

[72] Inventor **Jerome Carmel Caruso**
Arlington Heights, Ill.
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[73] Assignee **Shelby Williams Industries, Inc.**
Chicago, Ill.

[54] **CAST-ALUMINUM STACK CHAIR**
22 Claims, 11 Drawing Figs.

[52] U.S. Cl. **297/239,**
297/248, 297/445
[51] Int. Cl. **A47c 3/04**
[50] Field of Search 297/239,
248, 249, 160, 457, 440, 162, 445

[56] **References Cited**
UNITED STATES PATENTS

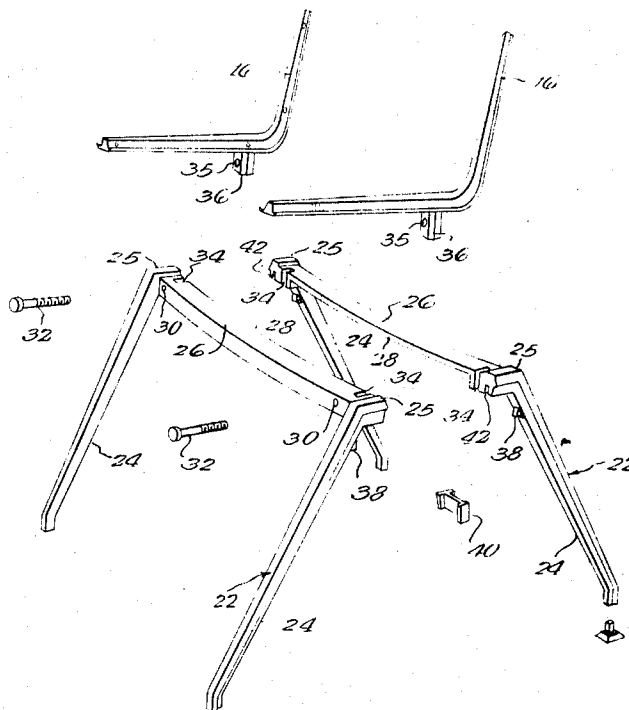
2,747,654	5/1956	Chapman	297/445 X
3,031,227	4/1962	Van Buren	297/239
3,123,399	3/1964	Wilson	297/239
3,159,425	12/1964	Engstrom	297/239
3,203,731	8/1965	Krueger	297/248
3,319,999	5/1967	Liberman	297/239
3,328,075	6/1967	Albinson	297/239
3,431,022	3/1969	Poppe	297/445
3,497,262	2/1970	Piretti	297/239

