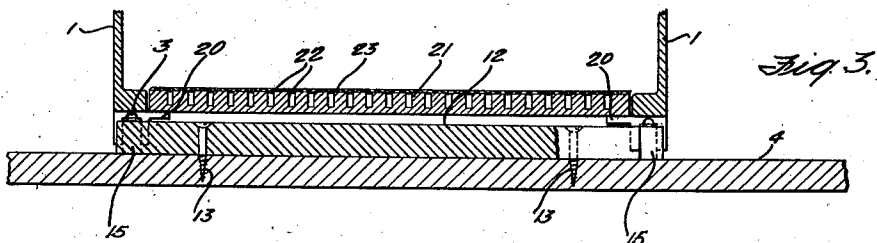
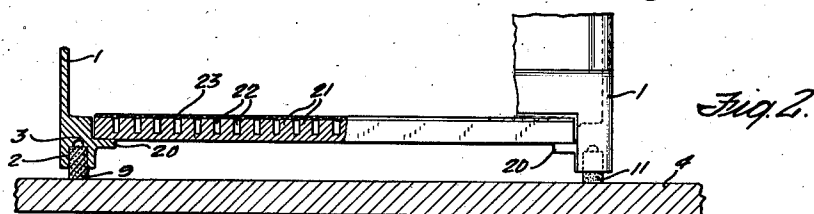
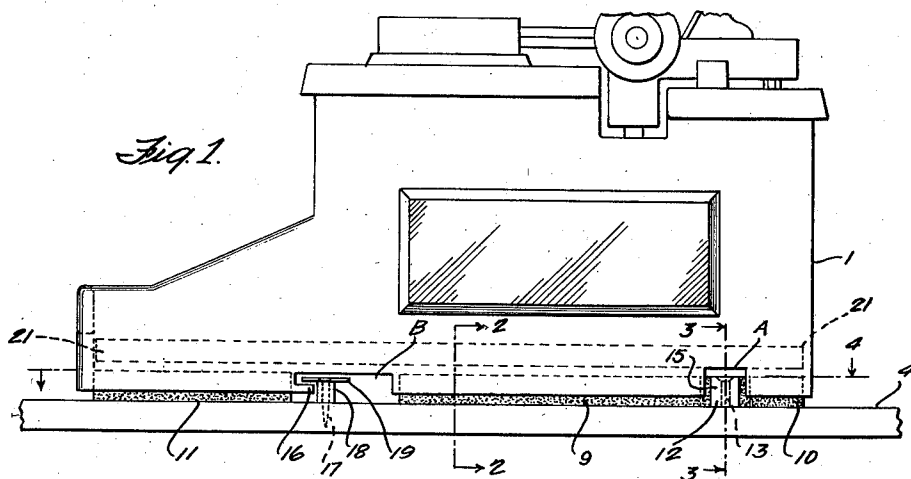


Fig. 4.

