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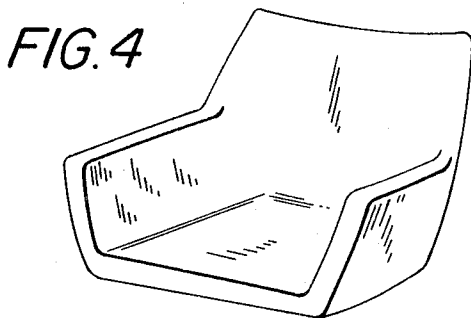
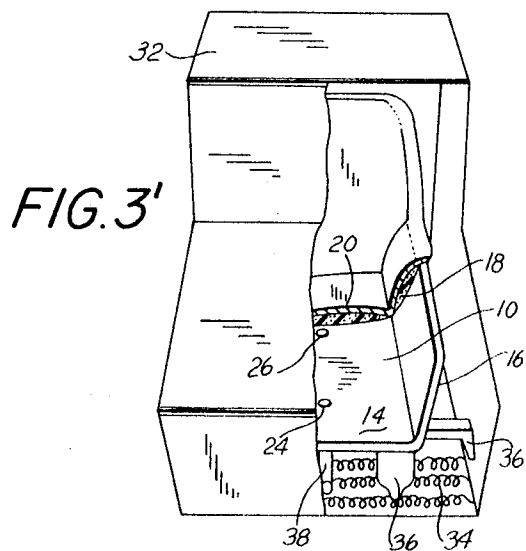
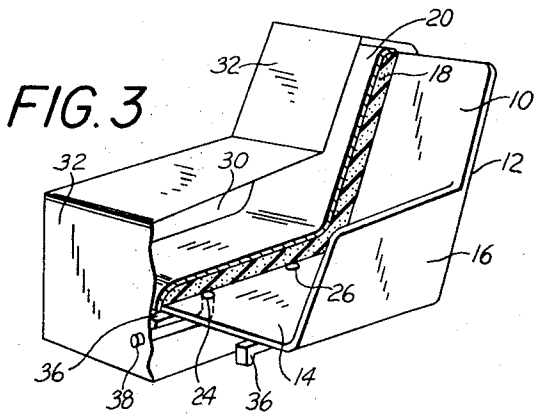
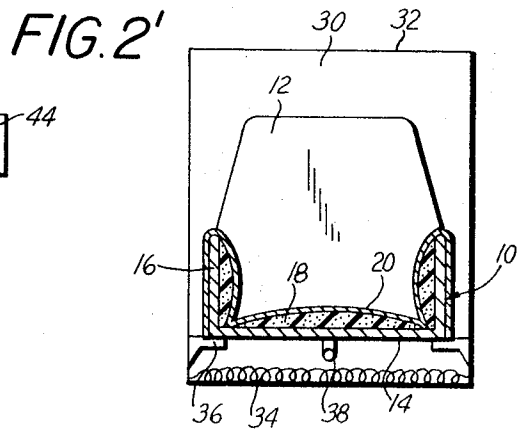
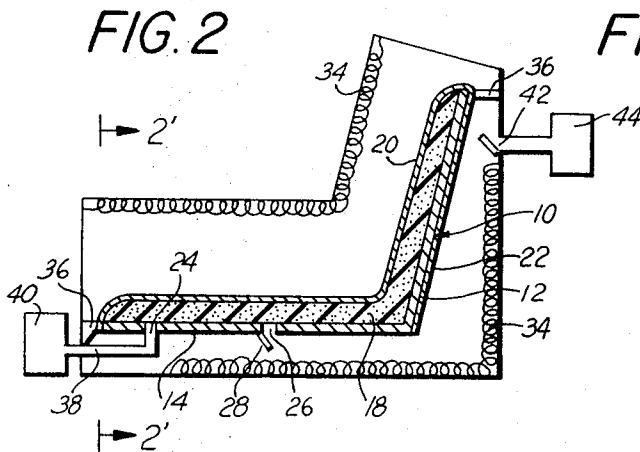
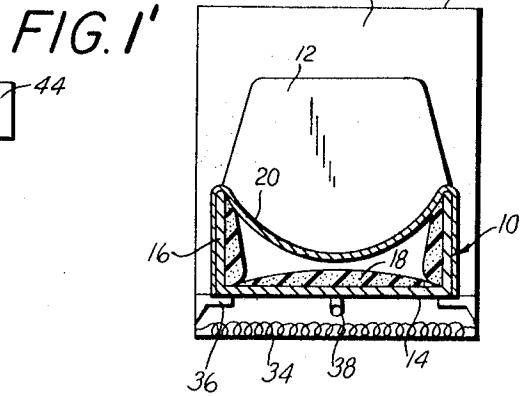
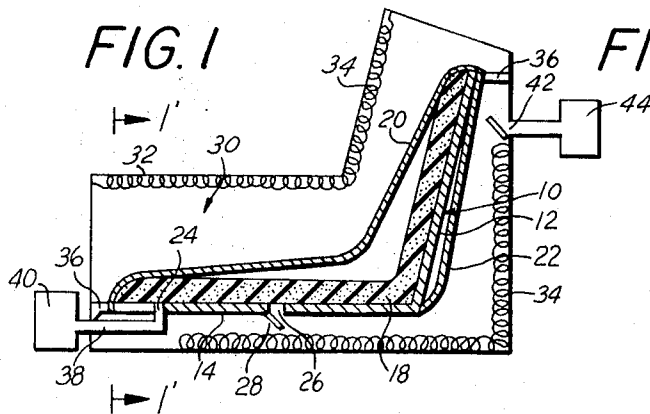
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3,589,967