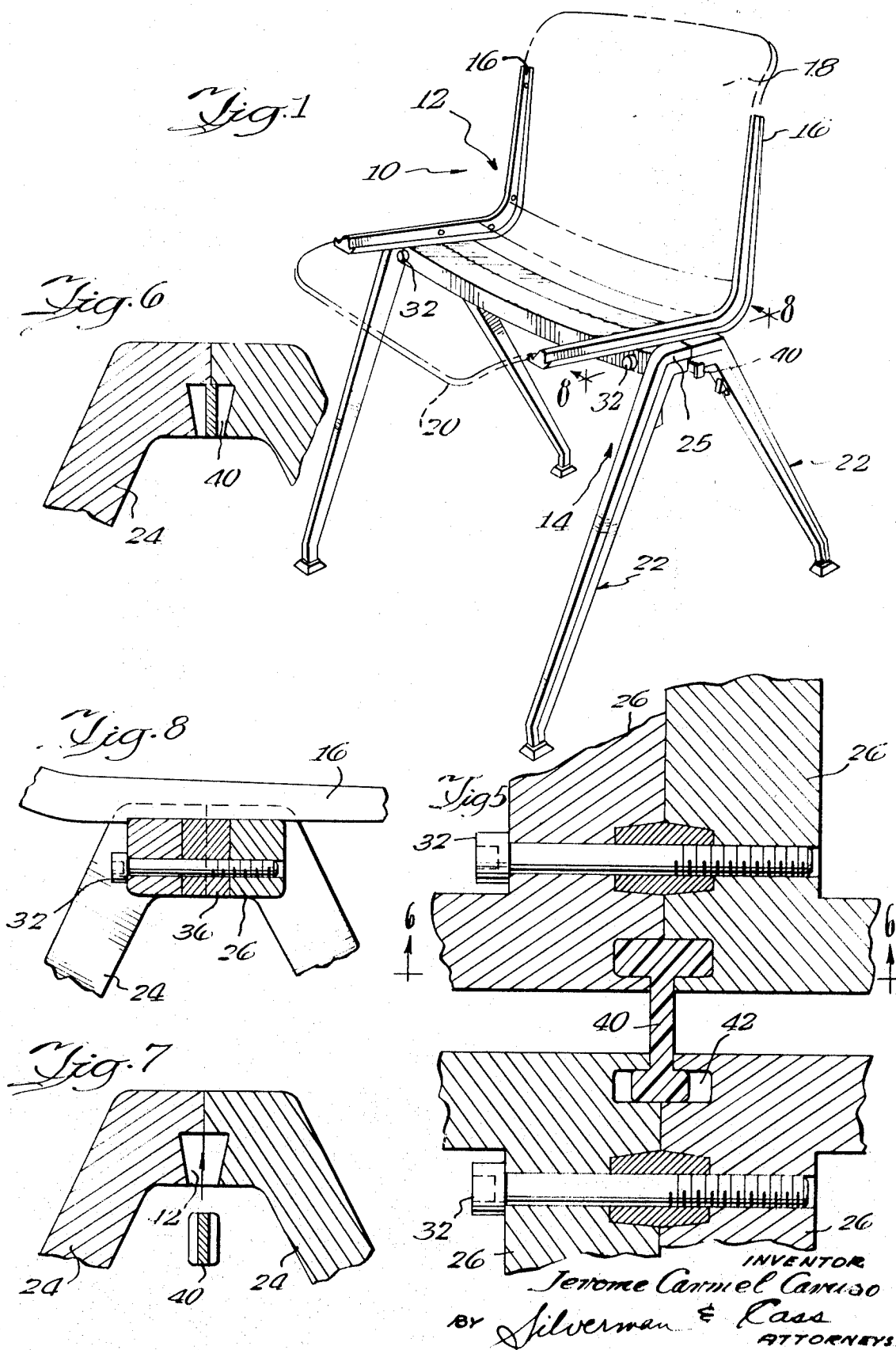
FOREIGN PATENTS

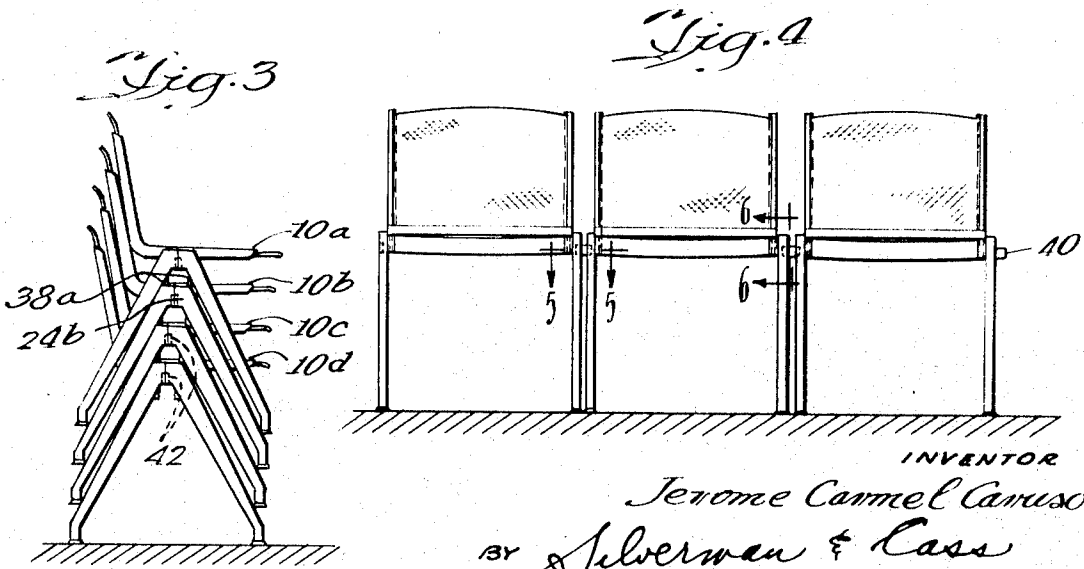
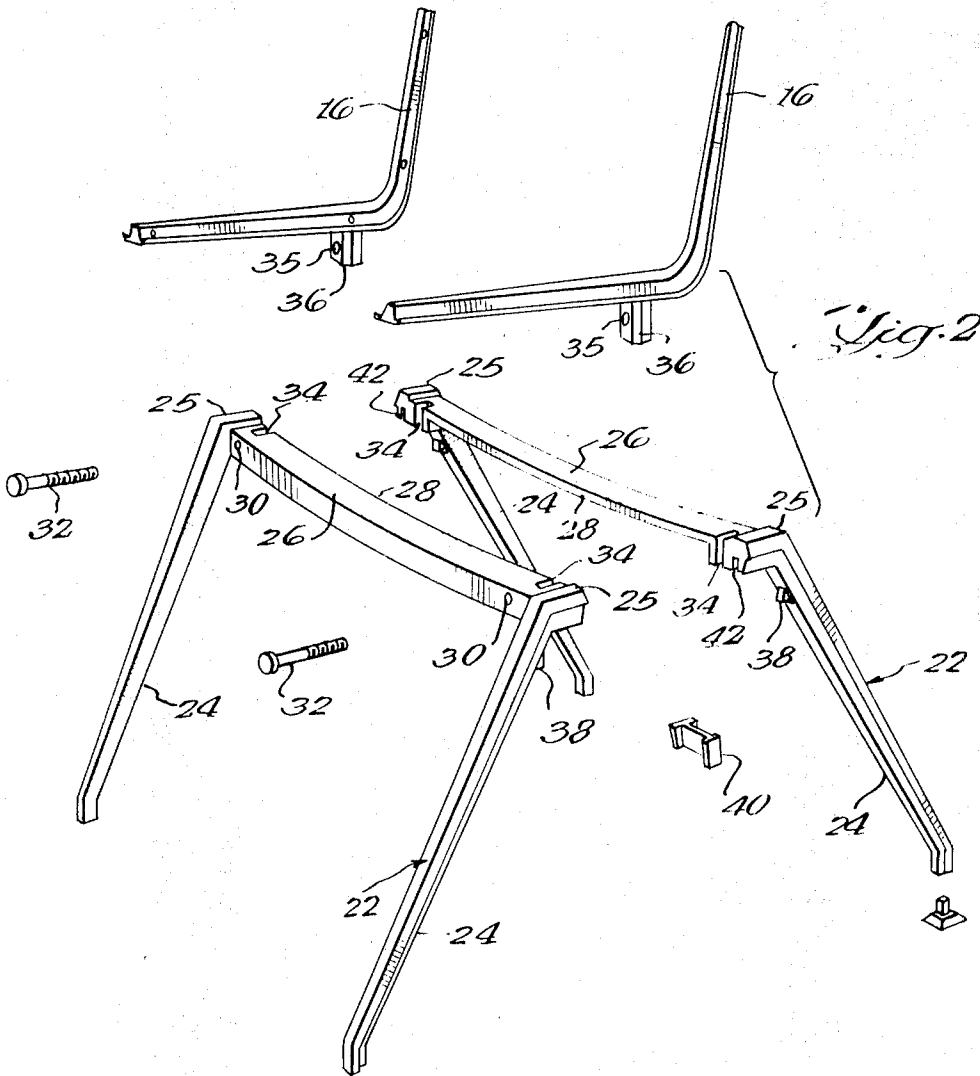
528,654	8/1956	Canada	297/445
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Primary Examiner—Francis K. Zugel
Attorney—Silverman & Cass

