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[54] **CHAIR STRUCTURE AND METHOD OF FORMING THE SAME**

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[51] **Int. Cl.** **A47c 7/00,** A47c 7/14

[58] **Field of Search** 182/217-219, 182/228; 312/264, 440; 297/445-449, 458, 440, 4

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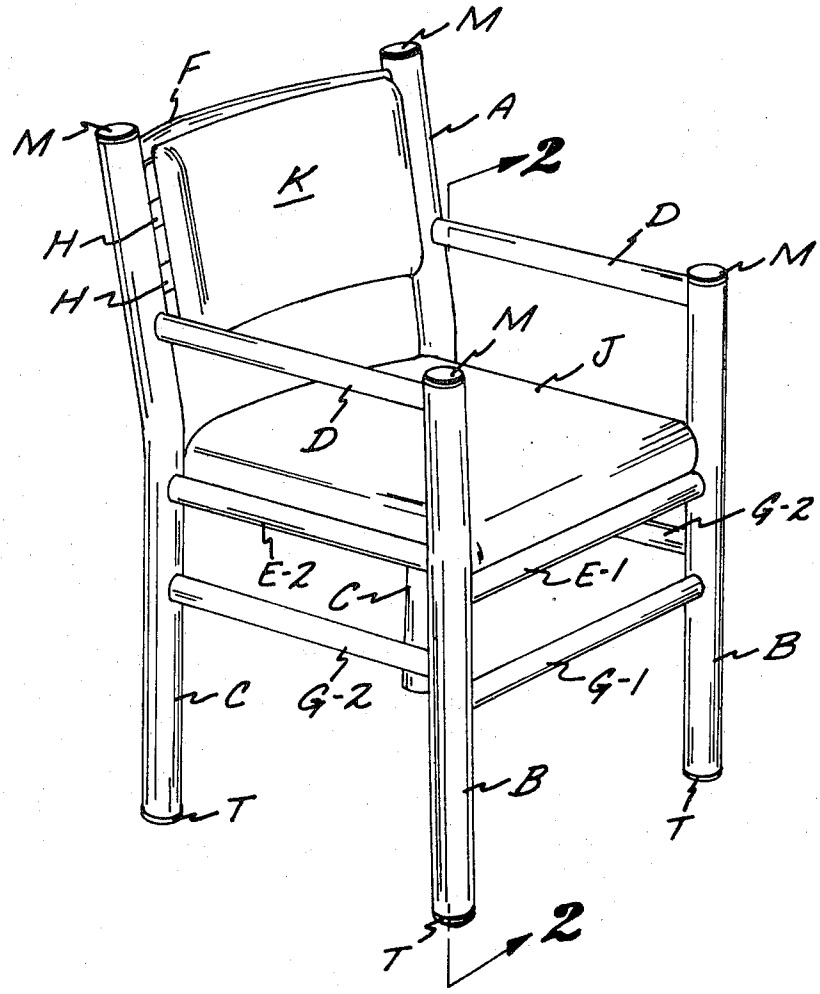
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[57] **ABSTRACT**

A chair structure and method of forming the same from commercially available, heat-bendable, non-metallic conduit or other tubular material.

The chair structure is characterized by the tubular elements defining the same not only being splined together within the interiors thereof, but the tubular elements being in communication with one another and completely filled with an integral mass of foamed-in-place polymerized resin. The splines and polymerized resin cooperate to impart substantial rigidity to the completed chair structure and to the extent that there is no movement of the elements defining the same relative to one another when the chair structure is subjected to a heavy, unequally distributed load.

