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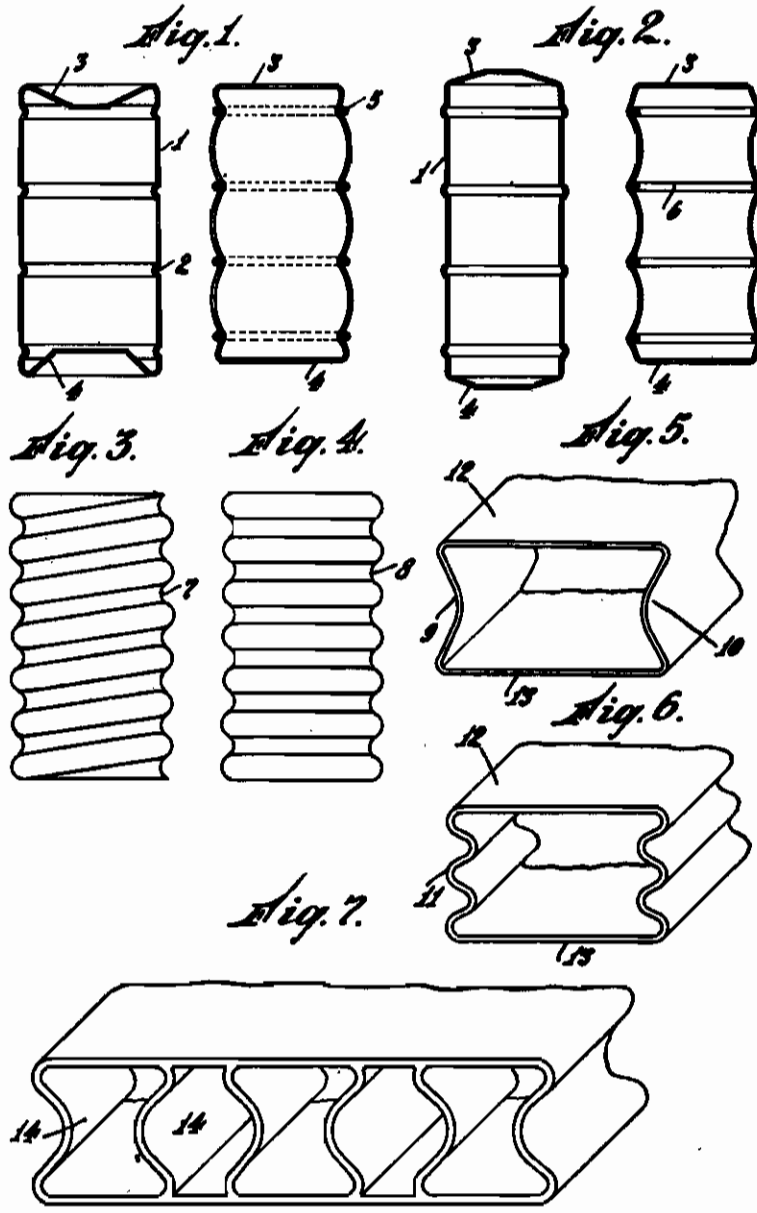
RUBBER CUSHIONING DEVICE AND RUBBER CUSHIONING  
ELEMENTS ADAPTED FOR USE THEREIN

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2 Sheets—Sheet 1



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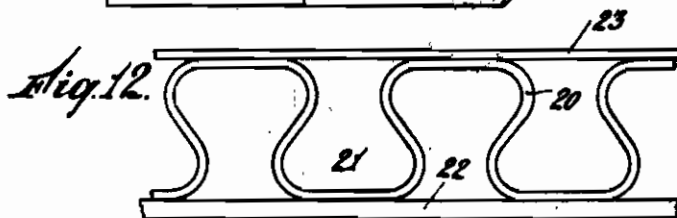
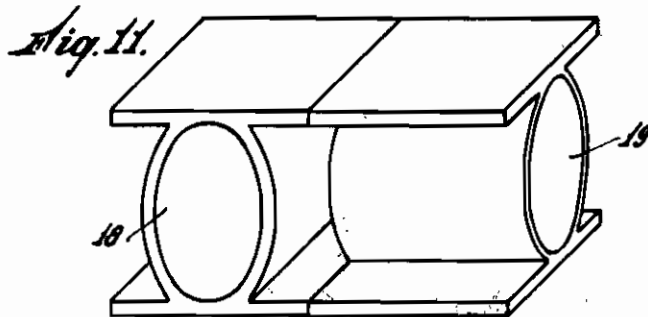
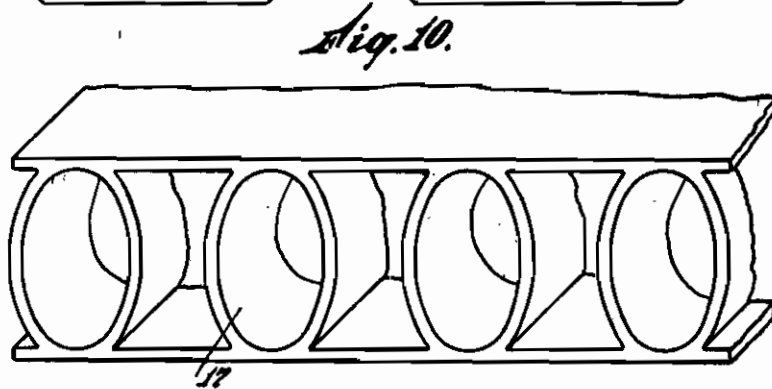
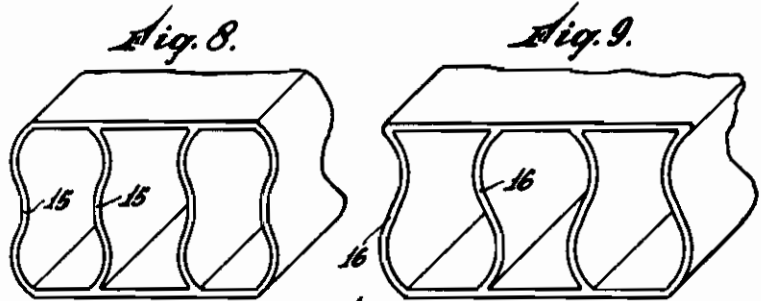
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2 Sheets-Sheet 2



