United States Patent [19]

Weidt

[11] **3,847,460**

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[54] **PLASTIC FURNITURE**

[75] Inventor: **Karl-Adolf Weidt,** An Der Alche, Germany

[73] Assignee: **Fritz Schaffer GmbH,** Neukirchen Kreis Siegen, Germany

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[30] **Foreign Application Priority Data**

Dec. 29, 1971 Germany 2165324

[52] **U.S. Cl.** ..... **312/257 R,** 220/97, 312/111, 312/263

[51] **Int. Cl.** **A47b 47/00,** A47b 57/08

[58] **Field of Search** 312/107, 108, 194, 195, 312/257, 263; 220/97

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Primary Examiner—Casmir A. Nunberg

Attorney, Agent, or Firm—Woodhams, Blanchard and Flynn

[57] **ABSTRACT**

A basic structural module for the manufacture of office and other furniture pieces is made of a structural plastics foam and has a rectangular panel portion with attachment legs, one at each corner. The legs and the adjacent main surface of the panel portion are formed with a sywtem of grooves for the location of panel elements, sliding doors and the like. Two opposed modules may be connected directly together, with the free ends of their legs abutting, or with beam-like connecting elements interposed if a larger or taller piece of furniture is required.

17 Claims, 13 Drawing Figures

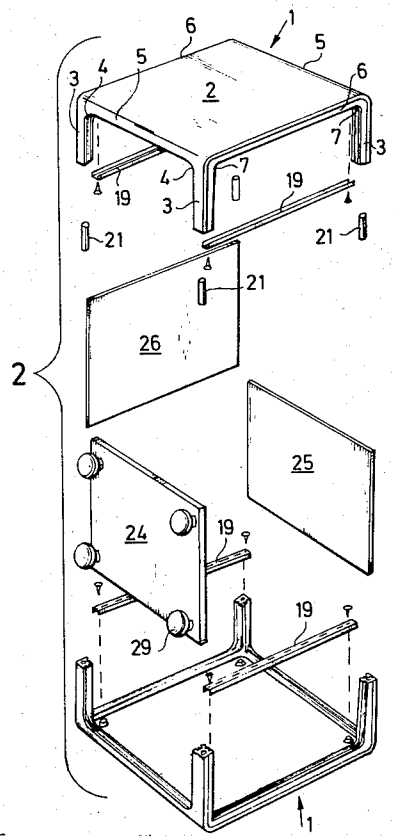


Fig. 1

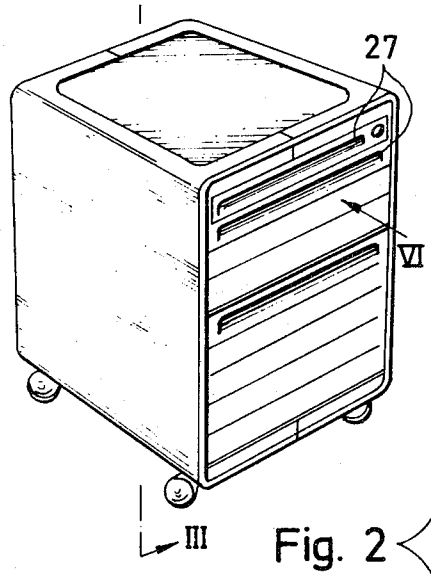
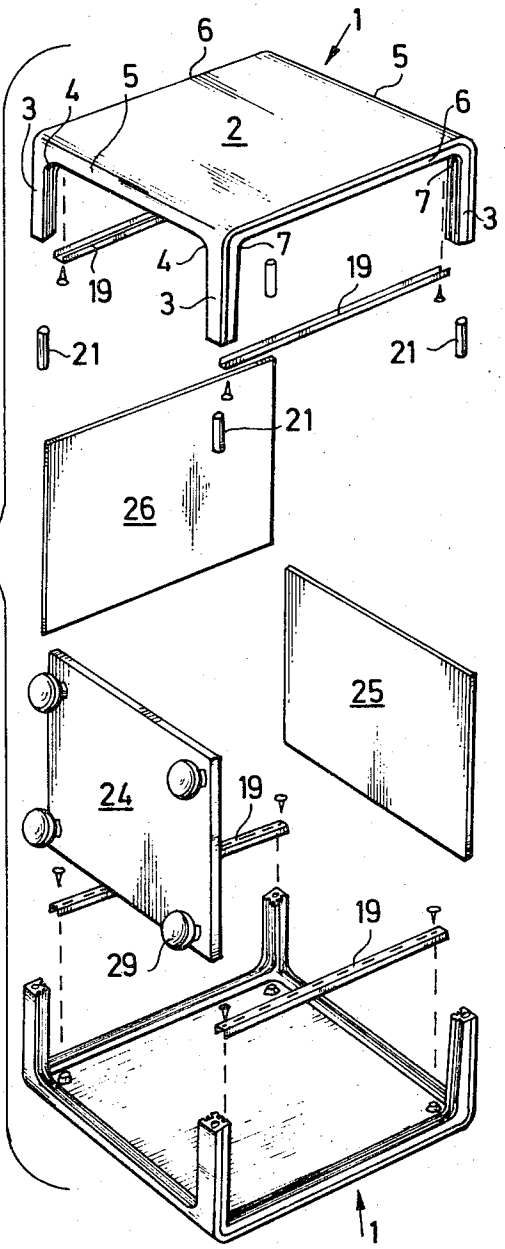