METHOD OF UPHOLSTERING

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2 Sheets-Sheet 1



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3,589,967

METHOD OF UPHOLSTERING

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8 Claims

ABSTRACT OF THE DISCLOSURE

A method of upholstering a chair of almost any shape without seaming work by employing a lining material which is airtight and fits the textiles of upholstery materials. The lining material also expands and contracts with the surface of the upholstery material during the process of pneumatically contouring the upholstery to the design conformation and fixing the upholstery in this condition.

This application is a continuation of commonly assigned application, Ser. No. 567,097 filed July 22, 1966, now abandoned.

This invention relates to a method of upholstering and, more particularly, to an automatic mechanized technique for upholstering chairs.

In the past, a number of approaches have been proposed for upholstering chairs but in the main most of them were basically manual operations. With the advent of modern and fashionable chairs of styles ranging from streamlined to the somewhat complex styles included in which is smocking or like patterns, it has become increasingly difficult to upholster such chairs manually because of the tedious nature of the work as well as the attendant cost of time and effort. Heretofore, machinery to perform this type of work has been virtually non-existent.

It is, therefore, a principal object of this invention to upholster the shell or frame substantially automatically and by machinery; and to upholster in this fashion by means of this invention chairs or other pieces of furniture.

Another object is to provide an automatic upholstering technique of the above type whereby it is now possible to incorporate selected patterns on the surface of the upholstery to obtain the desired contour of the upholstery and aesthetic or ornamental effect.

Briefly stated, the present invention utilizes a vacuum-forming technique in which the intended frame to be upholstered is placed in a vacuum chamber. In accordance with one embodiment of the invention, the selected cushioning material is initially applied to the frame and suitably secured thereto as, for example, by means of an interposed bonding agent. The selected upholstery or covering material is, preferably, conditioned to be substantially airtight and is placed over the cushioning material and adhered to the peripheral edges of the frame by means of a suitable interposed bonding agent. A vacuum is then drawn into the chamber to remove or expire the air between the upholstering material and the shell to draw the upholstery into relatively tight engagement with the cushioning material. Depending upon the effects desired, the vacuum drawn can be varied and in order to render the upholstery pliable and provided with some elasticity to conform to the desired contour, heat may be supplied to the vacuum chamber during the vacuum-drawing cycle.

