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Grant et al.

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[54] REPLACABLE SEAT INSERT AND PROCESS OF MAKING

[75] Inventors: **Bernard Carrington Grant**, Sylvania; **John F. Reilly**, Toledo, both of Ohio

[73] Assignee: **The General Tire and Rubber Company**

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Related U.S. Application Data

[62] Division of Ser. No. 63,371, Aug. 13, 1970, Pat. No. 3,647,260.

[52] **U.S. Cl.**.....**156/267,** 156/285

[51] **Int. Cl.**.....**B32b 31/00,** B29c 17/00

[58] **Field of Search**.....156/285, 286, 267, 252

[56] **References Cited**

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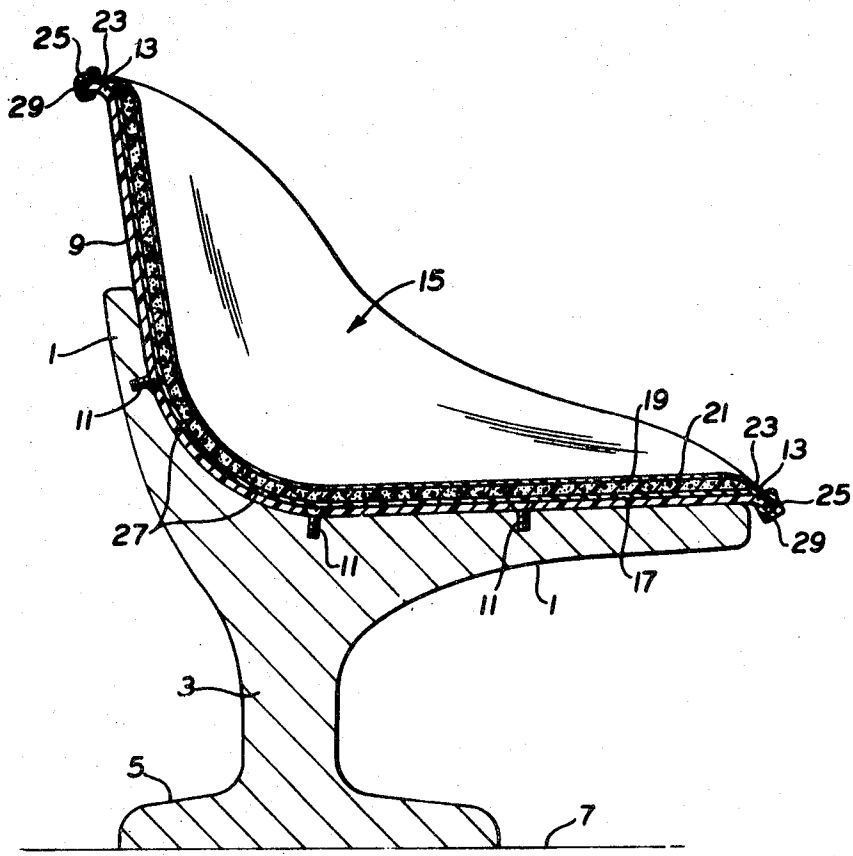
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Primary Examiner—Douglas J. Drummond
Attorney—John J. Murphey

[57] **ABSTRACT**

This invention concerns a replaceable insert for flare-edged, fully supported type chairs that combines the features of a rigid yet flexible base, a cushion, a non-wrinkling, nontearable cover, and resilient edge clamping means in one integral unit and to a novel method of making the insert. This seat insert is characterized by low manufacture and material costs as well as the absence of metal fasteners and other adjustable implements thus eliminating special installation skills and tools.