Fig. 2



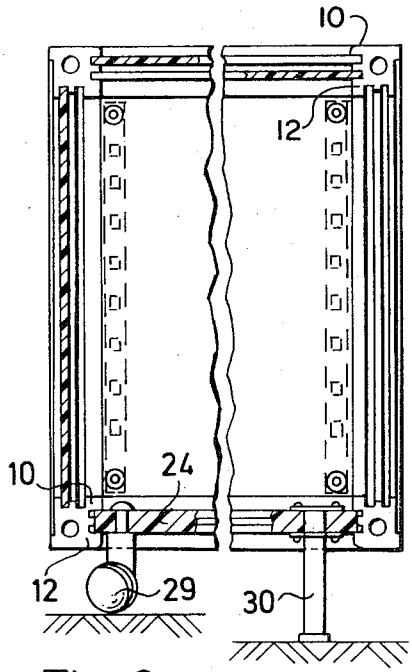


Fig. 3

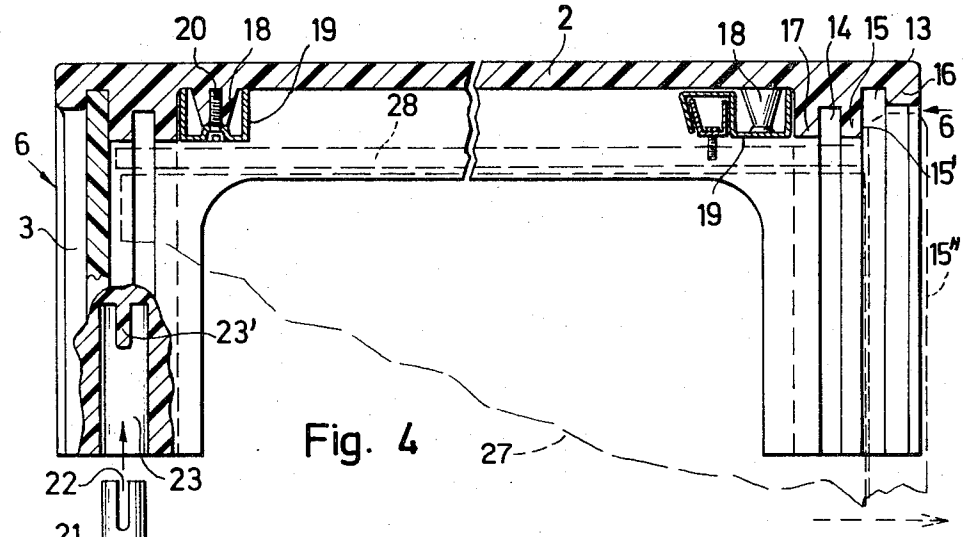


Fig. 4

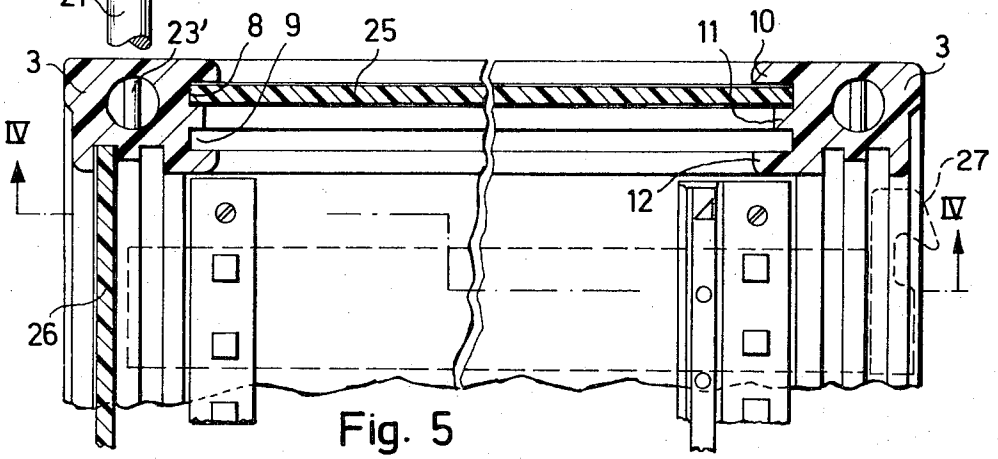


