

# United States Patent

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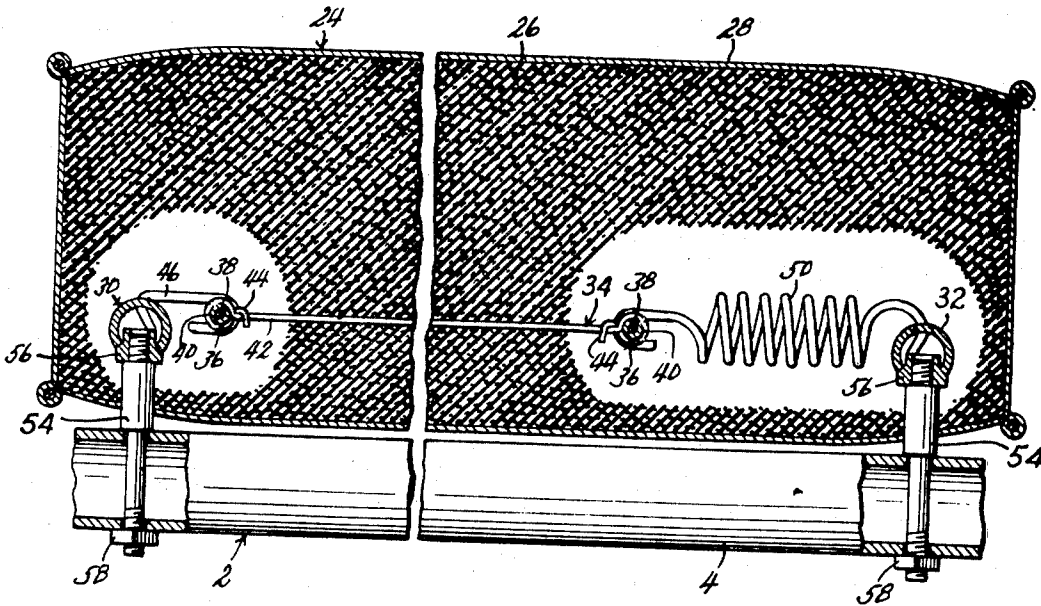
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- [54] **ENCAPSULATED CUSHION AND SPRING DECK ASSEMBLY FOR SEATING STRUCTURES**  
**2 Claims, 9 Drawing Figs.**
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- [51] Int. Cl. .... **A47c 7/20,**  
 A47c 7/14
- [50] Field of Search..... **297/445,**  
 452-458, 460, DIG. 1; 5/345, 355; 267/87
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**ABSTRACT:** An encapsulated cushion and spring deck assembly for use in both automotive and furniture seating, comprising a cushion formed of molded plastic foam or other suitable material having embedded therein a generally planar spring deck yieldable transversely to its plane, and yieldably supported at certain of its edges by elastic means yieldable in the plane of the deck and attached to a rigid marginal deck frame. The deck-supporting means and deck frame may be embedded in the cushion, whereby the assembly may be used as a free, reversible cushion to be supported in a basic seating structure, or may be disposed externally of the cushion, in which case the basic seating structure may serve as the deck frame. The deck frame, if embedded, may also nevertheless be permanently affixed to the basic seating structure if desired. In any case, the encapsulated deck serves as the only required spring support for the cushion.