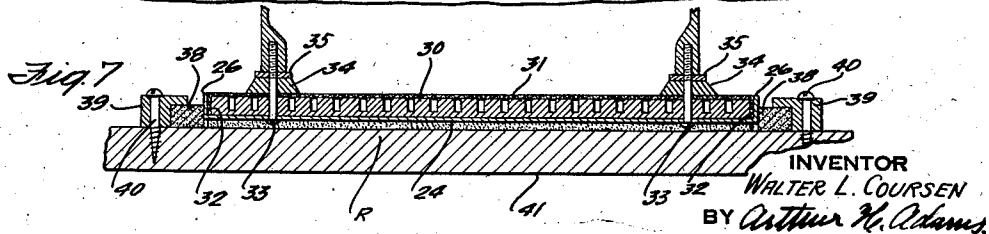
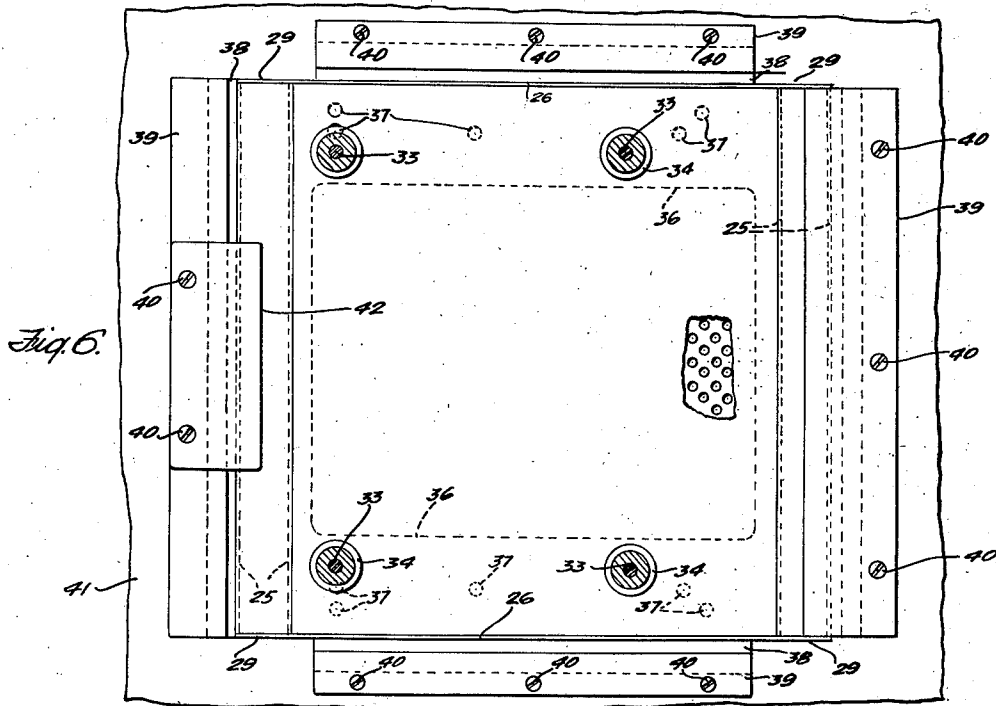
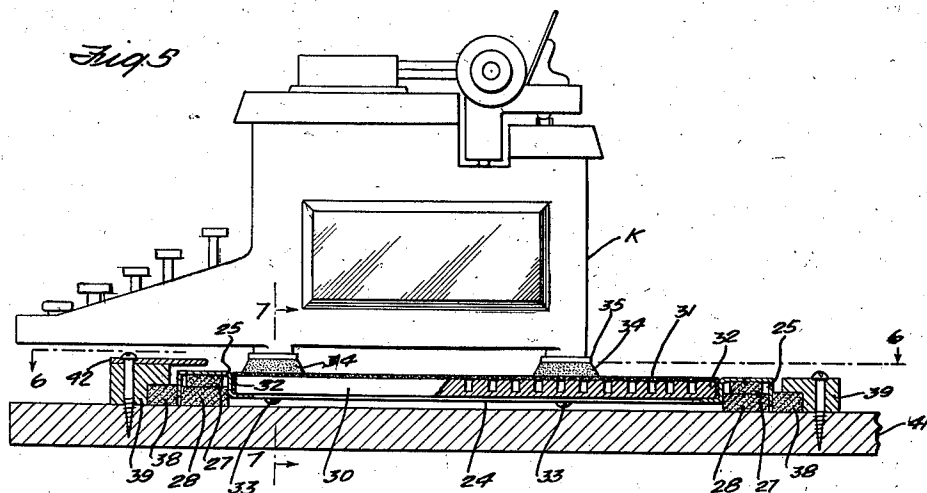
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UNITED STATES PATENT OFFICE

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DEADENING MEANS FOR OFFICE MACHINES
AND LIKE SHOCK AND NOISE GENERATING UNITS

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6 Claims. (Cl. 248—22)

This invention relates to improved deadening means and methods for hand operated or controlled machines and devices such as typewriters, teletyper keyboards, adding and calculating machines, staplers, punches and similar light machine units whether in the class of office machines or not, that create vibrations, shocks and noise and that thereby increase the fatigue and decrease the efficiency of their operators as well as of other nearby persons. One of the main fields where this invention brings relief is in the class of machines, mainly office machines, operated by finger keys.

