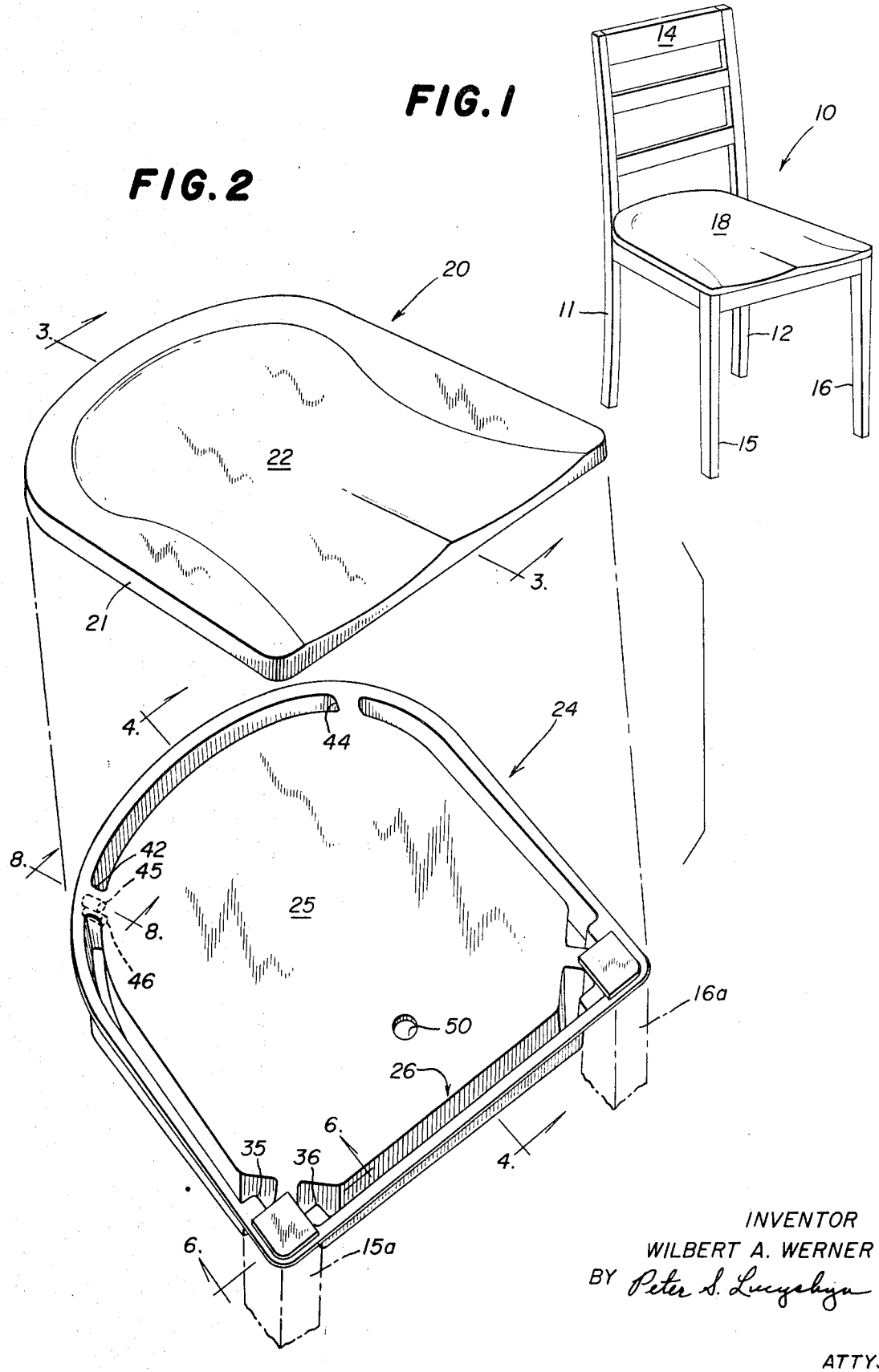
Sept. 8, 1970 W. A. WERNER 3,527,498

METHOD AND APPARATUS FOR CONSTRUCTING FURNITURE PIECES OF PLASTIC

Filed April 9, 1968 2 Sheets-Sheet 1

FIG. 1

FIG. 2



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METHOD AND APPARATUS FOR CONSTRUCTING FURNITURE PIECES OF PLASTIC

Filed April 9, 1968 2 Sheets-Sheet 2

FIG. 3

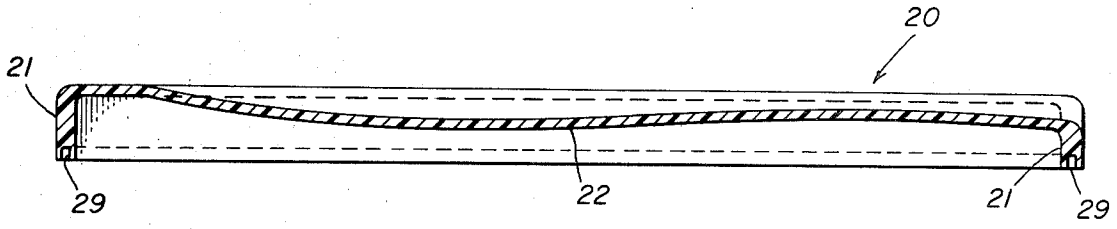


FIG. 4

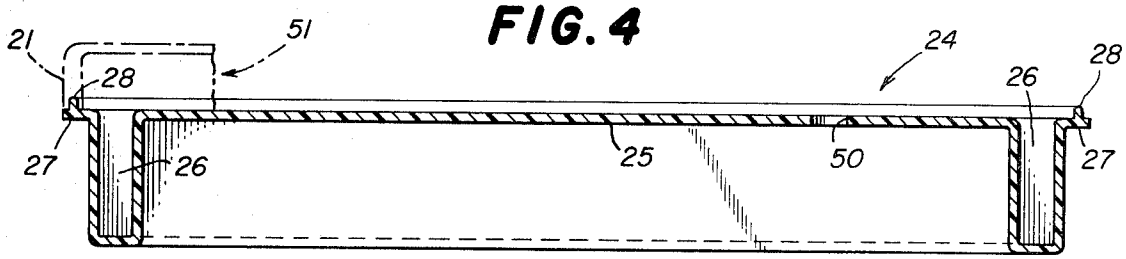


FIG. 5

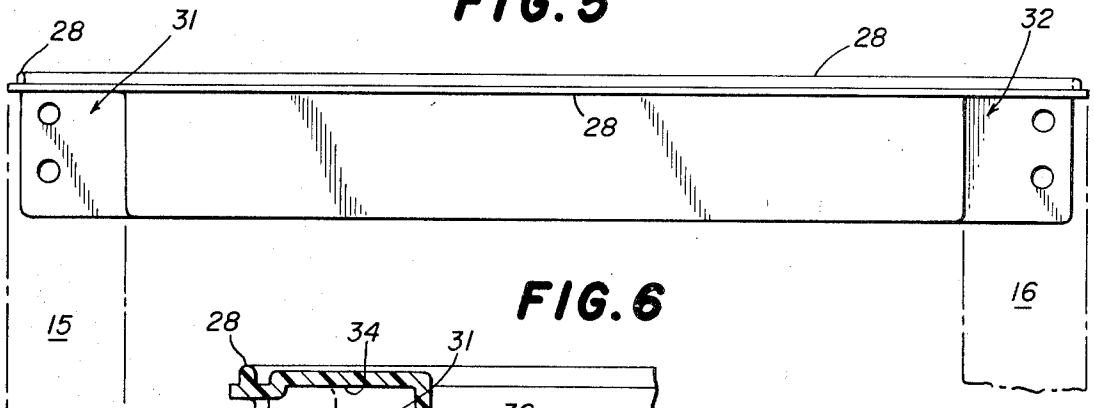


FIG. 6

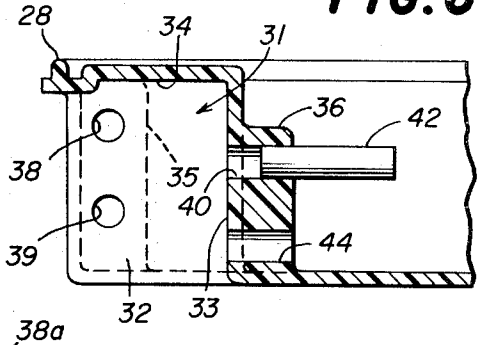


FIG. 7

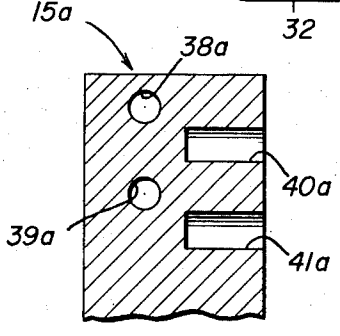
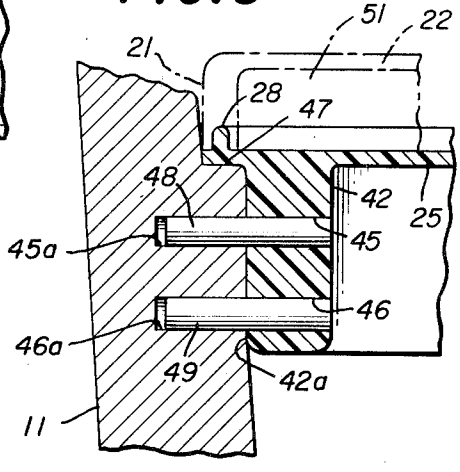


FIG. 8



United States Patent Office 3,527,498 Patented Sept. 8, 1970

3,527,498

METHOD AND APPARATUS FOR CONSTRUCTING FURNITURE PIECES OF PLASTIC

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U.S. Cl. 297—452 7 Claims

ABSTRACT OF THE DISCLOSURE

A furniture piece including a top and a bottom shell, respectively, assembled to form a load bearing surface, for example a seat of a chair, and having integrally molded joint means in the bottom shell permitting attachment of legs, the assembled joints being held by dowels adapted to fit into registering openings of said shell and said leg at each of the respective joints, with cellular plastic forced into the cavity between the respective shells.

