

[54] **CHAIR**

[72] Inventors: **Frans Semplonius, Kentwood; Stephen B. Kolk, Grand Rapids, both of Mich.**
 [73] Assignee: **Steelcase Inc., Grand Rapids, Mich.**
 [22] Filed: **Dec. 30, 1970**
 [21] Appl. No.: **102,592**

[52] U.S. Cl.297/455, 297/421, 297/460, 297/445
 [51] Int. Cl.A47c 7/00, A47c 7/02
 [58] Field of Search.....297/416, 420, 421, 445, 443, 297/451, 452, 458, 460; 5/356

[56] **References Cited**

UNITED STATES PATENTS

2,901,028 8/1959 Bottemiller297/421 X
 3,139,307 6/1964 Hawley et al.297/454

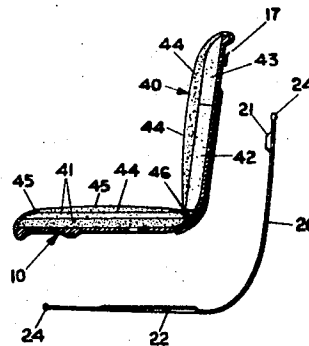
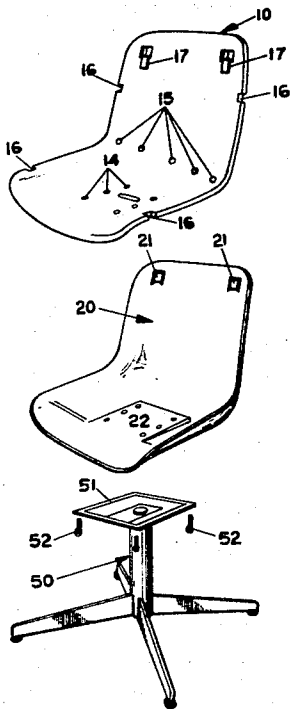
3,173,723 3/1965 Howen et al.....297/451
 2,769,485 11/1956 Shapiro.....297/458 X
 2,892,489 6/1959 Hurley297/456 X
 2,284,957 6/1942 Gedris297/460
 3,284,136 11/1966 Harrison.....297/445

Primary Examiner—Casmir A. Nunberg
Attorney—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

The specification discloses a chair whose structural strength is derived from a molded, high-impact polystyrene structural shell. The face of this shell is covered with suitable cushioning and upholstery and arms may be provided if desired. This structural shell is then joined to a decorative, molded polypropylene trim shell which covers the rear of the structural shell and which includes a recessed portion to accommodate the seat supporting pan of a chair base which is secured to the structural shell, through the trim shell.

18 Claims, 9 Drawing Figures



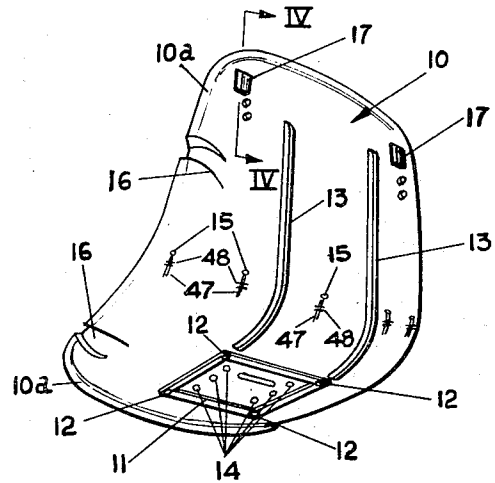
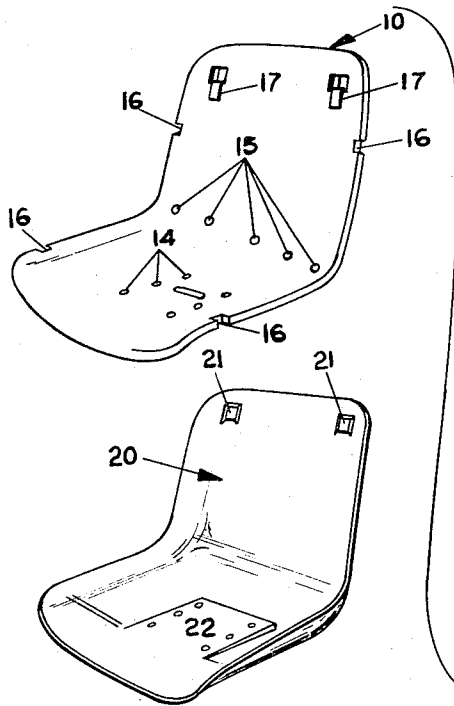


