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(54) **One piece plastic chair**

(57) A one piece integrally formed moulded plastic chair (11) is disclosed having a seat (2), backrest (3) and legs (4-7). A U-shaped rib (19) extends between the upper regions of the rear legs (6, 7) to cross-brace same.

A gap (24) is provided between the cross piece (20) of the rib (19) and the underside of the seat (2). In use the seat (2) deforms to reduce the size of the gap (24) under the weight of a sitter. This deformation thereby provides a more comfortable seat.

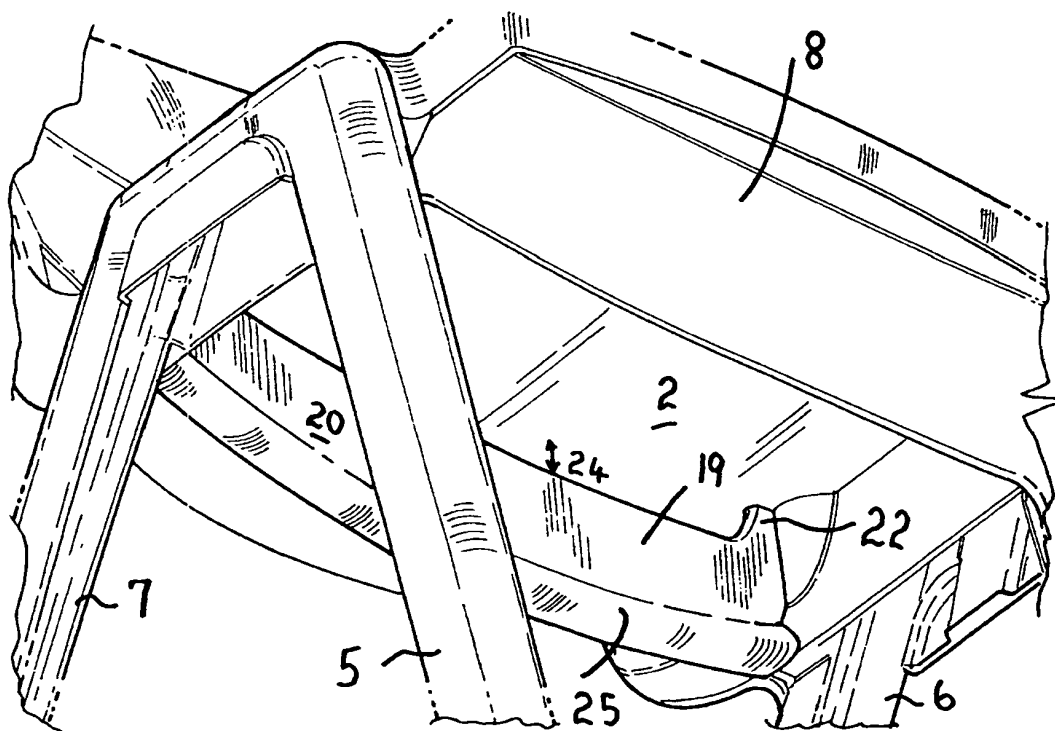


Fig. 4

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Description

[0001] The present invention relates to chairs and, in particular, to integrally moulded, one piece plastic chairs.

[0002] When plastic chairs were originally fabricated several decades ago, a plastic shell was moulded and this was screwed or otherwise connected to a steel frame which formed at least the legs of the chair. Such plastic shells did not include substantial reinforcing ribs and were thus relatively flexible. The metal legs were rigid and the shell could therefore flex relative to the frame and legs.

[0003] In more recent times, one piece chairs where the seat, backrest and legs of the chair are all simultaneously formed have also been produced. These are the chairs with which the present invention is concerned.

[0004] Such chairs are made by injection moulding and although the moulds for such chairs are very expensive, the individual chairs produced by such moulds are inexpensive and, if able to be sold in sufficiently large numbers, more than pays for the cost of the mould or tool. Educational institutions including schools and universities are a large market for such chairs. A prior art chair of this type is illustrated in Figs. 1 and 2 and is known from Australian Design Registration No. 316,934 (to which US Design Patent No. D607,654 corresponds). As seen in Fig. 1, the prior art chair 1 has a seat 2 and a backrest 3 and four legs 4-7 which are respectively a left front leg 4, a right front leg 5, a left rear leg 6 and a right rear leg 7.

[0005] As seen in Fig. 2, the upper portions of the front legs 4, 5 are joined by a front rib 8 and the upper portions of the rear legs 6, 7 are joined by a rear rib 9. This provides a strong cross brace for each pair of legs. Both the front rib 8 and rear rib 9 extend across the underside of the seat 2 and are integrally formed with it. This has the consequence that the seat 2 is relatively rigid and so provides a firm support for the sitter.