4 Claims, 3 Drawing Figures



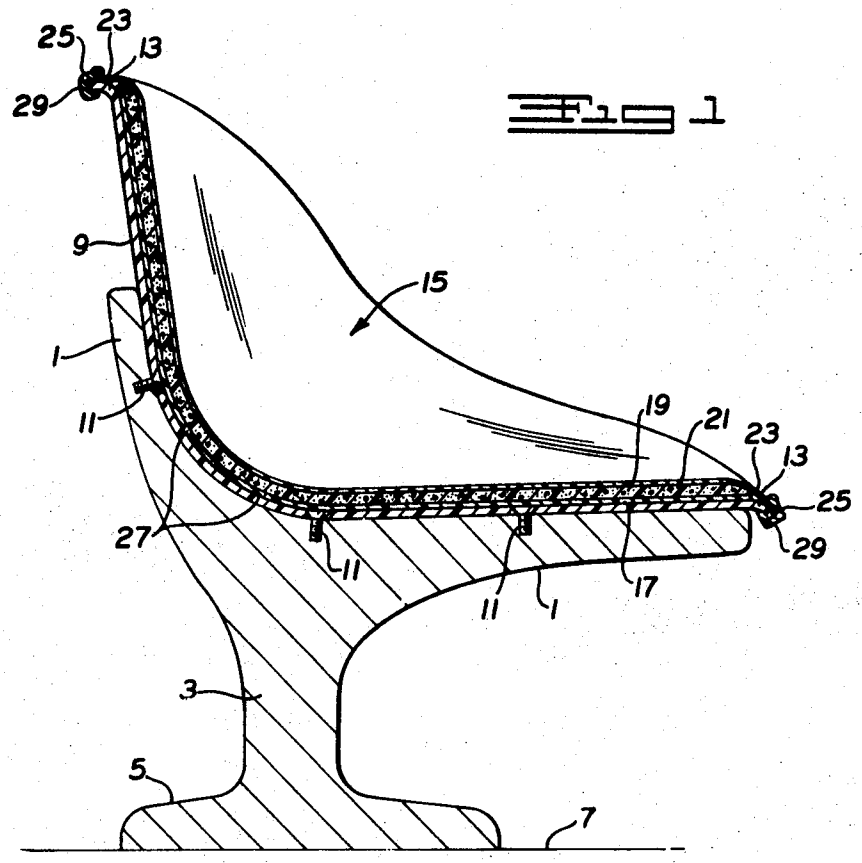


Fig 1

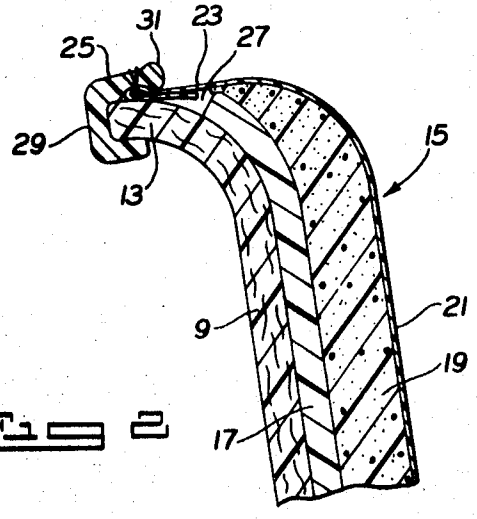


Fig 2

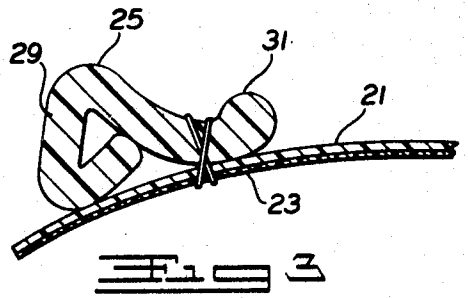


Fig 3

REPLACABLE SEAT INSERT AND PROCESS OF MAKING

This application is a division of copending patent application Ser. No. 63,371, filed Aug. 13, 1970, now U.S. Pat. No. 3,647,260, patented Mar. 7, 1972.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of upholstery. More particularly, this invention relates to the field of replaceable upholstery parts, namely, replaceable seat inserts for chairs.