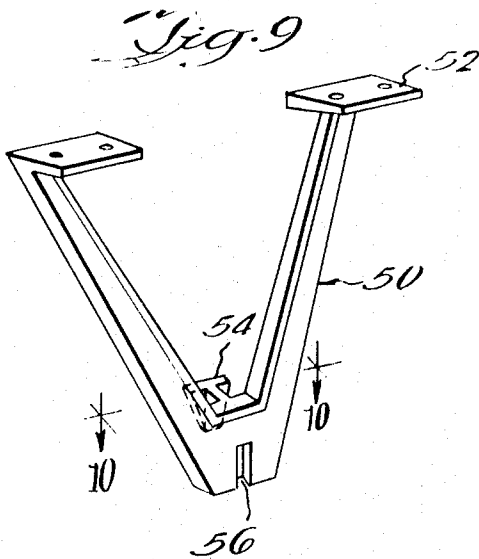
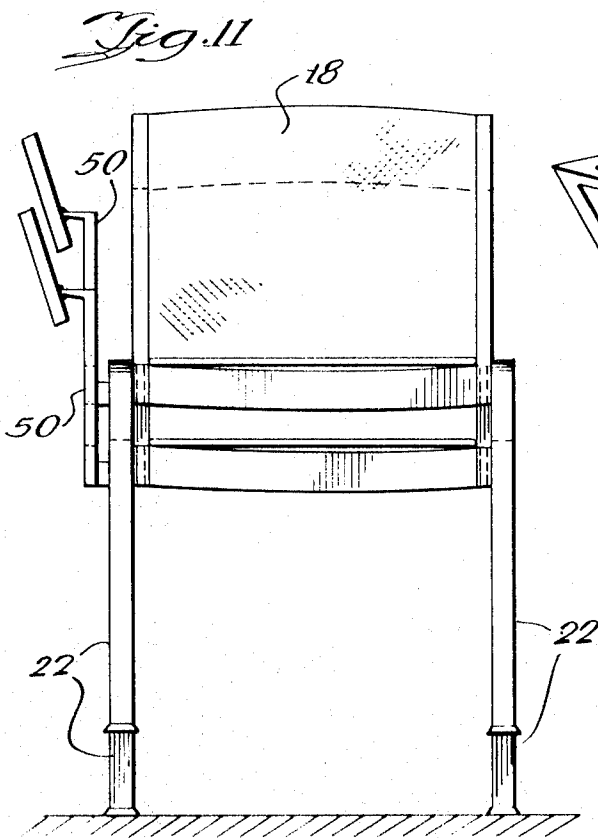
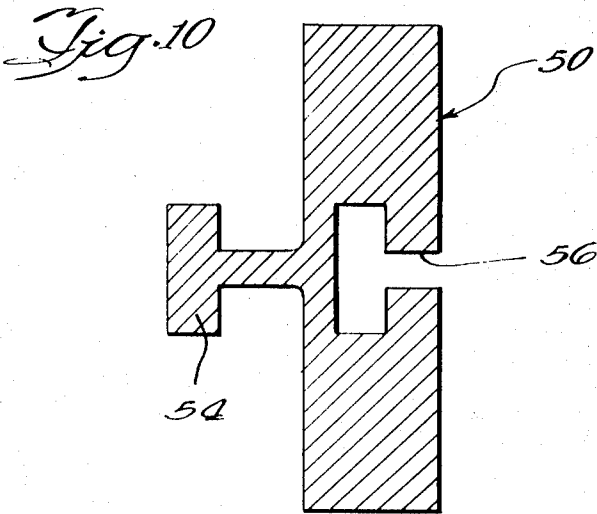
ABSTRACT: A chair capable of being stacked for storage and releasably coupled or ganged in side-by-side relation forming a row of like chairs each having a seat assembly mounted in a cantilever fashion to a base assembly. The base assembly includes a pair of substantially identical leg units; one leg unit provides the two front legs of the chair and the other unit provides the two rear legs of the chair. The legs of each pair are joined at their upper ends to an intermediate horizontal crossmember thereby forming the leg unit; the crossmembers of the two leg units are secured in back-to-back relation so as to form the base assembly. Mating slots are provided in the abutted crossmembers so as to form a mortise joint when the base is assembled. The seat assembly includes two identical L-shaped frame members between which are disposed and to which are secured a backrest and seat. The seat assembly is mounted to the base assembly by means of a tongue or tenon adapted to fit into the mortise joint and which depends from a horizontally oriented section of each L-shaped frame member. The chair is assembled by inserting the tenons of the seat assembly into the mortises provided in the base assembly. A hole can be drilled through the crossmembers and the mortise and tenon joint so that appropriate mechanical fasteners can be inserted for firmly securing the seat assembly to the base assembly. The facing or opposed surfaces of the front and rear legs of each chair have stacking bosses provided thereon each having a horizontally oriented bottom surface. A plastic insert is installed on each leg to cover said bottom surface. Upon stacking of a pair of chairs, the plastic insert of the upper chair will engage upon the shoulder of the lower chair to prevent a metal-to-metal contact between the chairs which could mar or scratch the chairs' finishes. A plurality of chairs may be coupled in side-by-side relation by providing a slot in the under portion of the shoulder of one chair in which can be engaged a crosshead of a connector member which projects outwardly from the side of an adjacent chair.







