Feb. 23, 1965 R. P. DOERER 3,170,222

METHOD OF MAKING AN INSULATOR AND ATTACHING THE SAME TO A SUPPORTING SPRING STRUCTURE

Filed Jan. 28, 1963 2 Sheets-Sheet 1

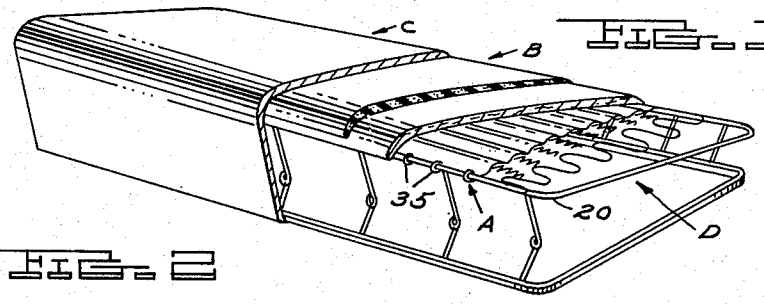


FIG. 2

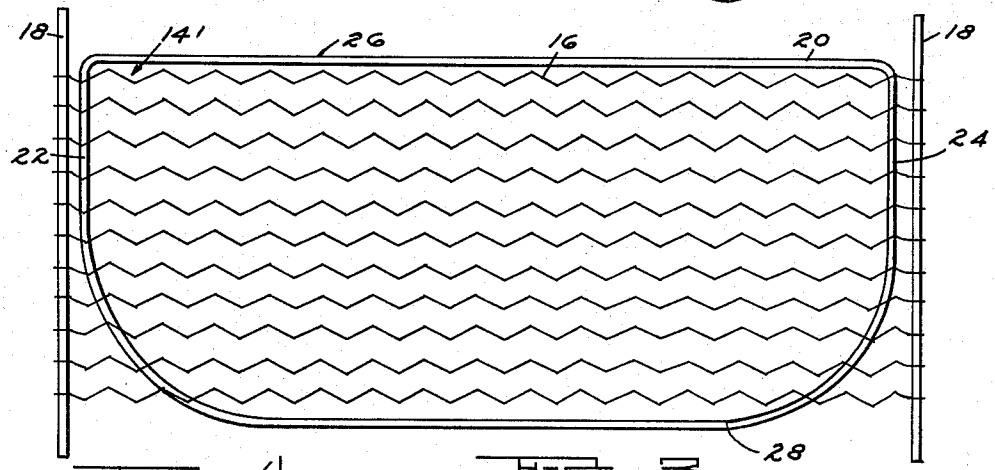


FIG. 4

FIG. 3

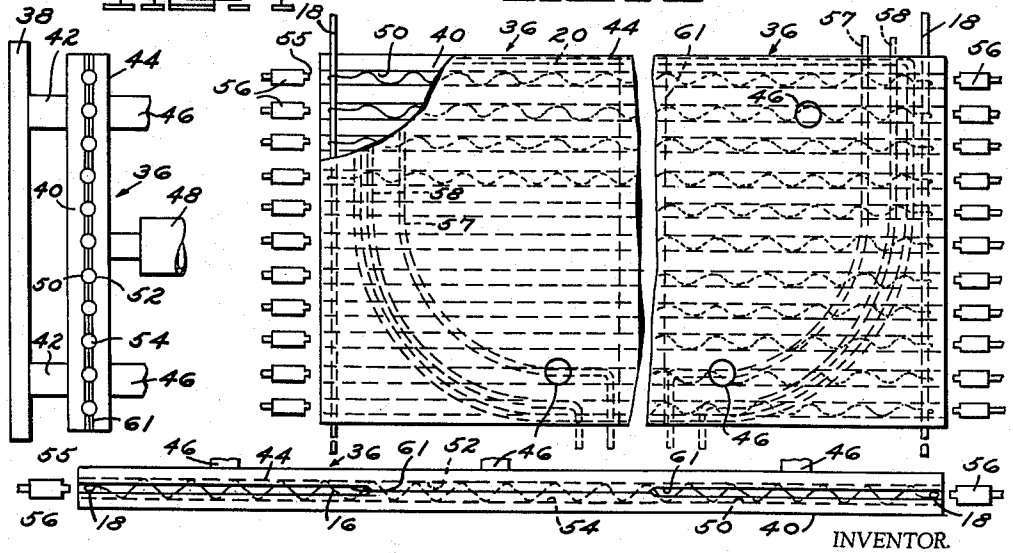


FIG. 5

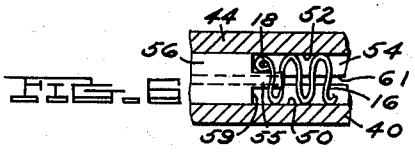


FIG. 6

INVENTOR.
RICHARD P. DOERER

BY

Whittemore, Hulbert & Belknap

ATTORNEYS

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FIG. 7

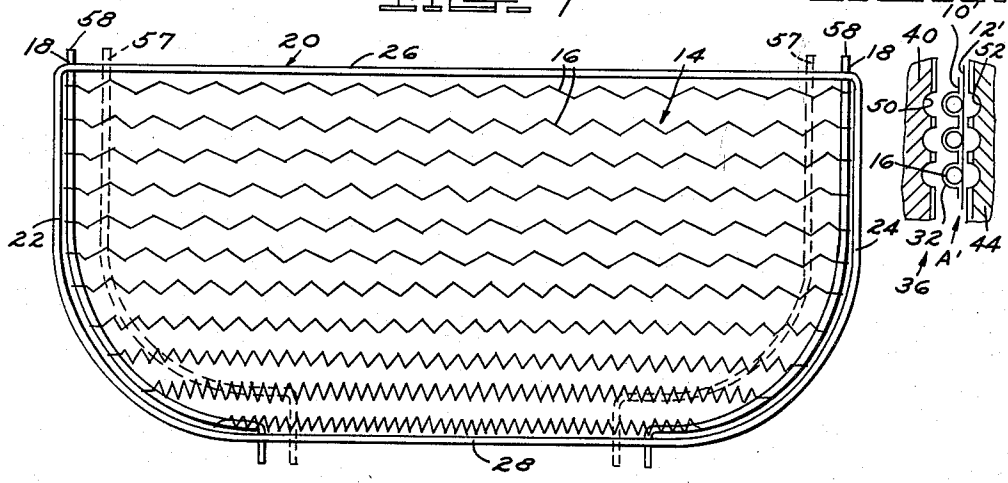


FIG. 14

FIG. 8

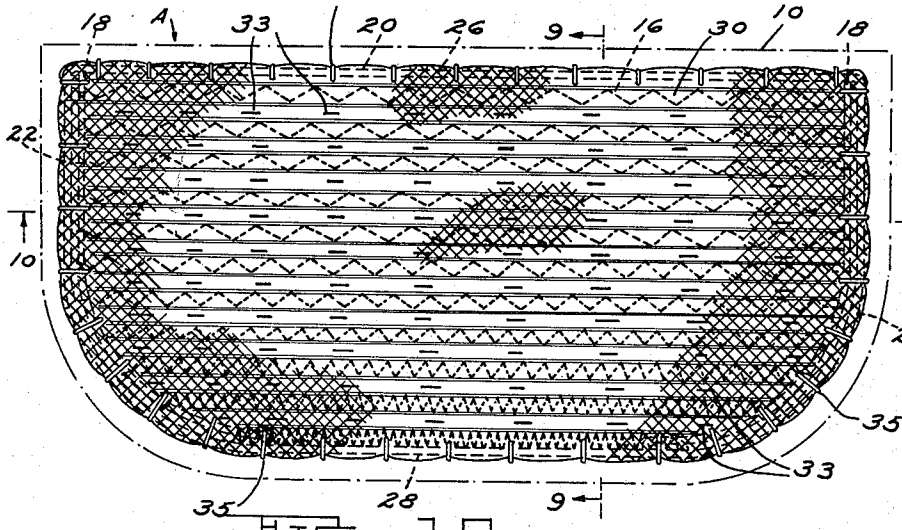


FIG. 9

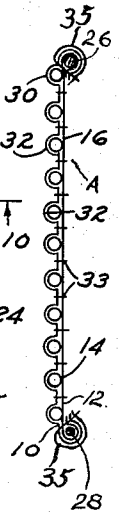


FIG. 10

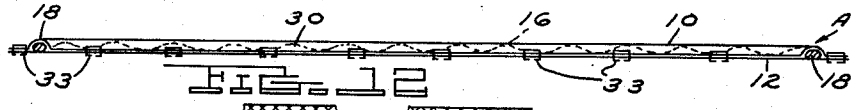


FIG. 12

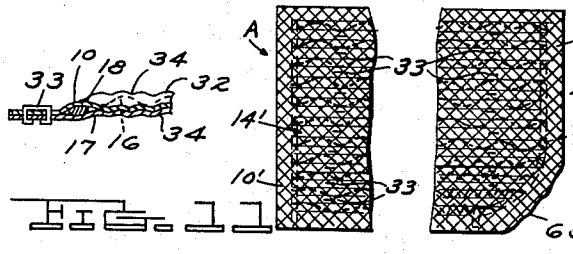


FIG. 13

FIG. 11

INVENTOR.
RICHARD P. DOERER
BY
Whittemore, Hulbert & Belknap
ATTORNEYS

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3,170,222

METHOD OF MAKING AN INSULATOR AND ATTACHING THE SAME TO A SUPPORTING SPRING STRUCTURE

Richard P. Doerer, Ypsilanti, Mich., assignor to Van Dresser Specialty Corporation, Warren, Mich., a corporation of Michigan

Filed Jan. 28, 1963, Ser. No. 254,353
8 Claims. (Cl. 29—91.1)

This invention relates to a method of making an insulator and attaching the same to the supporting spring structure of an upholstered assembly, and is a continuation-in-part of my copending application Serial No. 177,543, filed March 5, 1962, now Patent No. 3,132,356, granted May 12, 1964.

One of the essential objects of the invention is to provide a method of making an insulator of flexible material reinforced by a plurality of flexible strands, adapted to be attached to the supporting spring structure of an upholstered assembly.