2. DESCRIPTION OF THE PRIOR ART

In the field of upholstery for chairs and other support devices, there exist many types and designs of replaceable upholstery parts therefore such as seat inserts. There are inserts that contain rigid edges that snap into recesses in the chair support (U.S. Pat. Nos. 2,901,028 and 3,019,051); there is the cushion type of insert having a rim containing metal or rope for tightening over the perimeter of the chair (U.S. Pat. No. 3,174,797); there are cushion inserts having rims to be bolted or clamped to the chair frame (U.S. Pat. Nos. 3,182,377 and 2,186,301); there is the cushion type of insert that is pinched into narrow hook-shaped channels in the chair frame (U.S. Pat. No. 3,126,229); there are cushion inserts that are wedged and glued to the chair frame (U.S. Pat. Nos. 2,233,986 and 3,273,178); there is the cushion insert that is glued and/or resiliently clamped (U.S. Pat. No. 3,281,185); there is the cushion insert that has a cover which contains integral resilient edge clamping means (U.S. Pat. No. 3,216,029); and there is the rigid chair insert that has integral split tube clamping means (U.S. Pat. No. 3,061,374). All of these various types of replaceable upholstery inserts have certain disadvantages. Specifically, they are either too costly to manufacture in large quantities or require skilled or semiskilled technicians to effect their replacement in the chair.

The rising crime rate has in large part taken the form of vandalism of public and private property. This has manifested itself to a large extent in the slashing and cutting of pieces of public furniture such as chairs and seats in public transportation vehicles and demolishing of chairs in bus, airport, and train stations. Such damage requires that the replacement upholstery insert be not only installable by nonskilled workers, but of relatively low cost.

If the chair support recesses are damaged by vandals, the snap-in type of cushions become difficult to insert in the chair; replaceable inserts having perimeter tightening devices and bolts tend to tear at the cover layer and, in addition, require at least semiskilled personnel to effect installation; cushion inserts that are pinched into place tend to come loose during heavy usage, such as by a heavy flow of occupant traffic in a bus station; glued and wedged seat inserts require that the old glue be scraped away and that a period of time be set aside for the new glue to set or dry; many of the resilient edge clamping means require sharp hook-shaped supports that are easily damaged and if made from metal tend to rust and corrode; and rigid seat inserts containing split tube support means for fixing to a tubular frame are excessively expensive as the whole chair support must be replaced. The present trend of using inexpensive plastic films and sheets in construction of replaceable inserts has proved unsuccessful to a large extent because of the combined properties of most plastics known as "memory" and "stretchability"; many rigid plastic pieces undergo slow deformation at room temperature to their original configuration (hence, a memory) and many soft plastic cushion covers stretch upon usage and become wrinkled and lose their aesthetic appeal.

This invention is a replaceable seat insert for a flare-edged, fully supported type chair that overcomes to a great extent these aforementioned problems. The cost of the insert is low, both in terms of material and labor required to manufacture it; the insert may be installed on the chair by nonskilled workers; and the insert retains its shape and smooth surface over a wide range of temperatures and under heavy usage.

Therefore, the main object of this invention is a replaceable seat insert for a flare-edged, fully supported type of chair that is low cost and easily put into use. Other objects include a unique method of manufacturing said insert combining a number of different polymeric materials in a unique combination utilizing inexpensive bonding and other retaining means to effect construction of the insert at a low cost. These and other objects will become more apparent upon reading the Description of the Preferred Embodiment in conjunction with the drawings attached hereto.

SUMMARY OF THE INVENTION

This invention concerns a replaceable seat insert for a flare-edged, fully-supported type chair comprising in combination a rigid yet flexible base conforming to the contour and to the non-flared outline of the chair positioned by one surface against the chair support, the base having at least one aperture in the deepest drawn area thereof; a cushion layer comprising a relatively thin layer of open-celled flexible foam adhered to the opposite surface of the base; a nonwrinkling and nontearable cover layer comprising a fabric-backed expanded sheet of flexible polymeric material adhered by its fabric-backed side to the cushion layer, and being uniformly slightly larger in area than the base so as to provide an overlapping strip of material extending slightly beyond the periphery of the base and cushion layer; and resilient clamping means joined to the overlapping strip of cover layer for anchoring engagement with the flare-edge of the chair support. This invention also concerns a method of making the aforedescribed seat insert.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional side view of a typical flare-edged, fully supported type chair showing the replaceable seat insert of this invention in position.

