Aug. 5, 1958 R. J. ESTABROOK ET AL 2,845,998

VENTILATED CHAIR SEATS

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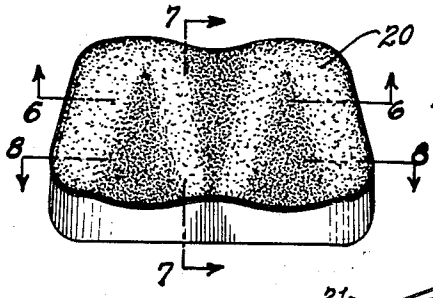


Fig. 1

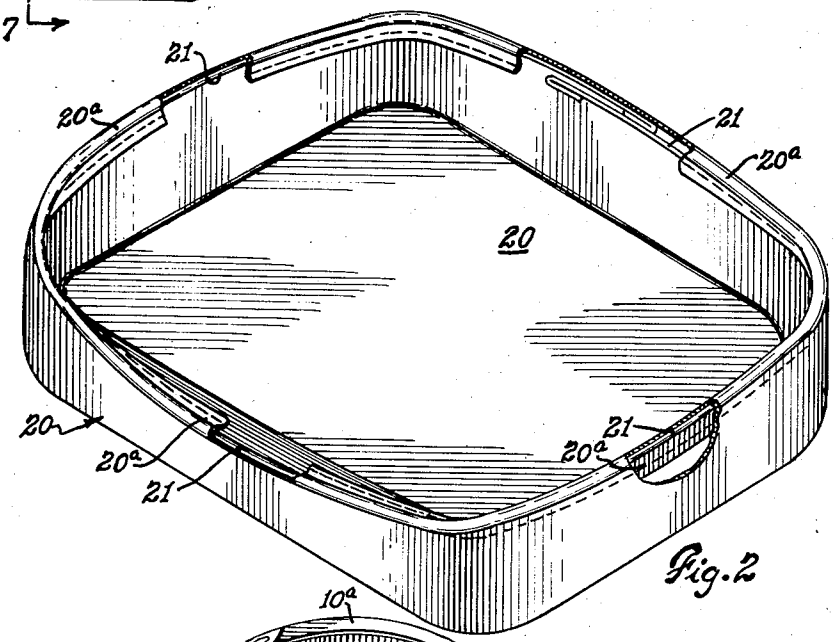


Fig. 2

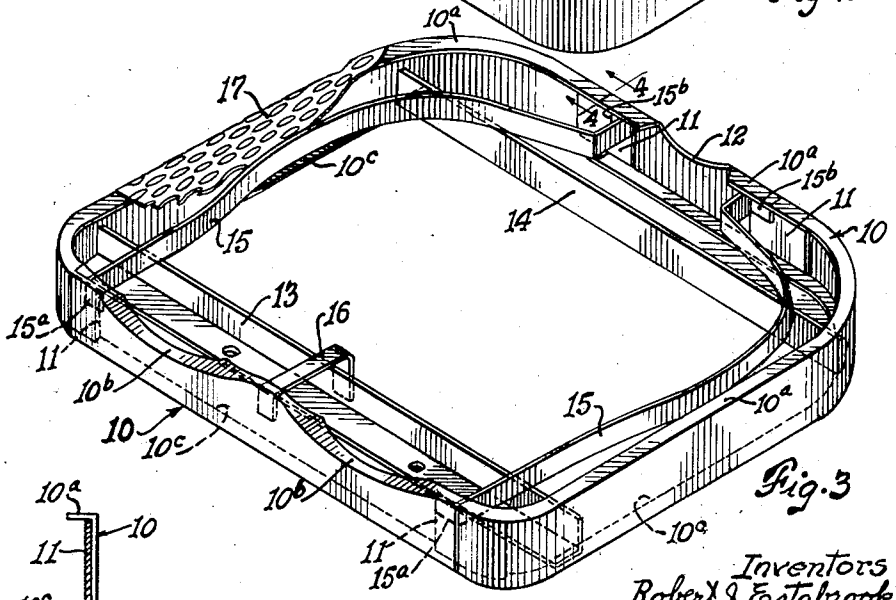


Fig. 3

Fig. 4

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Fig. 6

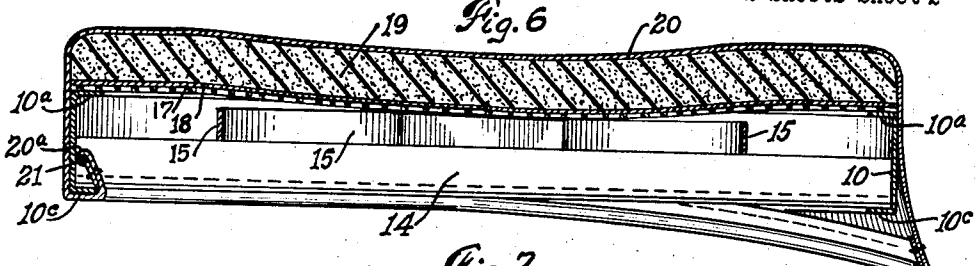


Fig. 7

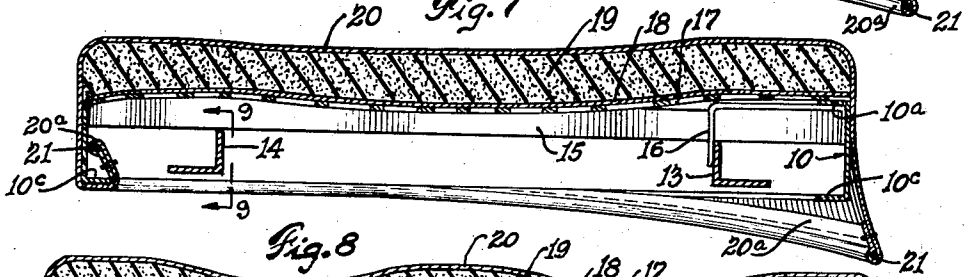


Fig. 8

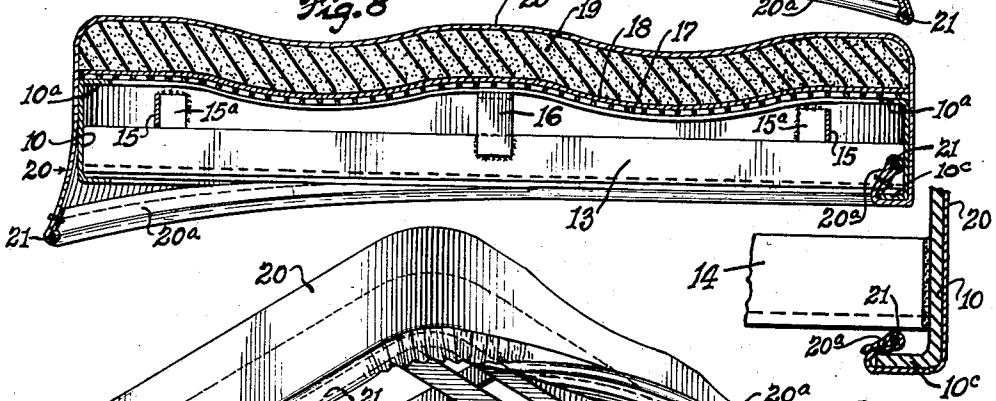


Fig. 9

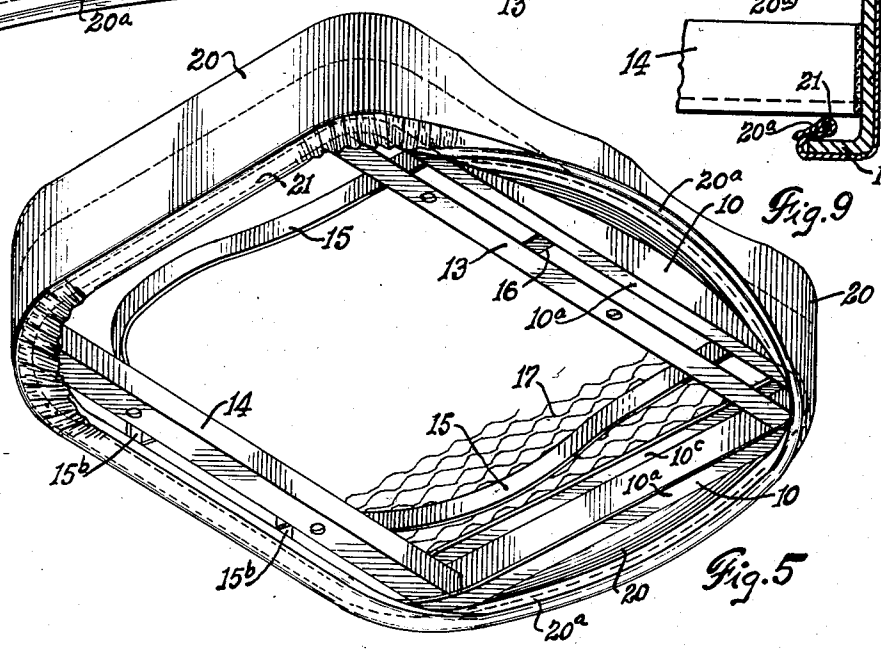


Fig. 5

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VENTILATED CHAIR SEATS

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8 Claims. (Cl. 155—184)

The present invention relates particularly to upholstered chair seats and has for its object to create a seat which, in the most important aspects of such structures, is a great improvement over prior seats.

Aside from sturdiness and a reasonably low manufacturing cost, the most important characteristic of a seat probably is that it should be comfortable. Viewed in one of its aspects the present invention may be said to have for its object to create a seat structure which shall possess this characteristic to a high degree.

To be entirely comfortable a seat must be cushioned, ventilated and form fitting; and another object of the present invention is so to construct a seat which shall respond to each of these requirements to a high degree.

Most seats are so constructed that objectionable pressure may be delivered against the base of the spine of the sitter and thereby create disturbance in the sitter's nervous system. A further object of the present invention is to create a structure which reduces to a minimum the possibility for such pressure to be exerted.

