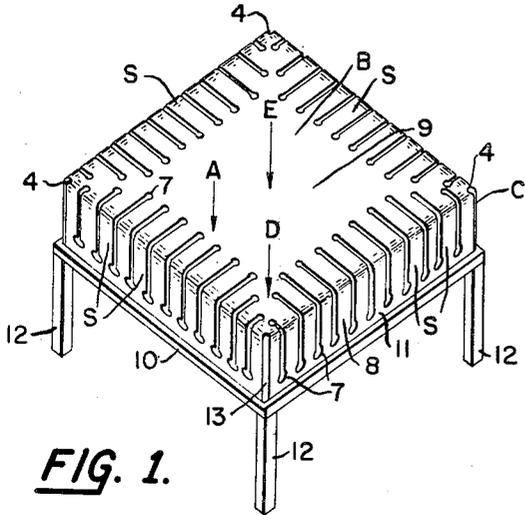


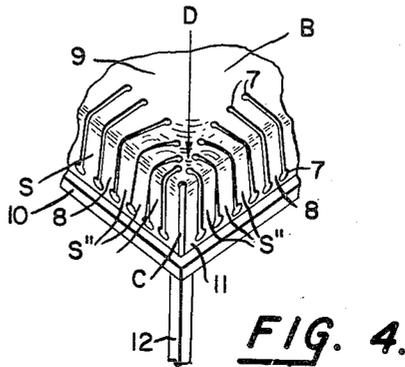
Aug. 27, 1957

R. L. PROPST  
CUSHION CONSTRUCTION  
Filed June 23, 1955

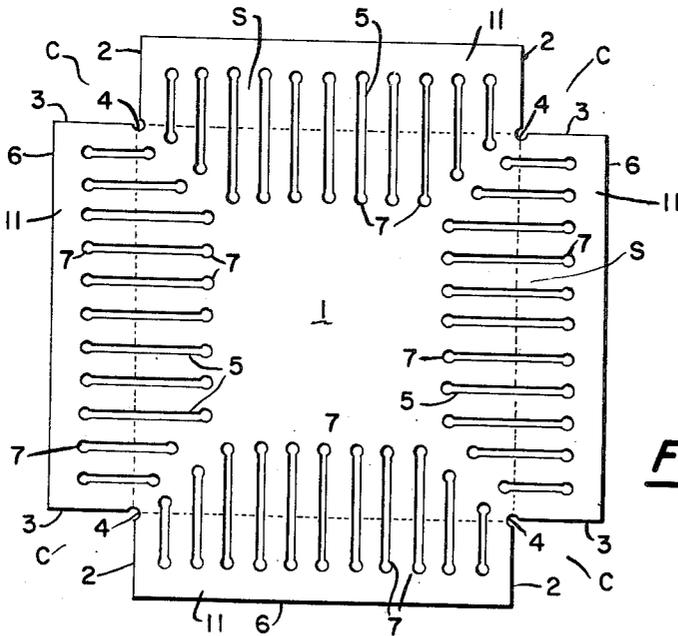
2,804,129



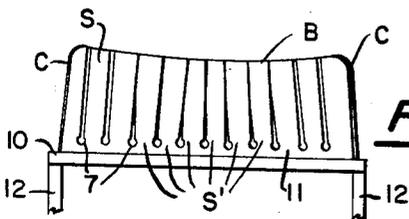
**FIG. 1.**



**FIG. 4.**



**FIG. 2.**



**FIG. 3.**

INVENTOR.  
ROBERT L. PROPST  
BY  
*Philip H. Sheridan*  
ATTORNEY

1

2,804,129

## CUSHION CONSTRUCTION

Robert L. Propst, Englewood, Colo., assignor, by mesne assignments, to Beauty Products, Ltd., Denver, Colo., a corporation of Colorado

Application June 23, 1955, Serial No. 517,510

10 Claims. (Cl. 155—179)

This invention relates generally to cushion constructions and particularly to an improved article of manufacture that may replace prior seats, cushions, mattresses and the like and bodies in general where springs or resilient material such as foam rubber are employed as the cushioning medium for a load force such as that of a human.