In accordance with another embodiment of the invention, a selected pattern is automatically incorporated into the upholstering by utilizing a frame form as, for example, that which will produce a smocking or quilted pattern. Air is exhausted between this pattern frame and

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the basic frame of the particular piece of furniture which will have had already sealed to the periphery thereof the film of upholstery material preferably of a substantially air-impervious nature. The air is exhausted between the shell frame and form frame in such a manner that the upholstery film is drawn or pulled against the form frame and bulged or expanded into arcuate configurations within the form frame openings. In the event heat is required to render the film more pliable or expansible in order to obtain the desired conformity with the form frame, hot air can be introduced at a controlled pressure equal to or less than the vacuum being drawn. When the desired conformity of the film with the form frame has been obtained, an expansible foam type of material may then be introduced between the shell frame and the film. Under controlled expansion conditions, the foam will fill the void or space between the film and shell frame. An adhesive may have been initially placed on the inner surface of the film such that when the foam material has set up, the film will be adhesively secured thereto to retain the desired pattern of upholstery. As is the case with the previous embodiment, the lining may then be applied to the rear of the shell frame and bottom portions thereof by drawing a vacuum between the shell frame and lining in order that an interposed bonding material may secure these two parts together.

A further embodiment of the invention contemplates following either of the above techniques but placing another material desired for upholstery such as woven goods or the like along with the essentially thin air-impervious film as a laminated structure. In this manner not only can selected patterns be obtained but selected goods as well for the covering upholstery material while still maintaining the automated process for upholstering.

Other objects and advantages will become apparent from the following detailed description which is to be taken in conjunction with the accompanying drawings illustrating several somewhat preferred embodiments of the invention and in which:

FIG. 1 is a diagrammatic side elevational view of vacuum chamber having inlet and exhaust ports as well as heating elements together with means for supporting a shell frame to which the upholstery material and lining has been peripherally secured prior to the initiation of the vacuum pulling operation;

FIG. 1' is a cross-section taken along the line 1'—1' of FIG. 1;

FIG. 2 is a similar side elevational view following the vacuum pulling operation and heat application step showing the upholstery material and lining secured and in conformity with the shell frame and cushioning material;

FIG. 2' is a cross-section taken along the line 2'—2' of FIG. 2;

FIG. 3 is a side perspective view with certain parts broken away and removed of the apparatus and internally mounted components of FIG. 2;

FIG. 3' is a front perspective view of FIG. 3;

FIG. 4 is a front perspective view of an upholstered chair made in accordance with the embodiment of FIGS. 1 to 3;

FIG. 5 is a diagrammatic side elevational view of another embodiment of this invention in which selected patterns may be incorporated into the upholstering material which, as illustrated, may be in the nature of smocking with a multiple chamber being shown having exhaust and inlet ports as well as means for supporting a shell frame as well as a form or pattern frame having interposed therebetween the upholstery film which ultimately conforms to the selected pattern of the form frame upon pulling of a vacuum between the frames with means also being shown for automatically applying foam type of cushioning mate-

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rial together with means for applying a lining to other parts of the shell frame;

FIG. 5' is a cross-section of FIG. 5;

FIG. 6 is a similar side elevational view showing the upholstery material conforming to the form frame upon the pull of vacuum between the form frame and shell frame;

FIG. 7 is an enlarged fragmentary perspective view of an exemplary form frame adapted to produce a smocking type of pattern on the upholstery material; and

FIG. 8 is a front perspective view of a chair made in accordance with the embodiment of FIGS. 5 to 7 having incorporated therein the selected smocking pattern for the upholstery.

