

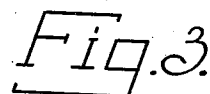
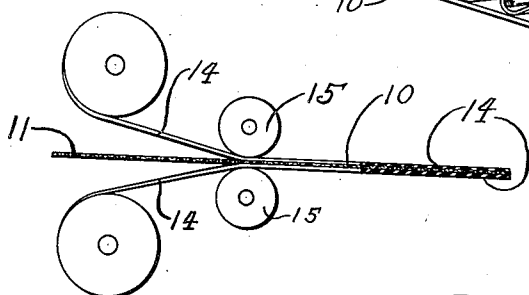
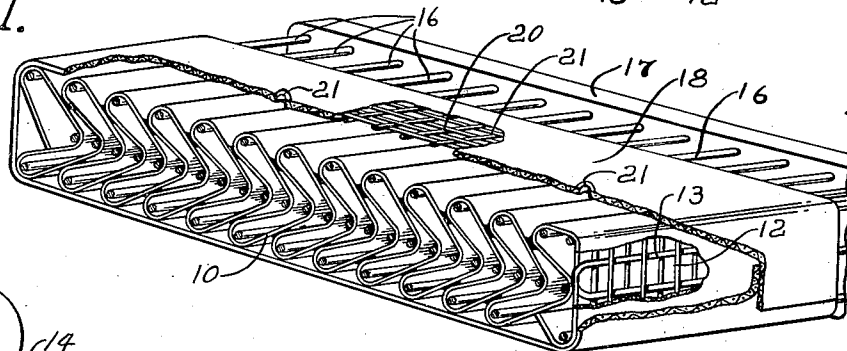
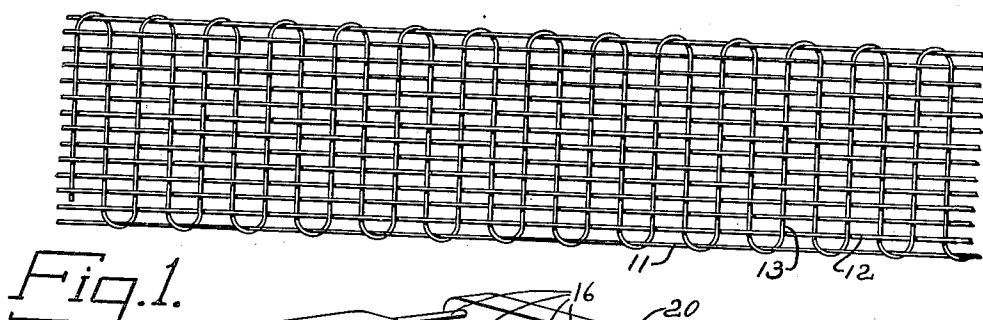
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CUSHION

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CUSHION

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This invention relates to an improved resilient cushion unit for vehicle seats, upholstered furniture, mattresses, and the like, and to the method of making the same.

5 The main objects of the invention are to provide a resilient unit of this character which gradually builds up resistance to compression throughout a substantially large initial portion of its deflection range, and which has a more rapid build-up rate
 10 throughout the remaining portion of such range; to provide a device of this kind which has substantially uniform flexibility and practically the same variable build-up characteristics throughout substantially all of its weight supporting por-
 15 tions; to provide a resilient cushion unit which readily conforms to the contours of the portion of the body with which it registers when in use, and which exerts a substantially evenly distributed supporting pressure thereon; to provide a
 20 device of this character which is particularly adapted to yield freely in compression throughout the initial stages of its deflection range so as to cushion the slight movements of an occupant of a vehicle seat which occur when the vehicle is
 25 driven over smooth or slightly rough road surfaces, and to yield less freely during the remaining portion of its deflection range so as to cushion the severe movements of the vehicle seat occupant when the vehicle is driven over compara-
 30 tively rough roads; and to provide for damping of the rebound action of the resilient unit.

Other objects of the invention are to provide, in a resilient cushion unit of this kind, a convoluted spring member having a metal wire body por-
 35 tion; to provide a sound insulating and rust resisting rubber envelope for the wire body portion thereof, and which holds the wires of adjacent folds against metal to metal contact; to provide
 40 an envelope of this character which is rigidly secured to the wire body portion by vulcanization; to provide a substantially integral bond between contacting portions of adjacent convolu-
 45 tions so as to stabilize and hold the convoluted member against collapsing and rocking; to provide a structure of this kind by which some of the resilient properties of the rubber embodied in the
 50 spring unit are utilized in yieldably supporting weight; and to provide an entirely resilient unit which has substantially less metal content per unit of weight sustaining capacity than conven-
 55 tional devices of this kind.