6 Claims, 5 Drawing Figures



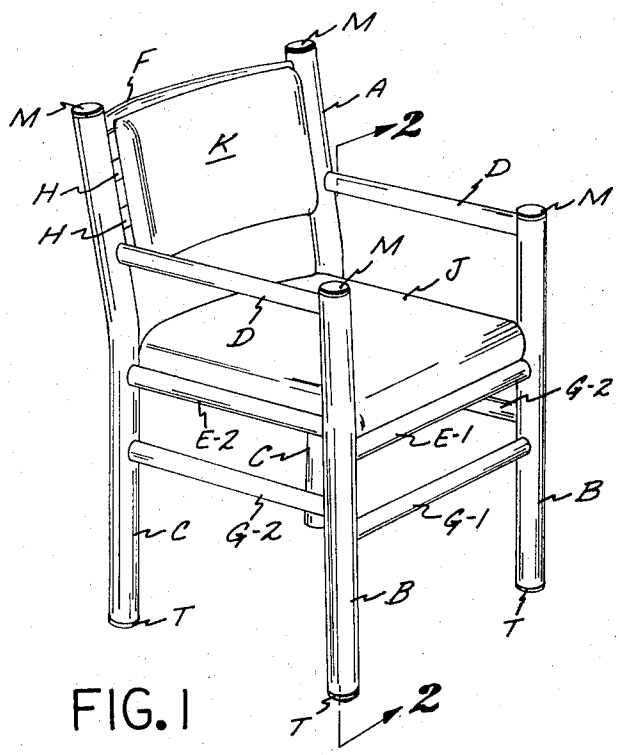


FIG. 1

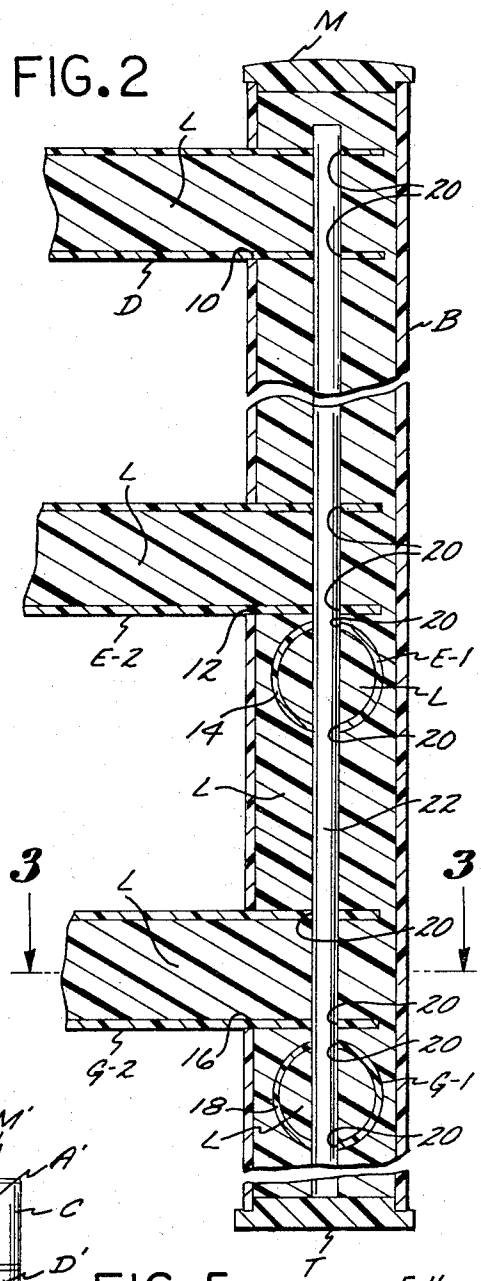


FIG. 2

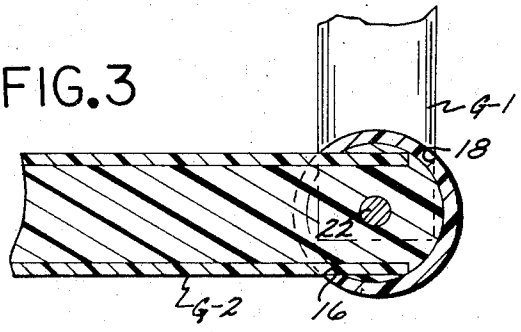


FIG. 3

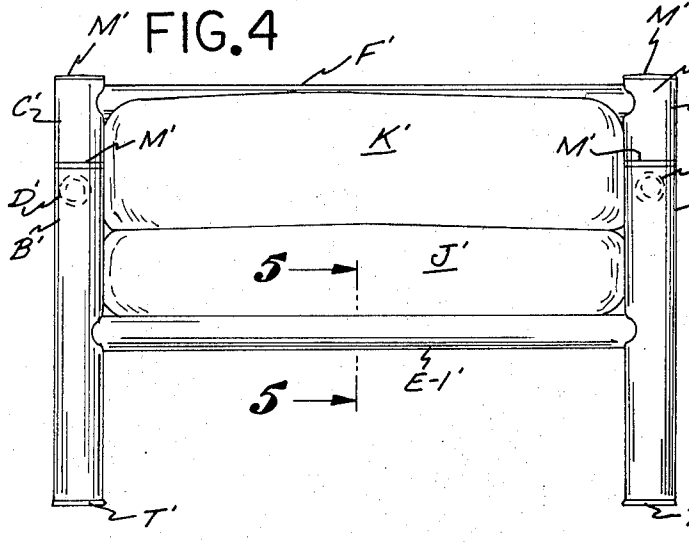


FIG. 4

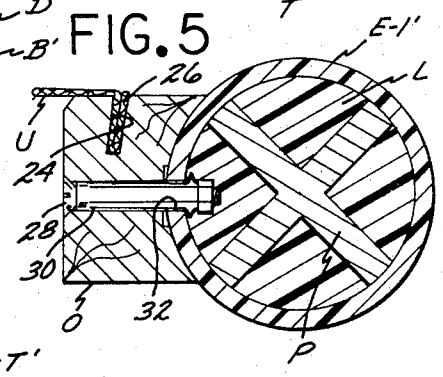


FIG. 5

CHAIR STRUCTURE AND METHOD OF FORMING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

Chair structure and method of forming the same.

2. Description of the Prior Art

Non-metallic, heat-bendable conduit has been available commercially for a number of years, and has the advantages that it is not only inexpensive, but has substantial strength. Although commercially available conduit when cut to suitable lengths provides ideal elements for use in assembling into a chair structure, conduit has not been used for this purpose prior to the present invention to any substantial degree, due to there being no inexpensive means available for permanently interlocking the assembled chair elements one to the other.

The primary purpose in devising the present invention is to supply a chair structure and method of forming the same in which the chair elements are lengths of commercially available, heat-bendable, non-metallic conduit, and by the use of internal splining and the foaming in place of a polymerizable resin within the interior of the conduit, providing a chair structure that remains rigid under ordinary usage, and one in which the elements do not move relative to one another even when subjected to a heavy, unequally distributed load.

SUMMARY OF THE INVENTION

The chair structure has the frame portion thereof formed from rigid, heat-bendable, non-metallic, commercially available conduit, with the forward and rearward legs being defined by lengths of a first conduit that are greater in diameter than than that of lengths of a second conduit. The second conduit is cut to lengths to define rungs, arms and cross pieces that are internally splined into fixed relationship with the forward and rearward tubular legs to define the chair structure. Chair structure as used herein includes individual chairs as well as divans and other structures on which more than one person may be concurrently seated.

The tubular elements above described, when assembled into a chair structure, have the interiors thereof in communication. A mass of polymerizable resin such as polyurethane that may be expanded into a foam is placed within the confines of the completed chair structure. By use of a suitable catalyst the polyurethane is expanded to a rigid foam within the confines of the tubular splined chair elements to completely fill the interiors thereof. The rigid foam and the interlocking splines cooperate to impart substantial rigidity to the chair structure, and to the extent that the elements defining the chair structure will not move relative to one another even when the chair structure is subjected to a heavy, unequally distributed load.