Referring now to the embodiment of FIGS. 1 to 4, the particular member to be covered or upholstered is a chair shell frame 10 which may be made of wood or any one or combination of available resins or synthetic material such as polyesters and glass fiber. The frame 10 will include, for example, a back 12, a seat 14 and a pair of arms 16. Cushioning material 18 will initially be placed on the forward side of the back 12 and upper side of the base 14 and perhaps on the interior base of the arms 16. This cushioning material is ordinarily elastic and sufficiently porous to have ventilating properties and may be selected from any one of a number of materials used for such purposes such as foam rubber or urethane foam. The cushioning material 18 is initially adhered or suitably connected to the surfaces of the shell frame 10 by a bonding agent having affinity for the cushioning material and shell frame. The selected upholstery material 20 is initially placed or draped over the cushioning material 18 and over such parts of the remainder of the frame 12 to be covered thereby and is suitably connected along its periphery to surfaces of the frame 12 in any one of a number of means and preferably in an airtight fashion as, for example, by means of a suitable bonding agent or other equivalent means. Interior surfaces of the upholstery material 20 have applied thereto a suitable bonding agent having affinity for the selected cushion material 18. In actual practice it was found to be desirable that the upholstery material 20 be substantially airtight and somewhat elastic. Commercially available vinyl resin sheet material has proven to provide satisfactory results either as the upholstery material or as a lining for the selected upholstery material which may assume any one of a number of forms including woven goods which are initially suitably adhered to the vinyl material. Other surfaces of the frame 10 particularly the back 12 may have applied thereto a substantially airtight end elastic sheet material serving as the lining 22 which is also initially secured at its periphery to the associated portions of the shell frame 10 as, for example, by means of a suitable bonding agent. The interior surfaces of the lining 22 will also have applied thereto a bonding agent having affinity for the associated surfaces of the shell frame 10 to which it will ultimately be placed in surface-to-surface relationship. For purposes of which will become apparent, the shell frame 10 is provided with an outlet opening or port 24 and an inlet or ventilating opening 26 the latter of which may be free to open and close by means of a flap-type of valve 28, for example.

The shell frame 10 and assembled cushioning material 18, upholstery material 20 and lining 22 is then placed in a vacuum chamber 30 defined by an outer housing 32 constructed in a substantially airtight manner and which may also have one or more access doors for purposes of placing the frame 10 with assembled materials in the vacuum chamber 30. The interior of the housing 32 may be provided with suitable heating means such as the coils 34 which may be thermostatically controlled to assure the proper amount of heat in the vacuum chamber 30. In addition, the interior of the housing 32 is provided with one or any number of supports 36 for supporting the shell frame 10 and assembled materials within the vacuum chamber 30. A conduit 38 which may be of the

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flexible type is suitably connected with the exhaust opening 24 of the shell frame 10 by any one of a number of suitable coupling means. The conduit 38 extends exteriorly of the housing 32 and is coupled with a suitable vacuum source 40 such as the usual air compressor. The housing 32 is also provided with a valve-controlled outlet 42 which, in turn, is coupled with another compressor 44 of the hypotonic type.

Assuming for the moment that the cushion material 18 has been adhesively secured to the shell frame 10, a bonding agent has been applied either to the interior surfaces of the upholstery 20 or on the outer surface of the cushioning material 18 which bonding agent preferably possesses some degree of elasticity and which may be selected from the class of gum arabic materials, and the edges or periphery of the material 20 has been secured in an airtight fashion to the peripheral surfaces or edges of the shell frame 10 by the use of the same or other suitable binding agent, the shell frame 10 and assembled material will be placed in the vacuum chamber 30 and supported therein by the supports 36. It should be understood that the present invention also contemplates assembling these parts within the vacuum chamber 30. The exhaust conduit 38 is suitably coupled with the exhaust opening 24 and thereafter the compressor or vacuum pump 40 is set into operation. In accordance with a successful application of the invention, the vacuum pump 40 drew a vacuum of between 7 to 10 atmospheres. Under the circumstances, the air between the cushioning material 18 and the upholstery 20 is expired or exhausted through the porous or ventilatable cushion material 18 through the exhaust port 24 out through the exhaust conduit 38. The upholstery material 20 is, accordingly, forced into engagement with the cushion material 18 and by means of the interposed bonding agent is adhered directly thereto.

In order to obtain optimum bonding or adherence between the cushioning material 18 and the upholstery material 20, it is advisable to assure a fresh air supply otherwise the air within the vacuum chamber 30 will become thin and stale thereby reducing the effectiveness of the bonding agent. In this connection, the hypotonic compressor or pump 44 comes into play and is set into operation following opening of the ventilating opening or port 42. In accordance with the mentioned successful application of this invention, fresh air was introduced into the vacuum chamber 30 by means of the hypotonic compressor at approximately 0.5 to 1.0 atmosphere to thereby reduce the generated vacuum by about 20%.