[0006] The genesis of the present invention is a desire to provide an essentially similar chair to that of the chair 1 but in which the seat 2 exhibits some "give" or flexibility and so is able to deform under the weight of a sitter. This has the consequence that the seat 2 to some extent moulds itself to the shape of the sitter. This has the result that the chair is more comfortable for the sitter.

[0007] In accordance with a first aspect of the present invention there is disclosed an injection moulded one piece plastic chair comprising:

a seat having a front region and a rear region, a pair of front legs, and a pair of rear legs;

wherein said seat and legs are integrally connected to each other, the upper portions of said front legs are interconnected by a first rib which projects from the underside of said seat across substantially the width of said seat front region and provides a support for said seat front region and a cross-brace for said front legs; and

the upper portions of said rear legs are connected by a second substantially U-shaped rib which is located below said seat rear region, which forms a cross-brace for said rear legs, which extends across substantially the width of said seat rear region, and which is connected with said seat only adjacent said rear legs, so that a first opening is formed between the underside of said seat and said second rib, whereby said rear region of said seat can flex toward said second rib under the load of the weight of a sitter.

[0008] According to another aspect of the present invention there is provided a method of deforming the seat of a one piece integrally formed moulded plastics chair under load.

[0009] A preferred embodiment of the invention will now be described, with reference to the accompanying drawings in which:

Fig. 1 is a front perspective view of a prior art chair; Fig. 2 is an inverted plan view of the chair of Fig. 1; Fig. 3 is a perspective view from the underside looking from the rear of the chair of the preferred embodiment;

Fig. 4 is a perspective view from the underside and looking from the front of the chair of Fig. 3;

Fig. 5 is a side elevational view of the chair of Figs. 3 and 4 with part of the view being a vertical cross-section;

Fig. 5A is an enlarged view the rib 19 of Fig. 5;

Fig. 6 is a side-elevational view similar to Fig. 5 but illustrating the deformation of the seat under the load imposed by a sitter; and

Figs. 7A - 7I are each cross-sectional views similar to Fig. 5 but each illustrating a rib profile arrangement. In Figs. 7A - 7I the cross hatching utilized in Figs. 5 and 5A has not been used so as to not overburden the drawings.

[0010] In Figs. 3-6, the chair 11 of the preferred embodiment is illustrated with those portions of the chair 11 which are the same as the chair 1 being allocated like designation numbers. Thus the seat 2, backrest 3 and legs 4-7 are as before. In addition, the front rib 8 which projects from the underside of the seat 2 and interconnects the front legs 4, 5 is also unchanged.

[0011] However, as seen in Figs. 3 and 4, the rear rib 19 which interconnects the rear legs 6, 7 is changed so as to be generally arcuate or U-shaped having a cross piece 20 and a right upright 21 and a left upright 22. As a consequence of this construction, there is a gap 24 between the upper edge of the cross piece 20 and the lower surface of the seat 2.

[0012] As seen in Fig 4, the lower forward edge of the rear rib 19 is provided with a thickened portion 25 to increase the rigidity of the rear rib 19. Preferably the thickened portion 25 is hollow and is formed by injecting gas into the thickened portion 25 thereby reducing the amount of plastic contained in the rear rib 19 and allowing

the rib to cool rapidly after moulding. The thickened portion 25 (which adds to the rigidity of the cross-brace between the rear legs 6,7) compensates both for the material removed from the rib 19 (relative to the rib 9 of Fig. 2) so as to create the gap 24 and for the fact that the rib 19 is only connected to the seat 2 by means of the up-rights 21 and 22.

[0013] Turning now to Figs. 5 and 6, it will be seen from Fig. 5 that with the chair 11 unloaded, the gap 24 between the seat 2 and cross piece 20 of rib 19, is appreciable. However, as seen in Fig. 6, with the chair 11 loaded by the weight of the sitter, the seat 2 has moved downwardly thereby reducing the size of the gap 24. This downward movement of the seat 2 allows the seat 2 to flex and to conform to some extent to the shape of the body of the sitter. This makes the seat 2 more comfortable and is thought to prolong sitter concentration. By comparison the seat of the prior art chair 1 of Fig. 1 and 2 is not "flat" or smooth because the presence of the rib 9 creates a corresponding inflexible ridge like undulation on the upper surface of the prior art seat which can be uncomfortable.

[0014] An unexpected benefit of the above described construction is that since most of the rear rib 19 does not contact the under surface of the seat 2, there is less likelihood for the upper surface of the seat 2 to be blemished. Such blemishes are sometimes caused by the existence of an integrally formed rib under the surface of the seat 2 which can create differential rates of cooling of the moulded plastic.