The methods and means herein taught may be applied to any self contained machine or unit the combined noises and shocks or vibrations from which are a sufficiently important disturbing factor to operators and to enough nearby persons to justify the relatively small outlay.

There are three main ways in which manually operated mechanisms such as typewriters, adding machines, hand riveters, etc., cause strain and fatigue. They generate primary noise, i. e. they radiate vibrations into the air of an audible range of frequency, directly from various surfaces of their own structure. They generate secondary noise, i. e. they transmit much energy as mechanical vibrations through their structure to the larger and usually more efficient sound radiating surfaces of supporting structures such as tables, desks, benches, walls, floors, etc., where this energy is usually quite efficiently converted into audible air vibrations. Finally they generate tactile shock, i. e. the jars of manually or digitally moved and suddenly arrested members, like keys or levers, impinge directly on the hands or fingers operating those keys or levers. That this latter cause of fatigue is very important is witnessed by the popularity of the many devices in the prior art adapted to combat it, such as soft rubber key tops and spring key tops sold and used on adding and typing mechanisms. That noise, direct radiated or desk radiated, is fatiguing need not be argued.

This invention is characterized by its simultaneous attack on all of the fatigue creating effects. That is why the word deadening has been used instead of silencing. By this invention something more than noise reduction is accomplished.

By use of suitable very "compliant" material, a use so generous as to produce qualitatively new results, the machine units to be deadened according to this invention are so sensitively suspended as to yield slightly but instantly to key or lever

blows, thus greatly reducing the operator's fatigue due to tactile shock. This suspension, while elastic, also is designed to provide high damping or energy destruction by friction with the result that reaction from such yielding is sluggish and dead and not quick and vibratory as with ordinary spring or rubber mountings. This permits a very much more "floating" or sensitive suspension without giving the impression of "dancing" or of undue instability of mounting than can be obtained otherwise. A further result is that any vibrational energy in or transmitted through the structure of the machine unit is largely absorbed or damped out. The largest single source of noise from the operation of a typewriter or adding machine as usually mounted on a wooden desk is just this energy transmitted as shock and vibration into the desk and reradiated as noise from the sounding board of the desk top and sides. By the generous compliant but damping mounting of this invention such transmission is practically stopped. The contact of the machine unit frame on the considerable mass provided in this invention of vibration deadening material, and over the considerable areas provided, has a big further effect in killing the vibrations in the actual machine parts themselves, as a hand kills a bell, and therefore in killing primary noise or noise directly radiated from the machine. This is more particularly true in that preferred form disclosed where the frame of the machine unit itself is specially designed to rest for a very considerable area on vibration damping material. This frame damping effect is weaker in the alternative form disclosed, for deadening existing machines, where an accessory mount or sub-base is provided. Finally there is provided, according to this invention, a considerable area of any well known porous or reticulated sound absorbent material, disposed to catch as much as possible of the already reduced direct or primary machine noise, subject always to not being so large and so placed as to cause serious inconvenience to the operator.

The most practical vibration and shock deadening material for use in this invention I have found to be the very soft and sluggish material which is described in U. S. Patent 1,918,140 issued July 11th, 1933 to Ernst Schluter and sold under the trade name "Keldur". The results I attain in amortizing shocks and isolating vibration in typewriters, for example, in using this material would be impossible, practically speaking, if I were to use cork. The stiffness of cork is so much greater than of this material that to get an

equally sensitive suspension some eight times the volume of cork as of this material would be needed. I do not, however, limit my invention to the use of this material. Springs or soft rubber may be used in conjunction with dash pots or other friction devices.