It is well known that springs as the flexible or resilient medium in prior art seat and furniture constructions have many defects. For example, such increases the cost of the article and often necessitates periodic repair to maintain the effectiveness of the springs. Furthermore, upholstering is quite a problem when springs are employed and the latter are believed to result in considerable damage to the upholstering and other material used. Foam rubber or other similar materials have, to some extent, replaced springs as the cushioning medium, but here again the element of cost is considerable and there are difficulties in upholstering and maintaining the cushioning medium effective. The present invention is believed to overcome a great many such defects, as well as others which will hereinafter be more clearly emphasized by a comparison between the instant article and prior art seat and furniture constructions.

With the above in mind, it is one of the objects of this invention to provide an improved cushion construction.

Another object of the invention is to provide an improved article of manufacture which overcomes many of the defects and difficulties in connection with prior art bodies employing springs or foam rubber or the like as the resilient or cushioning medium.

A further object of the invention is to provide an article of manufacture, namely a cushion construction, having a main body unit made solely from a single sheet of material having somewhat flexible, resilient and elastic characteristics, but being relatively rigid in a formed or fabricated shape and which, due to its construction, incorporates cushioning means fully as effective as the known springs and material that may be substituted therefor.

Yet another object is to provide an improved article of manufacture as described in the preceding paragraph wherein the spring or cushioning effect on the body is localized to a considerable extent when certain loads are applied.

A still further object of the invention is to provide an article of the type described in the penultimate paragraph wherein a frame of wood or the like is integrally secured to adjacent the peripheral edge of the body to provide a completely stable condition at said edge, following which upholstering material may be readily applied thereto.

It is also an object to provide an article of manufacture of the type described which may be upholstered at a relatively low cost and which will not, to any appreciable extent, damage the fabric used in upholstering and other materials.

Further, it is an object of this invention to provide an improved cushion construction which is inexpensive to construct, which is durable and rigid, but yet has desirable cushioning or resilient effects and which may be expected to have considerable life.

2

Finally, it is an object to provide a cushioning structure adapted to have upholstering applied thereto which may be constructed whereby the structure and upholstering material have substantially predetermined wear characteristics and which may be constructed to have desired and predetermined spring-like action.

Other objects and advantages of the invention will be apparent upon considering the following detailed description in conjunction with the drawings wherein:

10 Figure 1 is a perspective view illustrating application of this invention in connection with a cushion-like structure;

Figure 2 is a top view of the main body from which the embodiment of Figure 1 is constructed;

15 Figure 3 is a side elevational view of the cushion construction of Figure 1, but illustrating a typical deformed condition of one side of the structure following application of a load in the direction of arrow A; and

20 Figure 4 is an elevational view, broken away, illustrating a typical deformed condition somewhat adjacent one corner when a load is applied in the direction of arrow D.

Perhaps it should be stated at the outset that the invention is by no means limited to the application thereof as a cushion or hassock-like structure, the latter forming the basis of this disclosure only for convenience in illustrating the principles of the invention. Accordingly, it should be clearly understood and apparent that the present invention is equally directed to the construction of other articles, such as automobile and bar stool seats, mattresses and bodies in general where in the past springs or resilient mediums such as foam rubber, have been employed as the cushioning medium. Individuals skilled in and familiar with the furniture art and other fields where a load or weight is to be supported by a medium having cushioning effects could well be expected to apply the principles of the hereinafter detailed and specific disclosure to said other bodies without requiring the exercise of invention and, therefore, the scope of this invention is intended to cover such bodies in general. Also, the phraseology and terminology employed herein is for the purpose of description and not of limitation. For example, the term "cushion" in the specification and claims is intended to encompass the said bodies in general.

Now referring to the drawing in detail and particularly to Figure 2, numeral 1 represents a substantially square shaped body made of a plastic-like material having somewhat flexible, resilient and elastic characteristics, but being relatively rigid in a formed or fabricated shape. For example, a material of high impact polystyrene or a material known in the trade as "Royalite," such including a plastic copolymer and synthetic rubber, have proved satisfactory but, of course, the material may be made of other synthetic combinations which provide the desired qualities. Numerous other materials having the above characteristics may be employed satisfactorily and it is conceivable that sheet 1 could be made of a metal or metal alloy or even a plywood.