[0015] Turning now to Figs. 7A - 7I, in each drawing is illustrated one of a corresponding series of rib profiles 29-109 each of which is a replacement for rib 19. Thus each of the ribs 29-109 can operate in conjunction with the air gap 24 and provide a sufficiently rigid cross-brace for the rear legs 6,7 because each rib's stiffness is greater than a simple planar rib (such as rib 9). Each rib is illustrated in cross-sectional fashion in the same manner as Fig. 5 save that the cross-hatching is omitted.

[0016] For rib 19, the increase in stiffness is achieved by a single thickened region 25 which is preferably hollow. For rib profile 29 of Fig. 7A, the increase in stiffness is achieved by a kink or bend. For rib profile 39 of Fig. 7B, the increase in stiffness is achieved by both a kink and a thickened region 35 in the middle of the rib 39, the thickened region 35 again preferably being hollow.

[0017] In Fig. 7C, the rib 47 is provided with a J-shaped profile or cross-sectional shape to provide the increase in stiffness. In both Figs. 7D and 7E the rib profiles 59 and 69 respectively are provided with a thickened region 55 and 65 which are respectively of circular and approximately tear drop cross-sectional shapes. Again, preferably both thickened regions 55 and 65 are hollow.

[0018] In Figs. 7F and 7G, the corresponding rib profiles 79 and 89 are each provided with two thickened regions 75A, 75B and 85A, 85B respectively. These thickened regions extend in the same direction in Fig. 7F and in opposite directions in Fig. 7G. In Fig. 7H the in-

crease in stiffness is achieved by a double J (or S-shaped) profile for the rib 99. In Fig. 7I the rib profile 109 is provided with three thickened regions 125A, 125B and 125C.

[0019] It will be appreciated by those skilled in the plastic moulding arts that the tool required to mould the chair of Figs. 3-6 is more complicated than the tool required to mould the prior art chair of Figs. 1 and 2 with a conventional planar rib 9. This is because retractable parts are required to form the gap 24. Alternatively, conventional ejector mechanisms can be shaped to, and thereby used to, form the gap 24.

[0020] The foregoing describes only some embodiments of the present invention and modifications, obvious to those skilled in the plastic moulding arts, can be made thereto without departing from the scope of the present invention.

[0021] The term "comprising" (and its grammatical variations) as used herein is used in the inclusive sense of "including" or "having" and not in the exclusive sense of "consisting only of".

Claims

1. An injection moulded one piece plastic chair comprising:

a seat having a front region and a rear region, a pair of front legs, and a pair of rear legs; wherein said seat and legs are integrally connected to each other, the upper portions of said front legs are interconnected by a first rib which projects from the underside of said seat across substantially the width of said seat front region and provides a support for said seat front region and a cross-brace for said front legs; and the upper portions of said rear legs are connected by a second substantially U-shaped rib which is located below said seat rear region, which forms a cross-brace for said rear legs, which extends across substantially the width of said seat rear region, and which is connected with said seat only adjacent said rear legs, so that a first opening is formed between the underside of said seat and said second rib, whereby said rear region of said seat can flex toward said second rib under the load of the weight of a sitter.

2. The chair as claimed in claim 1 wherein the second rib is shaped to have an increased stiffness relative to a planar rib moulded together with said seat.
3. The chair as claimed in claim 2 wherein said second rib has at least one portion of appreciable thickness in a front to rear direction relative to said seat.

4. The chair as claimed in claim 3 wherein said second rib is at least partially hollow.
5. The chair as claimed in claim 2 wherein said second rib has a cross-sectional shape which is bent or curved or kinked. 5
6. The chair as claimed in any one of claims 1 to 5 and having a backrest extending upwardly from said seat rear region. 10
7. The chair as claimed in claim 6 and having a second opening between said backrest and said seat whereby said backrest can flex relative to said seat. 15

