

Nov. 5, 1963

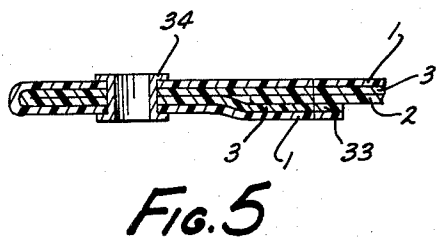
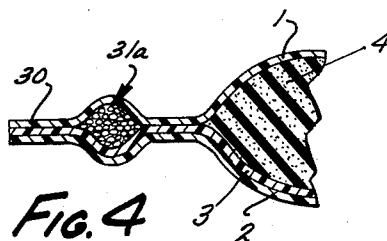
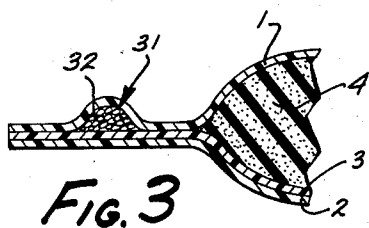
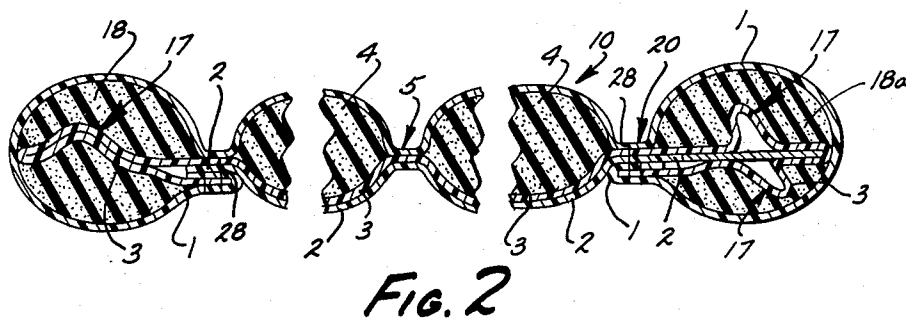
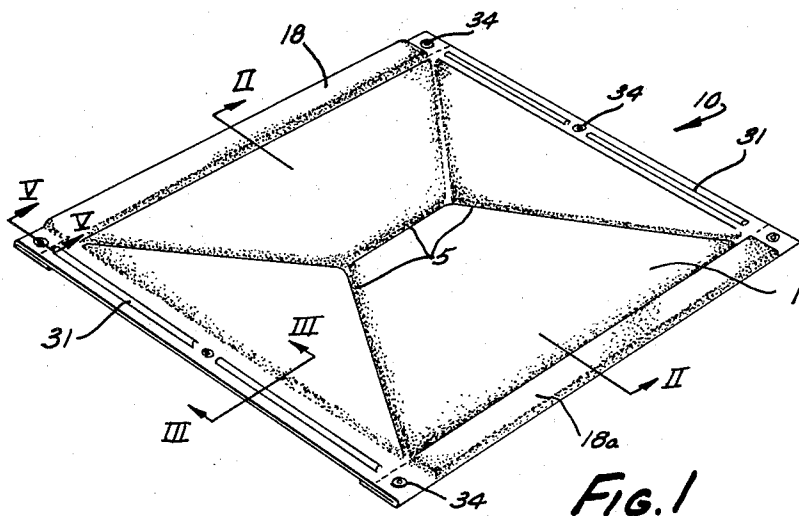
C. EAMES