Originally, the flat sheet 1, of a desired thickness, say in the neighborhood of  $\frac{1}{32}$  to  $\frac{1}{4}$  of an inch, is completely solid and, in accordance with the embodiment disclosed, square and, of course, the sheet 1 may be stamped or cut out from a larger piece of material. Next, the corners C are cut away or stamped out as shown to form edges 2 and 3 at each corner and a circular-like aperture or recess 4, the purpose of which will be hereinafter apparent, is similarly formed where the edges 2 and 3 would normally join or converge together.

70 Thereafter slits 5 are cut or stamped from adjacent the edges 6 of sheet 1 towards the center thereof and each end of these slits 5 terminates in a circular recess 7, as illustrated. A more detailed description of the size and

3

purpose of the slits, which form segments represented by letter S, will be hereinafter provided, but it is to be noted that, as shown, the slits are equally spaced apart and vary in size only adjacent the corners C. Now the sheet 1 is shaped into its final form by bending, following slight heating to permit same, along transverse lines (shown in dotted lines) joining apertures 4 to provide, as shown in Figure 1, right angled side walls 8 with respect to a substantially flat support portion 9 of a generally inverted U-shaped structure in cross section.

A square frame 10 of wood or other suitable material is integrally and rigidly secured by any suitable medium, such as screws, tacks, staples or nails, not shown, to the solid area 11 of side walls 8. The frame 10 holds the areas 11 in a completely stable or static condition and in operation under load, as will be hereinafter apparent, prevents the side walls 8 from spreading and permits the slits and segments S to function as will be described. Also, holes may be applied, if desired, to the central part of portion 9 for ventilation purposes and for making the portion 9 more deformable or elastic, but such holes should be designed not to interfere with the action of slits 5. Of course, the frame 10 could be attached to the interior of areas 11 and it is to be noted that there is a gap 13 formed between each of the edges 2 and 3.

The body B of Figure 1 could be constructed in other ways, such as by injection molding to form the substantial U-shape. However, regardless of how the body B is formed, it is important to note that, as a result of forming, it is not under tension and the frame 10 is not for the purpose of holding or maintaining the body unit B in shape. This is directly contrary to prior art installation involving coiled springs, no-sag springs and solid installations of material such as foam rubber where the springs or foam rubber are put under tension and maintained in such condition by the upholstering material and the frame. In other words, by the present invention, until a load is applied, such as in the direction of the arrows of Figure 1, no significant tension exists in the body B, the frame 10 and the upholstering material that normally will be applied.

The method of making the cushion or hassock-like structure of Figure 1 should be entirely clear from the aforesaid description and similarly the process of constructing other bodies, such as mattresses, circular seats, automobile seats and structures that have in the past incorporated springs, foam rubber or other cushioning mediums to include the principles of this invention should be obvious, although some variances will have to be made. For example, the size and number of the slits 5, which form segments S, may be altered and, in connection with a circular body B, the wooden frame 10 would naturally be circular and there would be no corners, and further the slits or slots 5 would have to extend completely through the side wall or skirt. Further, instead of four corners there may only be two or three, as in the case of rectangular or triangular bodies, and in such instances the number of slits 5 in each side wall would vary. In order to more properly depict the invention, the embodiment of Figure 1 has been illustrated without having upholstering applied thereto, but of course such preferably would be done prior to commercializing same. It might be again mentioned that, although the upholstering techniques form no part of this invention, the principal features of this invention permit numerous advantages in connection with upholstering and this will become apparent hereinafter.