Another object is to provide a method of making an insultor of the type having resilient reinforcing strands of undulating configuration wherein the strands are longitudinally compressed beyond their elastic limit to reduce the overall length of said strands to approximately the dimension of the correspondng portions of the supporting spring structure.

Another object is to provide a method of making an insulator wherein the strands are longitudinally compressed by the application of endwise pressure upon the ends of the strands.

Another object is to provide a method of making an insulator wherein the strands are individually laterally confined during the longitudinal compression thereof.

Another object is to provide a method of making an insulator wherein the strands are overcompressed somewhat with respect to the dimension of the correspoding portions of the supporting spring structure so that the strands, when relieved of pressure, will spring back more nearly to the desired length.

Another object is to provide a method of making an insulator wherein a sheet of flexible material is applied over one or both sides of the strands, either before or after the strands are compressed.

Another object is to provide a method of making an insulator wherein certain strands are compressed more than others.

Another object is to provide a method of making an insulator wherein the strands are of helical configuration.

Another object is to provide a method of making an insulator wherein the endmost convolutions of the helical strands are internally supported by pilots during compression.

Other objects, advantages and novel details of construction of the invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of an upholstered assembly provided with an insulator constructed in accordance with this invention, and showing parts broken away and in section.

FIGURE 2 is a top plan view of the core of the insulator before the strands are compressed, shown overlying the border frame of the supporting spring structure of the upholstered assembly.

FIGURE 3 is a top plan view of a compression fixture for compressing the strands of the core, showing the core in position between the closed plates of the fixture, with parts broken away.

FIGURE 4 is an end view of the fixture shown in

FIGURE 3, showing the plates closed but omitting the core.

FIGURE 5 is a side view of the fixture, showing the core between the closed plates.

FIGURE 6 is an enlarged fragmentary sectional view showing a piston extending into one of the grooves of the compression fixture.

FIGURE 7 is a plan view of the insulator core, after it has been compressed, shown over the border frame to illustrate the configuration of the compressed core with respect to that of the border frame.

FIGURE 8 is a plan view of the complete insulator shown marginally attached to the border frame of the supporting spring structure, the dotted lines indicating the outline of the insulator prior to being marginally attached to the border frame.

FIGURE 9 is a semi-diagrammatic view taken on line 9—9 of FIGURE 8.

FIGURE 10 is a semi-diagrammatic view taken on the line 10—10 of FIGURE 8, omitting the border frame.

FIGURE 11 is an enlarged sectional view of a portion of FIGURE 10.

FIGURE 12 is a fragmentary view of a modified form of the insulator before the strands have been compressed.

FIGURE 13 is a fragmentary view of the modified insulator after the strands have been compressed and the insulator is ready for use.