3,109,679

PAD FOR SEATING

Filed Oct. 2, 1961

3 Sheets-Sheet 1



INVENTOR.
CHARLES EAMES

BY

Price & Hennel

ATTORNEYS

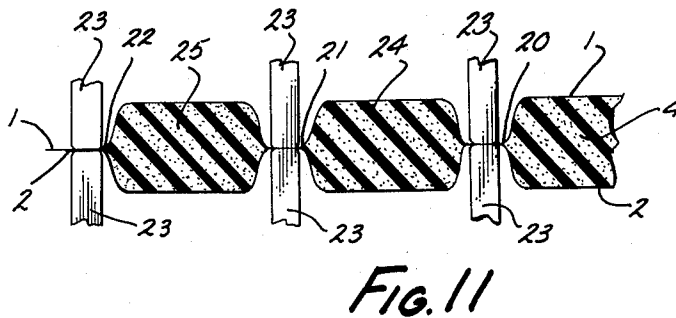
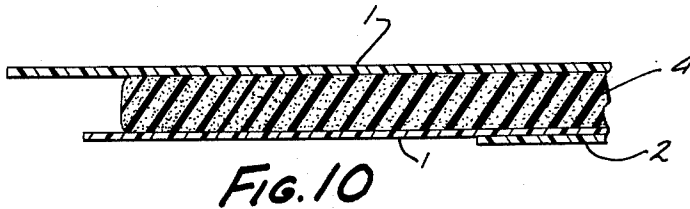
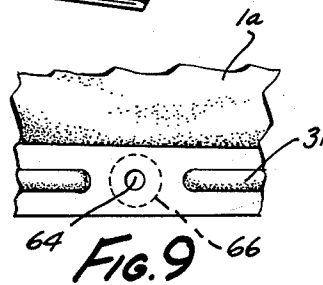
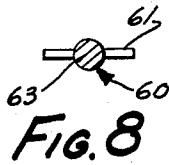
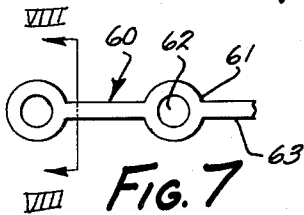
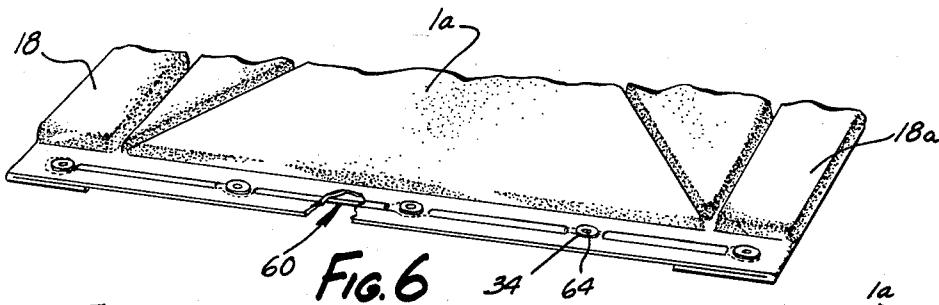
Nov. 5, 1963

C. EAMES
PAD FOR SEATING

3,109,679

Filed Oct. 2, 1961

3 Sheets-Sheet 2



INVENTOR.
CHARLES EAMES
BY *Price & Hennefeld*
ATTORNEYS

Nov. 5, 1963

C. EAMES
PAD FOR SEATING

3,109,679

Filed Oct. 2, 1961

3 Sheets-Sheet 3

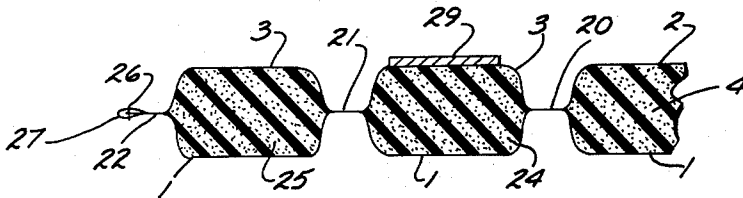


Fig. 12

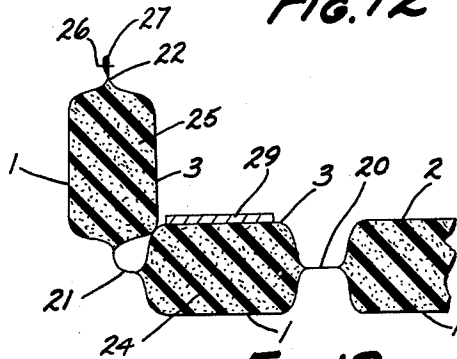


Fig. 13

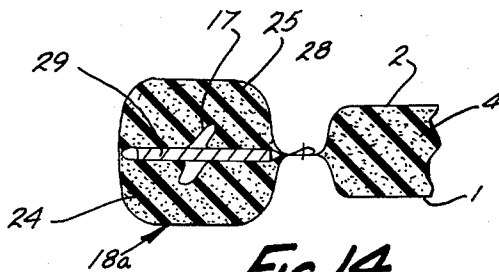


Fig. 14

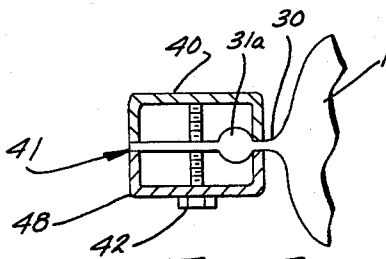


Fig. 15

INVENTOR.
CHARLES EAMES
BY *Price & Heneveld*
ATTORNEYS

1

3,109,679

PAD FOR SEATING

Charles Eames, Venice, Calif., assignor to Herman Miller, Inc., Zeeland, Mich., a corporation of Michigan
Filed Oct. 2, 1961, Ser. No. 142,069
12 Claims. (Cl. 297-458)