As to the operation and characteristics of the disclosed cushion construction of Figure 1 and particularly the purpose and function of slits 5, reference is made to Figures 1, 3 and 4. It might be mentioned at the outset that the slits 5 permit the cushion unit to function insofar as resilient or cushioning effects are concerned, as if springs or foam rubber or the like were employed as the damping medium. For example, assuming that a typical force

4

or load, such as that of a person, is applied as indicated by the arrow A of Figure 1, then certain segments S further indicated as S' will flex or bind together in abutting relation, at least at and adjacent the edge of portion 9 and at, if the load is enough, probably a major part of the area of the slits 5 associated with segments S', although the degree of abutting, depending on the amount of the load, could vary as illustrated in Figure 3. Of course, part of portion 9 adjacent the point of application of the load will be deformed or depressed, but it can be seen that the effect of the load on the body B will be somewhat localized, especially towards the one edge of the body B as the load at A, unless it is very substantial, will hardly affect other segments of the body B. Since the sheet 1 is made of material that is somewhat flexible, elastic and resilient in characteristics but is relatively rigid as a formed body B, the segments S' and that part of portion 9 that is depressed have a definite tendency to restore to normal shape or to again assume the condition of a stable spring unit when the load is removed and thus good spring resiliency or cushioning action is provided.

Of course, there are many factors of design and construction that control the amount of spring action, namely (1) the type and thickness of sheet 1, and in this latter connection the material must be of sufficient thickness to prevent sliding action or overlapping of flexed segments and to insure abutment of the flexed segments; (2) the size, both from a length and width standpoint, of slits 5; (3) the height of side walls 8 and the size of base 9; (4) the angle that the portion in side walls 8 and part 9 of each slot intersects the edge of portion 9; and (5) the number and spacing of slits 5. At this time it should be pointed out that recesses 7 are provided at both ends of each slit 5 for the purpose of preventing cracking or tearing of the solid part of base 9 and, although these are desirable in practice, they are not essential. Furthermore, if preferred, the portion of each slit in a side wall 8 could be designed to extend to the edge 6, thus eliminating the recesses 7 in the side walls 8. The circular-like recesses or apertures 4 are for the same purpose and also to provide the corners with substantially the same radius as segments S and, of course, holes 4 and 7 may assume other configurations.

Assuming a typical load is applied adjacent one corner C, as indicated by the arrow D of Figure 1, then the deformation could cause the body B to take the shape of Figure 4. The area of portion 9 adjacent the point of application of the load deforms considerably while the segments S on either side of the particular corner C do not close. However, the segments further identified as S'' do bind and abut and it is to be noted that the amount of binding of segments S'' varies progressively, these segments S'' controlling the spring-like action of the body B. Here again, the distribution of the load is local. Of course, the slits 5 are instrumental in controlling the ratio of deformation, regardless of where the load is applied, the unit B of Figure 1 happening to be designed for rapid deformation during first application of the load and a slowing down thereafter.

If a substantial load is applied centrally of the portion 9 and at the point of arrow E, then portion 9 is deformed into a saucer-shape and concaved with a good number of segments S in binding relationship. The degree of binding and abutment varies centrally of each side wall, where there may be a maximum, to adjacent the corners C. Unless the load is extreme, the segments adjacent the corners will probably not bind or abut to close the slits associated therewith.

In the event the principles of this invention are to be applied, for example to automobile seat constructions, then the area 11 could be attached directly to the metal frame which usually is incorporated in such seat structures, the metal frame taking the place of frame 10. It will also be noted that the corners C of unit B are a rigid construction, this being important in connection with up-

5

holstering as well as for other reasons apparent to those skilled in the art, but in the construction of circular bodies, such as a bar stool seat, corners are no problem although by the present invention a firm circular edge will be provided. It is impractical to mention all of the various uses of this invention, but to give an example of a rather remote application reference is made to the usual bunks in a submarine or the like, and in this connection the U-shaped body could be employed by reversing same from the inverted U of Figure 1 and enlarging same to simulate the size of the bunk and then ordinary cushion material could be placed within the thus formed receptacle. Previously, the portion 9 has been shown and described as being flat, but it may readily assume crown, dimpled or other shapes without departing from the spirit of the invention.