FIG. 2

FIG. 1

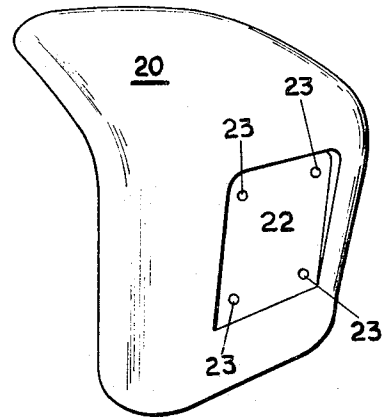
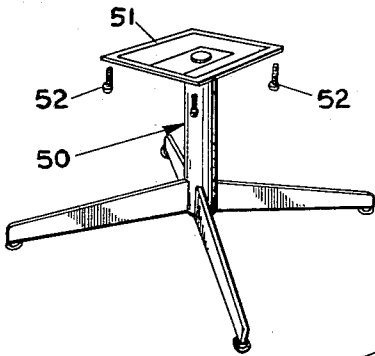


FIG. 3

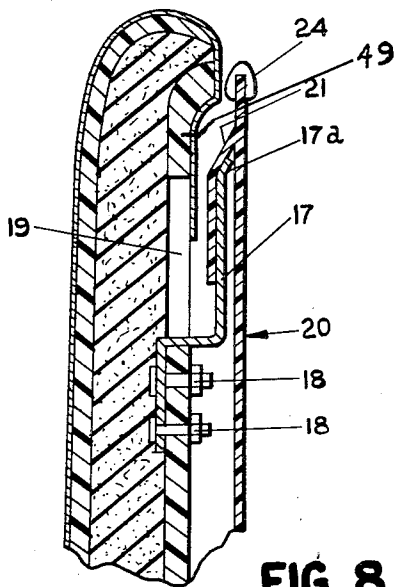


FIG. 5

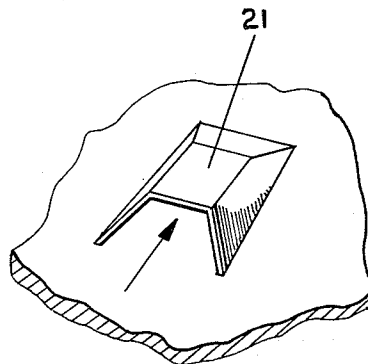


FIG. 6

INVENTORS
 STEPHEN B. KOLK
 FRANS SEMPLONIUS
Price, Kenevel
Heizenga, P. Cooper

BY

ATTORNEYS

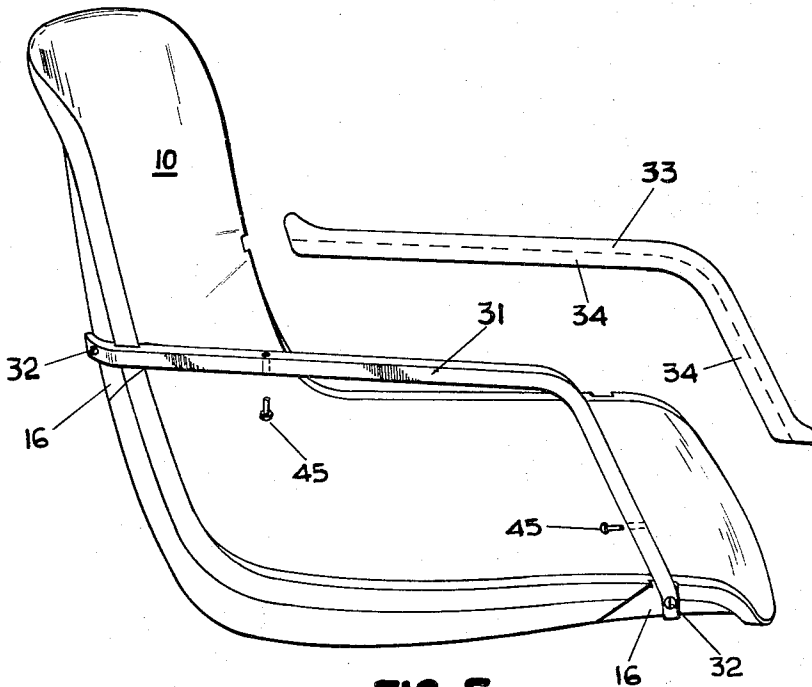


FIG. 5

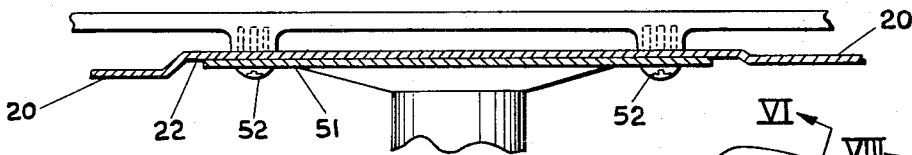


FIG. 9

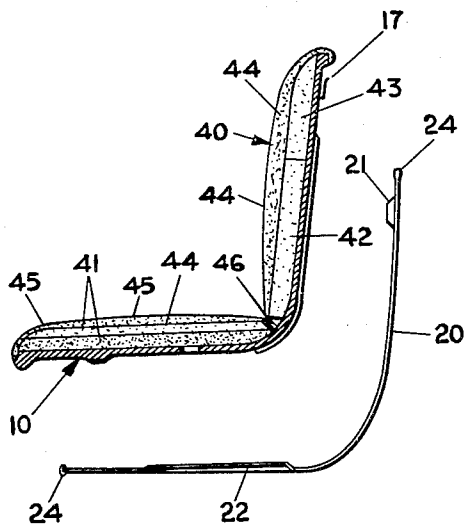


FIG. 6

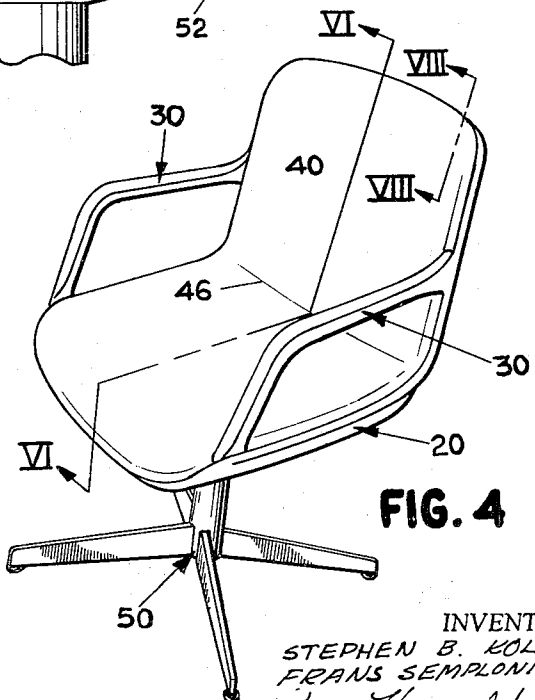


FIG. 4

INVENTORS
STEPHEN B. KOLK
FRANS SEMPLONIUS
*Eric, Hennel
Huizinga & Cooper*

BY

ATTORNEYS

1

CHAIR

BACKGROUND

The primary objectives of chair design are to achieve both beauty and substantial strength. Unfortunately, these objectives are not necessarily compatible. Accordingly, the more durable chairs tend to have conventional lines necessitated by the emphasis on structural strength. Molded, reinforced plastic chairs are also limited in design potential by the structural necessities of the chair, such as the necessity of conforming to back curvature. Furthermore, the exterior appearance of reinforced plastics renders it unacceptable for many design purposes.