INVENTOR
 Jerome Carmel Caruso
 BY Silverman & Cass
 ATTORNEYS



INVENTOR
Jerome Carmel Canuso
BY *Silverman & Cass*
ATTORNEYS

CAST-ALUMINUM STACK CHAIR

BACKGROUND OF THE INVENTION

This invention relates to seating furniture and more particularly, to a construction for a chair capable of being stacked for storage and coupled or ganged together in side-by-side relationship when in use.

Folding chairs have provided additional seating furniture for use in large halls such as auditoriums, synagogues, churches, and schools where temporary additional seating capacity is necessary. The problems presented by these chairs, such as storage, weight and comfort have been overcome by the use of nonfolding, rigid chairs capable of being stacked one upon another. Several United States patents have been issued which teach different structures for stackable chairs.

One type of chair, formed with a unitary molded seat and backrest mounted to a tubular-metal leg assembly, is disclosed in U.S. Pat. Nos. 2,952,300; 3,018,131; 3,025,105 and 3,084,977. These chairs have side cross braces to provide rigidity and stacking and coupling means. However, these chairs do not provide the clean functional styling now demanded; nor are they capable of being fabricated from a reduced number of parts and easily assembled.

Other chair constructions are known, but these disclose complex leg assemblies such as represented in U.S. Pat. Nos. 2,588,417 and 3,328,075 or stacking chairs with foldable back as represented in U.S. Pat. No. 3,203,721. These chairs have a large number of parts, are of a relatively complex construction and are not readily assembled.

Further, a stack chair having arms or alternatively, an integral writing table is disclosed in U.S. Pat. No. Re. 25,985. However, this chair cannot be ganged to form a row of chairs, and moreover, it has a large number of parts.

Therefore, a chair, which can be stacked and coupled, has few parts, is easily assembled, has clean functional lines and is light and strong, has, to the best of my knowledge, yet to be provided. Furthermore, without changing the basic structure, the chair should be capable of being constructed with or without arms and with or without a writing table and still retain the desirable features enumerated above. Lastly, the chair must be capable of economic mass production. Preferably, the chair also should be capable of shipment in knockdown condition and be easily assembled at the contemplated site of use.

SUMMARY OF THE INVENTION

The chair embodying the invention is constructed from an easily fabricated base assembly and seat assembly. The base assembly has two identical leg units; each leg unit includes two legs, either both front or both rear, and an intermediate horizontal crossmember joined to the legs at their upper ends or shoulders. When the two leg units are secured at the crossmembers in back-to-back relation, four legs are provided for the chair, and the crossmembers provide a support structure to which the seat assembly may be mounted. The seat assembly is fabricated from two identical L-shaped frames between which is disposed and secured backrest and seat members. The chair is formed by mounting the seat assembly to the base assembly crossmembers. The width or lateral dimension of the seat assembly may be less than the width of the base assembly so that the chairs may be stacked one upon another.