The present invention relates to furniture pieces made of plastic and more particularly to construction of the load bearing member of such furniture pieces, such as a seat of a chair or a top of a table.

The advantages of using plastics for manufacturing furniture pieces used in homes, offices, laboratories, industry, just to name a few uses, is well known. Explaining, plastic used to construct seats of chairs or tops of tables, desks, cabinets and the like, are resistant to moisture, solvents and stains. The plastic composition can be controlled to obtain the desired resistance to physical or chemical changes. Also, suitable dyes may be mixed in manufacturing the plastic to obtain a desired appearance. Regarding the latter, the plastic surfaces can even be given a wood-grained texture, for example, by etching the molding die to simulate a wood product. Also in using plastic instead of wood, it is not necessary to match grains in a particular manner to form a load bearing surface so as to prevent warping and splitting.

However, using presently known furniture construction practices, the use of plastic presents problems. Screws or other joint fastening means will not hold in a thin-walled plastic construction, and if solid plastic is used to construct a seat or a table top, for example, the furniture piece becomes undesirably heavy.

Accordingly, it is an object of the present invention to provide a plastic load bearing support surface, as exemplarily found in furniture and specifically in a chair seat, of a lightweight shell construction and having an improved joint construction for attaching structural members to the shell.

It is a more detailed object of the present invention in accordance with the above to construct a furniture support surface of thin-walled plastic shells which has strength as well as impact distributing properties by using a cellular filler material between the shells.

It is an overall object of the present invention to permit use of thin-walled plastic shell structures for forming furniture support surfaces so that the furniture pieces are of a knock-down type for easy shipment and can be economically manufactured, yet have an attractive appearance, are lightweight and are easily assembled at the place of use.

Other objects and advantages of the present invention will become apparent upon reading the following detailed description with reference to the drawings in which:

FIG. 1 is a perspective of a chair embodying the present invention;

FIG. 2 is an exploded perspective of a pair of shells used to form the seat in the chair of FIG. 1;

FIG. 3 is a section taken along 3—3 in FIG. 1;

FIG. 4 is a section taken along 4—4 in FIG. 2;

FIG. 5 is a front view of a portion of the seat shown in FIG. 2;

FIG. 6 is an enlarged section taken along 6—6 in FIG. 2;

FIG. 7 is a leg adapted for use as a first support in the chair of FIG. 1; and

FIG. 8 is an enlarged section taken along 8—8 in FIG. 2.