This invention relates to seating and more particularly to a pad or cushion for seating.

While this invention is usable in household applications, it is specifically designed to withstand the type of usage common to public seating. Public seating must be stronger, more durable and more capable of withstanding abuse than household seating. This invention is designed to provide a pad particularly adapted to satisfy these requirements.

It is a primary object of this invention to provide a pad of such design that it may be stretched between two supporting frame members in the nature of a suspended web. Mounted in this way, it may be used either as a seat or as a back. This type of mounting, utilizing a pad of proper construction, gives the pad a substantial degree of resilience or give whereby it may conform generally to the anatomy of the user. At the same time, it affords the user firm and comfortable support in areas of high loading. This assures the user a feeling of dependable support or security when utilizing this invention.

Only in recent years has it been recognized that the pressure exerted by the human body on a support, such as a seat, is not uniform throughout the area of contact. Certain areas are subjected to highly concentrated loads whereas other areas are subjected to relatively light loads. One of the objectives of this invention is to provide a flexible body support which, to a certain degree, will reshape itself in response to this type of loading so that the pressure between the human body and the seat is more evenly distributed. This eliminates the area of high loading and prevents them from becoming uncomfortable to the user over an extended period of time.

The pad is designed to provide firm support to the user at its two free edges. These edges would be the front and back of a seat or the top and bottom of a back. These are areas of high stress concentration. The design of the pad provides these areas with extra reinforcement and the firmness necessary to give the user a feeling of support and security without creating a zone of concentrated resistance against the user's body which will cause discomfort.

In addition to being comfortable, it is essential that this pad be strong and capable of withstanding long, hard usage. To this end, the pad has been designed so that it distributes its loads into the supporting frame over a large area with a minimum of concentrated pressure points which might ultimately cause structural failure. At the same time, it is built of materials which will withstand the severe usage incident to public seating. Its surface characteristics are resistant to soiling and may be readily cleaned. To facilitate maintenance, the pad is so designed that it may be quickly and easily replaced as a unit. This is essential to public seating due to the high incident of damage, such as staining, ripping, or cutting. This is necessary even though the pad is made of durable, wear resistant materials.

The pad is so designed that the rigid structure necessary for its support can be confined entirely to the sides. Thus, it never comes in contact with the user to create a pressure point. This is an important factor in assuring proper comfort.

The pad is designed to facilitate its manufacture. This

2

also assures uniformity of construction both as to size and strength. It also reduces its production cost.

These and other objects and purposes of this invention will be readily understood by those acquainted with the design and construction of seating equipment upon reading the following specification and the accompanying drawings.

In the drawings:

FIG. 1 is an oblique, top view of a pad incorporating this invention;

FIG. 2 is a fragmentary, sectional view taken along the plane II—II of FIG. 1;

FIG. 3 is a fragmentary, sectional view taken along the plane III—III of FIG. 1;

FIG. 4 is a fragmentary, sectional view taken along the same general plane as FIG. 3 but showing a slightly modified construction for the edge of the pad;

FIG. 5 is a fragmentary, sectional view taken along the plane V—V of FIG. 1;

FIG. 6 is a fragmentary, oblique view of a modified construction for the lateral edges of the pad;

FIG. 7 is a fragmentary, plan view of the reinforcement used in the edge construction illustrated in FIG. 6;

FIG. 8 is a sectional, elevational view taken along the plane VIII—VIII of FIG. 7;

FIG. 9 is a fragmentary, plan view of a still further modification of the side portions of the pad;

FIG. 10 is a fragmentary, schematic view of one edge of the pad assembled ready for fabrication;

FIG. 11 is a schematic view showing the edge of the pad being fabricated by heat sealing;

FIG. 12 is a schematic view of the pad, inverted, with a reinforcement strip added ready for the edge to be folded;

FIG. 13 is a schematic view of the pad showing the edge partially folded;

FIG. 14 is a schematic view showing the edge of the pad after it has been folded;

FIG. 15 is a fragmentary, sectional view showing the edge of the pad clamped to a supporting structure.