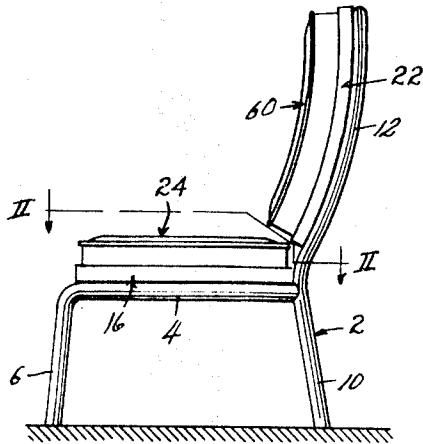


Fig. 1

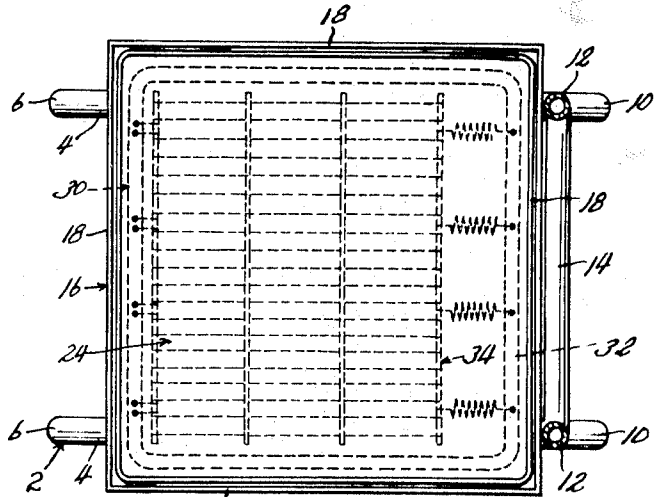


Fig. 2