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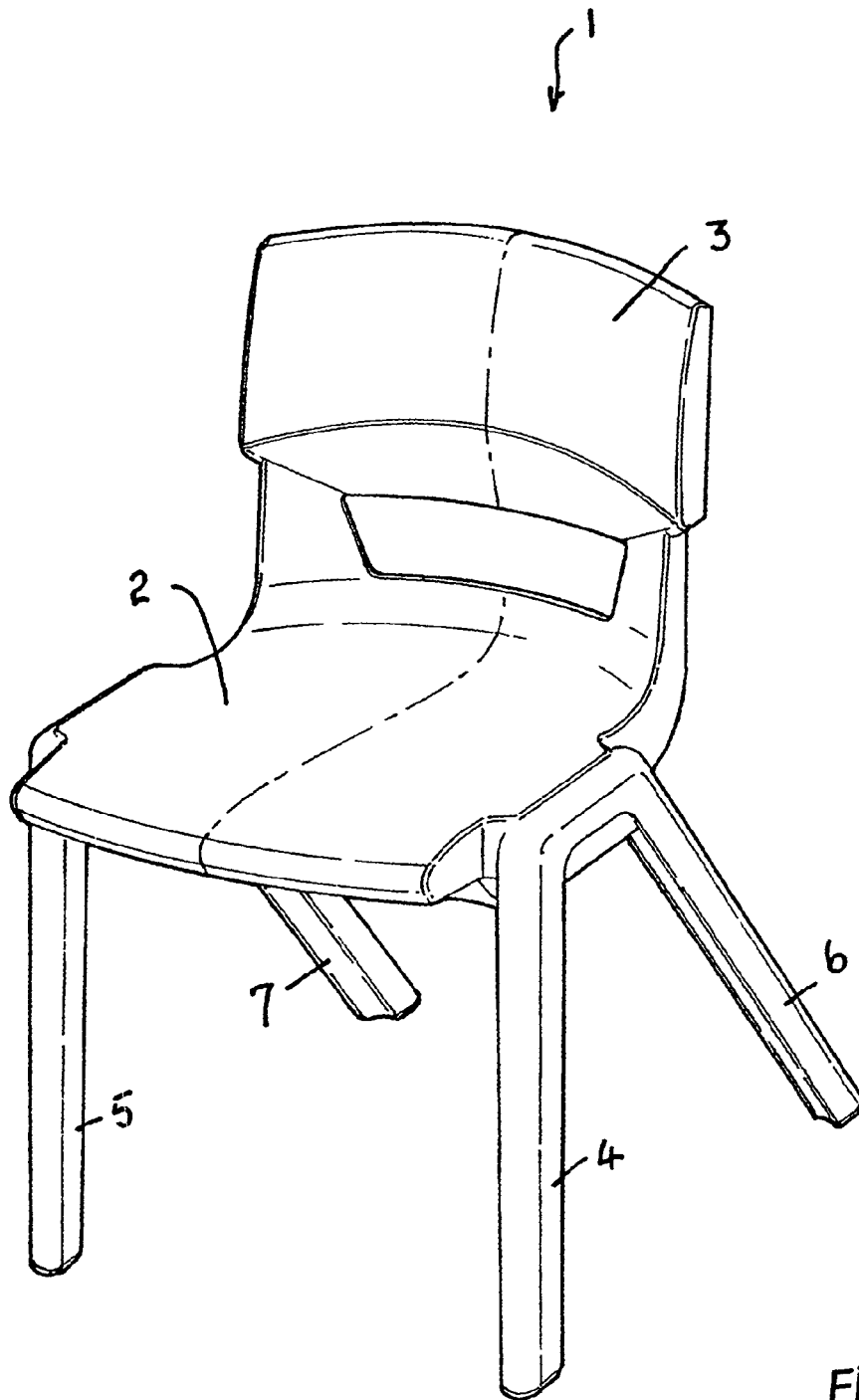