Assuming also that the lining material 22 has been applied to peripheral surfaces of the shell frame 10 prior to the operation of the vacuum pump 40 and that a suitable bonding agent has either been applied to the interior surfaces of the lining material 22 or, for that matter, to the opposed surfaces of the shell frame 10, the lining 22 will also be forced into engagement and conformity with the opposed surfaces of the shell frame 10 and adhered thereto by means of the interposed bonding agent. The resultant condition of the shell frame 20 and associated materials is depicted in FIG. 2.

In order to assure the desired confirmation of the upholstery material 20 and lining material 22 with the shell and cushioning material applied thereto and particularly when using a vinyl type of material for the upholstery and liner, the vacuum chamber 30 is heated by means of the heating coils 34 with sufficient amount of heat to render the upholstery and liner material slightly pliable and elastic. Of course, the generated heat should not be sufficient to degrade any of the materials to be assembled and, therefore, the amount of heat supplied to the vacuum chamber 30 will depend upon the materials therein. With this in mind, the time that the chair components remain in the vacuum chamber 30 will vary but generally will be between five to ten minutes. After the expiration of a predetermined period

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of time, the upholstery material 20 will be adhered to and in conformity with the cushion material 18 and the lining material 22 will be adhered to and in conformity with the shell frame 10. The air introduced into the vacuum chamber 30 by the compressor 44 is then stopped and the air exhausted from the vacuum chamber 30 by means of the vacuum pump 40 is also stopped. The assembled parts are then permitted to cool and dry either in the vacuum chamber 30 or exteriorly thereof. The cycle and process is then resumed when desired for purposes of upholstering another unit.

Referring now to the embodiment of the invention illustrated in FIGS. 5 to 8, it will initially be appreciated that a predetermined pattern, configuration or contour of upholstery is contemplated by this invention. In accordance with the illustrated embodiment, a smocking type of upholstery pattern is obtained. Thus, an outer housing 50 encloses an inner housing 52 defining a vacuum chamber 54. The selected dentiform or pattern frame 56 having projections or teeth 58 at the intersection of the frame members is suitably mounted interiorly of the inner housing 52 by suitable supporting means 60 and in such a manner that the dentiform frame 56 is placed into engagement with an inner substantially imperforate frame 62 and suitably spaced therefrom by means of the spacers 64 which cooperate in providing air passage between the dentiform frame 56 and inner frame 62. The inner frame 62 will be provided with a valve-controlled air vent 65 controlled by means of a flap type of valve. The shell frame 66 having only the selected upholstery material 68 and the lining material 70 adhered thereto along their respective peripheries is mounted in the vacuum chamber 54 by means of the supports 72. The peripheral securement of the upholstery material 68 and lining material 70 to the shell frame 66 is similar to that described in connection with the previous embodiment and as is the case with that embodiment, either the surfaces of the shell frame 66 or inner surfaces of the upholstery material 68 and lining material 70 will have applied thereto a suitable bonding agent. Where found to be desirable or necessary, all of the surfaces may have applied thereto a suitable bonding agent.

At the initiation of the cycle of operation of this embodiment, the components will assume the form schematically depicted by FIG. 5. The air between the inner housing 52 and inner frame 62 will be exhausted or expired by means of the vacuum pump 74 through the interconnecting exhaust conduit 76. The upholstery material which is of an imperforate nature will be drawn into conformity with the dentiform frame 56 as a result of the vacuum now being drawn through the opening 65 in the inner frame 62.

In order to facilitate the confirmation of the upholstery material 68 to the desired pattern, the present invention contemplates rendering the cushioning material more pliable and elastic by introducing heated air through the inlet opening 78 in the shell frame 66 through the inlet conduit 80 extending from the hypotonic compressor 82. In accordance with a successful application of the invention, the heated air was introduced for approximately one minute at a temperature of 40° C.

Thereafter, in order to maintain the desired generated shape of the upholstery material 68, an expandible foam type of material, as for example, of the urethane foam type 84 is injected between the upholstery material and shell frame 66 through the shell frame opening 78 from the source 86. In order to facilitate the desired expansion of the foam material 84 in accordance with the successful embodiment, the temperature of the air introduced through the opening 78 at relatively reduced pressure was maintained at about 25° to 26° C. and applied for about fifteen minutes. The desired extent of expansion of the urethane foam material 84 was then accomplished.