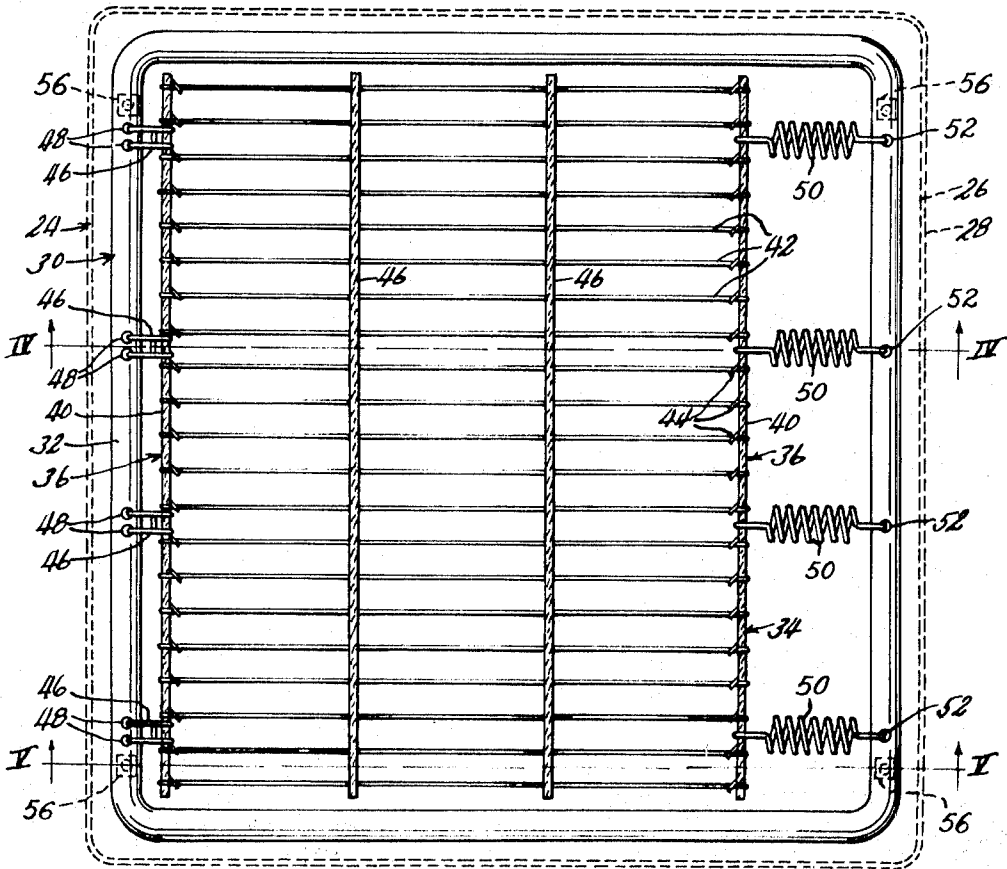
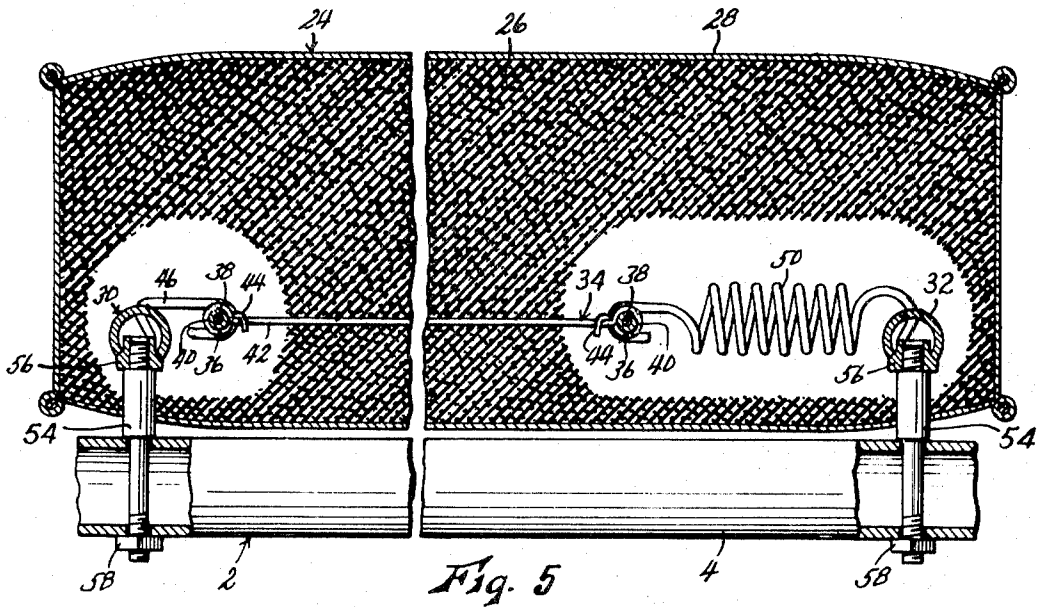
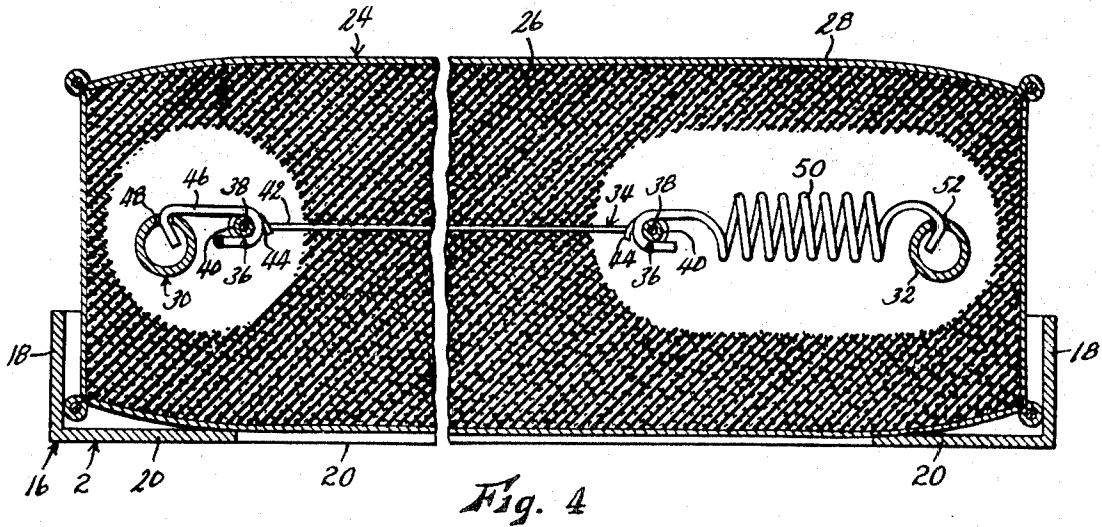