Further objects of the invention are to provide, in a spring unit, a convoluted resilient member which has adjacent series of nominally open folds

disposed at opposite inclinations to a common plane and extending in opposite direction to the latter; and to provide open folds of this character which have contact with each other and which are adapted to collapse sufficiently to allow the
 5 opposite sides thereof to at least partially come together when the pressure thereon exceeds a predetermined value, so as to vary the deflection rate during further compression.

Still further objects of the invention are to
 10 provide an improved method of making spring units of this character; to provide a method of this kind by which sheet-like material can be economically and conveniently formed to a de-
 15 sired convoluted contour and fixed in such condition; and to provide a method for integrally bonding adjacent contacting convolutions of such a structure together and to an external sheathing.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which:

Fig. 1 is a plan view of one form of wire netting which may be advantageously employed as a resilient, reinforcing structure in a spring unit embodying the invention.

Fig. 2 is a side elevational view diagrammatically illustrating one form of apparatus and method for forming the resilient stock embodied in the improved spring unit.

Fig. 3 is a perspective view, partly in section, of a spring unit showing parts thereof removed to
 30 disclose the underlying structure.

Fig. 4 is a perspective view, partly in section, of a vehicle seat including a seat back and illustrating one use for which the spring unit is par-
 35 ticularly adapted.

Fig. 5 is a perspective view of another type of wire netting which is suitable for use in spring units of this character.

In the form shown, the improved unit includes
 40 a convoluted body portion 10, which is formed from a composite rubber and resilient wire stock. The stock includes an intermediate wire netting 11, having laterally spaced, longitudinally extend-
 45 ing wire strands 12 secured together by transversely extending wire strands 13. The netting shown in Fig. 1 is of a woven type, but it may be fabricated in any desired manner. Disposed on
 50 respectively opposite sides of the netting 11 are sheet-like layers of vulcanizable rubber 14 which are integrally united together through the inter-
 55 stices of the netting. The assembly of the rubber sheets 14 and wire netting 11 may be conducted in the manner illustrated in Fig. 2 by passing the superimposed sheet-like elements between heated

rollers 15 which are constructed and arranged to firmly compress the sheet-like layers together.

If it is desired to form an integral bond between the wire netting and the rubber sheets, this may be accomplished by providing either the completed netting 14', shown in Fig. 5, or the wire of which it is formed with a film-like rubber coating 15', that is bonded by vulcanization to the surface of the wire. This coating may be formed either by spraying or dipping the wire or netting into a suitable rubber coating bath comprising a vulcanizable rubber composition having a volatile vehicle and having substantial quantities of vulcanizing and vulcanization accelerating agents. After application of the coating material, the wire is preferably heated to a temperature within the rubber vulcanizing range, so as to cure the film-like coating while it is in contact with the wire and to cause the same to become integrally bonded thereto. This heat treatment also simultaneously relieves the inherent stresses in the strands and the strains to which the latter are subjected during the convolution forming operation. When rubber coated wire netting is employed, the rubber sheets 14 become integrally united together and rigidly bonded to the wire netting as the assembly of sheet-like elements is subjected to heat and pressure between the rollers 15.

The sheet-like stock is then brought to a convoluted contour in any desired manner so as to provide a spring unit of substantial thickness. This is preferably done by winding it upon suitable spaced bars 16 which are removably mounted at their respectively opposite ends in side members 17 of a frame-like structure, illustrated in Fig. 3. For the purpose of illustration and in order to disclose the construction of the improved spring unit, only one side member 17 of the frame is shown in Fig. 3, the other side member being substantially identical.