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# ALIEN PROPERTY CUSTODIAN

## RUBBER CUSHIONING DEVICE AND RUBBER CUSHIONING ELEMENTS ADAPTED FOR USE THEREIN

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Application filed March 17, 1941

The invention relates to a rubber cushioning device and rubber cushioning elements adapted for use therein for various purposes, such as the cushioning of seats in motor-cars, busses and other vehicles, mattresses, chair seats, arms and backs of chairs, etc.

The invention is based on the insight that by suitably shaping the walls of hollow rubber elements a very convenient and comfortable cushioning means is obtainable which may be adapted to various purposes.

It is also based on the insight that a flat rubber strip, or a flat- or smoothwalled rubber tube section, which elements in their original shape are unsuitable for cushioning purposes, by deforming or denting obtain a larger resistance than tubular members or strips, which have not been brought under pre-tension by such a deformation or impression or dent. Keeping this in mind the invention consists in a rubber cushioning-device, the, or each, cushioning-element by local impression or deformation, e. g. by bending, from an original untensioned condition being brought and kept in a condition in which it is under pre-tension and in which it has the shape suitable for exerting its cushioning effect in the cushioning device.

Alternatively, the invention consists in this that of the, or each, rubber cushioning element, that entirely or partially encloses an interior space, the wall, confining said space, has a corrugated configuration, or such a curved configuration that an oval or similar oblong cross section is obtained.

Within this general principle various practical embodiments according to the invention are possible.

Thus, according to the invention, the, or each, cushioning element of the rubber cushioning device may consist in a rubber tube section, the ends of which constitute the supporting- and carrying surfaces and the axial section of which has the corrugated configuration referred to above.

Further, according to the invention, the, or each, cushioning element may consist in a rubber tube section the two oppositely lateral surfaces or wall portions of which constitute the carrying or supporting surfaces and the cross section of which has the corrugated configuration, or the curved configuration such that an oval or similar oblong section is obtained.

Cushioning elements according to the two embodiments referred to above may, either separately or in the required number, constitute the cushioning

device of various objects. Thus, the number of suitably spaced cushioning elements may constitute the cushioning means of a seat. Also one cushioning element according to the first embodiment may constitute the spring of an automatic door shutter and one element according to the second embodiment, the cross section of which has corrugated walls, or e. g. is oval, may serve as the cushioning means of e. g. an arm of a chair.

The corrugated configuration of the axial section may also be obtained by making a helically wound groove in the wall of a rubber tube section, in which case a so-called rubber spiral spring is obtained in which, however, the windings are interconnected.

The corrugated configuration of the axial section may further according to the invention be obtained by means of one or more rings the inside diameter of which is smaller than the outside diameter of the rubber tube section in tensionless and unloaded condition, which rings, spaced from one another, encompass and locally contract the tube section.

The corrugated configuration according to the invention may also be obtained by one or more rings, the outside diameter of which is larger than the inside diameter of the rubber tube section in tensionless and unloaded condition, which rings, spaced from one another, are arranged within the tube section and are locally forced outwardly.

Within the spirit of the invention further is an embodiment in which the wall of the, or each, cushioning element is provided with relatively offset wall portions defined by two different mutually parallel main planes, said wall portions constituting the carrying and supporting surfaces and merging into one another along corrugated intermediate wall portions which, on the one hand, with the carrying wall portions, on the other hand with the supporting wall portions, confine hollow spaces open towards opposite sides.

A cushioning device of this type is also very suitable for an arm of a chair or the like.

Besides a cushioning device comprising one or more cushioning elements according to the invention the invention also includes the cushioning elements in themselves in the condition in which they are under tension as well in the condition without any pre-tension. The invention therefore includes rubber elements in the shape of rubber tube sections the wall of which is provided with spaced circumferential grooves produced in the course of the manufacture of the

tube section. The said grooves may serve to receive the above-mentioned e. g. metal rings which after being mounted bring the rubber element under a predetermined tension. The cushioning device may have an additional tension produced by compression in axial direction.