BRIEF DESCRIPTION OF INVENTION

The present invention provides a chair having a load bearing structural shell with integral seat and back. Means are provided for covering the face of said shell to give the face a decorative appearance. A molded, plastic trim shell having a decorative exterior appearance and having integral seat and back covering portions is secured to the structural shell in such a manner that the rear of the structural shell is covered by the trim shell in order to give the chair a decorative exterior appearance.

Thus, the teachings of this invention contribute substantially to improve the compatibility of the design and structural objectives of chair engineering. The task of engineering the load bearing structural shell of this chair can be given to a structural engineer while the task of giving the chair a decorative exterior appearance can be given to a designer. The separate labors of the two men can be brought together into a single chair by utilizing applicant's unique means for joining the trim shell to the structural shell.

In accordance with this emphasis on design, other objects of the invention include that of providing a recess in the seat covering portion of the trim shell sufficiently large to accommodate and hide from view that portion of a chair base which is to be secured to the structural shell. The trim shell also hides from view the edge of the upholstery used to cover the face of the structural shell where the upholstery is wrapped around the peripheral edge of the shell and secured to the rear side thereof. Unique arm connections are provided which also can be hidden from view by means of the decorative trim shell.

Finally, yet another aspect of this invention is directed towards providing a unique cushion assembly whereby a plurality of cushions are adhered in adjacent fashion to the face of the back portion of the structural shell. The relative density of the different cushions varies directly with the amount of weight which must be supported by the portion of the shell back which is covered by that cushion. This unique human engineering feature substantially improves the comfort of applicant's chair.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of this invention will be seen by reference to the written specification and appended drawings wherein:

FIG. 1 is an exploded view of the structural shell, trim shell and chair base;

FIG. 2 is a perspective view of the rear side of the structural shell;

FIG. 3 is a perspective view of the rear side or the exterior side of the trim shell;

FIG. 4 is a perspective view of the fully assembled chair;

FIG. 5 is a perspective view of the structural shell and arm assembly;

FIG. 6 is an exploded cross section taken along VI—VI of FIG. 4;

FIG. 7 is a perspective, cutaway view of the upper right-hand portion of the trim shell;

FIG. 8 is a sectional view taken along VIII—VIII of FIG. 4; and

FIG. 9 is a cross-sectional view of a portion of the chair showing the connection of the base to the seat.

2

PREFERRED EMBODIMENT

In the preferred embodiment, the chair of this invention includes a structural shell 10 which is to be seated within, and secured to a trim shell 20 and mounted on a base 50 (FIG. 1). Shell 10 is provided with a suitable covering 40 (FIG. 6) and may be provided with arms 30 (FIG. 4). FIG. 4 shows a perspective view of the fully assembled chair and it can be seen that when the chair is assembled, structural shell 10 is completely hidden from view.

Structural shell 10 is formed by molding a high impact, expanded polystyrene. It includes an integral seat and back and must be of sufficient thickness that it will provide the structural support for the chair without the aid of trim shell 20. It has been found that a thickness of about three-eighths of an inch is suitable.

The bottom of shell 10 includes a rectangular rib 11 having T-nuts 12 located in the corners thereof to provide a means for mounting chair base 50 (FIG. 2). Rib 11 is thicker than the rest of structural shell 10 and accordingly provides additional rigidity and support in this crucial area. Similar reinforcing support is provided by ribs 13 which extend down the rear face of the shell back and around to the shell bottom. As with rectangular rib 11, these ribs 13 are thicker than structural shell 10 is generally and thereby provide additional structural support. Finally, the peripheral rim 10a of shell 10 is somewhat thicker than the rest of shell 10 to minimize the possibility of cracking and splitting in this region and to give shell 10 added rigidity.

Shell 10 includes a plurality of venting holes 14 in the seat portion thereof (FIGS. 1 and 2) to allow the seat cushion 41 (FIG. 6) to vent. A plurality of tufting holes 15 are provided along the junction between the seat and back portions of shell 10 to facilitate tufting of the upholstery 45 as indicated at 46 in FIGS. 4 and 6.