Any desired arrangement of folds or convolutions may be produced by selectively varying the spacing of the bars 16. One type and arrangement of convolutions which is found to be particularly adapted for use in vehicle seat construction is illustrated in the drawing. In this instance, three laterally spaced rows of longitudinally spaced bars are employed. The corresponding bars of each of the three rows are misaligned vertically as viewed in Fig. 3, so as to provide oppositely inclined convolutions or folds which extend in opposite direction from the plane containing the intermediate row of bars 16, corresponding to the common intermediate plane of both series of the folds. The folds of the upper and lower series, shown in Figs. 3 and 4, overlap each other and the rounded extremity or edge portion of each fold contacts with a side of the next adjacent fold. As the composite rubber and wire stock is wrapped around successive bars, it takes a permanent set in the contour illustrated in the drawing and tends to return to such contour after it is compressed in use.

While the convoluted stock is still mounted on the removable bars 16, it is wrapped with a flexible sheathing 18, preferably comprising an intermediate wire reinforcing element 20 which is embedded in rubber 21. The sheathing 18 may, if desired, be substantially identical to the stock from which the convoluted body portion of the spring unit is constructed, or any other suitable flexible sheet material may be employed.

After the convoluted body portion has been wrapped in a sheathing of this character in such

a manner as to bring the vulcanizable rubber thereof into contact with the vulcanizable rubber of the convolutions, the entire assembly is placed in an oven and heated to a temperature within the vulcanizing range, preferably 260° F., until the rubber content thereof has cured to a desired extent. During the curing treatment, the rubber coverings of the contacting convolutions of the body portion of the unit become integrally bonded together and those portions of the convolutions which contact with the sheathing 18 become integrally united therewith. The frame structure is disassembled and the bars 16 are removed after the curing operation, and the resulting spring unit is capable of sustaining the shape to which it was constructed and to readily return, by its own resiliency, to its initial shape after yielding under the action of weight supported on it.

Spring units of this character may be used, in place of the conventional coil springs, in mattresses, upholstered furniture, and seats which, as illustrated in Fig. 4, may be built to a desired shape and contour by applying cotton batting, or other padding 19, on the top and side walls of the spring unit, and then enclosing the padding and spring unit with an external layer of upholstery material 20.

In the operation of a spring unit of this kind, the bonds between the contacting convolutions and the integral attachment of the sheathing to such convolutions hold the unit against rocking and collapsing. The opposite sides of the open folds or convolutions are urged together during the initial stages of compression of the unit until the sides of such folds contact with each other. During this stage of compression of the unit, a relatively high and constant deflection rate is provided. After the sides of the folds engage each other, the structure more rigidly resists compression, and accordingly a lower deflection rate is established. The variable deflection rate of the spring unit renders it particularly adaptable for use in vehicle seat construction where a substantially high and constant deflection rate is required to absorb the slight shocks and variations to which an occupant is subjected during travel of a vehicle over a comparatively smooth or slightly rough road, and where substantial rigidity is needed to oppose the severe shock and vibration which is created when the vehicle is driven over rough roads.

The convolutions of the spring unit with which the seat proper, shown in Fig. 4, is provided extend transversely of the seat. This arrangement has been found to render all portions of the seat substantially equally resistant to compression. The convolutions tend to expand when the bars 16 are removed during construction of the unit and the sheathing 18 is, therefore, permanently placed under tension. As a result, pressure applied to a localized portion of the seat structure is resisted by those convolutions which are located at the point of application of pressure, and by the convolutions remote from the point of application of pressure which are brought into action by reason of their attachment to the tensioned sheathing.

In some instances, it is desirable to close the side edges of the spring unit from which the rods 16 are withdrawn during construction. This may be done by attaching flexible sheet material of any kind to the edges of the unit. When a damping of the rebound action of the spring unit is required, the side edges of the unit are flexibly

enclosed with impervious sheet material, such as rubber, and metering orifices of the character illustrated at 21 in Fig. 4, are provided in the wall structure of the spring unit to control the ingress of air to and the egress of air from the interior of the unit.

Although but several forms of the invention are herein shown and described, various changes in the arrangement and construction of the various elements and character of material employed, as well as in the steps of the method set forth, may be made without departing from the spirit of the invention, and it is not intended to limit its scope other than by the terms of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A spring unit for seats, mattresses, and the like including a convoluted sheet-like member comprising a resilient wire reinforcing structure enveloped in rubber, some of the successively adjacent convolutions of said member being disposed in at least partially overlapping relation and having contacting side portions bonded together independently of the opposite side portions thereof.