Fig. 1
PRIOR ART

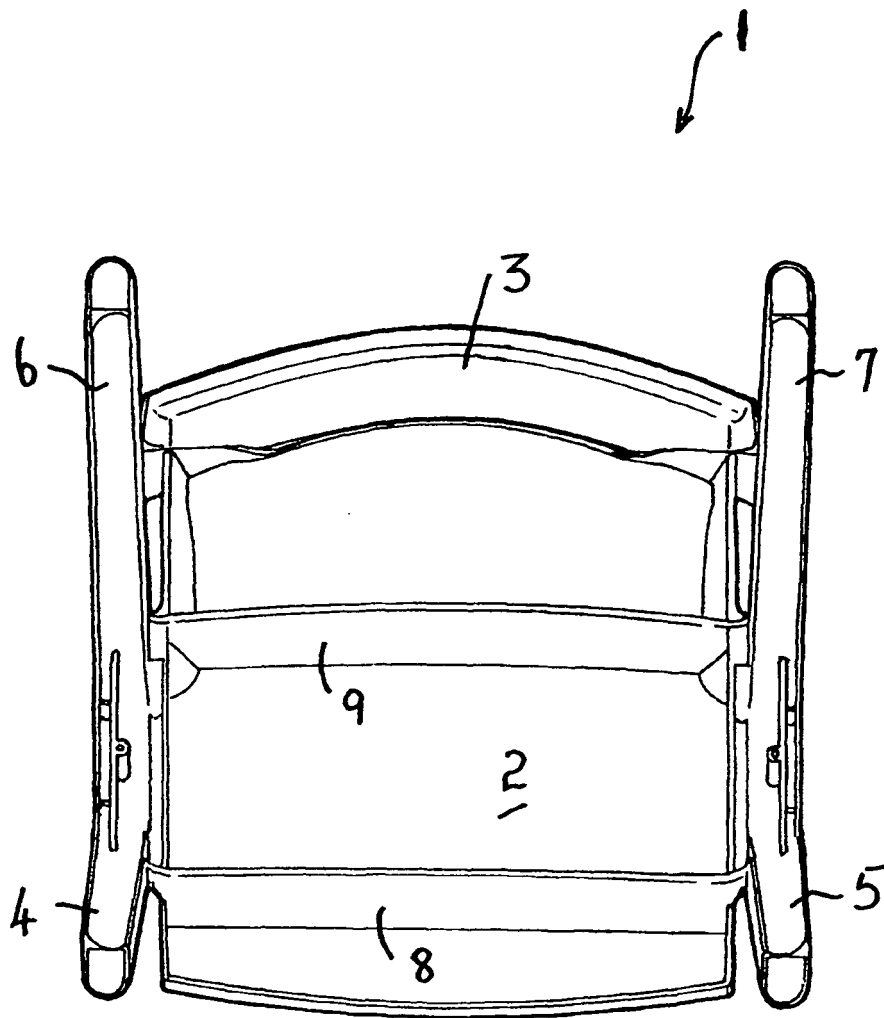


FIG. 2
PRIOR ART

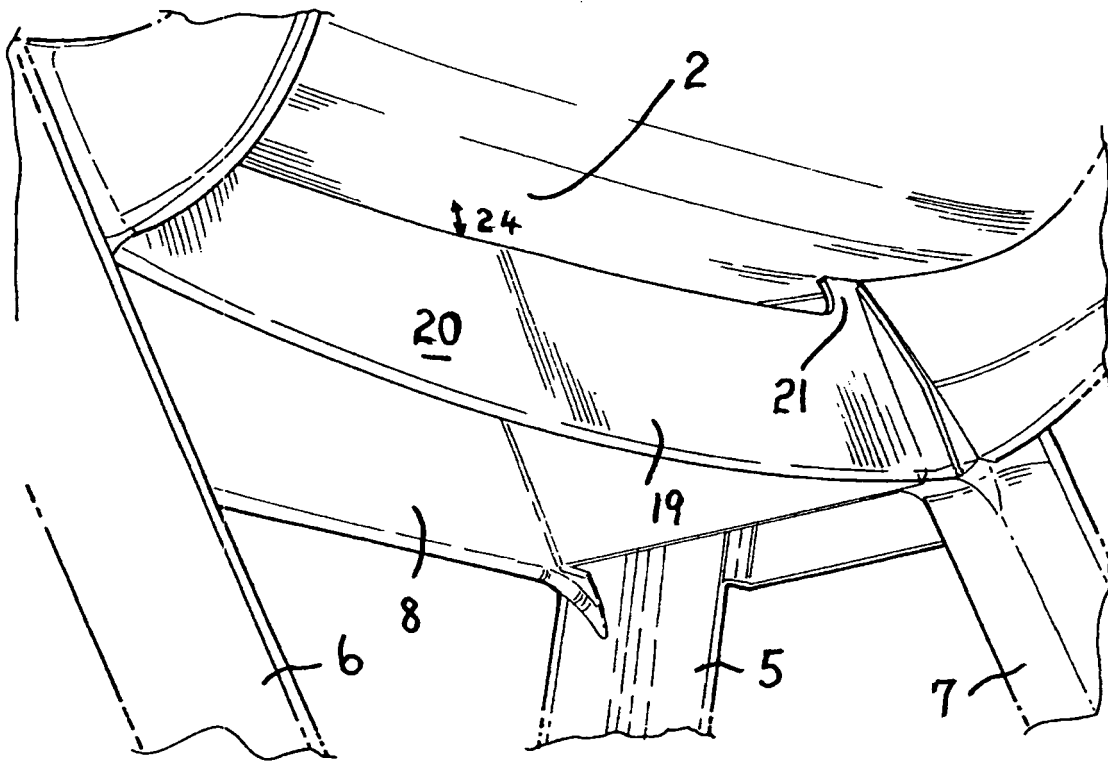


FIG. 3

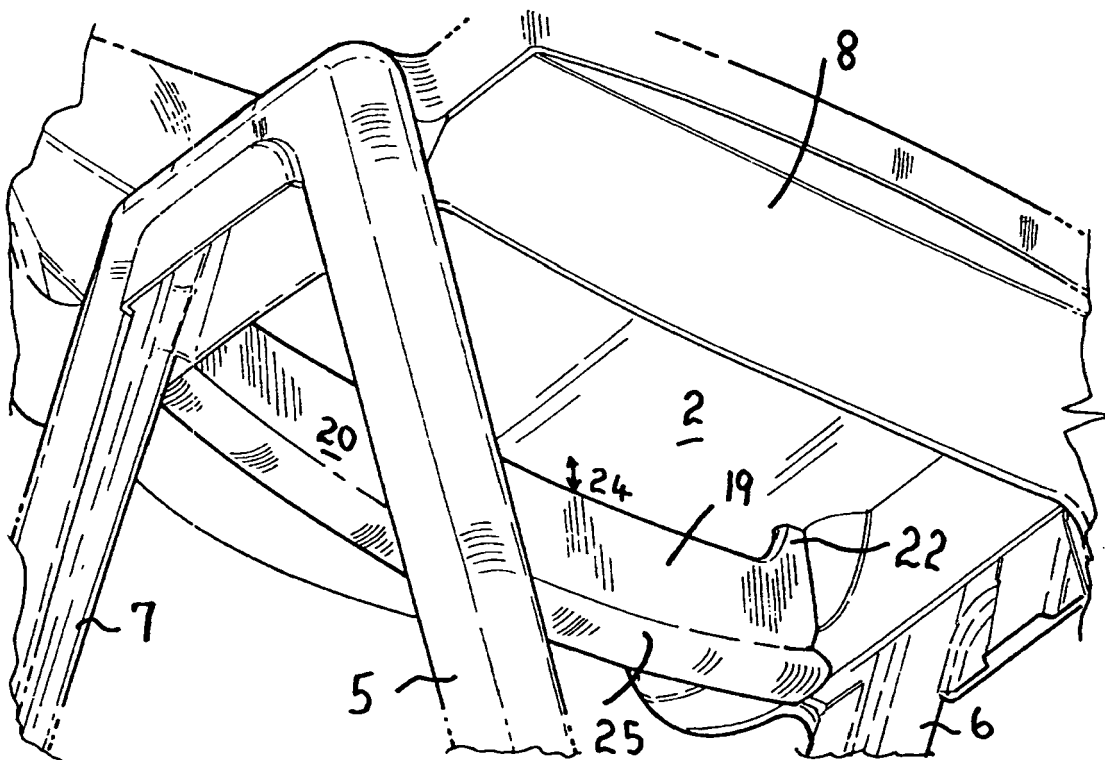


FIG. 4

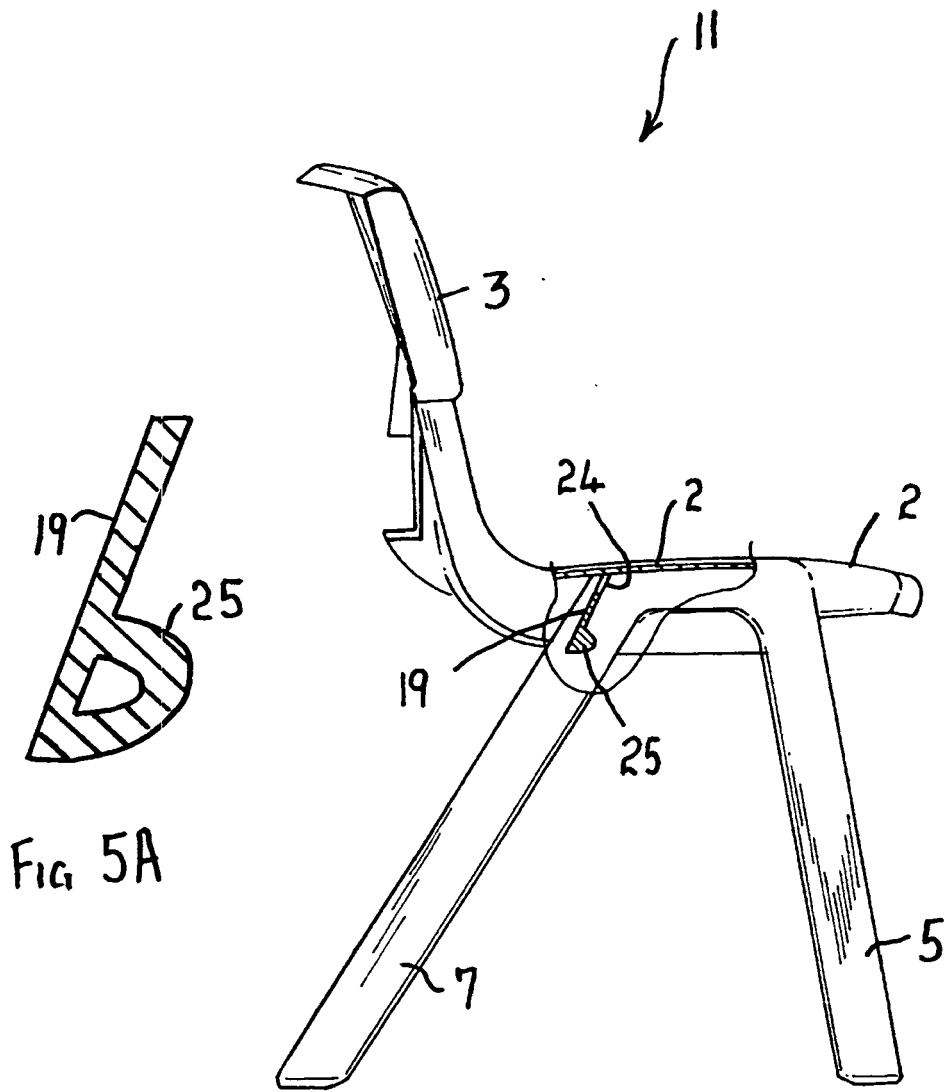


Fig. 5

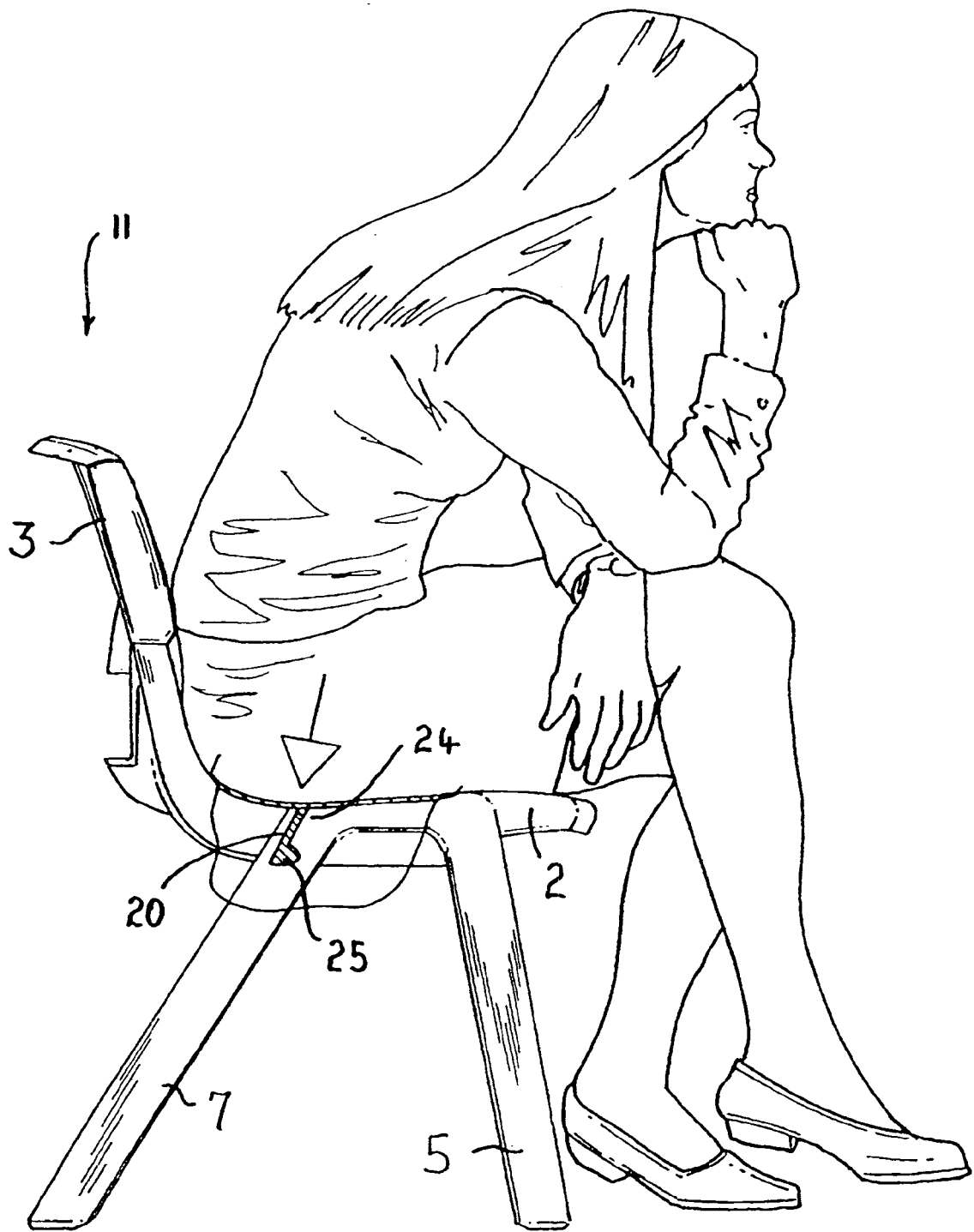