To facilitate the mounting of arms 30, the peripheral portion of shell 10 includes four recesses 16 (FIGS. 1 and 2), one being located at each side of the seat portion of shell 10 and one being located at each side of the back portion thereof. In order to facilitate the securing of trim shell 20 to structural shell 10, a pair of clips 17 are provided, each of which is bolted to the face of shell 10 by bolts 18 (FIG. 8), and which extend rearwardly through openings 19 in shell 10 and then extend vertically upwardly on the rear side of shell 10 (FIGS. 1, 2 and 8). These upper extremities are flanged, 17a in order to facilitate the easy securing of trim shell 20.

Trim shell 20 is preferably injection molded of polypropylene. This provides an impact resistant decorative shell at a reasonable cost. It need only be sufficiently thick that it holds a desired design configuration. It has been found that a thickness of about nine sixty-fourths of an inch is acceptable.

Protruding from the inner face of shell 20 are a pair of clip wells 21 (FIGS. 1 and 7) which cooperate with clips 17 on shell 10 in order to facilitate the joining of trim shell 20 to structural shell 10. Each well 21 projects from the surface of trim shell 20 and has an open bottom as is indicated by the arrow in FIG. 7.

Trim shell 20 also includes a recessed portion 22 in the base or seat covering portion thereof. This is sufficiently large to accommodate the seat supporting pan 51 of chair base 50 when the latter is secured to the assembled structural shell 10 and trim shell 20. Holes 23 are provided at the four corners of recessed portion 22 whereby nuts can pass through trim shell 20 into structural shell 10.

Finally, a decorative bumper strip 24 is secured around the peripheral edge of trim shell 20 (FIGS. 6 and 8). This strip is preferably made of polyvinyl chloride and is channeled so as to snap over the peripheral edge of trim shell 20. It serves as a bumper and it also serves to fill any slight gaps between the edge of trim shell 20 and structural shell 10.

If desired, arms 30 can be secured to structural shell 10 in the manner indicated in FIG. 5. A curved steel rod 31 provides the structural strength for arm 30. The ends of rod 31 wrap

around the peripheral edge of shell 10 to the rear of the seat portion at one end and to the rear of the back portion at the other end. These end portions of rod 31 reside in recessed channels 16 such that they do not extend a substantial distance beyond the peripheral edge of structural shell 10. They are then bolted to T-nuts embedded in structural shell 10 by means of bolts 32 or the like.

A trim portion 33, preferably of compression molded matte finish phenolic plastic, is secured over curved rod 31. It includes a channel portion 34 which fits over and encompasses rod 31, and it is bolted thereto by means of bolts 35 extending through rod 31 and into well nuts embedded in trim 33.

The covering for structural shell 10 begins with a laminated seat cushion 41 which is adhered by adhesive to the seat portion of structural shell 10. The first layer of laminate is a very firm density polyurethane material while the second layer is a softer density polyurethane material. A medium density cushion 42 is adhered by means of adhesives to the face of the back portion of structural shell 10 in the area which will have to support the lumbar region of a person seated on the chair. A softer urethane cushion 43 is adhered to the face of structural shell 10 in the shoulder supporting regions thereof (FIG. 6). In this manner, the lumbar region of a person's back is supported by a heavier density cushion 42 while the shoulder regions, which require less support, are supported by a softer foam cushion 43.

The cushions 41, 42 and 43 are covered with a continuous layer of padding material 44 which in turn is covered with upholstery 45. Both the continuous layer of padding 44 and the upholstery 45 are wrapped around the peripheral edge of structural shell 10 and are secured to the rear side thereof by means of staples 49 or the like (FIG. 8). Staples 49 are preferable since it is easier to staple than to glue. Thus, it is significant that structural shell 10 is rigid and dense such that it will hold staples 49 properly.

Upholstery 45 can be tufted as at 46 (FIGS. 4 and 6) by sewing threads 47 through upholstery 45 at selected points, pulling both ends of each thread 47 through a hole 15, and stapling the ends of the thread to the rear face of structural shell 10 by means of staples 48.

Once the covering material 40 and the arms 30 are in place on shell 10, trim shell 20 can be secured to shell 10. The flanged ends 17a of clips 17 are slipped into the openings in the clip wells 21 on trim shell 20. Because the clips are flanged at their end portion 17a, they can be more easily located with respect to clip wells 21 and can be more easily slid into position. The rods 31 of arms 30 are recessed in channels 16, extending no farther beyond the peripheral edge 10a than the thickness of upholstery 45 and padding 44. Thus, the perimeter of trim shell 20 fits snugly against structural shell 10.