2. A spring unit for seats, mattresses, and the like including a convoluted sheet-like member comprising a resilient wire reinforcing structure having sheets of rubber on its respectively opposite sides bonded together and to said reinforcing structure, some of the convolutions of said member being disposed in at least partially overlapping relation and having contacting side portions rigidly bonded together independently of the opposite side portions thereof, and a rubber sheathing enclosing said member and integrally united with the rubber on the outer portions of said convolutions.

3. A spring unit for seats, mattresses, and the like including a convoluted sheet-like wire netting having all of its successively adjacent folds extending in respectively opposite directions from and disposed at opposite inclinations with respect to a plane intermediate the side planes of said unit respectively.

4. In seats, mattresses, and the like, a spring unit including a convoluted sheet-like resilient member having successive folds extending from and disposed at opposite inclinations with respect to a plane intermediate the opposite side planes of said unit, alternate folds of said sheet-like member engaging each other.

5. A spring unit for seats, mattresses, and the like including a convoluted body part comprising a wire netting enveloped in and rigidly bonded to a rubber sheet and having successive, substantially round edge folds extending in opposite directions from and disposed at opposite inclinations to a plane intermediate the opposite side planes of said unit, the round edge of each of the folds on the respectively opposite sides of said intermediate plane contacting with the side faces of the next adjacent folds respectively and opposing compressive deflection of said body part.

6. A multiple deflection rate spring unit for seats, mattresses, and the like including a convoluted sheet-like body part comprising a wire reinforcing structure embedded in a layer of rubber and having a plurality of normally open adjacent contacting folds for establishing a relatively high and uniform deflection rate during the initial stages of compression of said unit, said folds being adapted to close under pressure of a

predetermined magnitude and to establish a comparatively lower and decreasing deflection rate during subsequent stages of compression of said unit.

7. A spring unit for seats, mattresses, and the like including a convoluted body part comprising netting enveloped in rubber and having wire strands, said body part having successive loops extending on opposite sides of a plane intermediate the side planes of said unit and extending at opposite inclinations to said intermediate plane respectively, portions of the sides of the adjacent loops on each side of said intermediate plane respectively being in contacting relationship.

8. A spring unit for seats, mattresses and the like including a convoluted body part comprising wire netting enveloped in rubber, said body part having successive loops extending on opposite sides of a plane intermediate the side planes of said unit and extending at opposite inclinations to said intermediate plane respectively, portions of the sides of the adjacent loops on each side of said intermediate plane respectively being in contacting relationship and bonded together.

9. In seats, mattresses and the like, a spring unit comprising convoluted sheet material including a wire netting and having cooperating series of convolutions, each of said series of convolutions extending transversely of said seat and extending in opposite directions from a plane intermediate the side planes of said unit respectively, the convolutions of each series being in partially overlapping relation, and flexible means for enclosing said unit normally holding the latter under an initial compression.

10. In seats, mattresses and the like, a spring unit comprising convoluted sheet material including a wire netting enveloped in a rubber composition and having cooperating series of convolutions, each of said series of convolutions extending transversely of said seat and extending in opposite directions from a plane intermediate the side planes of said unit respectively, the convolutions of each series being in partially overlapping relation and having contacting portions fixed together, and flexible means for enclosing said unit normally holding the latter under an initial compression.

11. In seats, mattresses and the like, a spring unit comprising convoluted sheet-like resilient material having cooperating series of convolutions, each of said series of convolutions extending in opposite directions from and at opposite inclinations to a plane intermediate the side planes of said unit respectively, the convolutions of each series being in partially overlapping relation, and flexible means for enclosing said unit normally holding the latter under an initial compression.

12. A spring unit for seats, mattresses, and the like, including convoluted sheet-like resilient material having adjacent connected series of convolutions, and said convolutions having looped portions oppositely inclined to a plane intermediate the opposite side planes of said unit, and said convolutions projecting depthwise of the unit a substantially greater distance than the width of said convolutions.

13. A spring unit for seats, mattresses and the like, including convoluted sheet-like material having adjacent connected series of open substantially parallel loops projecting in opposite directions from and at opposite inclinations to a plane intermediate the opposite side planes of

said unit respectively, the adjacent loops of each respective series being arranged in overlapping contacting relationship, with respect to each other.

