

March 1, 1955

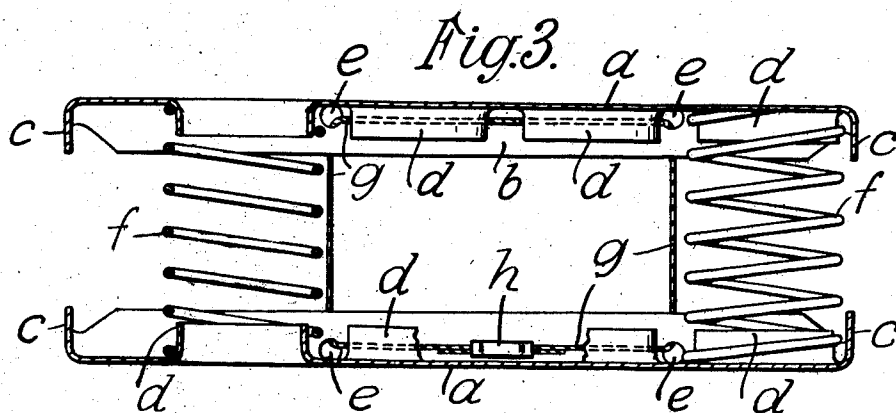
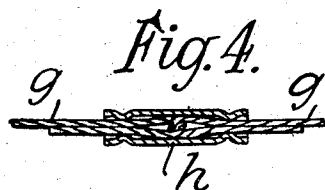
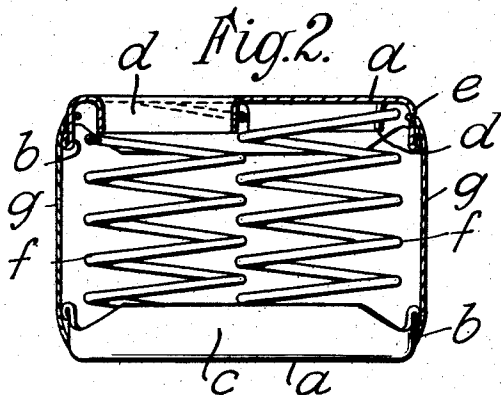
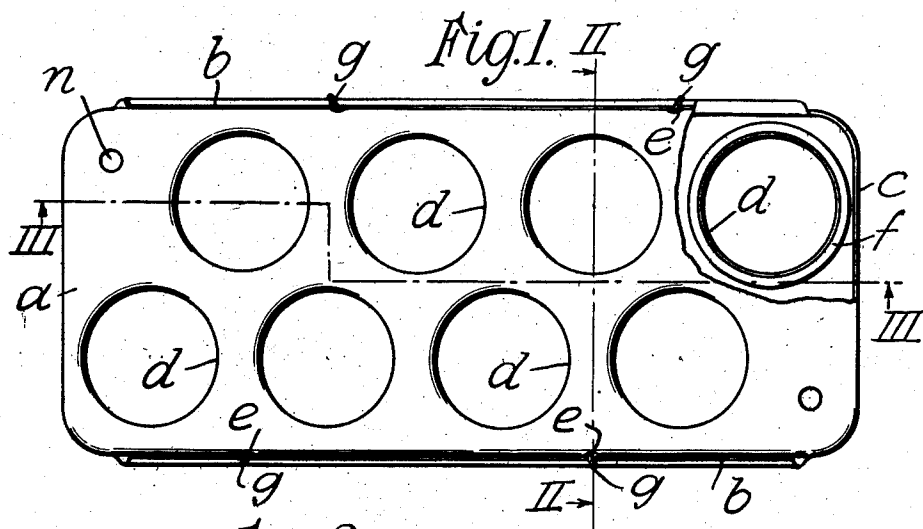
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2,703,232

SHOCK-ABSORBING DEVICE

Filed Dec. 8, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 6.