Fig. 3

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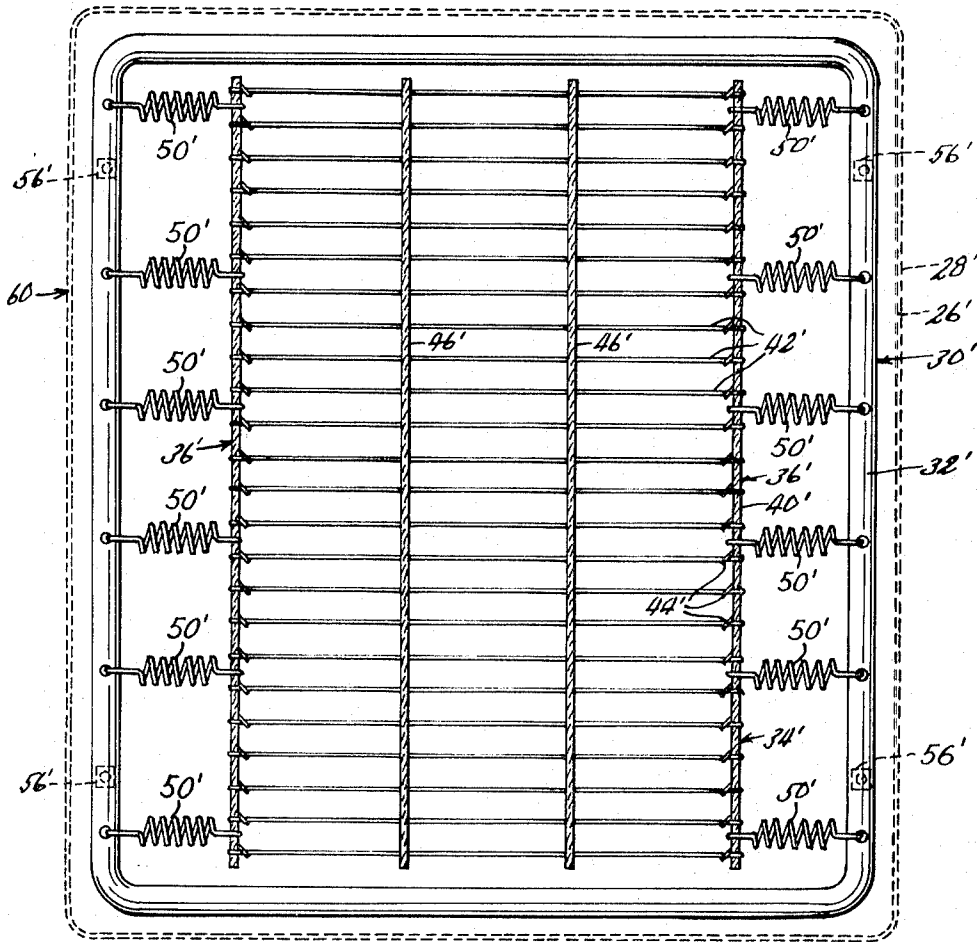
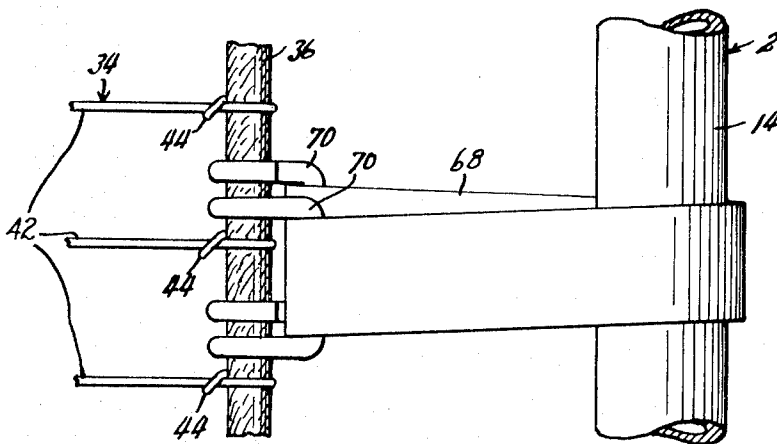
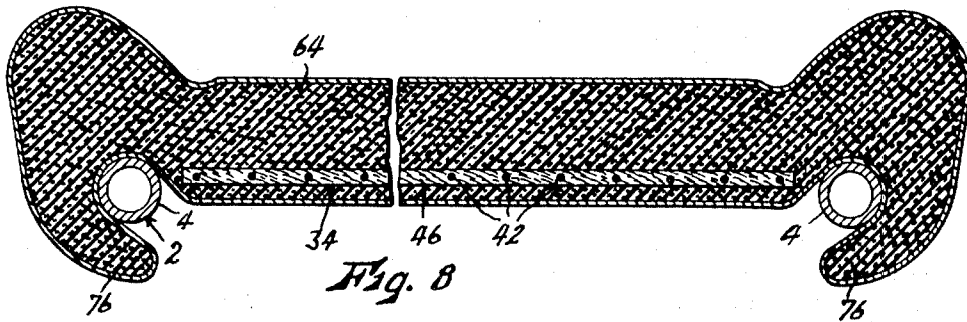
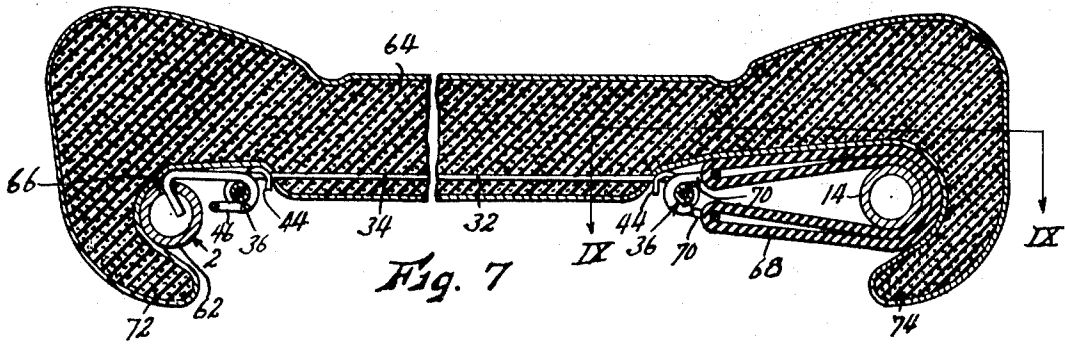


Fig. 6

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### ENCAPSULATED CUSHION AND SPRING DECK ASSEMBLY FOR SEATING STRUCTURES

The invention relates to new and useful improvements in cushion assemblies for use in both furniture and automotive seating structures, and has as its principal object the provision of a cushion assembly in which the cushion, composed of a molded body of rubber or plastic foam or the like, has embedded therein completely and permanently the spring deck necessary for the proper yieldable support thereof, in distinction from usual structures heretofore employed in which the cushion itself, as a separate unit, is supported on a spring deck built into a basic seating structure frame, as in a sofa, or where the cushion constitutes layers of padding material applied in a permanent assembly over a spring deck previously assembled in a seating structure frame.