One object of this invention is the provision of an unusually soft or compliant mounting for a hand operated mechanism, one sufficiently compliant noticeably to amortize tactile shocks.

Another object is the provision of such a sufficiently compliant mounting but with a sufficient sluggishness of return to avoid the feeling of instability of mounting.

Another object is the provision of a vibration damping mounting for such a mechanism to kill the transmission of most of the vibratory energy from the mechanism into the desk or other support structure and its radiation there as noise.

Another object is the damping of generous areas of the frame of such a mechanism by considerable masses of vibration damping material in order to reduce the direct sound radiation from the frame and other parts of the mechanism itself.

Another object is the provision of as large a sound-in-air absorbing area as may be used conveniently, so as to intercept and stop the reflection of a considerable part of the primary noise or noise radiated direct from the mechanism.

A main object is substantially the summation of all the above objects in the provision of a low cost practical deadening treatment for typewriters and similar hand operated mechanisms such as to prevent the creation of most of the secondary noise, to damp out part of the primary noise, to absorb a part of the remaining primary noise and to reduce the operator's tactile shock.

Another object is the accomplishment of the latter main or comprehensive object while permitting the use of the usual tilting desks where desired.

Another object is the provision of an acoustical panel, for the absorption of the considerable part of the primary noise, which shall be readily removed for cleaning.

Another object is the provision of a deadening mounting unit or adapter for hand operated fatigue producing mechanisms like typewriters which will accomplish satisfactorily the above objects when applied to existing mechanisms.

Other advantages and specific applications of this invention will become clear upon study of the description and claims.

In the drawings Figure 1 is a side elevation of a typewriter designed to be amortizingly mounted according to this invention on a desk or table top.

Figure 2 is a front elevation of the same, partly in section along the line 2—2 of Figure 1, but showing nothing of the typewriter but the lower part of its frame.

Figure 3 is a similar cross section on line 3—3 of Figure 1.

Figure 4 is a downwardly looking partial cross section on line 4—4 of Figure 1.

Figure 5 is a side elevation of a standard typewriter amortizingly mounted on a deadening adapter made according to this invention and mounted on a desk top.

Figure 6 is a plan of the deadening adapter and abutments with the typewriter feet in section taken along line 6—6 of Figure 5.

Figure 7 is a cross section of the deadening adapter along line 7—7 of Figure 1.

In Figures 1 to 4 the cast frame of the type-

writer is designated by reference numeral 1. The lower edge of frame 1 on both sides of the machine is enlarged and shaped into a deep channel or groove 2, in the bottom of which is preferably formed a relief groove 3 not quite so wide as groove 2. Grooves 2 and both sides of the lower edge of the frame are interrupted at A and B to provide abutments for holding frame 1 in proper position on table top 4 as will be described.

In Figure 4 is seen in more detail how channel 2 is interrupted at A, the inner wall of channel 2 being interrupted by a wider notch 5, 5 and the outer wall by a narrower notch 6, 6. In channels 2 are inserted blocks 9, 10 and 11 of a suitable isolant material. These blocks protrude well below the channels 2 to carry the weight and allow some easy deformation. The channels 2 are closed at 7 and 8 by cross walls in the casting so that blocks 9 and 10 of soft isolant material, which are made long enough to protrude into notches 5 and 6, cannot slide away from their positions shown.

On table top 4 is shown fastened a positioning or abutment member 12, of wood for example, by means of wood screws 13. Both ends of this member are narrowed to leave shoulders 14, 14 and a tongue 15 of correct width to fit between the ends of isolant blocks 9 and 10. The distance between shoulders 14, 14 visible in Figure 4 and the corresponding shoulders at the other end of number 12 is made to correspond to the distance between the inside line of right hand isolant blocks 9 and 10 and the inside line of the corresponding left hand isolant blocks 9 and 10.