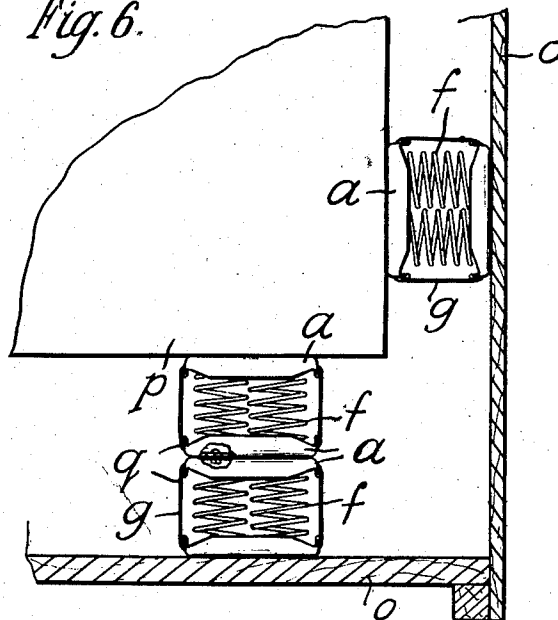
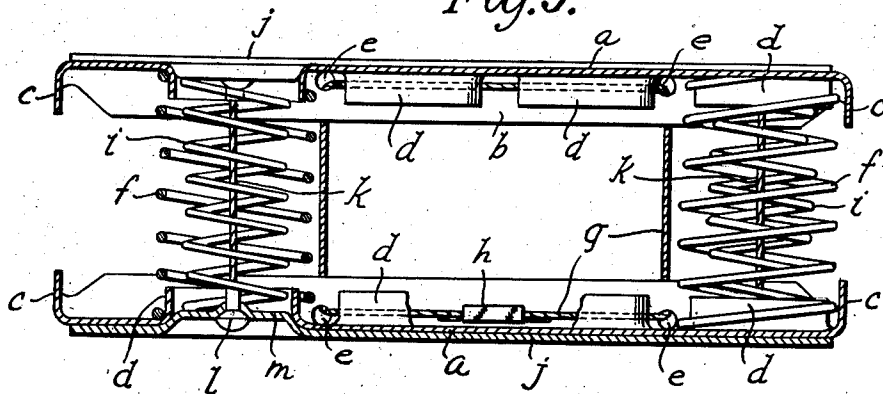


Fig. 5.



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1

2,703,232

SHOCK-ABSORBING DEVICE

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Application December 8, 1952, Serial No. 324,767

7 Claims. (Cl. 267—1)

This invention relates to shock-absorbing devices and more particularly but not exclusively to shock-absorbers intended for use with containers enclosing fragile cargo or contents, such as radio receivers and similar apparatus.

In its application to shock-absorbers for such containers, the invention has for its main objects to enable the bulk and outer dimensions of the container to be reduced, while affording better protection to the contents, the shock-absorber having external surfaces free from projections so that the container can slide across or along it. In all cases, the shock-absorbing device has for its main object to provide for high absorption of energy by the springs, which are preferably pre-loaded to one-half of their maximum or total compression.

Other objects and advantages of the invention will hereinafter appear from the following description of a preferred embodiment and two examples of the application thereof, given with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of the device in a preferred embodiment, one corner of the upper plate being broken away;

Fig. 2 is an end view, partly in cross-section on the line II—II, of Fig. 1.

Fig. 3 is a longitudinal section on the broken line III—III of Fig. 1 parts being omitted.

Fig. 4 is a detail.

Fig. 5 shows a modification of the device.

Fig. 6 illustrates the combination of two devices such as illustrated in Figs. 1 to 3, to form a double unit applied as a base support for a load within a container, a single device or unit being illustrated as a side support.