The advantages of this structure are numerous. It is highly economical, both in the original manufacture thereof and in the final assembly thereof in seating structures, requiring far less time in such assembly, and requiring far less complicated and less expensive basic seating structure frames in which to mount the cushion assemblies. The metallic spring deck elements, being completely encapsulated in the foam cushion, are protected from atmospheric corrosion or deterioration, and any possible objectionable metallic noises emanating therefrom in use are eliminated or at least greatly muffled and deadened. The spring deck, so encapsulated, reinforces the cushion, and the cushion in turn reinforces the deck, often permitting the use of smaller gauge and hence less expensive spring wires in the deck. The deck is supported in a rigid marginal frame by connecting members yieldable in the plane of the deck. If the connecting members and deck frame are also encapsulated in the cushion, the assembly can be used as a free, reversible cushion, as in sofas, the encapsulated spring deck serving as the sole spring support of the cushion. By extending post members from the embedded deck frame through a face of the cushion, said deck frame may be permanently and rigidly affixed to a seating structure frame of any simple form, whereby to serve not only as a frame for the spring deck, but also as the basic structural support for the entire cushion. Also, the connecting member and deck frame may be disposed externally of the cushion if desired, in which case the deck frame may constitute portions of the basic seating structure.

Generally, this object is accomplished by the provision of a planar, open spring deck frame of generally rectangular form, a spring deck fabric disposed within and in the plane of said frame, means connecting at least two opposite edges of said fabric to opposite edges of said frame, the connecting means of at least one of said edges being resiliently yieldable in the plane of the fabric, and a cushion of resilient foam material completely encapsulating said deck fabric, or both the fabric and the deck frame, with said fabric disposed parallel to and intermediate the faces of said cushion, in the latter case either with or without posts affixed to said deck frame and extending outwardly from one face of said cushion.

Other objects are simplicity and economy of structure, efficiency and dependability of operation, and adaptability for use in a wide variety of types and styles of seating structures.

With these objects in view as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawing wherein:

FIG. 1 is a side elevational view of a chair structure, employing one form of the encapsulated cushion and spring deck assembly embodying the present invention, as both the seat and back cushions thereof,

FIG. 2 is an enlarged sectional view taken on line II—II of FIG. 1, showing the seat cushion assembly,

FIG. 3 is an enlarged top plane view of the spring deck assembly utilized in the seat cushion assembly of FIG. 2, with the boundaries of the encapsulating foam cushion indicated in dotted lines,

FIG. 4 is an enlarged, foreshortened sectional view taken on line IV—IV of FIG. 3, including the foam cushion and the chair frame,

FIG. 5 is an enlarged, foreshortened sectional view taken on line V—V of FIG. 3 and similar to FIG. 4, but showing a modification of structure,

FIG. 6 is an enlarged front elevational view of the spring deck assembly utilized in the back cushion assembly shown in FIG. 1, with the boundaries of the encapsulating foam cushion indicated in dotted lines,

FIG. 7 is a view similar to FIG. 4, showing another modification of structure,

FIG. 8 is a transverse vertical sectional view of the structure shown in FIG. 7, and

FIG. 9 is an enlarged fragmentary sectional view taken on line IX—IX of FIG. 7 with the cushion material omitted.

Like reference numerals apply to similar parts throughout the several views, and referring first to FIGS. 1 and 2, it will be seen that the numeral 2 applies generally to a chair frame including a pair of horizontal bars 4 extending from front to rear respectively at opposite sides of the chair to form seat supports, each of said bars being bent downwardly at its forward end to form a front leg 6, and having its rearward end affixed to an upright bar intermediate the ends of the latter, the downwardly extending portions of said uprights forming rear legs 10, and the upwardly extending portions thereof forming parallel supports 12 for the chair back. Bars 4 and 12 at opposite sides of the chair may be rigidly interconnected by suitable crossbars extending therebetween, one of said crossbars being indicated at 14 in FIG. 2.