With structural shell 10 and trim shell 20 so joined, base 50 can be secured to structural shell 10. Base 50 is aligned such that its seat supporting pan 51 is positioned within recess 22 in trim shell 20 (FIG. 7). Bolts 52 are passed through holes in the four corners of seat supporting pan 51, through the holes 23 in recessed portion 22 of trim shell 20 and into the T-nuts 12 which are embedded at the corners of rectangular rib 11 of structural shell 10. By passing through trim shell 20, bolts 52 serve not only to secure structural shell 10 to base 50, but also to provide additional securance of trim shell 20 to structural shell 10.

Because of the unique construction outlined above, the edge of upholstery 45 and the means securing it to the rear of structural shell 10 are completely hidden from view by trim shell 20. Similarly, the ends of arms 30 which are joined to the rear of structural shell 10 are hidden. Because of the recessed channels 16, the passage of the arm supporting rods 31 around to the rear of structural shell 10 does not in any way interfere with the close fit which is achieved between the peripheral edge of trim shell 20 and structural shell 10. The unique arrangement of different density cushions on different portions of the back of structural shell 10 insures maximum comfort from the chair of this invention. Because all of the cushions

41, 42 and 43 are held by adhesive to the face of structural shell 10, they cannot bunch and shift around. This is also true of padding 44 since it comprises a continuous layer which is stapled to the rear of structural shell 10 at its peripheral edge.

It is also significant that the structural shell 10 and the trim shell 20 when joined together render structural shell 10 more rigid than it is when standing alone. Thus, this lamination which is achieved by tightly securing the two shells together makes it possible to use less costly construction in manufacturing structural shell 10.

Most importantly, maximum compatibility is achieved between the design objectives of providing structural strength and attractive appearance. Even though the material of which structural shell 10 is constructed does not have a suitable surface appearance for many purposes, it can be used in the construction of this chair for any purpose since the structural shell 10 is completely hidden from view when the chair is assembled. Applicant has created a unique marriage of heretofore divergent design objectives and accordingly, has made a significant contribution to the chair design art.

It will be understood that the above is merely a preferred embodiment of this invention and that many alterations and changes can be made without departing from the spirit and broader aspects of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A chair comprising a load bearing structural shell with integral seat and back; means for covering the front face of said structural shell; a molded, plastic non-load bearing trim shell having a decorative exterior appearance, integral seat and back covering portions for covering generally the rear surfaces of said structural shell, and sufficient thickness and rigidity to hold a desired design configuration; said trim shell being secured to said structural shell and being positioned to cover the rear of said structural shell to thereby give the chair a decorative exterior appearance.

2. The chair of claim 1 which comprises: a chair base having a seat supporting pan which is positioned within an upwardly projecting recess in said seat covering portion of said trim shell; means securing said supporting pan to said structural shell through said trim shell.

3. The chair of claim 2 in which the bottom of said structural shell comprises a downwardly projecting, generally rectangular rib to provide said structural shell with increased thickness and rigidity in the area of connection to said seat supporting pan.

4. The chair of claim 1 which comprises a continuous arm secured at either side thereof; one end of each arm extending around to the rear of said structural shell back and being secured thereto and the other end extending around to the rear of said structural shell seat and being secured thereto; said seat and said back each including a recessed channel in the peripheral edge portion of said structural shell for accommodating the thickness of said arm such that said trim shell can be snugly secured to the rear of said structural shell and thereby cover the connection of said arms to said structural shell.

5. The chair of claim 1 in which said means for covering the face of said structural shell comprises: cushioning secured to the face of said structural shell; upholstery covering said cushioning and extending around the peripheral edge of said shell to the rear thereof; said upholstery being secured at its perimeter to the rear of said structural shell, and being hidden from view at its perimeter by said trim shell.