In upholstered seats there is usually employed a cushioning layer held in place by a flexible seat cover. One of the objects of the present invention is to create a simple and novel means whereby such a cover is held securely in place, but may quickly and easily, and without the use of tools, be applied or removed at will.

The various features of novelty by which the present invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of the present invention and its various advantages and objects, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view, on a smaller scale than the succeeding figures, of a seat embodying a preferred form of the invention;

Fig. 2 is a perspective view of the seat cover, upside down;

Fig. 3 is a perspective view of the metal body or frame of the seat, with the greater part of the expanded metal saddle plate broken away;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the seat, looking from below, showing the cover unfastened along the front and one of the side edges of the metal body;

Fig. 6 is a section on line 6—6 of Fig. 1, showing the cover unfastened along one side of the seat as in Fig. 5;

Fig. 7 is a section on line 7—7 of Fig. 1, with the cover in the condition shown in Fig. 5;

Fig. 8 is a section on line 8—8 of Fig. 1, with the cover as shown in Fig. 5; and

Fig. 9 is a section on line 9—9 of Fig. 7, in enlarged scale.

Referring to the drawings, 10 is a metal frame formed preferably, of a channel member standing on edge. This frame is shown as being in the form of a rectangle having rounded corners. For convenience in manufacture

the frame may be composed of four sections held together by means of plates 11 welded to the web portions of the channels. The upper flange 10^a is cut away at the middle of the rear member of the frame, the excision extending down into the web to form a deep recess 12 in the top of the frame at the rear end of the seat. The front member of the frame has a special shape. The lower half is just like that part in the remainder of the frame, but the upper half is so shaped that top flange 10^b curves downward from each end and then upwardly to points near the middle; thus creating a central hump.

Positioned preferably a spaced distance above the lower flanges 10^c of the side channel members of the frame, and welded to the webs of the channel frame members, are two reinforcing cross bars 13 and 14, preferably angle irons; bar 13 being near and parallel to the front frame member and bar 14 being near and parallel to the rear frame member. Thus one leg of each cross bar is horizontal and the other is vertical. The vertical legs are narrower than the web of the channel of which the frame is made. This leaves considerable space between the tops of these bars and the plane of the top flange 10^a of the channel frame. In this space are two stiff metal strips 15, 15 arranged on edge between the front and rear channel frame members constituting abutment or stop means. The front ends of these strips are comparatively far apart, meeting the front frame member at about the points where the corner curves begin, whereas the rear ends terminate at about the ends of the recess 12. Each strip 15 begins to curve from the front of the frame very gradually, first away from and then toward the adjacent side member of the frame and, finally, about halfway toward the rear, makes about a quarter turn to reach the terminal point. The upper edges of the strips are preferably a little below the plane of top of the frame; the ends of strips 15 being angularly bent as at respectively 15^a and 15^b and welded to the connection plates 11 as shown in Figs. 3 and 5.