A major object of the present invention is to supply a chair structure of attractive appearance in which the frame is fabricated from elements that are formed from lengths of commercially available, non-metallic, heat-bendable conduit that are internally splined to one another, and with the interior of the chair structure completely filled with a foam-in-place polymerized resin, which, with the internal splining, provide a chair structure in which there is no movement of the elements defining the same relative to one another when the chair

structure is subjected to a heavy, unequally distributed load.

A further object of the invention is to provide a method of forming the frame of a chair structure in a novel and inexpensive manner by use of relatively unskilled labor, and utilizing a commercially available inexpensive material for this purpose.

Yet another object of the invention is to provide a chair structure that is durable, is not appreciably affected by water or moister, and is ideally adapted for outdoor use in such environments as gardens, around swimming pools and the like.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a chair structure embodying the use of a heat-bendable, non-metallic, commercially available conduit for the fabrication of the main frame thereof;

FIG. 2 is a fragmentary vertical cross-sectional view of the chair structure shown in FIG. 1 taken on the line 2—2 thereof;

FIG. 3 is a fragmentary transverse cross-sectional view of the chair structure taken on the line 3—3 of FIG. 2;

FIG. 4 is a front elevational view of a second form of chair structure embodying the use of non-metallic, heat-bendable conduit in the fabrication thereof; and

FIG. 5 is a fragmentary vertical cross-sectional view of the chair shown in FIG. 4 taken on the line 4—4 and illustrating the manner in which strips of fabric are secured to forward and rearward portions of the chair to support a cushion thereon.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Applicant's invention is illustrated in FIG. 1 in the form of an individual chair A that has two first forwardly disposed legs B and two second rearwardly positioned legs C that are formed from lengths of a heat-bendable, rigid, non-metallic, commercially available conduit of circular transverse cross section. The conduit is of the type used in protecting the electrical cable and wiring from the surrounding environment when the cables or wiring are extended therethrough. Such conduit may be bent by heating and applying pressure to the heated portion.