Thus when the typewriter frame 1 is properly set down on table 4 over member 12 it is held in every horizontal direction by either the tongues 15 or shoulders 14 of this abutment member 12; moreover frame 1 does not contact on any part of member 12 directly, but through the isolant blocks 9 and 10.

The notches provided in both sides of the casting at B are provided each with an undercut lug 16. Two hold downs comprising each a cylindrical spacer portion 18 and a flared top 19 are fastened to the table top 4 by wood screws 17 at such positions that flared tops 19 overlap undercut lugs 16 when frame 1 is properly set down over abutment member 12. Flared tops 19 do not touch undercut lugs 16 and the clearance is sufficient to permit the rear of frame 1 to be lifted clear of member 12. The length of the gaps or notches at B is sufficient to permit frame 1, when its rear is lifted clear of member 12, to be drawn forward to disengage lugs 16 from under flared tops 19. This whole arrangement provides for the case where top 4 is the top of a common tilting typewriter desk tiltable whenever the desk is closed, at a steep angle downward to the right as seen in Figure 1.

When in use and therefore horizontal the typewriter and its frame 1 is supported entirely on the desk top by blocks 9, 10 and 11, and is located entirely on member 12 by the ends of blocks 9 and 10. When the desk top is tilted and the machine not capable of operation the flaring top 19 may engage lug 16, metal to metal. There are at this time no vibrations to transmit. The ends of blocks 9 thrusting against members 12 carry a large part of the weight of the machine when so tilted.

I have found that of the many types of material of which deadening supports such as blocks 9, 10 and 11 can be made, only one general type is satisfactory. Cork is not sufficiently yielding

for the conditions. Less than a six inch deep cushion of cork would hardly be yielding enough for my purposes, but provisions for such a big volume of isolant are impossible practically.

5 Felt, which is often used under typewriters, is too prone to progressive hardening by packing down, is only less bad than cork on the space factor, and is not a good enough vibration killer. Any felt pad stiff enough to carry the weight
10 without quickly packing will, like cork, require to be very deep. A soft enough felt packs too quickly. Soft rubber is compliant enough, but has two defects. First it is too perfectly elastic; i. e. it is insufficiently sluggish. If blocks 9, 10
15 and 11 are made of it it is found that the machine gives the feeling of unsteadiness or swaying. In the second place soft rubber tends to oxidize and harden in the course of time. Springs with dash pots or other friction devices would
20 be quite expensive and the frictions are very changeable. I have found it best for the purposes of this invention to make blocks 9, 10 and 11 of a composition consisting of a gelatinous mass compounded with glycerine and so treated
25 by chromic acid and various other reagents as to be insoluble in water and oil, not easily softened by heat, and resistant to decomposition, while retaining much of its natural jelly-like compliance or softness and of its natural internal
30 friction or sluggishness. Such a material will not pack, oxidize or change, and its characteristics for my purposes are the best I have found by far. Using such a composition of matter the size of the supporting and isolant blocks 9, 10 and 11
35 may be small enough to be neat and practical.

The exact composition and method of manufacture of a suitable composition for this use is not part of the present invention. U. S. Patent 1,918,140 to Ernst Schluter, dated July 11,
40 1933, teaches the ingredients and methods of making the composition I have found best.