FIGURE 14 illustrates a step in the manufacture of the modified insulator.

In the drawings, A is an elongated, substantially horizontal, flexible, bodily stretchable, sheet-like insulator embodying my invention disposed between an overlying padding B for an exterior trim material C and an underlying supporting spring structure D of an upholstered assembly.

The insulator A is best shown in FIGURES 8–11 and includes an elongated sheet of flexible material 10, another elongated sheet of flexible material 12 having substantially the same marginal outline as the sheet 10, and a pre-compressed reinforcing core 14 between the sheets 10 and 12. The insulator is a composite laminated structure with the core 14 constituting a lamination or layer between the outer layers or sheets 10 and 12 of flexible material.

The pre-compressed core 14 includes a plurality of laterally spaced, substantially parallel, resilient stretchable reinforcing strands 16. The core is best seen in FIGURE 7 and it will be noted that anchorage means or members which may be in the form of cords 18 extend along both ends of the core 14 to which the wire strands are terminally connected. The ends of the wire strands may be simply wrapped or folded around the cords and held in a predetermined spaced relation to one another. The strands between their ends are helical as is apparent.

The supporting spring structure D includes an elongated substantially horizontal border frame 20 having the contoured ends 22 and 24. The border frame may be formed of a wire element or the like, and also has the longitudinally extending straight sides 26 and 28 connecting the contoured ends 22 and 24. The composite insulator A has an outline which closely approximates that of the border frame. The outline of the insulator A is shown in dotted lines in FIGURE 8. Preferably, the sheets 10 and 12 are slightly larger both in width and length than the border frame, while the core is very close in outline to that of the border frame.

As seen particularly in FIGURES 9 and 10, the sheet 12 is substantially flat and the sheet 10 is formed with loops 30 extending substantially from one end to the other, which cooperate with the sheet 12 in defining parallel open tunnels or pockets 32 which extend lengthwise of the insulator. The sheets are secured together by staples 33 or any other suitable securing means such, for example, as

stitching or adhesive. In this instance the staples run between the pockets 32 to separate them from each other. A strand 16 is disposed in each of the pockets 32, and the cords or anchorage members 18 extend across the ends of the pockets. It will, of course, be understood that the strands may, if desired, extend crosswise rather than lengthwise of the insulator.

Preferably the sheets are pleated transversely of the pockets, that is the material of the sheets is formed to provide the pleats 34 which extend at right angles to the pockets from one side to the other. The pleats are shown in FIGURE 11. By thus pleating the sheets, the sheets, as well as the strands 16, are stretchable in the direction of length of the insulator so as to yield under load.

The insulator is shown in FIGURE 8 marginally secured to the border frame 20, as by means of hog rings 35. The hog rings encircle the border frame and at the ends of the insulator also encircle the anchorage members or cords. The hog rings of course pierce the sheets. Other securing means such, for example, as clips may be provided instead of hog rings.

Although the various elements of the insulator may be formed from any suitable material for the purposes set forth, the sheets 10 and 12 are preferably formed of burlap, and the reinforcing strands 16 are preferably formed of wire. The anchorage members or cords 18 may be formed for example of rolled or folded burlap.

In the manufacture of the insulator shown in FIGURES 8–11, the core 14 is first formed to the shape and configuration shown in FIGURE 2. The core in its initial form shown in FIGURE 2 is designated 14', and it will be noted that the strands 16 are all initially of the same length and that the pitch of the helical convolutions is also the same. The ends of the strands are terminally connected to the anchorage members or cords 18 by being folded or wrapped about the cords, and the core thus formed is substantially rectangular with the strands substantially parallel and in laterally spaced relation to each other.

The core 14' of FIGURE 2, which is there shown in its free state, must be formed to the shape shown in FIGURE 7 before it is ready to be assembled with the sheets 10 and 12 to complete the composite insulator A. In other words, the strands 16 must be longitudinally compressed, certain strands more than others, so that in the free state of the core it assumes substantially the outline shown in FIGURE 7 which corresponds closely to the outline of the border frame. To accomplish this, the fixture 36 shown in FIGURES 3–6 is employed. The fixture 36 has a base 38 and a lower plate 40 supported on the base by posts 42. An upper plate 44 is supported for vertical reciprocation above the lower plate 40. The upper plate 44 is guided in its reciprocation by pins 46 and is positively moved by any suitable means such as the hydraulic cylinder 48.