When using rubber cushioning elements having an oval or similar oblong section in which the tendency to rock in a plane perpendicular to the axis is larger than in the vertical plane through the axis, this tendency may be counteracted by arranging according to the invention the axes of the cross sections of adjacent elements or cells perpendicular to one another and by interconnecting the elements.

Also, according to the invention, two or multiple cell-cushioning devices may be obtained by producing two or more rubber cushioning elements already during their manufacture consequently with common intermediate walls.

In order to obtain a more full idea about the possibilities of the invention, some embodiments thereof, to which, however, the invention is not limited, are shown in the drawing by way of example.

In the drawing is:

Fig. 1 an axial section of a cushioning element according to the invention, at the left in the initial condition without pre-tension and at the right under tension.

Fig. 2 is an axial section of a modification thereof.

Fig. 3 is an elevation of a cushioning element with helically wound groove and

Fig. 4 with spaced parallel circumferential grooves in the outer wall.

Fig. 5 is a perspective showing of a modified embodiment and

Fig. 6 is a corresponding showing of a modification thereof.

Figs. 7, 8 and 9 are perspective showings of three embodiments of multiple-cell-cushioning-elements with corrugated wall.

Fig. 10 is a perspective showing of a multiple-cell-cushioning-element with cells having an oval cross section.

Fig. 11 is a perspective showing of two adjacent cells of a multiple-cell-cushioning-device in which the axes of the cross sections of said cells are perpendicular to one another and the cells are interconnected.

Fig. 12 relates to a further embodiment very suitable for a seat or mattress.

According to Figure 1 the rubber cushioning element comprises a rubber tube section *f*, the wall of which at the exterior is provided with spaced superposed circumferential grooves *2*. At the ends the edges *3* and *4* are directed inwardly. In Fig. 2 rings *5* of rubber or of stiff material are arranged in the grooves *2*, whereby the cushioning element is brought under pre-tension and is somewhat shortened. Thereby the edges *3* and *4* have been brought in a flat plane. A similar cushioning element may e. g. be mounted in a seat, the ends then constituting the carrying and supporting surfaces adapted to be connected with parts of the seat. To this latter end e. g. press button closures may serve but other connecting means are of course also possible.

According to Figure 2 the rings *6* are located at the exterior instead of at the interior, as in

Fig. 1. The rubber tube section *f* is in this case, at the left in Fig. 1, provided with external circumferential ribs and internal circumferential grooves and with outwardly directed edges *3* and *4* which, at the right in Fig. 2, are positioned in a flat plane. In both cases the wall in the axial section is corrugated.

In Figure 3 the corrugated configuration of the wall in the axial section is obtained by a helically wound groove *7* produced during the moulding of the rubber tube section.

In Figure 4 the circumferential grooves *8* are also produced during the moulding of the tube section.

The elements according to Figures 3 and 4 as well as those according to Figures 1 and 2 are very suitable in cushioning devices for seats, provided they are used in the required number.

In Figures 5 and 6 cushioning elements are shown which may be used e. g. in arms of chairs.

In the cross section the element according to Figure 5 has two oppositely located corrugated walls *9* and *10*, each having one groove.

In Fig. 6 the corresponding walls have a plurality of corrugations *11*. The carrying and supporting surfaces are denoted by *12* and *13*.

In Fig. 7 a cushioning wall is shown having a plurality of rubber cells *14* each with two corrugated oppositely located walls in which the adjacent cells have common intermediate walls.

In Figs. 8 and 9 the same main idea is realised, however, the oppositely located corrugated cell walls *15* and *16* are corrugated otherwise.

In Fig. 10 the cells *17* have an oval cross section.

In Fig. 11 it is shown that the axes of the cross sections of two adjacent cells *18* and *19* are perpendicular to one another. This principle may be applied to more than two cells.

In Fig. 12 the rubber wall *20* is meandershaped; this wall confines only partially enclosed interior spaces *21*. The corrugated configuration is also present here. A lower layer, e. g. of wood, is denoted by *22* and an upper layer, e. g. a cingle, by *23*, to which layers the rubber wall is attached, preferably in a removable manner to the cingle.

The cushioning elements in which the axial or the cross section shows corrugated walls may, according to the invention, be stiffened by thickening the material at the plane of the tops of the corrugations. The bending through is thereby somewhat counteracted. In the drawing this has not been shown.

If for the cushioning element it is started from an originally substantially flat strip of rubber, then this strip according to the invention may have a centrally depressed curved portion which, after the strip is bent into the operative position corresponding to a tubular shape with interruption between the longitudinal edges of the strip, has become more or less flat or plane and then constitutes a satisfactory seat, e. g. for cingles, which may be attached thereto by means of press-button closures or otherwise. The longitudinal edges of the strip in tubular form may be clamped e. g. between spacing slats. The mutual distance of the cushioning elements may be chosen such that in the case of the deepest bending through or denting the places of maximum lateral deflection engage one another.

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