At the front of the frame structure is a flanged strap 16 extending along the longitudinal center of the frame and resting with its front end flange and integral flat side portion under and engaged with the frame web and flange 10^b at the hump in the latter. The rear end of the strap is bent down to form a flange that overlaps and engages with the vertical leg of bar 13.

Strips 15, 15 and straps 16 are secured in any suitable manner, preferably by welding them to the metal parts of the frame and across bars which they engage.

Overlying the frame is a perforated sheet or saddle plate 17 of expended metal type, wherein the total of the open areas equal about 60% of the area of the sheet. The saddle plate should be resilient so that it may be distorted considerably without being stressed beyond its elastic limit. The marginal portions of the sheet rest on and are welded to flanges 10^a and 10^b, leaving a gap at recess 12, in the rear, where there is no direct attachment of support.

Sheet 17 may preferably be pre-formed saddle-shaped or may be in a substantially flat state at the time of attaching it to the frame. Because of the diamond mesh structure it can readily expand to conform to the contour of flange 10^b and assume a more or less saddle shape in this area. Strap 16 aids in creating the new configuration, providing a rigid central ridge separating the two shallow valleys that extend rearwardly in the sheet. The sheet is preferably depressed in the rear central portion to the level of the bottoms of said valleys. Thus the sheet becomes a saddle plate for supporting a sitter in much the same way as does a saddle. The main body of the saddle plate is not only resilient but can expand under the weight of a sitter, so as automatically to fit the form of persons of different sizes. Strips 15, 15

serve as supports to prevent the saddle plate from being pressed down too far. The saddle plate has no support at the center in the extreme rear and, being yieldable there, cannot create objectionable pressure on the base of the spine of a sitter.

Overlying the saddle plate is a piece of pliable fabric cloth **18** or other suitable flexible material and, on top of that, is a thick cushioning layer **19**, preferably foam rubber. The cloth and the cushioning layer are held in place by a flexible cover **20**, preferably composed of a suitable plastic material, in the form of a pan into which the body member, along with elements **18** and **19** will fit. The top of the cover, particularly at the front and rear, is preferably shaped to provide the saddle-like contour.

An important feature of the present invention is the simple means for securing the cover in place. We make use of the principle that when a resilient wire is arcuately bent to any degree within its limits of elasticity, it will straighten again upon being released. We therefore employ a piece of spring wire **21** disposed within a marginal pocket of the cover around the rim thereof in such a manner that it can slip lengthwise but is held against lateral movement. In the arrangement shown, the attachment of the wire to the cover is effected by providing the cover with a tubular rim **20a** into which the wire is inserted, with its ends overlapping as shown in Fig. 2.

The depending sides of the cover, namely, those parts forming the front, rear and side walls, are of greater depth than the width of the channel members forming frame **10**. Therefore, when the cover is drawn down over the frame body of the seat and its overlying cushion, all four sides of the cover extend down below the plane of the bottom of the frame, as the side portion shown at the right in Fig. 5. The wire tends to straighten, but can only assume a shape approaching a circle.

When any one of the four sides or sections, comprising the portions of the cover extending down below the plane of the under side of the frame, is pulled inwardly under flange **10c** and pressed up past the edge of the flange, the wire in that side snaps over the inner face of the flange as shown at the left in Fig. 6. In doing this the wire straightens and hugs the web of the channel. One side after another may be folded inward in the aforesaid manner, until all four are anchored as are the two on the left hand side in Fig. 5. The securely fastened positions are shown at the left in Figs. 6 and 7 and at the right in Fig. 8; whereas the cover sides are in their released positions on the other opposite sides appearing in these same views.

By allowing the corner portions of the cover to underlie flange **10c** at the four corners after the cover has been fastened, it is made easy for one to grip the rim of the cover at a point where the wire has just made the turn over the edge of the flange, and pry it outward, when the cover is to be removed.

To facilitate the production of seats provided with covers bound neatly and securely to the undersides of the frame structure, the angle irons **13** and **14** may be of such size and their ends so positioned with respect to the bottom flanges **10c** of the channel frame members that adequate spaces are provided, between the bottom faces of the horizontal legs of the angle irons and the inner faces of the bottom flanges **10c** of the channel members, for insertion therein of the peripheral portions of the cover, as illustrated in Fig. 9 of the drawings.