Turning first to FIG. 1, there shown is a chair **10**, representative of a piece of furniture constructed in accordance with the teachings of the present invention. The chair **10** is of conventional appearance and includes a pair of rear legs **11**, **12** with suitable back-supporting cross members **14**. At the front there are a second pair of legs **15**, **16**. Attached to the respective legs **11**, **12** and **15**, **16** is a substantially flat load bearing surface or seat **18** formed of suitable plastic. One plastic which has been found to serve satisfactorily, for example, is ABS plastic (Acrylonitrile-Butadiene-Styrene plastic) sold by Borg-Warner Corp. under the trade name Cycolac.

In accordance with the present invention, the seat **18** is formed of a pair of shells, a top and a bottom shell, respectively, with integrally molded joint means for distributing forces transverse to the respective shell walls adapted to permit attachment of the respective supporting structural members **11**, **12** and **15**, **16**. As herein illustrated, a top shell **20** is made of plastic by injection molding, a process well known in the plastic art, and has a relatively thin wall (see FIG. 3), for example, a tenth of an inch in thickness except for a peripherial wall portion **21**. As exemplarily shown, the shell has a body portion **22** suitably fashioned to comfortably fit a human posterior. This is the substantially flat load bearing surface. About the body portion **22** and downwardly extending therefrom in the exemplary embodiment is the integral peripheral wall portion **21**. The necessity for having peripheral wall portion **21** thicker than the body portion **22** is explained subsequently. The bottom shell **24** is also molded so as to have a thin wall structure, exemplarily shown as being of the same thickness as the upper shell **20** (see FIG. 5). As best shown in FIGS. 4 and 5, the bottom shell **24** includes a central body portion **25** and an integral trough **26** disposed about the periphery of the body portion **25**. The trough **26** includes an integral flange **27** preferably provided with a tongue **28** which is receivable in a complementarily formed groove **29** in the upper shell peripheral portion **21**. In the exemplary embodiment the peripheral wall portion **21** is thicker than the body portion **22** so as to be able to carry the tongue **28** and rest in fitting engagement with the flange **27** when assembled. Of course, other interfitting edge constructions can be utilized to effect a tight fit between the upper and lower shells. The need for the tight fit is explained subsequently. The trough **26** defining the periphery of the bottom shell **24** gives the assembled seat **18** an appearance of depth.

The lower shell **25** includes a pair of sections, herein shown as respective socket-like means **30**, **31** adapted to receive respective upper ends **15***a*, **16***a* of front supporting structural members or legs **15**, **16**. Describing these shell sections or sockets in more detail and particularly socket **31** which is representative (see FIG. 6), the latter includes side walls **32**, **33** and a cap portion **34** all molded as an integral part of the plastic bottom shell **24**. As best shown in FIG. 6, the socket cap **34** is formed with a recess and the respective side walls **32**, **33** are provided with respective bosses **35**, **36**. The latter are provided with openings, therein illustrated as a pair of openings **38**, **39** in boss **35** and **40**, **41** in boss **36**. The openings are adapted to receive a longitudinally extending joint mem-

ber, for example, a dowel, one dowel **42** being exemplarily shown. The trough **26** extends colinearly with the bosses and provides access to the respective openings so that the dowels can be suitably directed, for example, by hammering, into the upper portion **15***a* of leg **15**. Of course, the lower shell may be formed so as to permit access to the dowels from externally of the assembled shells.

To this end the leg **15** is fitted into the socket **31** so as to press juxtaposed the socket walls **32**, **33** and is provided with openings **38***a*, **39***a*, **40***a*, **41***a*, respectively, which register with corresponding socket openings. The recess in cap **34**, the sidewalls of the socket, and dowels provide a joint of great strength which in use has been found to support unexpectedly large weights. The particular chair has been purchased in substantial quantities by the U.S. Government, completely meeting specifications for this type of furniture item.