14. A multiple deflection rate spring unit for seats, mattresses and the like including a convoluted sheet-like resilient element having a plurality of normally open adjacent contacting folds for establishing a relatively high and uniform deflection rate during the initial stages of compression of said unit, said folds being adapted to substantially close under pressure of a predetermined magnitude and to establish a comparatively lower and decreasing deflection rate during subsequent stages of compression of said unit.

15. A multiple deflection rate spring unit for seats, mattresses and the like including a convoluted sheet-like resilient element having cooperating series of adjacent contacting open folds for establishing a relatively high and uniform deflection rate during the initial stages of compression of said unit, each of said series of folds extending in opposite directions from and at opposite inclinations to a plane intermediate the side planes of said unit respectively, said folds being adapted to substantially close under pressure of a predetermined magnitude and to establish a comparatively low and decreasing deflection rate during subsequent stages of compression of said unit.

16. A spring unit normally compressible in the direction of its thickness for seats, mattresses and the like including a strip of resilient sheet-like material having a plurality of return-bent portions forming a series of convolutions, the opposite sides of said convolutions normally being arranged in planes disposed diagonally of the thickness of said unit and extending in the general direction of said thickness a distance greater than the distance between said opposite sides of said convolutions, said convolutions having adjacent portions superimposed in said direction of normal compression of said unit.

17. A spring unit of the character described normally compressible in the direction of its thickness including a convoluted strip of resilient material comprising resilient metallic elements and having a plurality of convolutions arranged in planes disposed diagonally of the thickness of said unit and extending in the general direction of the thickness of said unit distances greater than the width of each convolution, said convolutions being arranged in contacting mutually supporting relationship with respect to the successively adjacent convolution.

18. In seats, mattresses, and the like, a spring unit including a convoluted body part comprising netting having wire strands and enveloped in rubber, said body part having successive folds extending in opposite directions from and disposed at opposite inclinations to a plane intermediate the opposite planes of said unit.

19. In seats, mattresses, and the like, a spring unit including a convoluted sheet-like resilient member having successive folds extending from and disposed at opposite inclinations with respect to a plane intermediate the opposite side planes

of said unit, alternate folds of said sheet-like member engaging each other only at their outer end portions when the unit is unloaded.

20. In the manufacture of seats, mattresses and the like, the method of making a resilient unit which consists in forming a sheet-like stock comprising a stranded resilient wire reinforcing structure and a layer of rubber composition, bringing said stock into convoluted contour with the wire strands of said re-enforcing structure conforming to said contour and heat treating the resulting product at such a temperature as to simultaneously cure said rubber composition and relieve the inherent stresses in said strands and the strains to which the latter are subjected during said convolution forming operation.

21. In the manufacture of seats, mattresses and the like, the method of making a resilient unit which consists in forming a sheet-like stock comprising a resilient wire reinforcing structure and a layer of rubber composition, forming said stock into a series of successive folds extending on opposite sides of a plane intermediate the opposite side planes of said series and extending at opposite inclinations to said intermediate plane respectively and bringing portions of adjacent folds into contacting relationship, securing the rubber composition of the contacting portions of said folds together, and heat treating the resulting unit to relieve the internal strains and stresses of the wire strands of said reinforcing structure and to simultaneously cure said rubber composition.

22. A resilient unit for seats, mattresses, and the like including a convoluted sheet-like element comprising spaced strands of resilient wire and having the opposite side walls of respective successive convolutions extending in opposite directions from and disposed at opposite inclinations with respect to a plane intermediate the opposite side planes of said unit respectively, said wire strands having a permanent set corresponding to the normal relaxed contour of said convolutions.

23. In seats, mattresses, and the like, a spring unit including a convoluted sheet-like resilient member comprising strands of wire and having successive folds extending from and disposed at opposite inclinations with respect to a plane intermediate the opposite side planes of said unit and having alternate folds engaging each other, said wire strands having a permanent set corresponding to the normal relaxed contour of said folds.

24. A resilient unit for seats, mattresses and the like, comprising a convoluted sheet-like element having resilient wire strands therein, successive convolutions of said element extending on opposite sides of a plane intermediate the side planes of said element and extending at opposite inclinations to said intermediate plane respectively, and adjacent folds of said element being in contacting relationship, said wire strands having a permanent set and corresponding in contour to the desired contour of said convolutions.

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