FIG. 2 is a cross-sectional view of the flared edge of the chair of FIG. 1 and in particular shows the insert of this invention positioned thereon.

FIG. 3 is a cross-sectional view of one embodiment of the resilient clamping means of this invention in its relaxed condition.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like elements are identified by like numerals throughout the three figures, FIG. 1 shows in cross-section a typical flare-edged, fully-supported type chair and comprises in combination a pedestal 1 that surrounds a large portion of the seat and back of the chair and is connected to or integral with leg 3 that is in turn connected to or integral with platform 5 for mounting or resting directly on floor 7. Pedestal 1, leg 3, and platform 5 may be made of virtually any solid material such as metal, wood, plaster, plastic, or concrete; usually a plastic or concrete is used. Full chair support 9 is positioned on pedestal 1 and is a contoured unitary structure of a size to include the back and seat portion of a typical chair. Full chair support 9 may be made of a number of different rigid materials such as wood, metal, and plastic; however, the latter construction is becoming extremely popular, especially a rigid material known as fiber reinforced polyester resin (FRP) that comprises glass or other type fibers embedded in a cured polyester resin thermosetting plastic. This construction is not only inexpensive, but FRP materials are chemically inert, resistant to corrosion and hydrolytic degradation, relatively insensitive to thermal changes, and have other features which make them desirable for use where heavy occupant traffic is in existence. Full chair support 9 is termed "full support" because it extends fully around the chair including the back, seat and portion joining the two; this is in contrast to a "partial support" that includes only a portion of the back, seat, or portion joining the two. Full chair support 9 is fastened to pedestal 1 by most any conventional means, one form shown here as counter-sunk machine screws 11 that pass from support 9 into pedestal 1. Full chair support 9 terminates at its periphery in flared-edge 13 which comprises in cross-section a rearwardly directed gentle curve. Flared edge 13 performs a number of separate function; it is the connecting portion of full chair support 9 to the replaceable seat insert of this invention and, in addition, the curvature of edge 13 provides the periphery of support 9 with additional rigidity. Moreover, flared edge 13 being a rearwardly directing curve places the edge of full chair support 9 out of contact with an occupant seated in the chair so as to reduce the possibility that he or she would snag their clothing on it as well as lowering the incidence of wear on the clamping means.

Positioned on full chair support 9 is seat insert 15 of this invention. Insert 15 is contoured to cover all of full chair support 9 including the back and bottom portion thereof so that the term "seat insert" will be taken hereafter to mean a unitary structure including the back, sides, and bottom portion of a chair support.

Referring to FIG. 2, there is shown in combination a rigid yet flexible base 17 that conforms to the contour of full chair support 9 and whose outline conforms to the non-flared outline of chair support 9. This is particularly important to the operability of insert 15 because, as will later be seen, the size of base 17 must be maintained at less than the full, flared outline of full chair support 9 to permit the other components of insert 15 to function as designed. Atop base 17 or, in other words, on the opposite surface of base 17 from that resting against chair support 9, is cushion layer 19 that comprises a relatively thin layer of open-celled flexible foam in bonded adherence with base 17. As will be described later in more detail, it is imperative that cushion layer 19 be made of an open-cell foam. Cushion layer 19 is adhered to base layer 17 by conventional cements or adhesives, the preferred type being a contact-type adhesive. Atop cushion layer 19 is nonwrinkling and nontearable cover layer 21 that comprises a fabric-backed expanded sheet of flexible polymeric material that is adhered by its fabric-backed side to cushion layer 19 by an adhesive and that is uniformly slightly larger in area than base 17 and cushion layer 19 so as to provide an overlapping strip 23 that extends slightly beyond the periphery of base 17 and cushion layer 19. Onto strip 23 is joined resilient clamping means 25 that is snapped into anchoring engagement with flare edge 13 of chair support 9.