FIG. 6

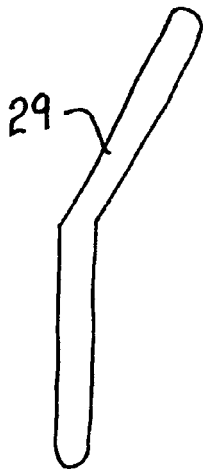


FIG. 7A

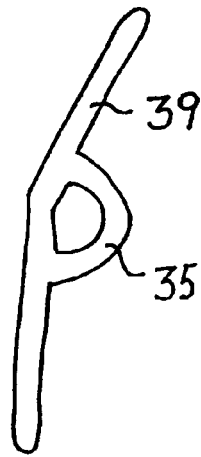


FIG. 7B

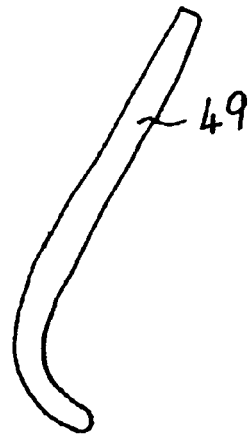


FIG. 7C

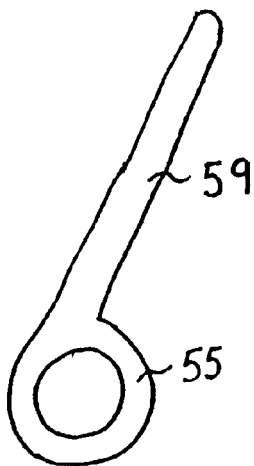


FIG. 7D



FIG. 7E