Fig. 5

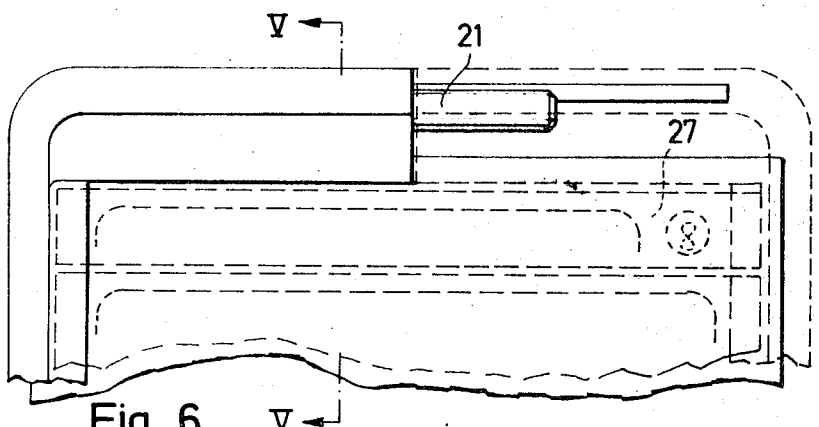


Fig. 6

Fig. 7

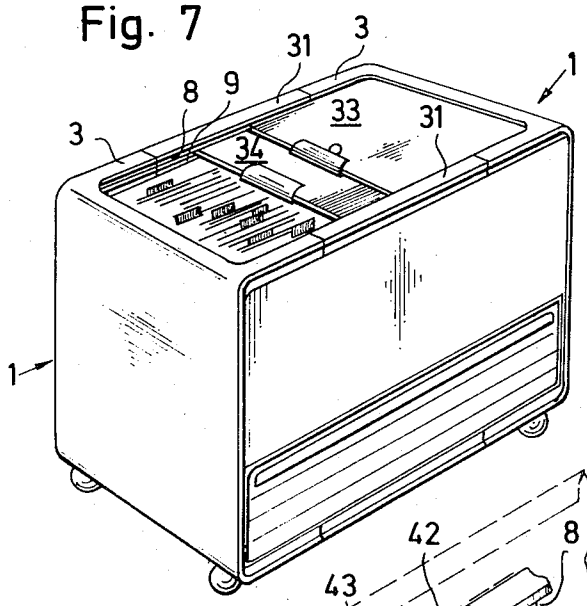
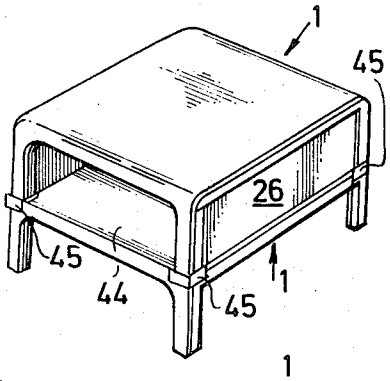