As illustrated in Figs. 1 to 3, the shock-absorbing device comprises two substantially rigid plates *a* of oblong shape, made as steel or aluminum pressings, about six inches long and three inches wide, with rounded corners, the side and end edges of each being turned over as flanges *b*, *c*, about half-an-inch deep. The flat central parts of the plates *a* are pierced and pressed to form a number of hollow bosses *d*, about one inch in diameter, extending in the same direction as the flanged edges; there are shown, for example, eight of these bosses, arranged in two rows of four, with the bosses staggered alternately towards opposite sides of the plates. Each of the side flanges *b*, *c* is pierced with two holes *e*, spaced apart at double the spacing of the hollow bosses *d* and located intermediately of two, so as to be staggered on the respective sides, as clearly seen in Fig. 1.

When the two pressings or plates *a* are assembled, their flanges *b*, *c* and their inwardly directed bosses *d* register with one another; coiled springs *f* about one and a quarter inches in diameter and about three inches in free length are engaged between the plates, each spring having its end coils fitted around two hollow bosses *d* in the respective plates so as to locate the springs in relation thereto. In Fig. 3, only two of these springs *f* are shown, those on the middle bosses *d* being omitted for the sake of clarity. After compression of the assembled springs, two tie-wires *g*, each about twelve inches long, are threaded into the holes *e* at opposite sides of the plates, each wire *g* extending along the inside of the two bent-over side flanges *b* and from the holes *e* in one plate to those in the other, outside the flanged side edges of the plates. The two ends of each wire *g* are bent to hook shape and secured together, so as to fix the length of the looped wire to give a desired pre-loading or compression of the springs *f*; the ends of the tie-wires may then be locked, as shown in Fig. 4, by means of ferrules *h*, intended on assembly, which may be conveniently arranged within the bent-over side flanges *b* after the ties have been fixed. The plates may be provided with suitable means for minimizing wear of the tie-wires *g* in the neighborhood of the apertures or holes *e* through which they pass. The absence of tie-wires or other projections on the central load-bearing surfaces of the plates *a* results in the latter having free sliding contact with the container or other parts against which they press, without making contact with the tie-wires.

The pre-compression of the springs *f* by the tension of the tie-wires *g* is preferably such as to represent one-half of their total possible compression, which is limited by the interengagement of the side and end flanges *b*, *c* of the two plates.

In a modification, as illustrated in Fig. 5, the device as described above may be provided with additional springs *i* fitted co-axially within the first set *f*, these inner springs abutting against a pair of outer plates *j* making contact with the plates *a*; the outer plates may be held together either by the same tie-wires *g* or by similar but separate tie-wires, or again by headed ties *k* passing axially through the nested springs *f*, *i*, the heads or nipples *l* of these ties *k* being engaged in countersunk recesses *m* upon the outer plates *j*. The number of these additional springs *i* may be equal to or less than that of the first set of springs *f*.

The metal pressings or plates between which the springs are mounted and localized are normally made substantially flat, but in some cases they may be curved transversely or longitudinally to suit containers of cylindrical or like shape, and they may be made of metals other than steel or aluminum.

In some cases, where longer movements are required, double or multiple units may be constructed by assembling two or more of these devices with the plates *a* in contact, the plates of contiguous devices being bolted or riveted together; for this purpose, the plates are conveniently provided with holes *n* as shown in Fig. 1, to receive the connecting bolts or rivets, these holes being arranged in the corners left vacant by the staggering of the bosses *d*, so that access may be had to the bolt or rivet heads without difficulty. Such a double unit is shown in Fig. 6, where a container *o* such as a wooden packing case is employed for a radio receiver set *p*, the latter resting upon a double-unit shock-absorber *q* formed by the combination of two devices such as shown in Figs. 1 to 3. On each side of the receiver set, a single device such as shown in Figs. 1 to 3 is inserted between the set and the wall of the container. Any number of the double units may be provided as base support for the set *p*, and any number of the single-unit devices may be provided at the sides of the set and over the top of the latter.