Fixed to support bars 4 is a horizontal rectangular seat cushion frame 16 composed, as best shown in FIGS. 2 and 4, of four lengths of angle iron each having an upright leg 18 and a horizontal leg 20 extending inwardly from the lower edge of said upright leg. Similarly, a back cushion frame 22 formed of angle iron in the manner of frame 16 is fixed to supports 12 of the chair frame, and opens forwardly. However, back cushion frame 22 may be vertically curved, as indicated in FIG. 1, to any contour which it may be desired to impart to the back cushion. Both of frames 16 and 22 are open rectangles, being substantially unobstructed through the central portions thereof.

Seat cushion frame 16 carries an encapsulated cushion and spring deck assembly embodying the present invention, and indicated generally by the numeral 24. Said assembly includes a thick cushion 26 (see FIGS. 4 and 5), said cushion being generally planar and formed of a molded, resilient foam material such as foam rubber, or of a polyurethane plastic, or other suitable material. Said cushion may have a decorative covering 28 of fabric, leather, plastic or the like applied thereto to completely envelope it, after it is molded. Alternatively, there is believed to be perfected, or nearly perfected, a cushion material and molding process wherein the foam forms a tough, pliable "skin" integrally therewith as it is molded. Said "skin" may be externally "grained" to any desired appearance in the mold, and subsequently given any desired color. In this case, the covering 28 may be dispensed with, but this feature is not necessary to, nor does it form any essential part of, the present invention.

Completely encapsulated in cushion 26 and bonded thereto is a spring deck assembly indicated generally by the numeral 30, said spring deck assembly being inserted into the mold in which cushion 26 is to be formed, and the cushion molded thereabout and bonded thereto. Said spring deck assembly includes an open rectangular frame 32 which is formed of tubular metal stock and which is substantially rigid. The plane of frame 32 is parallel to and intermediate the cushion faces, and its sides are disposed adjacent but spaced inwardly from the horizontal periphery of the cushion. Disposed within frame 32, and substantially coplanar therewith, is a spring deck fabric indicated generally by the numeral 34. Said fabric consists of a pair of parallel side strands 36 which as best shown in FIGS. 4 and 5 may consist of a heavy spring wire core 38 covered by a sheath 40 of a soft, indentable material such as twisted paper or the like, and a continuous series of parallel, closely spaced-apart cross wires 42 extending between side

strands 36 and each affixed at its respective ends to said side strands by being wrapped thereabout and then twisted in itself to form a "knot" 44. The cross wires are also spring wires, but of less stiffness than the core wires 38 of the side strands. They obtain a nonslip purchase on the side strands by indenting the sheaths 40 of said side strands, and the sheaths also prevent the rubbing, grating, or grinding noises which otherwise might result from the metal-to-metal contact between the wires. To keep cross wires 42 uniformly spaced throughout their lengths, strands 46 of twisted paper only, without core wires, may be disposed intermediate and parallel to side strands 36, cross wires 42 piercing said intermediate strands.

FIGS. 2-5 show a particular arrangement of the spring deck especially adapted for use in seat cushions. In this arrangement, side strands 36 extend transversely of the chair, while cross strands 42 extend from front to rear. The front strand 36 is connected directly to the front leg of frame 32 by a series of wire hooks 46 each engaged at one end about said front strand 36 and at its opposite end in suitable holes 48 formed therefor in frame 32. The rear side strand 36 is connected to the rear leg of frame 32 by a series of helical tension springs 50, each hooked at one end about rear strand 36, and at its opposite end into a suitable hole 52 provided therefor in the rear leg of frame 32.

The seat cushion assembly 24 as thus far described may be supported as a free reversible cushion in seat frame 16 of chair 2 as shown in FIGS. 1 and 2, resting freely on the horizontal legs 20 of the angle irons forming frame 16, and being restrained against horizontal movement by upright legs 18 of said angle irons, as shown in FIG. 4. Horizontal legs 20 directly underlie spring deck frame 32 to support the cushion assembly securely, but the central portion of the assembly may be deflected downwardly through the open central portion of frame 16 when the cushion assembly is loaded from above. The advantage of supporting spring deck fabric 34 directly from deck frame 32 at its forward edge, and by springs 50 at its rearward edge, as relates to seat cushions of chair structures, is that the yieldability of springs 50 at the rear, in combination with the combined stiffness of cross wires 42, tends to cause the deck to tilt downwardly to the rear when loaded rather than "hammocking" freely between its front and rear edges. This tends to cause the user to shift his hips rearwardly on the seat cushion, so that his back is better supported by the back cushion, and hence promotes better posture and less fatigue in the user. However, if desired, deck fabric 34 can be supported from frame 32 by springs 50 at both its front and rear edges, or turned so that cross wires 42 extend transversely of the chair, and supported at both sides by springs 50. In the "loose cushion" application of assembly 24, it is of course desirable that the assembly be reversible, that is, used with either side thereof uppermost. This is of course possible with the structure shown, since spring deck fabric 34 is of course deflectable in either direction. In this case, it is perhaps most desirable that the spring deck assembly 30 be disposed generally midway between the faces of the cushion, as shown in FIG. 4, in order to derive the benefit of about the same thickness of cushioning material 26 regardless of which face of the cushion is uppermost.