Fig. 8



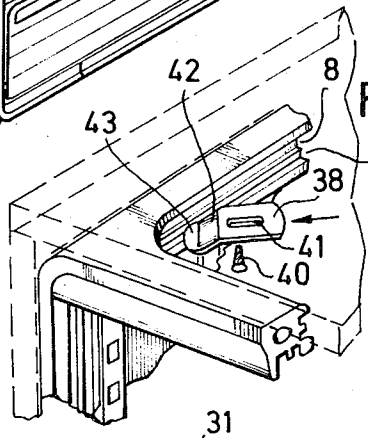


Fig. 12

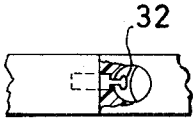


Fig. 13

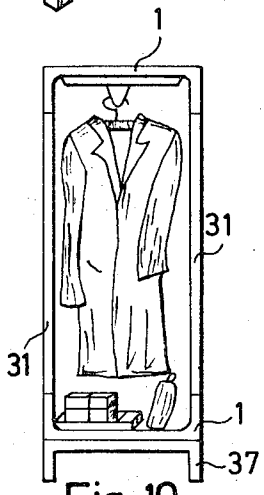


Fig. 10

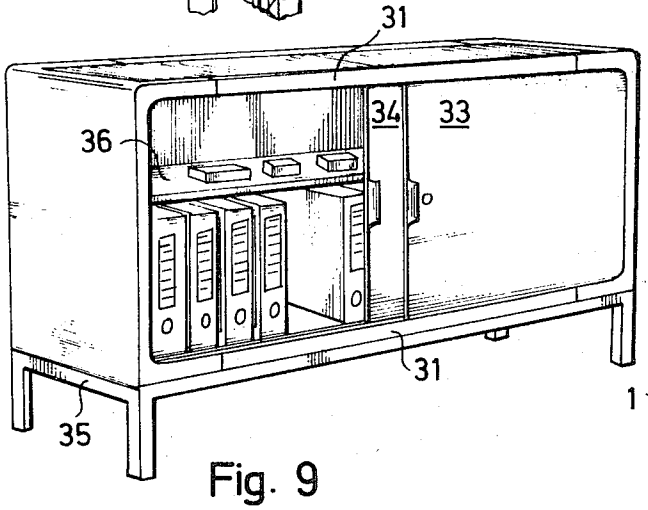


Fig. 9

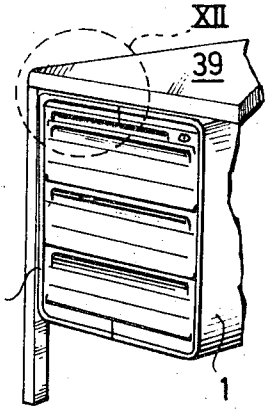


Fig. 11

PLASTIC FURNITURE

The invention refers to pieces of furniture and structural modules for marking up pieces of furniture, which modules are made of structural foam plastics material.

Such furniture may in particular be employed as office furniture. Other applications are however possible. For the production of furniture of synthetic material, so called structural foam is particularly suited. Structural foam is, as is well known, a synthetic plastics material which consists of a porous central layer and nonporous surface layers. This porosity can be attained by mixing together two liquid components, by mutual reaction, release gases, e.g., Desmophen and Desmodur (both trade marks of the firm of Bayer). Shortly before changing the mould, the two components are intimately mixed in mixer heads by turbulence, and after the mixing reach the mould (by the shortest possible route) where foaming immediately occurs. Smooth outer layers form, whilst the central layer assumes a porous or cellular structure. The outer layers can be given for example, a grain-like structure, resembling wood. The end product is known as Polyurethane-Duromer (trade mark of the firm of Bayer). Normal thermoplastics which have been on the market for a longer time, such as polystyrene, polypropylene, polyethylene, ABS-synthetic, etc., can, however, also be employed.

These thermoplastics are injection-moulded in known machines after a foaming agent has previously been added to them. This foaming agent can either be contained in the granules, e.g., in an ABS synthetic called Novodur (trade mark of the firm of Bayer), or else added shortly before the injection of the synthetic into the mould, for which purpose, a gas, e.g., nitrogen, can be employed as foaming agent. An advantage of these materials is that ordinary injection-moulding machines can be employed. Structural foams have a relatively low weight with a high rigidity since the components of a structural foam body can be conceived as a sandwich construction which consists of two stable outer plates and a light-weight filling between the plates, which is formed by the porous portions of the body.