Base 17 is termed "rigid yet flexible" to denote that while it is not totally rigid, it is far short of being considered flexible. Primarily, base 17 is a rigid plastic material that may be formed such as by vacuum forming to the contour of full chair support 9. Preferable in this respect is a vacuum-formable thermoplastic material known as acrylonitrile-butadiene-styrene (ABS) resin because of its low cost, light weight, and easy formability. The thickness of base 17 should be sufficient so that the particular plastic is restrained from "memory" deformation or reversion to its former shape and should not be so thick that it will crack under vacuum forming in the areas of high curvature or deep draw. In respect to the ABS resin, it has been found that a 50 mil thick sheet of resin is both easily vacuum formed and is sufficient to overcome memory deformation. At the deepest drawn or deepest contoured portion of base 17 is placed at least one and preferably a plurality of apertures 27. These apertures serve a dual function; they permit subsequent vacuum forming of cover layer 21 (to be disclosed more fully later) and, during use of the chair by an occupant, they permit air to escape from collapsed or partially collapsed cushion layer 19 along the surface between full chair support 9 and the abutting surface of pedestal 1. Without apertures 27 in base 17, the occupant gets the uncomfortable feeling that he or she is sitting on a balloon wherein the air entrapped in the cushion layer cannot escape and causes a bulge elsewhere in insert 15; moreover these bulges tend to delaminate cover layer 21 from cushion layer 19.

Base 17 may be formed from a wide variety of materials; in addition to the preferred material of acrylonitrile-butadiene-styrene (ABS) resins, other resins and resinous materials may be used, such as acetyl resins, acrylics, alkyd resins, amino resins, cellulosics, epoxies, fluorocarbons, phenolics, polystyrene, polyamides, polycarbonates, polyesters, polythenes, polypropylene, and vinyl and vinyl copolymer materials, such as polyvinyl chloride, vinyl chloride-vinyl acetate copolymers, vinyl chloride-vinylidene chloride copolymers, polyvinyl acetate, polyvinyl alcohol, polyvinylidene chloride, polyvinyl carbazole, polyphenylene oxide, phenoxy resins, ionomer resins, poly 4-methyl pentene-1, polyallomers, and the like. Both thermosetting and thermoplastic polymeric

materials are usable as base 17; however, for cost and manufacturing reasons, vacuum formable thermoplastic materials such as ABS resins are preferred.

Cushion layer 19 is comprised of a relatively thin, i.e., one-quarter to 1 inch and preferably one-half inch thick layer of open-celled flexible foam. It is necessary that the foam be open-celled to enable subsequent vacuum forming of cover 21 by the method of this invention and also to allow air to escape from and return to cushion layer 19 during use of insert 15 by an occupant. A preferred material for cushion layer 19 is flexible polyurethane foam because of its good aging properties, its resistance to mildew, etc., however, other materials may be used such as reticulated polyethylene or polypropylene foam, open-celled polyvinyl chloride foam, and other similar materials. Cushion layer 19 is adhered to base 17 by an adhesive that is preferably coated on both cushion layer 19 and base 17. Generally speaking, a contact-type cement is preferred for this construction.