The lower plate 40 is formed in its upper surface with a plurality of laterally spaced, parallel semicylindrical grooves 50, and the upper plate 44 is formed in its lower surface with a like series of parallel semicylindrical grooves 52. When the plates are brought together, the grooves register with one another to define cylindrical passages 54 open at both ends of the plates.

As shown in FIGURES 3 and 4, a series of plungers 56 is provided at each end of the fixture, the plungers respectively being aligned with the adjacent ends of the cylindrical passages 54. In other words, there is one plunger for each end of each passage, and the plungers are guided for reciprocation along the axes of the respective passages. For this purpose, any suitable means may be employed. The plungers are of course individually operated so that some may reciprocate through a larger stroke than others. The plungers have reduced ends 55 adapted to extend into the end convolutions of the strands to serve as pilots during compression, the end convolutions bearing against the annular shoulders 59 defined by the reduced ends 55 (see FIG. 6). While preferably two plungers are provided for compressing each strand, only one need be employed. That is, one plunger may be provided to engage one end of the strand and a fixed abutment may be provided for the opposite end.

In operation, the plates 40 and 44 of the fixture 36 are separated and the insulator core 14' in its initial condition shown in FIGURE 2 is laid over the lower plate with the strands 16 in the respective grooves 50. The upper plate 44 is then lowered or closed with respect to the lower plate 40, as shown in FIGURES 4 and 5, thereby confining the strands in the respective passages 54. Although the strands are closely confined in the passages, they are capable of movement in an axial direction. The plungers 56 are advanced into the passages 54, engaging the ends of the strands and compressing them axially, thereby closing the pitch of the convolutions of the helix. In this connection, it will be noted in FIGURES 4 and 5 that the opposed surfaces of the plates 40 and 44 are relieved or cut away near both ends, as shown at 61, for some distance toward the middle in order to clear the anchorage members or cords 18.

The strands 16 are compressed far enough to exceed their elastic limit so that when the plungers 56 are withdrawn the strands will not return to their original full length shown in FIGURE 2. The dotted positions 57 (FIG. 3) of cords 18 indicate the extent to which the strands are compressed. When the plungers are withdrawn, the strands spring back slightly and assume a permanent free state condition indicated by the positions 58 of cords 18. The fixture 36 is then opened and the pre-compressed core 14 removed for assembly with the sheets 10 and 12 to form the composite insulator A.

The sheets 10 and 12 when laid out flat are slightly longer than illustrated in dotted lines in FIGURES 8 and 10, it being understood that in these figures the material of the sheets has been transversely pleated as indicated in FIGURE 11 at 34, somewhat shortening their overall length. It will also be understood that when laid flat the sheet 10 is of a somewhat greater dimension from side to side than the sheet 12 since enough material must be provided to form the loops 30.

In order to form the composite insulator A from its parts, the pre-compressed core 14 shown in FIGURE 7 may be laid over the sheet 12, the sheet 12 having first been pleated in a transverse direction. The sheet 10 may then be laid over the core and likewise transversely pleated. The margins of the sheets coincide with one another, and the material of the upper sheet 10 will fold about the individual strands 16 to form the loops 30. The sheets are secured together by any suitable means such as the staples 33 which run between the loops 30 to permanently separate the pockets or tunnels 32 from each other. The completed insulator A is attached to the border frame by any suitable means such as the hog rings 35. When laid over the border frame in its free state, the margins of the sheets are as shown in dotted lines in FIGURE 8. The margins of the sheets are folded over the border frame, in the manner shown in FIGURE 9, and the hog rings are applied without the need of any stretching. The hog rings encircle the border frame and also the cords 18 which lie inside the ends of the border frame.

FIGURE 12 illustrates one end of a modified insulator A' before the strands have been compressed. It will be understood that the opposite end of the insulator A' before compression will be a mirror image of that shown in FIGURE 12. FIGURE 13 illustrates the opposite end of the same insulator A' after the strands have been compressed and the insulator is ready for use. The other end of the insulator A' after compression is a mirror image of the FIGURE 13 illustration. The insulator A' differs from the insulator A in the initial

configuration of the sheets 10' and 12' and in the method of manufacture.