Furniture of synthetic materials is relatively expensive, since the injection moulds are naturally large and thereby correspondingly expensive and the price of the moulds must be apportioned to the injection-moulded parts. The mould costs can be reduced, if for a given piece of furniture, a number of like injection-moulded parts and for different pieces of furniture the same parts can also be employed.

One object of the invention is to produce a construction of furniture which by the employment standardised structural modules enables the same injection moulded parts to be used in the assembly of different pieces of furniture and in which inside a piece of furniture like injected moulded parts can be employed.

The basic structural module of the present invention is made of a structural foam plastics material and has a rectangular flat panel portion with opposed outer and inner surfaces, and a plurality of stump-like connecting legs positioned at the respective corners of said panel portion and extending in one direction away from said inner surface, adjacent pairs of said legs having grooves extending longitudinally thereof and said inner surface of said panel portion having grooves therein each communicating with the said grooves of a respective said adjacent pair of legs.

The frame of a piece of furniture thus consists of two similar injection-moulded parts of structural foam which are connected together. This frame already has two wall surfaces, e.g., bottom and top or two sidewalls depending on the position of the panel portions of the modules. Other walls can be formed by panels which can, for example, be cut out of larger panels. Thus, these other walls are as a rule not injection moulded parts of synthetic material, and in any case no special injection moulds are needed for the production of these other walls. Lines of separation need only be visible at the points at which the stumps of the two structural foam parts abut. The walls inserted in the form of panels have no line of separation, which is of advantage to the appearance of the piece of furniture.

The piece of furniture in accordance with the invention can be altered appreciably especially when in accordance with a further development of the invention beam-like connecting pieces are employed for connection between the legs of the structural modules. Preferably these pieces provided with grooves to match those in the legs of the structural foam modules. Thus, relatively long or high pieces of furniture can be assembled, such for example, as wardrobes or longer companion cupboards. Examples of these will be further described below with the aid of the drawings.

The arrangement of the grooves is preferably such that at the inner surfaces of the flat panel portion and at the inside of the legs in each case two parallel grooves are provided. In addition, in the case of some of the parallel grooves, preferably in the case of the grooves arranged on the legs, the partition walls between the parallel grooves can be shorter than the other groove boundary walls. In the case of some other parallel grooves, preferably in the case of the grooves arranged in the lower surface of the flat panel portion, the outer wall of the outer groove can be set back relative to the outer wall of the inner groove, so that the latter wall forms a stop face for drawers or doors respectively.

The said arrangement of grooves can be made use of in various ways. Thus sliding doors can be inserted, in which case one part of the sliding door runs in the one groove and the other part runs in the groove parallel with it. Also thick panels, e.g., bottom panels, can be inserted and are held between the outer wall of one groove and the outer wall of the other groove. Such panels are positioned to support the weight of the piece of furniture, so that casters or feet can be applied to them.

Further deatils of the invention will appear from the following description of embodiments of the invention, illustrated in the accompanying drawings, in which:

FIG. **1** is a perspective elevation of a piece of furniture in accordance with the invention,

FIG. **2** the details of the piece of furniture before assembly, likewise in perspective,

FIG. **3** is a vertical section through the piece of furniture as FIG. **1** along the line III—III in FIG. **1**, in which two different embodiments are shown,

FIG. **4** a horizontal section along the line IV—IV in FIG. **5**.

FIG. **5** a vertical section along the line V—V in FIG. **6**,

FIG. 6 a partial front elevation of the piece of furniture in the direction of the arrow VI in FIG. 1.

FIG. 7 a perspective elevation of a piece of furniture formed as a card index chest with an upper sliding door,

FIG. 8 a perspective elevation of a piece of furniture in accordance with the invention formed as a table,

FIG. 9 a perspective elevation of a companion cupboard in accordance wih the invention, which rests on a special base frame,

FIG. 10 a front elevation of a wardrobe in accordance with the invention,

FIG. 11 s partial elevation of a desk,

FIG. 12 an enlarged detail from FIG. 11 in the zone of the broken circle XII in FIG. 10, in which, however, the desk top is shown as transparent, and

FIG. 13 a detail referring to the connection between parts of a piece of furniture.