In Figures 2 and 3 is seen how the lower edge of frame 1 forms an inwardly turned ledge 20 on which is carried a panel 21 of sound absorbent
45 material. This panel, as is seen in Figure 1, extends under the whole of the typewriter. The sides of the frame 1 confine and direct downward a large part of the direct noise, i. e. of the sounds created in air by the vibration of the parts of the
50 machine itself. The closure of the whole bottom area of frame 1 by panel 21 places this panel in position to receive upwards of half of the direct noise. Panel 21 is made of any one of a large number of acoustical materials. Light matted
55 slabs of the fibrous waste of sugar cane, and preferably made more sound absorbent by the well known device of many small blind or bottomed holes 22, have proven very good. Panels of felted rock wool or other mineral fibres, confined between
60 woven wires, or of some kinds of very porous felt or of any other well known and efficient sound absorbing materials may be used. For appearance and dirt protection the sound absorbing panel 21 may be covered with a very
65 loose or reticulated textile such as the weave known as monk's cloth, or a burlap, suitably colored.

Panel 21, with the textile cover 23, if any, is arranged to be taken out toward the front like
70 a drawer or slide, as is most clearly visible at the right of Figure 2. By this means panel 21 is easily cleaned of the accumulations of paper scraps, ribbon lint, eraser dirt, and other matter that may fall upon it, and the task of cleaning beneath the typewriter is made less onerous.
75

The structural variant shown in Figures 5, 6 and 7 is identical in function with that just described; the yielding, shock and vibration absorbing composition used and the sound absorbent material used may be the same. The sole
5 reason for this different structure is to show how the benefits of this invention can be applied to existing typewriters and to similar fatigue creating mechanisms, even though not originally
10 designed to obtain these benefits.

Adapter frame 24, as shown, is made of stiff sheet metal. Obviously a cast or other construction may be used. The front and rear edges are turned up, over and down again, so as to form
15 two channels 25, 25. The two lateral edges are merely turned up to form sides 26, 26. Lips 29 of these turned up sides 26, 26 are extended over to close the ends of channels 25, 25, and preferably welded or brazed in place for greater stiffness.
20

In channels 25, 25 are inserted vibration and shock absorbing blocks 27, 27 and 28, 28. These are preferably of the sluggishly compliant composition above described as best for my purposes. The upper blocks, 27, 27 are preferably cut narrower than the channels 25, leaving some empty
25 space as shown. The lower blocks 28, 28 fit snugly in channels 25, 25 and are held in place by friction. The empty space provided is for the same purpose as groove 3 in Figures 2 and 3, i. e. to provide relief, or room into which the incompressible material of the preferred isolant may flow when sudden blows or pressures are applied. There is relief provided, of course, by the amount
30 that blocks 28 extend below the confining walls of channels 25,—and, in the Figure 1 structure, by the amount blocks 9, 10 and 11 extend below channel 2. But the relief, directly above the pressure, that results from making blocks 27 narrow—
35 or, in Figure 1, that results from the provision of groove 3—gives the whole mounting much more compliance or sensitiveness than it would have with deeper blocks if they filled the channels.
40

Into the shallow tray integrally formed of the top of adapter frame 24 with its formed channels
45 25, 25 and turned up sides 26, 26 is pressed a panel 30 of any well known sound absorbent, such as the light porous matted fibrous slab with blind holes already described. For appearance
50 this panel may be covered with a suitable open work or reticulated textile 31. This textile cover may be fastened at the edges with an adhesive or may be held by the turned in edges 32 being
55 pinched as shown between the panel 30 and the walls of the shallow tray described. Adhesive must not be spread on the top of panel 30, for the same reason that this panel should not be painted or varnished:—the closing over of the porosities of the panel material greatly interferes
60 with the absorption of sound.

The typewriter or adding machine K, or other machine unit to be deadened, is attached to frame 24, with its feet 34 bearing on the top of the acoustical panel 30, by screws 33, in the same
65 way that it might be attached to any table top. As such machines now usually have soft rubber feet attached to their metal feet, such are shown in the drawings. The metal feet 35 may equally well bear directly on panel 30, however.
70

The central part of adapter frame 24 is preferably cut out as shown dotted in Figure 6, to leave a large rectangular opening 36. This saves weight and metal and eliminates any tendency to resonance of the bottom metal of frame 24.
75

A plurality of holes 37 may be provided as shown in the remaining strips of bottom metal of frame 24. These are located to correspond to the feet of various makes and patterns of typewriters or of other machines to be deadened, so that the one adapter can be applied to deadening a considerable number of different units.