The rear supporting structural members or legs **11**, **12**, respectively, are mounted using dowels for joining the seat **18** and the legs. A pair of bosses **42**, **44**, respectively, are provided in the bottom shell **24** for carrying dowels. Only one of the fastening assemblies, those for leg **11**, is shown, it being representative of the joints between the seat, having a thin-walled plastic shell construction, and the rear legs. Turning to FIG. 8, there shown is a section of boss **42** including openings **45**, **46** for receiving dowels **48**, **49**, respectively, the boss openings registering with leg openings **45***a*, **46***a* to permit fitting of the dowels through both members, the seat lower shell and the rear leg **11**. The shell wall surface, herein shown as the outside wall of trough **26**, includes a section, integral with boss **42**, permitting the legs to be fitted snugly in juxtaposed relationship to the shell wall. Also in the exemplary structure, the leg **11** is provided with a ledge **47** upon which the flange **27** of the lower shell can rest and thereby provide support for the assembled seat carrying an applied load.

It is clear from the foregoing description, that the thin-walled plastic shell structure when assembled to form a load bearing surface, is of light weight. Furthermore, support members, i.e., legs **11**, **12**, **14** and **15**, respectively, can be rigidly connected to the plastic shell structure and the joints thereby formed could effectively transfer the load applied to the load bearing surface to the legs. If screws or like fastening means were utilized with the thin-walled plastic shell to mount structural members thereto, the plastic would most likely crack or the threads would "strip." However, following the teachings of the present invention, dowels or like longitudinally extending joint means can be driven into the structural member such as the chair, table or desk leg and a rigid support is effected for the furniture piece load bearing surface, i.e., seat, table or desk top. Also, the complete furniture piece may be assembled or disassembled easily to facilitate shipment. In addition, the integrity of the joints is maintained even when loads are applied from different angles, for example, if a person is "leaning back" or "squirming." Furthermore, 45° angle blocks, as separate members, are not necessary, yet leg bolts commonly used in furniture to effect strong joint construction are usable.

Once the structural members are attached or mounted on the lower shell, then the upper shell is fitted to the lower shell. To this end the upper shell is provided with the aforementioned groove **29** which, in the exemplary embodiment receives tongue **28** as the upper shell **20** is assembled with the lower shell **24**. A suitable bonding agent, such as epoxy glue or methylethyl ketone, are applied to the interfitting surfaces so that when the upper shell peripheral wall edge is pressed against the lower shell flange or shelf **27**, a completely assembled seat **18** as shown in FIG. 1 is formed.

As an additional feature of the present invention, to improve the load carrying ability of the seat and give it particularly desirable impact absorbing properties, a suitable filler material is directed through an opening **50** (see FIG. 2) exemplarily provided in the bottom shell **24**, and into a space **51** defined between the assembled shells **20**, **24**. One example of a suitable filler material is urethane, which is a cellular plastic. Preferably, a tight tongue and groove fit between the top and bottom shells is necessary to assure that filler material entering the cavity **51** does not escape along the joint between the respective shells. The filler also assures that the dowels do not back out of their engagement with the legs. Thus, the dowels can fit in somewhat loosely.

Another feature of the present invention includes the steps of constructing the furniture piece. The method can be summarized as follows: *first*, the respective shells **20**, **24** are molded of plastic so as to have a thin-walled construction. In the present instance the top shell **20** is provided with a peripheral skirt portion **21** having a groove **29**, and the bottom shell **24**, of similar thin-walled construction, is preferably provided with a complementary tongue **28** receivable in the aforesaid top shell groove. The respective shells **20**, **24** are formed so that they can fit together. The shells are also molded with dowel receiving structures. In the present instance these are shown as bosses having respective openings. As a subsequent step, dowels are inserted into these openings. Thereafter, as another step, structural members, such as legs, are positioned juxtaposed the side walls of one of the respective shells, in the illustrative embodiment the bottom shell **24**, and the dowels are driven into the registering openings provided in the structural members. As a result, a rigid joint is provided capable of supporting a load applied to the assembled shells. In the illustrative embodiment, the dowels are driven into position from inside the bottom shell, so that the next step involves installing the top shell **20** on the lower shell **24** after a suitable bonding agent has been applied to the interfitting portions of the respective shells. As can be appreciated, if access to the dowels could be obtained with the respective shells assembled, the latter step could be performed earlier in the construction of the furniture piece.