The core 14 of insulator A' is the same as the core of insulator A, but the sheets of flexible material 10' and 12' differ in that they are initially rectangular. The sheets 10' and 12' are initially somewhat longer and wider than the core and cover opposite sides of the core, so that the core forms a lamination between the sheets. In this form of the invention, the sheets 10' and 12' are secured together on opposite sides of the core before, rather than after, the core is compressed. The core is shown in FIGURE 12 prior to compression of the strands 16 and is there designated 14'. The staples 33 secure the sheets together in the spaces between the strands 16, thus providing the tunnels 32 for the individual strands.

The insulator as it is shown in FIGURE 12 is structurally complete but has not been compressed. It is placed between two plates 40 and 44 of the compression fixture 36 so that the strands of the core register with the matching grooves 50 and 52 of the fixture. This can be seen in FIGURE 14. When the upper plate 44 is brought down on the lower plate 40, the strands 16 will be laterally confined within the passages 54 defined by the matching grooves, whereupon the pistons 56 are advanced into the passages 54 to compress the strands beyond their elastic limit as before described in connection with the manufacture of insulator A. The plates of the fixture should not be moved as close together as they were in the manufacture of insulator A, because of the presence of the sheets 10' and 12'. If desired, the sheets along their ends may be spread apart so that the pistons 56 can enter the tunnels 32 between the sheets and engage the ends of the strands. The reduced ends of the pistons will enter the end convolutions of the strands to act as pilots, as before described in connection with the manufacture of insulator A.

The finished insulator A', one end of which is shown in FIGURE 13, will have substantially the same outline as the insulator A shown in FIGURE 8. The sheets of the insulator A' will be transversely pleated in the compression fixture by the action of the pistons 56. These pleats extend from one side of the insulator to the other generally transversely of the strands, although near the side where the strands are compressed to a greater degree (i.e., the bottom side in FIGURE 13) the pleats are of course somewhat deeper. Moreover, the curved portions 65 of the ends of the insulator A' are somewhat irregular in outline due to the fact that the sheets are initially rectangular. Except in the particulars mentioned, insulator A' is the same as insulator A. The insulator A' is attached to the border frame by any suitable means such as hog rings 35 in exactly the same manner as the insulator A described above.

Both insulator A and A' are capable of stretching longitudinally, since the pre-compressed strands of the cores are stretchable and the pleated material of the sheets is likewise capable of extending or stretching.

Although the strands are shown extending from end to end of insulators A and A', they may extend transversely, that is from side to side, in which event the pleats would extend from end to end.

While the strands 16 are preferably helical as shown, they may also be of other undulating form. Thus the undulations may, for example, lie in the same plane and be sinuous, or V-shaped, or any other desired wavy configuration.

What I claim as my invention is:

1. A method of forming an elongated, flexible, sheet-like insulator having in its free state condition a lengthwise dimension approximating the lengthwise dimension of an elongated border frame of a supporting spring structure of an upholstered assembly, for use of said insulator between said supporting spring structure and an overlying padding; comprising providing first and second elongated sheet of flexible material adapted to extend lengthwise of said border frame and which have a lengthwise dimension approximating the lengthwise dimension of said border frame, providing a plurality of elongated, laterally spaced, substantially parallel, flexible, resilient reinforcing strands of undulating form adapted to extend lengthwise of said border frame and which are initially longer than the corresponding portions of said border frame, longitudinally compressing said strands beyond their elastic limit to a stable free state condition of decreased length such that said compressed strands have approximately the same lengthwise dimension respectively as the corresponding portions of said border frame, extending said compressed strands upon one side of said first sheet lengthwise thereof and extending said second sheet upon the side of said compressed strands opposite said first sheet lengthwise of said first sheet, and then securing said sheets together.

2. A method of forming an elongated, flexible, sheet-like insulator having in its free state condition a lengthwise dimension approximating the lengthwise dimension of an elongated border frame of a supporting spring structure of an upholstered assembly, for use of said insulator between said supporting spring structure and an overlying padding; comprising providing first and second elongated flat sheets of flexible material adapted to extend lengthwise of said border frame and which are longer than said border frame, providing a plurality of elongated, laterally spaced, substantially parallel, flexible, resilient, helical reinforcing strands adapted to extend lengthwise of said border frame and which are initially longer than the corresponding portions of said border frame, forming transverse undulations in said sheets to shorten the same to an overall length approximating the lengthwise dimension of said border frame, laterally confining said strands, longitudinally compressing the strands beyond their elastic limit by applying endwise pressure upon the ends of said strands while they are compressed and then relieving said strands of the endwise pressure and confinement so that said strands assume a stable free state condition of decreased length and have approximately the same lengthwise dimension respectively as the corresponding portions of said border frame, then extending said compressed strands upon one side of said first shortened sheet lengthwise thereof and extending said second shortened sheet upon the side of said compressed strands opposite said first sheet lengthwise of said first sheet, then forming longitudinally extending portions of said sheets to provide individual tunnels for the separate strands, and thereafter securing said sheets together between said respective strands to confine said strands within said tunnels and to maintain the substantially parallel relation of said strands.