The air between the shell frame 66 and lining material 70 is then expired or exhausted by pulling a vacuum

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through the exhaust conduit 88 communicating in the space therebetween. The other end of the conduit 88 is coupled with a vacuum pump 90. Under the circumstances, the lining material 70 will be drawn into conformity with the shell frame 66 and secured thereto by means of the interposed adhesive. The valve controlled vent opening 92 having the conduit 94 extending therefrom to another hypotonic compressor 96 assures the introduction of a fresh supply of air at reduced pressures to obtain optimum effectiveness of the bonding agents employed for securing the lining material 70 to the shell frame 66.

As will be appreciated by those skilled in the art, the securement of the lining material 70 to the shell frame 66 can be accomplished either at a separate time or simultaneously with the formation of the upholstery material 68 to the desired pattern.

Thus, it will be apparent that it is now possible to upholster substantially any shape or shell without seaming work and to complete upholstering without seams and to secure the assembled parts to one another relatively rapidly and automatically. In order to assure an effective and efficient operation in accordance with this present invention, the upholstery material, whether it be material 20 or material 68, is carefully selected and processed beforehand to assure its desired confirmation and its softness in the finished upholstered unit. The outer surface of the upholstering material may be either nylon or material of any other suitable yarn which is either jerseyed or knitted. This material is preferably lined with an imperforate layer such as very thin vinyl film pasted to the backside of the surfacing material with a suitable bonding agent which again may be a suitable and compatible type of gum arabic of either a methyl, ether, or ketone derivative. Of course, the surfacing material may also be selected from woven goods. In accordance with successful applications of the present invention, vinyl film of approximately 0.14 millimeter thickness and composed of vinyl chloride (65%), plasticizer (33%), and stabilizer (2%) has afforded excellent properties of stretch, elasticity and contraction for purposes of furthering the invention.

I claim:

1. A method of upholstering a piece of furniture comprising:

providing a shell frame for defining the piece of furniture to be upholstered and the shell frame having certain parts to be upholstered;

applying a substantially air-impervious flexible covering sheet of material having a peripheral edge over certain parts of the shell frame and adhering the sheet to the frame;

providing a chamber defined by a housing having a reclosable opening;

placing the shell frame with applied covering sheet in a chamber through the opening, supporting the frame therein and reclosing the opening;

providing a substantially air-impervious connection between the peripheral edge of the covering material and the shell frame;

subjecting the interior of the housing and the chamber to a temperature and pressure controlled atmosphere; subjecting the covering material to air pressure differential while under the influence of the controlled atmosphere to draw the covering material into a predetermined conformation; and

fixing this conformation of the covering material.

2. The invention in accordance with claim 1 wherein a bonding agent is applied intermediate said covering material and frame prior to the application of the air pressure differential.

3. The invention in accordance with claim 1 wherein a cushioning material is interposed between the shell frame and covering material.

4. The invention in accordance with claim 3 wherein the cushioning material is preformed and adhered to the

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surfaces of the shell frame over which the covering material is to be applied and a bonding agent is applied between the cushioning material and the covering material prior to the application of the covering material over the shell frame and the air pressure differential is in the form of a vacuum to draw air between the shell frame and covering material to thereby draw the covering material into conformity with the opposed surfaces of the cushioning material and shell frame.

5. The invention in accordance with claim 4 wherein during the vacuum-drawing step, heat is applied to render the covering material pliable and elastic to cause the covering material to conform with the opposed surfaces of the cushioning material and shell frame.

6. The invention in accordance with claim 1 wherein said covering material includes a surface upholstery material, a lining membrane, and adhesive means to bond said lining membrane to said surface upholstery material thereby reinforcing said surface upholstery material and maintaining the flexibility of said lining membrane.

7. The invention in accordance with claim 6 wherein the covering material is a nylon surface upholstering material and said lining membrane is a film-like vinyl which is between 0.05 and 0.5 millimeters in thickness and is composed of vinyl chloride 65%, plasticizer 33%, and

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stabilizer 2% for the nylon surface upholstery material.

8. The invention in accordance with claim 1 wherein fresh air circulated between the covering material and shell frame at reduced pressures to cooperate in fixing the conformation of the covering material and its relative relationship with the shell frame.

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