In some instances, it may be desired to mount the seat cushion assembly permanently in chair frame 2. In this case a plurality of post members 54 are fixed in deck frame 32, respectively adjacent the four corners thereof, said frame being provided at these points with nut members 56 welded or otherwise fixed therein for receiving the threaded inner ends of these posts. Said posts extend downwardly through the lower face of cushion 26, for attachment, as by nuts 58, to seat support bars 4 of chair frame 2, as shown in FIG. 5. They could also be affixed to frame 16, but their attachment to bars 4 permits frame 16 to be dispensed with. Also, posts 54 could be attached directly to, or form portions of, floor-engaging legs. Thus frame 32 serves not only as a support for deck fabric 34 as before, but also as the primary structural support for the entire cushion assembly. Posts 54 can be screwed into

nuts 56 prior to the molding of cushion 26, so as to extend outwardly from the mold, but also can if desired be inserted subsequent to molding of the cushion, since nuts 56 can be easily located by probing through the cushion and since the cushioning material can be easily pierced to receive the posts. When the cushion assembly is to be permanently mounted as described, it is preferable to dispose deck assembly 30 adjacent the lower face of the cushion, in order to utilize a maximum thickness of cushioning material above the deck. The arrangement is also shown in FIG. 5. However, posts 54 can also be utilized with the deck disposed midway between the cushion faces, as in FIG. 4. Posts 54 are of course shown in exemplary form only, and could have many different forms. In automotive seating, for example, they could constitute portions of brackets adapted to be bolted or otherwise affixed to the floor of a car body.

FIG. 6 is a view similar to FIG. 3, except that it shows a front elevational view of a cushion assembly 60 especially adapted for use as a back cushion in chair assembly 2. Internally, assembly 60 is in all respects similar to assembly 24, corresponding parts bearing corresponding primed numerals, except that it will be understood that spring deck frame 32' thereof, is not planar but is vertically curved to conform to the vertical contour of back cushion frame 22, that cross wires 42' of deck fabric 34' extend horizontally and transversely of the chair, and that both vertical side strands 36' of the deck fabric are connected to frame 32' by helical tension springs 50', rather than only one side strand as in assembly 24. This disposition of wires 42' and springs 50' is preferable in a back cushion, first since it provides an assembly better adapted to vertical contouring as shown, and second because the tilting action of the deck as provided by springing only a single edge of the deck fabric, as in assembly 24, while desirable in a seat cushion for the reasons previously discussed, is not desirable in a back cushion, both vertical side edges of which, for reasons of comfort, should yield equally. However, in the back cushion assembly 60, the stiffness of wires 42', in combination with the yieldability of springs 50', provides a tendency for the deck fabric 34 to yield equally across substantially its entire width when loaded from the front, rather than "hammocking" freely from one side to the other. This is a provision conducive to greater comfort, since such hammocking tends to cause an uncomfortable "hunching" or rounding of the user's shoulders.

Back cushion assembly 60 may be retained in frame 22 by a snug or frictional fit in said frame, said frame being sufficiently small to compress the portions of cushion 26' between frame 22 and deck frame 32', but is also provided with nuts 56' whereby frame 32', may be rigidly fixed to frame 22, or to back supports 12, by posts 54 in the same manner as seat cushion assembly 24 in FIG. 5. Since back cushion assembly 60 obviously cannot be reversible if vertically contoured as shown, it is preferable that spring deck assembly 30' of the back cushion be disposed adjacent the rearward face of said back cushion.

In the form of the seat cushion shown in FIGS. 7-9, the seating frame 2, in addition to side bars 4 and rear crossbar 14, has a crossbar 62 extending horizontally and transversely between bars 4, beneath the forward edge of the seat. Deck fabric 34 is arranged as in FIG. 5, except that while most of the area thereof is molded in cushion material 64, generally parallel to the cushion faces but more closely adjacent the lower face, the front and rear side strands 36 thereof are left exposed exteriorly of the cushion material. Front side strand 36 is connected by hooks 46 engaged thereabout at one end, and engaged at their opposite in holes 66 provided therefor in frame crossbar 62. Rear side strand 36 is attached to rear frame crossbar 14 by a series of wide loops 68 of rubber or the like, in place of the springs 50 and 50' of FIGS. 1-6. Each rubber loop 68 is doubled at its midpoint about crossbar 14, and has each of its ends attached to rear side strand 36 by a wire hook 70. Loops 68 serve the purposes of helical springs 50 and 50' as shown in FIGS. 1-6, and could be substituted for said springs in some instances. Bars 4, 14, and 62 of frame 2, in FIGS. 7-9, serve

the same functions as deck frame 32 in FIGS. 1-6, insofar as support of deck fabric 34 is concerned, but of course are not embedded in the cushion.