6. The chair of claim 5 which comprises: a continuous layer of soft padding material covering said cushioning material and being covered by said upholstery and extending around the peripheral edge of said structural shell, beneath said upholstery, and being secured to the rear of said structural shell along with said upholstery.

7. The chair of claim 5 in which said structural shell comprises: a plurality of holes therethrough along the junction between said seat and back; said upholstery being tufted along

the junction between the seat and back by means of threads sewn thereto and being pulled through said plurality of holes and stapled to the rear of said structural shell, hidden from view by said trim shell.

8. The chair of claim 1 in which said structural shell comprises a plurality of integral, reinforcing ribs extending down said back on the rear side thereof and around to the bottom of said seat.

9. The chair of claim 5 in which said cushioning comprises: a first cushion being applied to the face of said back in the lumbar supporting region thereof; a second cushion being applied to the face of said back in the shoulder supporting region thereof; said first cushion being of heavier density than said second cushion in order to provide greater support to the lumbar region of a person's back.

10. The chair of claim 1 in which the peripheral edge of said trim shell is covered by an elongated bumper strip to provide edge protection and to fill any slight gaps between said peripheral edge and said structural shell.

11. A chair comprising: a molded, high impact polystyrene structural shell having sufficient thickness to provide an integral, load bearing seat and back; means for covering the front face of said shell; a molded, decorative polypropylene non-load bearing trim shell for covering the rear surfaces of said structural shell, the thickness of said trim shell being sufficient to give it enough rigidity to hold a desired design configuration; means for securing said trim shell to said structural shell whereby the exterior of said chair is given a decorative appearance.

12. The chair of claim 11 in which said structural shell comprises integral reinforcing ribs to give it added rigidity in strength.

13. The chair of claim 1 with said trim shell being rigidly secured to the back and to the seat of said structural shell to increase the rigidity thereof.

14. The chair of claim 4 in which said arm comprises: a metal support rod defining the general configuration of said arm and including a first end portion bent inwardly from the generally vertical plane of the arm to wrap around the underside of said structural shell seat and a second end portion bent inwardly from said generally vertical plane to wrap around the rear of said structural shell back; said first and second end portions being secured to said structural shell; a decorative trim member having a channel on the underside thereof for receiving said metal support rod, except for said first and second end portions; means securing said trim member to said support rod

with said support rod within said channel.

15. The chair of claim 1 in which an arm is secured to either side thereof, said arm comprising: a metal support rod defining the general configuration of said arm and including a first end portion bent inwardly from the generally vertical plane of the arm to wrap around the underside of said structural shell seat and a second end portion bent inwardly from said generally vertical plane to wrap around the rear of said structural shell back; said first and second end portions being secured to said structural shell; a decorative trim member having a channel on the underside thereof for receiving said metal support rod, except for said first and second end portions; means securing said trim member to said support rod with said support rod within said channel.

16. A chair comprising: an inner shell with a seat and a back; means for covering the face of said inner shell; an outer shell having seat and back covering portions; said outer shell being secured to said inner shell and being positioned to cover the rear of said inner shell; a continuous arm secured at either side of said chair; one end of each arm extending around to the rear surface of said inner shell back and being secured thereto and the other end extending around to the under surface of said inner shell seat and being secured thereto; said seat and said back each including a recessed channel in the peripheral edge portion of said inner shell for accommodating the thickness of said arm such that said outer shell can be snugly secured to the rear of said inner shell and thereby cover the connection of said arms to said inner shell.

17. The chair of claim 16 in which said arm comprises: a metal support rod defining the general configuration of said arm and including a first end portion bent inwardly from the generally vertical plane of the arm to wrap around the underside of said inner shell seat and a second end portion bent inwardly from said generally vertical plane to wrap around the rear of said inner shell back; said first and second end portions being secured to said inner shell; a decorative trim member having a channel on the underside thereof for receiving said metal support rod, except for said first and second end portions; means securing said trim member to said support rod with said support rod within said channel.

18. The chair of claim 17 in which said inner shell comprises a structural load bearing shell and said outer shell comprises a molded, plastic non-load bearing trim shell having a decorative exterior appearance and sufficient thickness and rigidity to hold a desired design configuration.

* * * * *

50

55

60

65

70

75