In executing the objects and purposes of this invention, a pad is provided having a core of flexible foam enclosed in an envelope of a durable, flexible material such as a reinforced plastic. The side edges of the pad are flattened and having beads running parallel to the edge of the pad to facilitate its attachment to a supporting structure. The front and back edges of the pad have foam filled tubular sections running parallel to the edge. Two of these are provided, one of which is folded back upon the other to form an edge roll of double thickness. In those edges subjected to particularly high loading, such as the front edge of the seat pad and the top edge of the back pad, a further reinforcement member is incorporated in the rolled edge to stiffen it.

Referring to the drawings and specifically to FIGS. 1 and 2, the pad 10 has a top web 1 and a bottom exterior web 2. The lower side of the pad is reinforced by an inner or reinforcing web 3. These webs form an envelope within which is a core 4 of a flexible foam material. The core 4 is between the webs 1 and 3. The core 4 may be of any suitable material, such as a flexible, vinyl, polyurethane or foam rubber. Vinyl is considered preferable because of its heat sealing qualities. It may be of any suitable thickness such as, for example, approximately $\frac{3}{4}$ of an inch. The top and bottom webs 1 and 2 may be of any suitable materials, as for example, a fabric reinforced vinyl such as that sold under the trademark "Nugahyde." This type of material is moisture and stain resistant. It is strong and yet flexible. It also is resistant to abrasion and

tearing. It is not stained, deteriorated or otherwise mechanically or chemically affected by perspiration. It also may be surface cleaned by washing. This latter is an important factor in connection with public seating.

The interior bottom web 3 may also be of any suitable high strength, flexible material, such as a fabric reinforced plastic material. However, unlike the webs 1 and 2, it need not have an attractive external appearance nor need it be as resistant to abrasion since it is concealed and protected against mechanical abuse. However, it should be characterized by high tensile strength since its major purpose is to help support the tension loads applied to the bottom of the pad. The lower webs 2 and 3 are preferably provided with a number of small apertures to permit the interior of the pad to breathe. This is necessary since the pad will tend to be flattened when a load is applied to it and due to the elastic memory of the materials from which the pad is made, it will tend to return to its original thickness when the load is relieved. This requires a degree of freedom for air interchange between the interior and exterior of the pad.

It is important that the materials for the webs 1, 2 and 3 resist permanent elongation. If any significant degree of permanent elongation occurs, the pads will rapidly be stretched out of shape. This will make them uncomfortable as well as unsightly. It is also important that their elongation under loading be limited so that they will not stretch or sag to the point that the user has the feeling of being in a deep trough either when he initially sits down or comes to assume such a position due to gradual stretching over a period of time.

Along certain lines in the main body portion of the pad, the bottom webs 2 and 3 are firmly joined to the top web 1 by heat sealing. These bond lines are indicated by the numeral 5. It will be recognized that these lines may be arranged in patterns different than that illustrated in FIG. 1. The heat sealing forms a permanent bond, firmly joining the webs together. In the area of the bond lines 5, the foam core 4 may either be omitted or it can be eliminated by the heat sealing process itself. The heat sealing is effected by suitable dies which apply heat and pressure, forcing the top and bottom of the pad together. The heating, with certain types of foam, will melt the foam, permitting the webs to be brought into contact with each other. This is true of the vinyl foams, making them particularly suitable for use in this pad. The bond lines 5 reinforce the pad and keep the top and bottom webs reasonably uniformly spaced so that one will not have a tendency to drape or hang away from the other.

The forming of the edge rolls 18 and 18a will now be described. The basic components of the pad are first assembled as indicated in FIG. 10. They consist of the top web 1, core 4, interior or reinforcing web 3 and the lower exterior web 2. The lower exterior web terminates just beyond the point where its edge will be incorporated in the hereinafter described bond 20. In the particular construction shown, the core 4 extends into the edge portion. However, it will be recognized that it may be terminated adjacent the bond line 20 and the cores of the hereinafter described tubes 24 and 25 formed by separate strips of foam.