Actually, the appearance of the article of Figure 1 is quite pleasing and has commercial possibilities without further treating, such as by upholstering. The outside and underside of body B may be treated, by painting or the like, to be quite eye-appealing and finally, shipment of a structure as shown in Figure 1, especially with the legs 12 detached, would be simple and of relatively low cost in view of the weight and the fact that similar sized units may be nested one within the other.

It is within the scope of this invention to modify the slits 5 to the extent that they are angled with respect to the edges of portion 9 instead of being at right angles thereto. Furthermore, the length that these slits extend into support portion 9 and side walls 8 is a matter of choice and depends on the desired resiliency of the body unit B. Similarly, the spacing of the slits from one another may be varied at will. Still further, the size of each slit opening throughout its length could be constructed to vary as desired. Finally, the part of each slit 5 in the portion 9 or a side wall 8 could be at an acute or obtuse angle with respect to the edge of portion 9 instead of at right angles thereto. In other words, the slits do not have to be positioned in a parallel system and this is particularly important if it is desired to soften or increase the resiliency of a corner C.

As to upholstering a body such as that of unit B, there are many advantages over similarly treating a unit embodying coiled springs, no-sag springs or foam rubber or equivalent material. First of all, one of the most important advantages of the present invention is that one can upholster over a stable unit which is directly contrary to bodies having coil springs, no-sag springs or foam rubber or the like as the cushioning medium. Secondly, the upholstering material and frame structure is not used to maintain the body B in a static condition as is the case in such prior art techniques. Thirdly, it is believed that the present invention permits the use of practically all types of upholstering material, such as foam rubber, bonded shredded rubber or similar materials which can readily be applied in single or laminated sheets to body B and frame 10 by any conventional adhesive medium, but preferably some suitable fabric will be utilized. Fourthly, the upholstering material used is substantially continuously supported by the body unit throughout its action and while in loaded or unloaded condition.

The upholstering material may be readily applied to the unit B of Figure 1 by means of an attachment to the frame 10 or, if desired, area 11 could be modified somewhat to provide a surface to which the material could be secured. Briefly, the structure of Figure 1 replaces many essential parts used in upholstering bodies incorporating springs, such as the springs, burlap, twine, clips, nails, cambric, webbing and welt cords. Use of these parts in prior art structure requires many skilled operations and, of course, increases considerably the cost of the completed article. Even when foam rubber or the like is used, such generally necessitates the expense of a foam rubber thickness of at least 4 inches, the use of harder

6

rubber or foam rubber laminated thereto to stiffen the edges, the application of welt cords and quite frequently the insertion of springs beneath the foam rubber. In all of these prior structures, the forming of the corners and edges is an extreme problem and it should be appreciated that upholstering is very difficult, such being lessened to a considerable extent by the present invention.

Also, in prior art arrangements including, for example, springs, burlap, padding and covering or foam rubber with fabric, when a load is applied, there is necessarily a compression of the spring-like material which results in a decrease of the dimension size of the spring-like material. Since the padding and fabric are not by nature elastic or compressible in the sense that springs are, the action causes a pulling, sliding and bunching of the fabric and padding with respect to the spring medium and such results in wear and tear and difficulty in having the fabric and other materials maintain their original shape. The present invention overcomes this, principally due to the body B retaining substantially or close to the same dimensional length under a loaded or unloaded condition, although altered in shape.

In the claims the term "cushion" is intended to encompass various seat structures, such as those of a chair or automobile, mattresses and generally all bodies adapted to support a load or weight where it is desired to have a cushioning effect. Also, the term "edge means" is meant to include all of the edges of body B where a side wall 8 and portion 9 join, which may be four in the case of the cushion of Figure 1 or one in the case of a circular bar stool seat. Similarly, "skirt means" is meant to cover all portions of the body unit extending, from the load applying portion, at the edge means thereof, such as the side walls 8.

It might be mentioned that the slots 5, which influence and control the character of the spring action, can and should be designed to protect the sheet material 1 in the sense that the amount of deformation will not damage the natural resilient characteristics thereof. Summarizing, when a load is applied to unit B, the slits allow an appreciable deformation of the portion 9 by providing an edge means of flexible dimension. At the same time, the width of the slots provide the ultimate limits of the deformation by forming segments 8 which bind and abut and establish a minimum dimension of the edge means.