It will be seen from Figs. 6 and 8 that normally saddle plate **17** stands clear of strips or saddle supports **15**, **15**, therefore the saddle plate **17** is free to bend and stretch sufficiently to become form-fitting with respect to persons of various sizes. Under a too heavy load, however, the saddle plate **17** is stopped by these supports and no deterioration of the elasticity of the plate occurs.

The use of expanded metal in the saddle plate not only provides increased flexibility and resiliency to achieve form fitting, but also ensures much better ventilation than is achieved in seats depending on prior perforated sheets or plates. This causes the present seats to be cooler; the temperature of the present seats having been found to be 15° lower than that of supposedly comparable prior seats, used under the same conditions. This difference in temperature often results in discomfort instead of comfort in the case of prior seats.

It should also be noted that because the frame structure is simple and the cover and fastening therefor is also a simple unit, the seat can be manufactured at a minimum cost; so that the greater comfort and well being of the sitter is achieved at a cost that needs be no greater than that of much less satisfactory seats.

While we have illustrated and described with particularity only a preferred form of our invention, we do not wish to be understood as limiting ourselves to the exact details of construction thus illustrated and described; but intend to cover all forms and arrangements coming within the scope of the definitions of our invention constituting the hereto appended claims.

We claim:

1. A seat body comprising a frame the front, rear and two side members of which are composed of a metal channel standing on edge with the flanges directed inwardly, a resilient sheet of openwork expanded metal overlying the channel and welded thereto at its margins, cross bars extending between, and secured at their ends to, the two side portions of the channel near the front and rear, two curved strips resting on and secured to said cross bars, said strips being spaced apart a short distance laterally at and secured to the rear of such body and extending laterally and then forwardly near the sides of the body with their front ends secured to the front of the body, there being between the tops of said strips and said sheet a free space of such magnitude that downward movement of the sheet is arrested before it is stressed beyond the elastic limit during use as a seat.

2. A seat body as set forth in claim 1, wherein the top of the rear member of the frame is recessed at the middle and the overlying part of the resilient sheet stands clear of the frame over the recessed area.

3. A seat body as set forth in claim 2, wherein the top of the front member of the frame curves downwardly in opposite directions, from two points near the longitudinal center of the seat, and then upwardly to points near the ends of that member.

4. A seat body comprising a frame composed of front, rear and two side members, the top of the front member being depressed at spaced portions to provide a central hump and two long concave depressions on opposite sides of the hump, the top of the rear member containing a long central recess, a sheet of resilient expanded metal overlying the frame, said sheet being deformed at the front end to fit the top of the front frame member and being depressed in the center to the level of the bottoms of the valleys formed therein at opposite sides of the hump, and the sheet being welded at its margin to the frame except at the recess in the top of the rear frame member where the sheet is out of contact with the frame.

5. A seat including a frame and a flexible seat cover extending over the top and down along all sides below the plane of the bottom of the frame, said frame being flanged inwardly at the bottom; a resilient wire carried along the free edge of the cover and tending constantly to straighten; stiffening supporting bars extending transversely of the seat above the plane of the top faces of the bottom flanges of the sides of the frame; a pair of curved strips extending between the front and rear ends of the frame and supported on the tops of said bars; a sheet of perforated expanded metal above said strips supported on the frame; a layer of flexible fabric overlying said sheet of expanded metal; a layer of foam

rubber overlying said layer of fabric; said flexible cover overlying said layer of foam rubber; and the free edge portion of said cover together with said wire being tucked inwardly under and then over the top face of the bottom flange of the frame whereby said cover is removably secured to the frame.

6. A seat as set forth in claim 5 including: a recess at the top of the middle of the rear portion of the frame; and a short flat strap secured to the center of the front of the frame extending longitudinally of the seat below the plane of said sheet to produce the effect of a pommel of a saddle when said sheet is pressed down; the top of the front portion of the frame being depressed in areas extending on opposite sides of the center of said front portion of the frame to enhance together with said flat strap said pommel effect.

7. A seat body comprising a frame having an open center, a sheet of resilient, open-work expanded metal overlying said frame and fixed thereto along its margins, and stop means carried by the frame in such open center and below and so spaced apart from said sheet as to engage the latter before the elastic limit of the sheet is reached during downward movement thereof

under pressure, said stop means comprising long curved strips standing on edge near the two sides of the frame and having their concave sides facing each other.

8. A seat body as set forth in claim 7 wherein the top of the frame is recessed at the middle of the rear portion and the sheet stands clear of the frame above said recessed region.

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