Along two opposite edges of the pad, a triple line of heating sealing is applied forming bond lines 20, 21 and 22, as indicated in FIG. 10. Here the combination of pressure and heat applied by the heat sealing equipment 23 bonds the upper and lower webs together, forming two spaced, parallel, foam filled ridges or tubes 24 and 25. The outer tube 25 is then folded back upon the undersurface of the inner tube 24, as indicated in FIG. 13 (the pad is shown inverted in FIGS. 12, 13 and 14). The outer edge of the pad is reinforced by folding the top web 1 back over the projecting edge of the bottom web 2 and sewing the two together by the stitching 26 to form the hem 27 (FIG. 12). When the tube 25 has been folded completely back on the tube 24, the hem 27 is sewn to

the pad by the stitching 28 along the bond line 15 adjacent the main pad body (FIG. 14). This forms the edge roll 18. Thus, the edge is reinforced by an enlarged tube or elongated bulb having a double thickness of the foam, and of the surface web materials. This strengthens the edge, gives it increased resistance to deflection and at the same time makes it comfortable because it has extra cushioning or padding effect.

In certain of the edges, such as the front edge of a seat pad and the top edge of a back pad, it is desirable to further stiffen and reinforce the pad. This is accomplished by placing a reinforcing strip 29 between the inner and outer tubes 24 and 25 as they are folded one upon another. This process is illustrated in FIGS. 12, 13 and 14 and forms the edge roll 18a. While the reinforcement strip 29 may be bonded to one of the tubes, it is preferably left free to permit a limited degree of sliding movement and thus adjustment to the position and types of loads imposed upon the edge roll. The reinforcement strip is preferably of a strong material resistant to buckling under lateral compression but in a long strip may be flexed lengthwise. A suitable material would be a highly compressed, hard, fiberboard. This material will not rupture even though bent over an arc of reasonably small radius. Yet it has memory to return to its original shape even after many cycles of such flexing. It will, thus, impart a degree of stiffness in the edge roll without creating a sharply defined zone of resistance which would cause discomfort. Also, embedding it within the edge roll will insulate it against feel by the user.

As is specifically shown in FIG. 2, the external web 2 on the lower side of the pad is terminated just beyond the heat seal joint 20. Therefore, the surfaces of the tubes 24 and 25 are formed by the top web 1 and the internal reinforcing web 3. In the folding process, the web 3 is folded inside the tube and therefore remains concealed. Also, it is foreshortened and the excess material thus created is permitted to buckle into folds, as indicated at 17 (FIG. 2).

Along the side margins of the pad, the foam core 4 is eliminated and the webs 1, 2 and 3 are heat sealed together over a wide area to form a wide, laterally extending flange 30. Approximately midway between the edge of the foam core 4 and the edge of the pad, a bead 31 is formed. The bead 31 has a foam core 32 and, as indicated in FIG. 3, may extend outwardly only from one surface of the flange or, as indicated in FIG. 4, the bead 31a may extend from both surfaces of the pad. The foam core within the bead may be provided by placing a special strip of foam for this purpose between the upper and lower webs or the foam core 4 may be extended to the edge of the pad and then eliminated by heat sealing except in the area of the bead. The beads 31 and 31a provide an anchor for the edge of the pad, as will be explained more fully hereinafter.

Neither the edge rolls 18 and 18a nor the beads 31 extend into the corner portions of the pad as illustrated in FIGS. 1, 3 and 4. The construction of the corner portions is best illustrated in FIG. 5 wherein they are shown to be folded over upon themselves in the same manner as they would be in the edge roll 18 were the foam eliminated. The folded over layers are joined by stitching, as illustrated at 33 (FIG. 5). Grommets 34 are installed through the folded over corners of the pad to provide metal reinforced openings. Similar grommets 34 are also provided at at least one intermediate point along each of the lateral edge margins of the pad. In the area of the intermediate grommets 34, the bead 31 is eliminated.

FIGS. 6, 7 and 8 illustrate a modified construction for the lateral edges of the pad 1a. In this construction a reinforcement member 60 which is preferably a metal rod is incorporated in the edge. At intervals it is flattened to form a washerlike area 61. Each of the areas 61 has a central hole 62. The member 60 extends substantially the full length of the edge with the body portions 63

5

forming the core of the bead 31b and the areas 61 forming a reinforcement around each of holes 64. The holes may be further reinforced by grommets 65 similar to the grommets 34. The member 60 must be capable of flexing sufficiently to permit the pad to conform to the contour of the frame to which the pad is attached.