Second legs C are of substantially greater height than the first legs B. Second legs C, at substantially two-thirds the height thereof, angle slightly rearwardly to define a portion of the back of the chair, as may be seen in FIG. 1. The conduit used in forming the first legs B and second legs C is of substantially greater diameter than the conduit employed in forming the blance of the frame structure of the chair A. Two substantially horizontal arms D extend rearwardly from the upper portions of the first legs B to the second legs C.

Situated under the arms D are two pairs of rungs E-1 and E-2 that are normally disposed to one another and at slightly different elevations. The pair of rungs E-1 extend transversely between the first legs B and the second legs C. The second pair of rungs E-2 extend rearwardly from the first legs B to the second legs C. A cross piece F extends transversely between the upper portion of the legs C. For decorative and reinforcing purposes, a second rung G-1 may be provided that extends transversely between the first legs B and is situated below the forwardly disposed rung E-1. Also, a

pair of second rungs G-2 may be incorporated in the chair A to extend rearwardly from the first legs B to the second legs C, as shown in FIG. 1, with the second rungs G-2 being at a different elevation than the second rung G-1. Also for reinforcing and decorative purposes, a number of rungs H may be incorporated into the chair A, which rungs H are situated below the cross piece F, and extend between the back-defining portions of the second legs C, as shown in FIG. 1.

The pair of rungs E-1 serve as the support for a conventional cushion J that has a rigid bottom structure (not shown). The pair of second rungs E-2 prevent lateral movement of the cushion J relative to the chair A. An upholstered pad K may be removably secured to the forward surfaces of the cross piece F and the rungs H by conventional means (not shown), such as by adhesives, straps or the like. Each of the legs B, as may best be seen in FIG. 2, has longitudinally spaced openings **10, 12, 14, 16** and **18** formed therein. End portions of the arm D and rungs E-2, E-1, G-2, G-1 extend into the confines of the legs B through the openings **10, 12, 14,** 16 and **18,** respectively. The end portions of the arms D, and rungs E-2, E-1, G-2 and G-1 situated within the confines of the first legs B, as may be seen in FIG. 2, have pairs of axially aligned openings **20** formed therein that are snugly engaged by an elongate, vertically extending spline **22.** Each of the first legs B has the same structure as illustrated in FIG. 2.

The rearward end portions of the arms D, rungs E-2 and G-2, as well as the cross piece F and the third rungs H extend through openings **12** formed in the second pair of legs C and are interlocked together in the interior thereof by a spline (not shown) which is of the same structure as the spline **22** illustrated in FIG. 22, but that is bent to conform to the bent upper portion of the second legs C that define the back of the chair A.

If desired, two splines may be disposed in each leg C to connect the end portions of the rungs E-2 and G-2, with the second splines connecting the end portions of the cross piece F and rungs H. The illustration of the structure of one of the first legs B when assembled into the chair-defining structure A is further illustrated in FIG. 3. After the chair A has been assembled as shown in FIG. 1, caps T are secured to the lower ends of the legs B and C to close the open ends thereof. After the conduit elements above described have been assembled to form the chair A, it will be apparent that the interiors of the conduit elements are in communication with one another.

A liquid resin is now poured into the interior of the legs B and C, together with a catalyst, and this material undergoes a polymerization reaction to expand to a cellular, rigid foam L that completely fills the interior of the conduit members above described, and this rigid foam, in conjunction with the splines **22,** serves to rigidly connect the conduit members above described to the extent that the chair A defined thereby will sustain a relatively heavy, unequally distributed load thereon, without the conduit members moving relative to one another.

After the resin material has polymerized to define the rigid foam L, caps M are applied to the upper open ends of the first legs B and second legs C to impart a finished appearance to the chair A. The completed chair structure minus the cushions J and K may be spray painted or otherwise have a decorative coating applied to the exterior surfaces thereof to enhance the appearance of the structure.