In the claims the term "relatively thin" is meant to include a thickness of sheet 1 along the lines mentioned but this would vary, depending upon the material employed, the only limitations being that the material may not be so thin as to prevent abutting of the walls of the slits nor too thick to prevent the action described. As to the expression "relatively flat," this is intended to cover variances from an entirely horizontal surface, such as a supporting surface that is slightly concave. Finally, the purpose of a frame 10 is to prevent spreading and to provide stability, but in some instances this would not be necessary, such as in connection with circular bodies and also as a substitute for the frame 10, the side walls 8 could be locked together adjacent the bottom of gaps 13 by any suitable means.

From the foregoing it will be seen that this invention is one well adapted to attain all the ends and objects herein above set forth, together with other advantages which are obvious and which are inherent to the structure of the several embodiments. It will be understood that certain features and subcombinations are of utility and may be employed with reference to other features and subcombinations and this is contemplated by and is within the scope of the claims. As many alterations may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A cushion construction having spring-like cushioning characteristics comprising a somewhat rigid body made of relatively thin material having resilient characteristics, said body including a relatively flat support portion for receiving a load directly, said portion having edge means, and downwardly directed side skirt means depending from said support portion at said edge means; and means for controlling the amount of distortion and deformation of the support portion when a load is applied thereto comprising spaced apart slits passing completely through the material throughout a substantial part of the body, each slit extending in at least a part of the support portion and the skirt means and through the edge means whereby when the load is applied the body is distorted and the edge means is altered in shape under substantial control of the slits and when the load is removed the body assumes its original shape.

2. A cushion construction as defined in claim 1 wherein the portion of each slit in the support portion terminates in an enlarged recess.

3. A cushion construction as defined in claim 1 wherein the portion of each slit in the support portion and in the skirt means terminates in an enlarged recess.

4. A cushion construction as defined in claim 1 wherein each slit is equally spaced from the next adjacent slit.

5. A cushion construction as defined in claim 1 wherein each slit intersects the edge means at right angles.

6. A cushion construction as defined in claim 1 wherein a rigid frame is integrally secured to the skirt means at the end remote from the edge means to prevent spreading of the skirt means.

7. A cushion construction having spring-like cushioning characteristics comprising a body made of relatively thin material having resilient characteristics but being somewhat rigid, said body including a relatively flat support portion for receiving a load directly, said portion having edge means, and side skirt means extending from said support portion at said edge means at a substantial angle thereto; and means for controlling the amount of distortion and deformation of the support portion when a load is applied thereto comprising spaced apart slits

passing completely through the material throughout a substantial part of the body, each slit extending in at least a part of the support portion and skirt means and through the edge means.

8. A cushion construction having spring-like cushioning characteristics comprising a body made of relatively thin material having resilient characteristics but being somewhat rigid, said body including a relatively flat support portion for receiving a load directly, said portion having edge means, and downwardly directed side skirt means depending from the support portion at said edge means, and means for controlling the amount of distortion and deformation of the support portion when a load is applied thereto comprising spaced apart slots in the body passing completely through the material, at least a substantial number of said slots each extending in at least a part of the support portion and the skirt means and through the edge means.

9. A cushion construction comprising a body shaped and formed to simulate the desired configuration of the construction, said body being made of a single plastic-like and relatively thin sheet material having resilient and flexible characteristics but being somewhat rigid when shaped, and a plurality of spaced-apart slits passing completely through the material in a substantial part of the body, said slits forming segments which are adapted to bind and abut one another when a load is applied to said body whereby when the load is applied the body is distorted under substantial control of the segments and when the load is removed the body assumes its formed shape.

10. A cushion construction as defined in claim 9 wherein the body is shaped to form a substantially inverted U including a relatively flat support portion and downwardly directed skirt means divided by edge means common to both, at least the majority of said slits being arranged to pass through said edge means.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

2,082,151 De Poix ----- June 1, 1937