3. The method defined in claim 2, wherein said strands are shortened by the aforesaid application of endwise pressure upon the ends thereof to lengths less than the corresponding portions of said border frame so that when said strands are relieved of said endwise pressure they spring back to an overall length more nearly approximating the lengthwise dimension of the corresponding portions of said border frame.

4. The method defined in claim 3, wherein anchorage members are provided along opposite ends of said strands to which said strands are terminally connected prior to being compressed, and attaching said anchorage members to the ends of said border frame after said sheets are secured together as aforesaid.

5. A method of forming an elongated, flexible, sheet-like insulator having in its free state condition a lengthwise dimension approximating the lengthwise dimension of an elongated border frame of a supporting spring structure of an upholstered assembly, for use of said insulator between said supporting spring structure and an overlying padding; comprising providing first and second elongated flat sheets of flexible material adapted to extend lengthwise of said border frame and

which are longer than said border frame, providing a plurality of elongated, laterally spaced, substantially parallel, flexible, resilient, reinforcing strands of undulating form adapted to extend lengthwise of said border frame and which are initially longer than the corresponding portions of said border frame, extending said strands upon one side of said first flat sheet lengthwise thereof and extending said second flat sheet upon the side of said strands opposite said first flat sheet lengthwise of the latter, then securing said sheets together, then forming transverse undulations in said sheets to shorten the same to an overall length approximating the lengthwise dimension of said border frame while simultaneously longitudinally compressing said strands to a stable free state condition of decreased length such that said compressed strands have approximately the same lengthwise dimension respectively as the corresponding portions of said border frame.

6. A method of forming an elongated, flexible, sheet-like insulator having in its free state condition a lengthwise dimension approximating the lengthwise dimension of an elongated border frame of a supporting spring structure of an upholstered assembly, for use of said insulator between said supporting spring structure and an overlying padding; comprising providing first and second elongated flat sheets of flexible material adapted to extend lengthwise of said border frame and which are longer than said border frame, providing a plurality of elongated, laterally spaced, substantially parallel, flexible, resilient, helical, reinforcing strands adapted to extend lengthwise of said border frame and which are initially longer than the corresponding portions of said border frame, extending said strands upon one side of said first flat sheet lengthwise thereof and extending said second flat sheet upon the side of said strands opposite said first flat sheet lengthwise of the latter, then forming longitudinally extending portions of said sheets to provide individual tunnels for the separate strands, then securing said sheets together between said respective strands to confine said strands within said tunnels and to maintain the substantial parallel relation of said strands, then laterally confining said sheets and strands, then while said sheets and strands are confined forming transverse undulations in said sheets to shorten the same to an overall length approximating the lengthwise dimension of said border frame while simultaneously compressing said strands beyond their elastic limit by applying endwise pressure upon the ends of said strands and then relieving said strands of the endwise pressure so that said strands assume a stable free state condition of decreased length and have approximately the same lengthwise dimension respectively as the corresponding portions of said border frame.

7. The method defined in claim 6, wherein said strands are shortened by the aforesaid application of endwise pressure upon the ends thereof to lengths less than the corresponding portions of said border frame so that when said strands are relieved of said endwise pressure they spring back to an overall length more nearly approximating the lengthwise dimension of the corresponding portions of said border frame.

8. The method defined in claim 7, wherein anchorage members are provided along opposite ends of said strands to which said strands are terminally connected prior to being extended upon said first sheet as aforesaid, and attaching said anchorage members to the ends of said border frame after undulations have been formed in said sheets as aforesaid and said strands have been compressed as aforesaid.

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WHITMORE A. WILTZ, *Primary Examiner.*

THOMAS H. EAGER, *Examiner.*