An alternate form of the structure A′ is shown in FIGS. 4 and 5 that includes two forwardly disposed legs B′, rearwardly positioned legs C′, arms D′ and a pair of transverse rungs E-1′. The second form A′ of the invention also includes a cushion J′ and a rearwardly disposed cushion or pad K′. The upper portions of the second legs C′ have a cross piece F′ extending therebetween. The cushion J′ is supported on a number of rearwardly extending strips U that have doubled over end portions **26** that are glued into transverse recesses **24** formed in wood cleats O that are secured to the adjacent surfaces of the rungs E-1′. The cleats O are secured to the rungs E-1′ by expansion bolts **28** that extend through bores **30** in the cleats as well as openings **32** in the rungs E-1′. The strips U permit the cushion K′ to be removably supported on the chair structure A′. The legs B′ and C′ have caps T′ mounted on the lower ends thereof, and likewise caps M′ are secured to the upper ends of the legs B′ and C′ in the same manner as described in first form A of the invention.

To reinforce the rungs E-1′, particularly if the second form A′ of the invention is in the form of a divan, metallic reinforcing members P of any desired transverse cross section, such as an L, T or X, may be disposed within the confines thereof.

After the form A′ of the invention has been assembled, as shown in FIGS. **4** and **5,** a liquid resin and catalyst is placed within the tubular conduit elements and allowed to expand to define the rigid foam L previously described in connection with the first form A of the invention.

The structure of the first and second forms A and A′ of the chair structure has previously been described in detail, as well as the method of forming the same, and the description need not again be repeated.

I claim:

1. A chair structure of the type that includes two first forwardly disposed legs, two second rearwardly disposed tubular legs of greater length than said first legs, with the upper portion of said second legs defining a portion of the back of said chair structure, four substantially horizontal first rungs that are normally disposed to one another and extend between said forwardly and rearwardly disposed legs, a seat, means for supporting said seat in a substantially horizontal position from said first rungs, at least one transverse cross piece that extends between said upper portions of said legs to define said back, two arms that extend between said forward and rearward legs above said seat, said first and second legs, first rungs, cross piece and arms formed from lengths of rigid, non-metallic conduit, said first and second legs of greater diameter than that of said first rungs, cross piece and arms, and having openings therein through which end portions of said first rungs cross piece and arms extend into the confines of said first and second legs, with the portions of said first rungs, cross piece and arms within said confines having pairs of axially aligned openings therein, said first and second legs, rungs, cross piece and arms being formed from a heat bendable conduit and said chair being characterized by:

a. two first splines within said first legs that snugly engage said pairs of openings in said arms and rung portions within said first legs;

b. two second splines within said second legs that snugly engage said pairs of openings in said arms, rungs and cross piece within said second legs;

c. a plurality of caps that close the upper and lower ends of said first and second legs; and

d. a quantity of a rigid polymerized foamed resin that fills the interior confines of said first and second legs, rungs, cross piece and arms to cooperate with said first and second splines to hold said chair structure together as an integral unit.

2. A chair structure as defined in claim **1** that in addition includes:

e. a plurality of second tubular rungs situated below said first rungs that have end portions that extend through openings in said first and second legs into the confines thereof, with the portions of said second rungs in said first and second legs having axially aligned pairs of openings therein, and said pairs of openings in said second rungs being engaged by said first and second splines.

3. A chair structure as defined in claim **2** that in addition includes:

f. a plurality of third transverse, vertically spaced tubular rungs situated between said cross piece and said seat that have end portions that extend through openings in said second legs into the confines thereof, with the portions of said third rungs in said second legs having axially aligned pairs of openings therein, and said openings in said third rungs being engaged by said second splines.

4. A chair structure as defined in claim **1** in which the portions of said second legs that partially define said back taper upwardly and rearwardly relative to said first legs.

5. A chair structure as defined in claim **1** in which said seat is a cushion and said means to support said seat includes:

e. two transverse cleats secured to the adjacent sides of said first rungs that extend transversely between said first pair of legs and said second pair of legs; and

f. a plurality of spaced, pliable strips that extend between said cleats and are secured thereto, with said strips supporting said cushion thereon.

6. A chair structure as defined in claim **1** which in addition includes:

e. elongate metallic reinforcing means situated in at least a portion of said rungs to strengthen the latter.

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