In all the illustrated pieces of furniture, injection moulded structural modules of structural foam, indicated as a whole by 1 are employed. These injection moulded parts have a rectangular flat, panel portion 2 at the corners 4 of which stump-like legs 3 are integrally attached and directed away from the inner surface of the panel portion 2. On opposite sides 5 of the flat portion 2, the legs 3 merge into the flat portion via fillets 4, whilst on the other sides 6 this transition is formed by sharp intended angles 7.

On the inside of the legs 3 and on the underside of the edges of the flat portion 2 are arranged grooves which are to be more precisely examined with the aid of FIGS. 4 and 5. The grooves in legs 3 are shown in FIG. 5, comprising in each case an outer groove 8 and an inner groove 9. The outer groove 8 is bounded by an outer wall 10 and an inner wall 11, of which the inner wall 11 is shorter than the outer wall 10. The groove 9 is likewise bounded on one side by the wall 11 and at the other side by a wall 12 which as the same height as the wall 10. This arrangement of grooves presents the possibility of inserting either one panel or two panels. Finally, a thick panel 24 as in FIG. 3 can be inserted, in which case such a panel is held between the walls 10 and 12.

As shown in FIG. 4 the flat portion 2 has two parallel grooves, viz, an outer groove 13 and an inner groove 14. The outer groove 13 is deeper than the inner groove 14. The grooves 13 and 14 are separated from one another by a dividing wall 15 which is higher than one outer wall 16. The inner groove 14 is also bounded by a wall 17 which has the same height as the wall 15. From the said arrangement of grooves there results a stop face 15′ for the front of a drawer 15″ or, for example, for a door. On the opposite side 6 there is the same arrangement of grooves.

On the side 5 of the flat portion 2 (see FIG. 2 at the top there is the same groove arrangement as on the legs (grooves 8 and 9) with dividing wall 11).

The edges of the outer walls 10 and 12 of the grooves run into the corners between the stump and the flap portion at the fillets 4 (FIG. 2), whilst the grooves 8 and 9 themselves and also the edges of the dividing wall 11 form angles. There exists thereby the possibility of inserting in the grooves square cornered filler panels as will be further described, so obtaining a stiffening at the corners from the fillets and an advantageous appearance.

Eyes 18 (FIG. 4) are also formed on the flat portion to receive screws 20 for securing for example, spacer bars 19 for the attachment of guide rails for drawers.

Pins 21 of which one is partially shown on an enlarged scale in FIG. 4, serve to connect the two injection-moulded parts 1 of structural foam together These pins have slits 22 at their ends. The pins can be inserted in blind holes 23 in the legs 3. From the bottoms of the holes 23 project wedge-shaped lugs 23′ which engage in the slits 22. The portions of the pins on the two sides of the slits 22 are thereby forced outwards and thus grip in the holes 23.

Further components of the piece of furniture in FIGS. 1 to 6 are a bottom panel 24, a top panel 25 and a back wall 26 (in FIG. 2 the details are turned 90° in the space from their final position). The piece of furniture also has drawers 27 and drawer guiderails 28 (see FIG. 4) which are attached to the spacer-bars 19. The panels 24, 25 and 26 are conveniently cut from a larger panel.

When assembling the piece of furniture, the walls 24, 25 and 26 are first of all inserted in the grooves as shown in the drawings, that is, so that the back wall 26 and the top panel 25 are pushed into the outer grooves 8, whilst the bottom 24 is held between the outer walls 10 and 12 as may be seen from FIG. 3. The two structural foam parts 1 are pushed together, the pins 21 being inserted at the same time, so that the pins spread and thus firm wedging is achieved. The panels 24, 25 and 26 are then held fast in their grooves on all sides. Next the spacer-bars 19 are screwed in and drawer guiderails 28 are attached to them. The drawers 27 can then be slid in. It should be noted from FIG. 4 that the fronts 15″ of the drawers come to rest with their edges against the stop-faces 15′ on the walls 15, whereby the depth to which they can be pushed in is limited. The use of sharp-cornered panels 24, 25, 26 is possible because the grooves into which the panels are received form sharp corners in turn, that is, even where the fillets 4 are provided.