A final step which can be advantageously practiced is to provide a filler material for the space between the respective top and bottom shells so as to effect a strong, comfortable chair seat. This may be either a shredded polyurethane filler material forced into the cavity, or a foaming-in-place material which expands to fill the space **51**.

Though in the present instance the invention has been described with respect to a particular plastic furniture piece, i.e., a chair, the teachings are applicable in regard to construction of other furniture pieces, for example a table, which has a top that provides for loads applied thereto. It is clear that the teachings of the present invention can be advantageously applied wherein a thin-walled plastic construction is used for constructing a load bearing surface, as is widely followed in the furniture art.

While I have described my invention in connection with one specific embodiment and method, it is to be understood that this is by way of illustration and not by way of limitation and the scope of my invention is defined solely by the appended claims which should be construed as broadly as the prior art will permit.

I claim as my invention:

1. In a furniture piece or the like having a plurality of structural joints, the combination comprising a relatively thin-walled plastic shell adapted to provide a support surface, a plurality of sections of said shell wall adapted to engage respective legs, means integral with said shell wall at each of the joints extending transversely to said shell wall and of greater thickness than the latter, a first opening associated with each of said integral means adapted to receive a longitudinally extending joint member, a second opening associated with

each of said legs registerable with said respective first openings, and a plurality of interfitting longitudinally extending joint members, each one adapted to fit into one of said registering openings, said shell wall integral means and said interfitting joint members cooperating to distribute forces transverse to said shell wall and provide substantially rigid joints between said shell and said legs.

2. The combination of claim 1 wherein said respective shell wall sections engaging said respective legs, is formed with a complementary surface adapted to fit snugly against said legs so as to form a rigid joint when said longitudinal members are inserted.

3. In a furniture piece of the like having a substantially flat load bearing surface, the combination comprising a first top thin-walled plastic shell, a second bottom thin-walled plastic shell adapted to engage said top shell, a leg, a section of one of said shells formed to engage said leg, a boss molded integral with said shell section adapted to distribute forces transverse to the said shell thin walls, a first opening in said leg, a second opening in said shell section and said boss, said respective first and second openings being registerable, a dowel positioned in said first and second openings, respectively, to provide a substantially rigid joint between said shell and leg, thereby providing support for the load bearing surface formed by said interfitting shells.

4. The combination of claim 3 wherein the respective engaging portions of said top and bottom shells, respectively, are complementarily shaped so as to fit together and prevent disassembly of said shells when a cellular material is forced into the cavity defined between said assembled shells.

5. In a furniture piece such as a chair or table having a substantially flat load bearing surface, the combination comprising a first thin-walled plastic shell adapted to define the flat load bearing surface, a second bottom thin-walled plastic shell adapted to engage said top shell, said interfitting shells formed so as to define a space therebetween, a plurality of legs adapted to provide support for said fitted shells, a plurality of respective shell sections formed to engage each of said respectvie legs, a plurality of bosses, one molded integral with each of said shell sections, and adapted to distribute forces transverse to said shell thin walls, a first set of openings, one in each of said legs, a second

set of openings, one in each of said shell sections and extending through said respective bosses, said openings being registerable, one associated with said shell and the other associated with said leg, a plurality of dowels, one positioned in each of said registering openings to provide a substantially rigid joint at each of said legs and thereby support said shells so that a load can be carried.

6. A method of forming a furniture piece such as a chair or the like having a top substantially flat load-bearing surface, wherein a thin-walled construction is subjected to twisting forces which comprises molding a first shell of plastic to have a thin-walled body portion and an integral skirt portion and including a plurality of dowel receiving structures integral with sections of said body and peripheral skirt portions, respectively, molding a second shell of plastic to have a thin-walled body portion adapted to fit together with said first shell, inserting a dowel into each of said dowel receiving structures, positioning respective structural members, such as legs, juxtaposed each of said second shell peripheral wall sections having said dowel receiving structures, driving said dowels into said structural members to form joints between the latter and the first shell and fitting the respective first and second shells together so as to form the substantially flat load bearing surface.

7. The method of claim 6, wherein the interfitting shells form an enclosed space therebetween, and including the additional step of forcing filler material, for example urethane foam, into said space thereby giving said composite shell structure additional load carrying ability along with resilience.

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U.S. Cl. X.R.

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