Positioning abutments 38 made of a vibration isolant, preferably the same as for blocks 27 and 28, are glued or otherwise fastened in wooden angle strips 39. Four of these latter are fastened to the table or desk top 41, by wood screws 40, so as closely to surround and position adapter frame 24 on the desk top. Only the blocks 38 of isolant material make actual contact on frame 24.

On top of the wooden angle 39 at the front of the machine is shown a hold down plate 42, of metal preferably. This plate is held by the same screws 40 that fasten the wooden angle in place. It extends backward above, but normally not touching, the front of frame 24. This plate serves to prevent the machine from tilting away from the desk top and falling, if the latter is tipped backward as is usual in typewriter desks.

What is claimed is:

1. A mounting for a mechanical unit that emits vibrations in the structure thereof, comprising a supporting frame for said unit having a recess therein, and a mass of incompressible, elastic, compliant solid having high internal energy losses in said recess and protruding therefrom for supporting said frame upon a base structure, the size of said recess being greater than the amount of said solid located therein, whereby the solid in said recess may yield distortably therein when subjected to vibrational forces.

2. A mounting for a mechanical unit that emits vibrations both in the air and in the structure thereof, comprising a supporting frame for said unit having a recess in the lower side thereof, a mass of incompressible, elastic, compliant solid having high internal energy losses in said recess and protruding therefrom for supporting said frame upon a base structure, the size of said recess being greater than the amount of said solid located therein, whereby the solid readily may yield distortably therein when subjected to shocks and blows, material of good sound-absorbing qualities carried by said frame at the upper side thereof, and means for supporting the unit on said frame over at least a part of said sound-absorbing material so that air-borne vibrations emanating from said unit are intercepted.

3. A mounting for a mechanical unit compris-

ing a base structure, a supporting frame for said unit, a mass of incompressible, elastic, compliant solid having high internal energy losses for supporting said frame on the base structure and absorbing vibrations transmitted thereto by said frame, and abutments including like elastic material on said base structure for positioning said frame solely by contact with such incompressible, elastic, compliant solid.

4. A mounting for a mechanical unit comprising a base structure, a supporting frame for said unit, a mass of incompressible, elastic, compliant solid having high internal energy losses for supporting said frame on the base structure and absorbing vibrations transmitted thereto by said frame, abutments of like incompressible, elastic, compliant solid on said base structure for positioning said frame, and a hold-down to limit the movement of one edge of said frame away from the base structure, said hold-down normally being out of contact with said frame.

5. A mounting for a mechanical unit that emits vibrations both in the air and in the structure of the machine, comprising a base structure, a supporting frame for said unit, a mass of incompressible, elastic, compliant solid having high internal energy losses for supporting said frame on the base structure and absorbing vibrations transmitted thereto by said frame, an expanse of material of good sound-absorbing qualities carried by the upper side of said frame beneath said unit, abutments on said base structure for positioning said frame laterally and solely by contact with such incompressible, elastic, compliant solid, and a hold-down for limiting the movement of said frame away from the base structure, said hold-down normally being out of contact with said frame.

6. A mounting for a mechanical unit that emits both air-borne vibrations and vibrations in the structure thereof, comprising a supporting frame for said unit having recesses in its lower side adjacent opposite edges and a central recess in its upper side, a mass of incompressible, elastic, compliant solid positioned in each of said recesses at the lower side of said frame and protruding therefrom to support the frame on a base structure, said incompressible, elastic, compliant solid having high internal energy losses whereby it is so slowed down in rebound as to deaden vibrations and shocks transmitted thereto by said frame, and an expanse of material of good sound-absorbing qualities positioned in said upper, central recess for intercepting air-borne vibrations.

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