The bottom thick plate 24 is strong enough for casters 29 or feet 30 to be able to be fixed to it. Both alternatives are shown in FIG. 3.

In the case of the furniture as FIGS. 7, 9, 10 and 13 beam-like intermediate connecting pieces 31 are provided between the structural foam parts 1. These intermediate pieces 31 have the same profile as the legs 3 of the structural foam parts 1. With the aid of such intermediate pieces furniture as long (FIGS. 7, 9) or as high (FIG. 10) as required can be produced. The joining of the beams 31 to the stumps 3 can be effected by pins corresponding with the pins 21 (FIGS. 2, 4). Camlocks 32 as FIG. 13 can however also be employed, being in themselves known in the furniture trade.

The piece of furniture as in FIG. 7 is made as a card-index cabinet. Panels 33, 34 are arranged slidably in the grooves 8, 9. The panels are sliding doors which allow opening and closing of the trunk shaped chest. Inside the piece of furniture fitments are provided as usual for card-index chests.

In FIG. 9 a piece of furniture is shown which is built like the piece as FIG. 7. It is however turned 90° so that the sliding doors 33 and 34 are on a vertical wall of the piece of furniture. The piece of furniture also has a base frame 35 which can consist, for example, of

square metal sections. In the chest is a shelf **36.** Other fitments can also be provided.

In FIG. **10** is shown a piece of furniture usuable for example as a wardrobe. In this case, the structural foam modules **1** form the top and bottom of the cupboard. Here too beam like intermediate pieces **31** are provided by which the structural modules **1** are connected together. The body of the cupboard stands on a special base frame **37.** In FIGS. **11** and **12** the use of the piece of furniture as the body of a desk is shown. The structural foam modules **1** again form the sidewalls of the piece of furniture so that the basic construction corresponds with FIGS. **1** to **6.** The upper wall **25** is however missing, so that the grooves **8, 9** are freely accessible from above. This enables attachment of the body, by means of fixing brackets **38** and screws **40** to the underside of a desk top **39.** The fixing lug **38** has a slot **41** and an offset **42.** This enables the tip **43** to slip into the groove **8.** Since the body lies directly against the underside of the desk top, the top closure is formed by the desk top.

In FIG. **8** it is further shown that two structural foam modules **1** can be assembled into a small table with a lower shelf **44.** In this case stacker cornerpieces **45** are used by which the superimposed structural foam part is fixed to the underneath structural foam part. Connection by means of pins is however also possible, in which case holes must of course be formed in the underneath structural foam part, which are open at the top.

In the drawings, an embodiment is shown in which the legs of the structural foam modules are all of equal length and their end faces run at right angles to the long axes of the legs. The modules could however also be so formed that the legs have different length and the end faces of all the stumps lie in a common plane which lies at a slant to the lengthwise direction of the stumps. In this case, lines of separation between the structural foam parts and beam-like intermediate pieces fitted between them would be obtained, running on the slant.

Because of the walls of the piece of furniture consist in part of inserted panels it is possible, without complicating the manufacture, to employ wall-plates of different fashions according to taste. It is further possible to employ heat insulating panels, whereby the piece of furniture can be made into a hot cupboard for keeping food hot. Insertion of glass or transparent synthetic panels is also possible whereby, for example, display cases for jewellers can be created. If instead of panels, screen mats are inserted, a piece of furniture for storing in rolls of drawings can be produced.

A detachable connection which is not shown in the drawing can be produced as follows. Instead of pins **21** continuously smooth on the outside (FIG. **4**) pins without end-slits can be employed which in the vicinity of their ends are provided with a neck. In the stumps holes invisible from the outside are then formed, through which self-tapping screws can be driven from the inside which screws wedge against the necks and produce a secure interconnection of the parts of the piece of furniture. A piece of furniture so assembled can be dismantled again to its parts so that damaged panels can readily be exchanged or in case of a change of taste panels of another pattern can be inserted. The said connection requires no further changes relative to the connection shown in FIG. **4,** since the notched pins are of sufficiently short length to be axially clear of the lugs **23'** inside the holes **23.**

I claim:

1. A frame for a piece of furniture, comprising a pair of identical structural foam plastic modules, having spaced and opposed rectangular flat panel portions closing the ends of said frame, spaced beam members extending transversely between and interconnecting said panel portions, said beam members having end segments consisting of aligned stump-like legs formed on and in one piece with said panel portions, said stump-like legs forming the entire cross sections of said beam members, means defining grooves on the inner surfaces of the panel portions and continuing along the adjacent inner surfaces of said legs, and filler pieces inserted in aligned grooves of the panel portions and legs for closing remaining sides of said frame.