The member 60 is placed between the webs of the pad before heat sealing and is locked into place by the heat sealing process. The structure may be further strengthened by precoating the member 60 with a suitable adhesive which will positively bond it to the webs.

In this construction the member 60 prevents the forces generated about the openings 64 from causing bearing failure in the pad materials. The continuity of the member also spreads the loads around the openings 64, materially reducing their intensity. It also makes the bead 31b rigid and thus incapable of being collapsed even under severe compressive pressures.

In this construction the number of openings 64 is increased over that shown in FIG. 1. The number of these openings is a matter of design choice depending upon the characteristics of the materials used and the circumstances of final use of the pad.

It is also possible as suggested in FIG. 9 to limit the embedded reinforcement to the area immediately surrounding each of the openings 64. In this case a washer-like rigid reinforcement 66 is used. The openings may be further reinforced with grommets or in appropriate cases these may be omitted, reliance for bearing being placed entirely upon the reinforcement 66. The reinforcement 66 is shown as circular, but could be square, rectangular or elliptical if desired.

FIG. 15 illustrates the purpose of the bead 31. Here the lateral edge 30 of the pad 1 is clamped between the two halves 40 and 40a of the internally recessed supporting frame 41. The two halves 40 and 40a are drawn together by any suitable means such as the bolt 42. This causes the frame to clamp tightly about the side 30 of the pad with the bead 31 acting as a stop, preventing the pad from working its way out from the clamp formed by the supporting frame 41. The bolt 42 may also pass through one of the grommets 34 to positively anchor the pad. This is particularly useful as a temporary pad holding means during installation before the clamp can be secured. This type of arrangement assures a large area of load transmission from the pad to the supporting structure. This materially increases the life of the pad and prevents localized destruction due to concentrated loads applied in limited areas.

This invention provides a strong, durable pad for public seating. At the same time, its construction permits the use of materials particularly adapted to facilitate renovation by cleaning. Also, it permits the use of materials which are abrasion and tear resistant. It accomplishes this without sacrifice of comfort and permits the whole unit to be flexible, resilient, and to afford a high degree of cushioning effect to the user. Its construction permits the pad to afford firm but contour conforming support to the user without the areas of high resistance to deformation which cause discomfort. It is particularly adapted to rapid and simple replacement. This permits damaged units to be repaired quickly and at minimal cost. This also makes it possible to keep the units neat and presentable at all times.

While a primary embodiment together with two modifications of this invention have been described, it will be recognized that other embodiments of the invention may be made without departing from the principles of the invention. Such of these modifications as embody the principles of the invention are to be considered as included within the language of the hereinafter appended claims unless these claims by their language expressly state otherwise.

I claim:

1. A pad for body supporting furniture comprising: an

6

envelope of materials characterized by flexibility and high resistance to wear; said pad having a pair of opposite side portions and a pair of opposite end portions; said envelope between said side and end portions being the main body of said pad and filled with a flexible foam; said end portions having a pair of foam filled ridges each of the same general thickness as the main body of said pad; said ridges extending lengthwise of said end portions and being separated from each other and from said main body of said pad by areas where said envelope materials of the opposite faces thereof are in contact with each other and joined together; the outer of said ridges being folded back upon the inner one thereof and means securing said outer ridge in said folded position to impart to said end portions greater body and stiffness than that of said main body of said pad.

2. A pad as described in claim 1 wherein a stiffener is positioned along one end between said inner and outer ridges when they are in folded position; said stiffener being thin and extending substantially the full length of said end; said stiffener being flexible lengthwise and rigid crosswise.

3. A pad as described in claim 1 wherein said foam terminates short of said side portions and said side portions are thinner than the main body of said pad; an elongated bead on each of said side portions; said beads projecting outwardly from the surface of said pad, spaced from and extending parallel to the margin thereof.

4. A pad as described in claim 1 wherein said foam terminates short of said side portions and said side portions are thinner than the main body of said pad; an elongated bead on each of said side portions; said beads projecting outwardly from the surface of said pad, spaced from and extending parallel to the margin thereof; hollow reinforcement members mounted in each of said side portions at spaced intervals and defining holes through said pad.