Over cushion layer 19 is placed cover layer 21 that comprises a relatively thin, i.e. 10–200 mils, nonwrinkling and nontearable fabric-backed expanded sheet of flexible polymeric material that is uniformly slightly larger in area than both base 17 and cushion layer 19 so as to provide overlapping strip 23 that extends slightly beyond the periphery of base 17 and cushion layer 19. Cover layer 21 is adhered to cushion layer 19 by its fabric-backed side; in other words, the fabric-backed side of cover layer 21 is in contact with cushion layer 19 through a layer or layers of adhesive. Preferred in this respect is also a contact-type adhesive. Note should be made that cushion layer 19 may be of the same area and size as base 17 or may be slightly larger as there is a small area 27 between the end of base 17 and clamping means 25 for collapsed cushion layer 19 to occupy. It is essential that cover layer 21 be made from a nonwrinkling and nontearable material such as a fabric-backed polymeric material so that it will not pucker and fold during extended use. However, this material while nonwrinkling and nontearable in normal use, i.e., when used on the seat insert at or near room temperature, is sufficiently stretchable to permit it to be vacuum or heat formed--usually by heating it and subjecting it to pulling and stretching (via vacuum or press head) to conform it to the desired contour. In addition, the nonstretchability of cover layer 21 at or near room temperature works in combination with clamping means 25 to ensure that the latter does not loosen during extended use of insert 15. Many types of fabric-backed materials may be used, preferred is a nylon-backed expanded sheet of flexible polyvinyl chloride plastic because of its low cost and the fact that it is vacuum formable. Generally speaking, cover layer 21 is vacuum formed or otherwise formed against cushion layer 19 so that in its relaxed position it is tight and nonwrinkled over the entire surface of insert 15.

Nonwrinkling and nontearable (and relatively nonstretchable at or near room temperature) cover layer 21 may be comprised of a variety of materials. The fabric layer may be chosen from a variety of weaves such as knits, straight weaves, and nonwovens; however, it has been found that the knit weave permits a greater degree of vacuum forming and at the same time provides a high degree of tear resistance to layer 21 over a wide temperature range; a knit nylon is preferred herein for its strength and ease in vacuum forming. The flexible polymeric material comprising the rest of cover layer 21 may be chosen from a wide range of materials such as vinyl polymers and copolymers, for example, plasticized polyvinyl chloride, vinyl chloride-vinyl acetate copolymers, vinyl chloride-vinylidene chloride copolymers, vinyl acetate copolymers, polyvinyl alcohol, polyvinylidene chloride, polyvinyl carbazole, and blends of polyvinyl chloride with various elastomers such as polyvinyl chloride-nitrile rubber blends, etc. It is preferred that cover layer 21 be of an expanded type of material, i.e., having at least one foam layer therein. This may conventionally be done by mixing the thermoplastic flexible material, such as vinyl material, with a blowing agent such as azodicarbonamide, azodiisobutyronitrile, benzenesulphonhydrazide, benzonesulphonhydrazide, p-toluene sulfonyl semicarbazide, N,N′ dimethyl N,N′ dintrosoterphthalamide, trihydrazino triazine, nitrogen, carbon dioxide, pentane, fluorocarbon 11, fluorocarbon 12, fluorocarbon 114, and methylene chloride with the thermoplastic, calendering the material into a sheet, and then heating it to the point wherein the blowing agent gasifies and forms a cellular structure within the sheet. This is desired in cover layer 21 so as to provide additional cushioning for insert 15 and to hide any strike through of the fabric backing. Cover layer 21 may be kept nonfoamed (unexpanded) until the time it is vacuum formed during its adherence to cushion layer 19 and then raised in temperature to not only gasify the blowing agent within the layer but to smooth out any wrinkles that may have developed in the vacuum forming step. Cover layer 21 may be pigmented or otherwise colored to show a wide variety of decorative colors and in addition may be printed, laminated, or otherwise decorated to any desired design.

Onto strip 23 is joined resilient clamping means 25. One embodiment of clamping means 25 is shown in cross-section in FIG. 3 and comprises a semi-flexible extruded polymeric material in the general shape of a question mark wherein the major hook-shaped portion 29 is snapped over flared-edge 13 and wherein minor hook-shaped portion 31 is sewn or stapled to strip 23. The channel or depression formed by minor hook-shaped portion 31 in the outer surface of means 25 permits the stitches or staples to be hidden from view which not only provides for a more pleasing aesthetic appearance but maintains the stitches or staples out of contact with occupants or objects that come against clamping means 25 thereby ensuring a longer life for the joining structure, i.e., stitches or staples. Other embodiments of clamping means 25 are possible and are fully contemplated herein. Note that strip 23 is folded back upon itself under clamping means 25, as shown in FIG. 2; this is an optional treatment of strip 23 for it may be trimmed near the stitches that pass through minor hook-shaped portion 31; however, trimming strip 23 back to this area invites the fabric backing of cover layer 21 to unravel during severe stress. Therefore, it is preferred to merely fold strip 23 back upon itself at the sewn or stapled portion to ensure a more rigorous affixation to clamping means 25. Preferably, clamping means 25 is made of an extruded polyvinyl