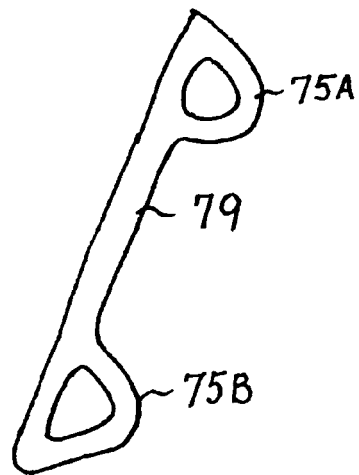


FIG. 7F

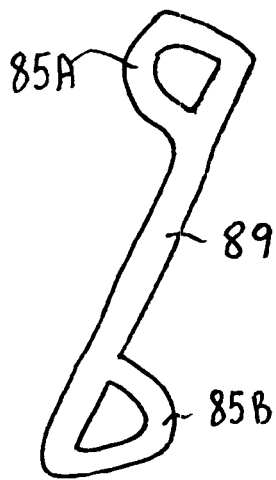


FIG. 7G

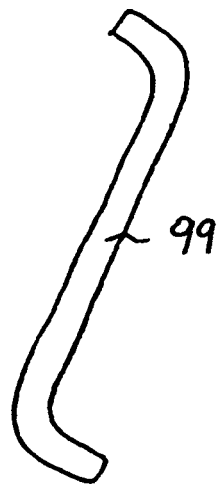


FIG. 7H

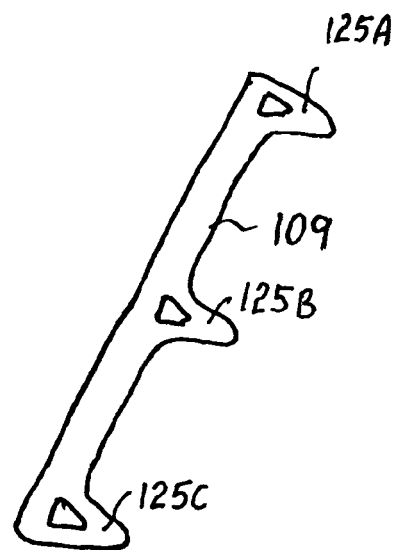


FIG. 7I



EUROPEAN SEARCH REPORT

Application Number
EP 11 25 0899

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1	Place of search Munich		Date of completion of the search 20 March 2012
		Examiner Behammer, Frank	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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