2. A frame according to claim **1** in which said legs are visible segments of the part of the frame bordering said filler pieces and of said piece of furniture.

3. A frame according to claim **2** in which said legs terminate in free abutment ends, said beam members including end abutting connection means between the legs of one module and the opposed legs of the other module and with hidden pin means at abutting ends.

4. A piece of furniture comprising a pair of opposed structural modules of a structural foam plastics material, each said module having a rectangular, flat panel portion with oppositely facing outer and inner surfaces and having a plurality of stump-like connecting legs positioned at respective corners of said panel portion and extending in one direction away from said inner surface, said legs of a module each being a length segment of a corresponding beam member connecting opposed corners of said panel portions of said pair of modules, aligned legs of the pair of modules being at least the end length segments of such beam members, adjacent pairs of said legs having grooves extending longitudinally thereof and said inner surface of said panel portion having grooves therein each communicating with the said grooves of a respective said adjacent pair of legs, and means rigidly connecting said modules together with said flat panel portions in spaced parallel relation.

5. A piece of furniture according to claim **4** in which said legs form the entire cross section of said beam member.

6. A piece of furniture according to claim **4,** wherein said modules are assembled together with said aligned legs of the pair of modules being rigidly coupled, said modules defining a rectangular space frame structure having one pair of opposed ends closed by said flat panel portions and pairs of open sides extending therebetween and at least in part bounded by said legs.

7. A piece of furniture according to claim **6,** wherein aligned legs of said opposed modules are directly connected to each other in end abutting relationship.

8. A piece of furniture according to claim **6,** including beams each interposed longitudinally between and end abutting an aligned pair of legs of the opposed modules, each said beam being the central portion of a corresponding said beam member and rigidly interconnecting the aligned legs so as to both connect and space legs of said modules.

9. A piece of furniture according to claim **8,** wherein said beams are formed with longitudinally extending

grooves which are continuous with the said grooves in the legs which they bridge.

10. A piece of furniture according to claim **4,** including fillets smoothly joining said legs to said panel portion of a module and forming corner reinforcements, said grooves in said legs and panel portion forming angular corners at their points of communication with each other for permitting installation of a rectangular panel element therein.

11. A piece of furniture according to claim **4,** in which said grooves comprise first and second parallel grooves on the inner sides of the panel portion and legs of a module and including planar elements insertable into communicating sets of first and second grooves of said opposed modules for closing sides of the piece of furniture.

12. A piece of furniture according to claim **11,** wherein at least in the parallel grooves of the legs, the partition walls between such parallel grooves are shorter than the outer groove walls and including a relatively thick planar element of width to abut the outer groove walls of such parallel grooves and usable as a floor for such piece of furniture.

13. A piece of furniture according to claim **11,** wherein at least in the parallel grooves of the panel portion, the outer wall of the outer of said parallel grooves is shorter than the outer wall of the inner one of said parallel grooves and said last mentioned outer wall forms a stop surface for drawers or doors.

14. A piece of furniture according to claim **4** including upstanding eyes on the inner surface of said panel portion for securing of adjusting plates for drawer guide rails to said panel portion.

15. A piece of furniture according to claim **4,** further comprising a panel element engaged in coplanar ones of said grooves in said panel portions and legs for closing a side of said piece of furniture transverse to said panel portions.

16. A piece of furniture according to claim **4,** wherein said modules are connected together with the free ends of said legs of one said module opposing the outer surface of the panel portion of the other said module, and including shorter separate pieces interposed between said leg ends and outer surface for interconnecting same.

17. A piece of furniture according to claim **8,** in which the distance between the opposed panel portions of said pair of modules is the sum of lengths of an aligned pair of said legs and the intervening beam.

* * * * *