chloride based material that is rigid yet flexible however more flexible than base 17, however other polymers are usable such as elastomers for example butadiene rubber, isoprene rubber, chloroprene rubber, acrylate-butadiene rubber, isobutylene-isoprene rubber, nitrile-butadiene rubber, nitrile-chloroprene rubber, pyridine-butadiene rubber, styrene-butadiene rubber, styrene-chloroprene rubber, styrene-isoprene rubber and elastomer-plastic blends for example nitrile rubber-polyvinyl chloride blends, urethane rubber-nylon blends, butadiene rubber-polypropylene blends, etc.

When placing insert 15 onto chair support 9, clamping means 25 must be "opened up" by bending out major hook-shaped portion 29 and snapping it over flared-edge 13. At this time, cover layer 21 is stretched as far as possible so that it is thereafter held taut, and, due to its fabric backing will remain taut throughout extended usage. The provision that base 17 be kept to the size of the non-flared outline of chair support 9 should now be apparent; it permits clamping means 25 to be placed in full clasping contact with flared-edge 13 to achieve a good anchoring position thereon. Clamping means 25 may be affixed to strip 23 by different means that intertwine in the fabric backing of cover layer 21 such as by sewing or by stapling; however, sewing has been found to be the most inexpensive as well as one of the most longest lasting constructions.

In a separate embodiment of this invention, base 17 is roughened on the surface that is adjacent to cushion layer 19 to enhance the bonding therebetween. A preferred method of roughening the surface of base 17 is to pass a sheet of base 17 material through a calender or embossing device wherein tiny indentations are placed in the surface; this is known in the vernacular as "hair cell embossing." Base 17, cushion layer 19, and cover layer 21 may be bonded together by a wide range of adhesives provided they are compatible with the particular materials used in these elements. Examples of adhesives usable herein include acrylic and methacrylic adhesives, bitumen adhesives, casin, cellulose acetate and cellulose caprate adhesives, cellulose nitrate and cyano acrylate adhesives, epoxy polyamide adhesives, phenolic-polyamide, phenolic-vinyl adhesives, polyamides, polyisobutylenes, polystyrene, polyvinyl acetyl, polyvinyl acetate, rosin adhesives, epoxies, furanes, melamine-formaldehyde adhesives, oleoresins, phenol-formaldehyde adhesives, phenolic-epoxy, phenolic-neoprene adhesives, phenolic-nitriles, polyester adhesives and polyurethane adhesives, resorcinol-formaldehyde and ureaformaldehyde adhesives, polychloroprene adhesives and acrylonitrile-butadiene adhesives. Specifically preferred in this respect are adhesives known as "contact" adhesives.