It will be understood that by reason of the plates *a* of the shock-absorber devices pressing firmly against the set, the movements of the latter within the container will be controlled and limited, the pressure exerted by the top and base devices causing frictional resistance to lateral displacements of the set allowed by the side supports, and the pressure exerted by the side supports causing frictional resistance to vertical displacements allowed by the top and base supports. The use of double or multiple units results in greater protection without loss of efficiency and overcomes the difficulty of buckling with long compression springs of small diameter.

The invention may also be applied to other purposes, such as anti-vibration mountings and shock-absorbers for the seats of vehicles.

What I claim is:

1. A shock-absorbing device comprising two rigid metal plates, coiled compression springs interposed between said plates and extending substantially perpendicularly thereto, said plates including hollow bosses projecting into the end coils of said springs, two corresponding edges of each of said plates being formed with flanges having apertures therein, and flexible tying means extending between said corresponding edges of said plates, said flexible tying means consisting of wires threaded

3

through said apertures and extending along said flanges between pairs of said apertures, the extremities of said wires being secured together to form loops limiting the separation of said plates so as to maintain a predetermined minimum loading of said springs.

2. A shock-absorbing device comprising two rigid metal plates, coiled compression springs interposed between said plates and extending substantially perpendicularly thereto, said plates including hollow bosses projecting into the end coils of said springs, other coiled compression springs fitted coaxially within at least some of said first-mentioned springs, outer plates making contact with said first-mentioned plates, said outer plates forming abutments for said other springs, and flexible tying means extending between said outer plates, said flexible tying means limiting the separation of said plates so as to maintain a predetermined minimum loading of said springs.

3. A shock-absorbing device comprising two rigid metal plates, coiled compression springs interposed between said plates and extending substantially perpendicularly thereto, said plates including hollow bosses projecting into the end coils of said springs, other coiled compression springs fitted coaxially within at least some of said first-mentioned springs, outer plates making contact with said first-mentioned plates, said outer plates forming abutments for said other springs, flexible tying means extending between adjacent edges of said first-mentioned plates, and headed ties extending between said outer plates, said headed ties passing axially through said other springs, said flexible tying means and headed ties limiting the separation of said plates so as to maintain a predetermined minimum loading of all said springs.

4. A shock-absorbing device comprising two substantially oblong metal plates, a set of spring elements located between said plates and extending substantially perpendicularly thereto, each of said plates including a plurality of anchorages engaged by the end portions of said spring elements, each of said plates also including apertured flanges on opposite edges thereof, and flexible ties passing through the apertures of said flanges, said ties forming loops of determined length holding said plates together under predetermined minimum compression of said spring elements.

5. A shock absorbing device comprising two rigid metal plates, coiled compression springs interposed between said plates and extending perpendicularly thereto,

4

said plates being separated solely by means of said springs, hollow bosses projecting from said plates into the end coils of said springs, two corresponding edges of each of said plates being formed with flanges having apertures therein, said apertures in each of said plates being separated from one another by a distance equal at least to the width of one of said bosses, and flexible tying means extending between adjacent edges of said plates said tying means consisting of wires threaded through said apertures and extending along said flanges between pairs of said apertures, and said wires forming loops which limit the separation of said plates and maintain said plates and springs under a predetermined minimum loading.

6. A shock absorbing device according to claim 4, in which the length of each of said loops is such that the minimum compression of said spring elements is made equal to substantially half the complete compression of said spring elements.

7. A shock-absorbing device comprising two substantially oblong metal plates, a set of spring elements located between said plates and extending substantially perpendicularly thereto, each of said plates including a plurality of anchorages engaged by the end portions of said spring elements, each of said plates also including apertured flanges on opposite edges thereof, the longer edges of said flanges having outwardly beaded edges, and flexible ties passing over said beaded edges and through the apertures of said flanges, said ties forming loops of determined length holding said plates together under predetermined minimum compression of said spring elements.

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