5. A pad as described in claim 1 wherein said foam terminates short of said side portions and said side portions are thinner than the main body of said pad; a reinforcement member extending lengthwise of each of said side portions and embedded therein; openings at spaced intervals through said pad and said reinforcement members; elongated beads on each of said side portions between said openings; said reinforcement member forming the core of said beads.

6. A pad for body supporting furniture comprising: an envelope of materials characterized by flexibility and high resistance to wear; said pad having a pair of opposite side portions; said envelope between said side portions being the main body of said pad and filled with a flexible foam; said foam terminating short of said side portions and said side portions being thinner than the main body of said pad; an elongated bead on each of said side portions; said beads projecting outwardly from the surface of said pad, spaced from and extending parallel to the margin thereof; an incompressible reinforcement member embedded in each of said side portions; said reinforcement member forming the core of said bead.

7. A pad for body supporting furniture comprising: an envelope of materials characterized by flexibility and high resistance to wear; said pad having a pair of opposite side portions; said envelope between said side portions being the main body of said pad and filled with a flexible foam; said foam terminating short of said side portions and said side portions being thinner than the main body of said pad; an elongated bead on each of said side portions; said beads projecting outwardly from the surface of said pad, spaced from and extending parallel to the margin thereof; an incompressible reinforcement member embedded in each of said side portions; said reinforcement member forming the core of

said bead; said side portions each having openings there-through at spaced intervals; said reinforcement member surrounding each of said openings.

8. A pad for body supporting furniture comprising: a pad of flexible material, said pad having a pair of opposite side portions and a pair of opposite end portions; said end portions each having an enlarged tubular member extending substantially the full length thereof; said tubular member being filled with a flexible foam for forming an enlarged impressionable reinforcement for said ends and being substantially thicker than the remainder of said pad; a stiffener embedded in at least one of said tubular members and extending the length thereof; said stiffener being flexible lengthwise and rigid crosswise.

9. A pad for body supporting furniture comprising: a pad of flexible material, said pad having a pair of opposite side portions and a pair of opposite end portions; said end portions each having an enlarged tubular member extending substantially the full length thereof; said tubular member being filled with a flexible foam for forming an enlarged impressionable reinforcement for said ends and being substantially thicker than the remainder of said pad; said side portions having elongated beads therein projecting outwardly from a surface of said pad, spaced from and extending parallel to the margin thereof.

10. A pad for body supporting furniture comprising: a pad of flexible material, said pad having a pair of opposite side portions and a pair of opposite end portions; said end portions each having an enlarged tubular member extending substantially the full length thereof; said tubular member being filled with a flexible foam for forming an enlarged impressionable reinforcement for said ends and being substantially thicker than the remainder of said pad; a stiffener embedded in at least one of said tubular members and extending the length thereof; said stiffener being flexible lengthwise and rigid crosswise; said side portions having elongated beads therein projecting

outwardly from a surface of said pad, spaced from and extending parallel to the margin thereof.

11. A pad for body supporting furniture comprising: a pad of flexible material, said pad having a pair of opposite side portions and a pair of opposite end portions; said end portions each having an enlarged tubular member extending substantially the full length thereof; said tubular member being filled with a flexible foam for forming an enlarged impressionable reinforcement for said ends and being substantially thicker than the remainder of said pad; said side portions having elongated beads therein projecting outwardly from a surface of said pad, spaced from and extending parallel to the margin thereof; hollow reinforcement members mounted in each of said side portions at spaced intervals and defining holes through said pad for the reception of fixed supports whereby said pad may be supported from its side portions both by suspension from said reinforcement members and by clamping about said beads on said side portions.

12. A pad for body supporting furniture comprising: a pad of flexible material, said pad having a pair of opposite side portions and a pair of opposite end portions; one of said end portions having an enlarged tubular member extending substantially the full length thereof; said tubular member being filled with a flexible foam for forming an enlarged impressionable reinforcement for said ends and being substantially thicker than the remainder of said pad; a stiffener embedded in said tubular member and extending the length thereof; said stiffener being flexible lengthwise and rigid crosswise.

References Cited in the file of this patent

UNITED STATES PATENTS

2,138,610	Overly	Nov. 29, 1938
2,728,382	Baranski	Dec. 27, 1955
2,801,948	Walker	Aug. 6, 1957
2,865,436	Thorne	Dec. 23, 1958
2,999,332	Stein	Sept. 12, 1961
3,024,068	Eames	Mar. 6, 1962