The process of making insert 15 is by a unique combination of steps designed to obtain the benefits of adhesives to lower the material cost and manufacturing costs. The first step in making the replaceable seat insert of this invention is to vacuum form or otherwise form base 17 from a flat sheet to the contour of the chair support 9 and then trim the edges back to the non-flared outline of chair support 9. Prior to this step of course the surface of base 17, that is to be bonded to cushion layer 19, may have been previously roughened such as by the "hair cell embossing" step heretofore disclosed. After vacuum forming, apertures 27 are placed (drilled or punched) in the deepest drawn or highest contoured area of base 17. Care must be taken to ensure that the apertures are not too large, such as over one-half inch in diameter, etc. Thereafter, cushion layer 19 is placed in adherence with base 17. This is preferably accomplished by precoating the surface of base 17 and the surface of cushion 19 (a thin sheet of open-celled flexible foam) with a contact type cement so that upon joining of the two there is formed immediately a strong bond therebetween. The edges of cushion layer 19 may then be trimmed to the general outline of base 17 or, of course, it may have been precut to this size. Thereafter, cover layer 21 and the surface of cushion layer 19 are precoated with a contact adhesive and then cover layer 21 is vacuum formed onto cushion layer 19 and base 17 by utilization of apertures 27. During this step, cover layer 21 may be heated so that it conforms to the contour of base 17 without wrinkling. The edges of cover 21 are trimmed to a uniformly larger size than base 17 so as to provide strip 23. Cover layer 21 should be vacuum formed to cushion layer 19 so that the fabric is adjacent the surface of cushion layer 19. Such a construction permits the wearing surface of cover layer 21 to be decorated and otherwise finished without impairment by the presence of the fabric layer. Next, clamping means 25 is sewn or stapled around the edge of cover layer 21 onto strip 23. Thereafter, insert 15 comprises the aforementioned construction and may be readily placed onto chair support 9 and clamping means 25, snapped over flared-edge 13 of chair support 9 to place insert 15 in tight anchoring engagement with chair support 9.

What is claimed is:

1. A method of making a replaceable seat insert for a fully-supported type chair comprising the steps of:

a. vacuum forming a base, consisting of a sheet of about 50 mil thick acrylonitrile-butadiene-styrene resin, to the contour of said chair support wherein said sheet is roughened on the surface that is subsequently covered with a cushion layer;

b. forming a plurality of apertures in said base at the deepest drawn portion thereof;

c. trimming the periphery of said base to the non-flared outline of said chair support;

d. applying a thin coat of contact cement to the roughened surface of said base;

e. applying a cushion layer comprising a contact cement coated layer of open-celled flexible polyurethane foam, between about one-quarter to about one inch thick, to the cement coated surface of said base;

f. trimming the periphery of said cushion layer to the outline of said base;

g. applying a thin coat of contact cement to the exposed surface of said cushion layer;

h. vacuum forming a nonwrinkling and nontearable cover layer consisting of a contact cement coated nylon knit-backed sheet of flexible, expanded polyvinyl chloride resin, that is uniformly slightly larger in area than said base, by its knit-backed side to said layer of foam; and

i. sewing a polyvinyl chloride-based extruded clamp onto the overhanging periphery of said cover sheet, wherein said clamp is in the general shape of

a question mark wherein the major hook-shaped portion clasps the flared-edge of said chair support and wherein said minor hook-shaped portion is sewn against said cover layer.

2. A method of making a replaceable seat insert for a flare-edged fully supported type chair comprising the steps of:

a. forming a rigid yet flexible plastic chair supporting base sheet to the contour of the chair support and trimming the periphery thereof to the non-flared outline of said chair support;

b. placing at least one aperture in said base at the deepest drawn portion thereof;

c. adhering a cushion layer, comprising a relatively thin layer of open-celled flexible foam, to the opposite surface of said base sheet;

d. adhering a nonwrinkling and nontearable cover layer, comprising a fabric-backed sheet of expanded flexible polymeric material, to said cushion layer wherein said cover layer is uniformly slightly larger in area than said base so as to provide an overlapping strip of said material extending slightly beyond the periphery of said base; and,

e. joining resilient clamping means onto said overlapping strip of said cover layer, said resilient clamping means being adapted to secure said overlapping strip to the flare edge of said chair by applying forces in opposed directions to force said flare edge against said overlapping strip and thereby to fasten said replaceable seat insert to said chair.

3. The method of claim 2 wherein the step of forming the rigid yet flexible base sheet is accomplished by vacuum forming.

4. The method of claim 2 wherein said base sheet is roughened on the surface that is to receive said cushion layer prior to forming it to the contour of the chair support to enhance the adhesion therebetween.

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