In FIGS. 7-9, cushion 64 extends horizontally outwardly in all directions from the edges of deck fabric 34, and the edges thereof are molded to extend downwardly and then inwardly to engage about the associated bars of frame 2 in a "hooking" arrangement. That is, as shown in FIG. 7, the forward edge of cushion 64 forms a hook 72 engaging around front frame crossbar 62, and the rearward edge thereof forms a hook 74 engaging around crossbar 14 while as shown in FIG. 8 the side edges of cushion 64 form hooks 76 engaging around the bars 4. These hooks, being formed of molded cushioning material, are of course yieldable, whereby first they can be snapped about their associated frame bars, and second so that when the cushion is downwardly deflected by top loading, the hooks can yieldably "unwind" from the frame bars to permit the deflection, and will recover when the load is removed. For this reason, the cushion material used in FIGS. 7-9 may necessarily be somewhat firmer than that required in FIGS. 1-6. Another advantage of the firmer cushioning material, however, is that the top surface of the cushion may be deeply contoured, the better for example to provide the appearance of "bucket" seats presently so popular in automotive seating, and will retain said contour.

In addition to those features of structure and operation already discussed, the encapsulation of the spring deck assemblies directly in the foam cushions, with the foam material completely enclosing and being bonded to every deck element has been found to have several advantages. The metallic elements of the deck are completely sealed from the atmosphere, and hence are protected from atmospheric moisture, corrosion, physical damage from blows and the like, and other deterioration. The enclosing foam cushion tends to eliminate completely, or at least to substantially muffle and deaden, any metallic noises which might otherwise emanate from the deck during the repeated deflections of usage. The spring deck, when encapsulated as shown, of course stiffens and reinforces the cushion foam itself, particularly against flexure of the cushion transversely to its plane, apparently to a greater extent than cushions are stiffened by their application over a separate spring deck, even when the cushion is tightly fastened to said separate spring deck as by a taut upholstery covering or by stitching or the like. The encapsulation also avoids the rubbing or abrading damage to the cushion material often inflicted thereon by spring deck members due to relative movement therebetween when the cushioning material is applied

over a separate spring deck. On the other hand, by encapsulation the cushioning foam tends to reinforce and stiffen the spring deck itself. Said foam is bonded to wires 42 and hence tends to increase their resistance to flexure, and the portions of the foam between the convolutions of springs 50 when said springs are encapsulated, tend to inhibit the tensile elongation thereof. As a result, it appears that with encapsulation, wires 42 and springs 50 of smaller gauge may be used than when the deck is not encapsulated, with no sacrifice or reduction of strength or performance characteristics.

While we have shown and described certain specific embodiments of our invention, it will be readily apparent that many minor changes of structure and operation could be made without departing from the spirit of the invention.

What we claim as new and desire to protect by Letters Patent is:

1. An encapsulated cushion and spring deck assembly for seating structures comprising:

- a. a rigid, open, generally rectangular deck frame,
- b. a deck member comprising a planar sheet of flexible material disposed generally within, and in the plane of, said deck frame, said deck member being substantially inelastic in its own plane but capable of flexure transversely to its plane,
- c. connecting means joining a pair of opposite edges of said deck member to corresponding edges of said deck frame, said connecting means of at least one of said deck member edges being resiliently yieldable in a direction transverse to the deck member and frame edges connected thereby, and
- d. a generally planar cushion of resilient foam material molded to enclose at least the major portion of said deck member, the plane of said deck frame and deck member being disposed intermediate and generally parallel to the faces of said cushion, the edge portions of said deck member to be connected to said deck frame extending outwardly from said cushion, said connecting means being joined to said extended deck member edges, said deck frame and said connecting means being disposed exteriorly of said cushion.

2. The assembly as recited in claim 1 wherein said cushion is provided with outward extensions around substantially its entire periphery, and projecting outwardly beyond the members constituting said deck frame, said cushion extensions being molded along each edge of said cushion to form a continuous, resiliently yieldable hook portion engaged about the corresponding member of said deck frame.

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