In a preferred embodiment, the seat assembly is secured to the base assembly by means of a mortise and tenon arrangement. The mortise is provided in the crossmembers, and mating depending tenons are provided on horizontally oriented sections of the L-shaped frame members. The fastening means which secure one leg unit to the other can function to supplement the mortise and tenon joint. Thus, in the preferred embodiment, a locking bolt can be extended through the crossmember through the mortise and tenon and fastened to the other crossmember.

A simple slip-lock construction is provided for coupling one chair in side-by-side relation to another. An I-shaped crosshead in the horizontal position is secured at one end to the base assembly of one chair in such a manner that it projects outwardly from the side thereof. The adjacent chair can be coupled by raising it slightly, aligning a slot provided in the under portion of the shoulder and end of the crosshead and lowering the chair so that the slot engages the crosshead end. Vertical support members can be secured to the base assembly so as to provide armrests or writing tables. Chairs constructed with sidearms and writing table attachments can be stacked and ganged as hereinafter described.

The invention provides a chair having a small number of parts which can be fabricated by mass production techniques. Furthermore, there are no cross braces between the front and rear legs or between the front legs or rear legs themselves, thereby providing a base assembly with uncluttered or clean, functional modern lines. The cost of the chair is significantly reduced since there are few parts and many of the parts are duplicates of one another; moreover, the chair can be assembled in a very short length of time by means of very simple fastening devices. This enables shipment in knockdown condition for the chair with attendant advantages. Due to the construction of the chair, many of the assemblies can be fabricated from lightweight materials, such as die-cast aluminum. Therefore, the chair of this invention alleviates many of the problems heretofore prevalent in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a chair embodying this invention;

FIG. 2 is an exploded perspective view depicting the elements of the chair of FIG. 1 with the backrest and seat not shown;

FIG. 3 is a side elevational view showing several chairs embodying the invention in stacked or stored condition;

FIG. 4 is a front elevational view showing three chairs coupled together in side-by-side relation;

FIG. 5 is a fragmentary sectional view taken along line 5—5 of FIG. 4 and showing the crosshead in place in the ganging slots;

FIG. 6 is a fragmentary sectional view taken along line 6—6 of FIG. 4 and showing the tapered end of the crosshead secured in place in a ganging slot;

FIG. 7 is a fragmentary sectional view showing the straight-sided end of a crosshead poised for engagement with a ganging slot;

FIG. 8 is a fragmentary sectional view taken along line 8—8 of FIG. 1 and showing a locking bolt extended through the crossmembers and mortise and tenon joint;

FIG. 9 is a perspective view of a side support member which is adapted to be secured to the base assembly;

FIG. 10 is a sectional view taken along line 10—10 of FIG. 9 and in the general direction indicated showing the mounting head and ganging slot; and

FIG. 11 is a front elevational view showing several chairs stacked and with writing table attachments oriented in the vertical position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, reference numeral 10 designates generally a chair constructed in accordance with this invention. A separate seat assembly, designated generally by reference numeral 12, is secured to a base assembly, designated generally 14.

The seat assembly 12 includes a pair of identical, L-shaped frame members 16 between which are mounted a backrest 18 and seat 20. The base assembly 14 includes two identical leg units 22, each of which includes a pair of front or rear legs 24 having shoulder portions 25 to which the ends of an intermediate horizontal crossmember 26 are joined. Both leg units 22 are fastened together along the inner faces 28 of the cross-

members so as to form the base assembly 14. In order to provide a stable base, the legs 24 slope downwardly and away from the inner face 28 so that the front and rear legs are divergent. Suitable fastening means are used to secure together the two leg units in back-to-back relation.

A preferred method for so securing said leg units 22 together is to provide internally threaded holes 30 in the crossmembers into which locking bolts 32 can be threadedly engaged. Nut and bolt arrangements, clip arrangements, or even tongue and groove arrangements may be used instead of the preferred locking means described and illustrated.

The crossmember 26 can be straight or curved as shown in FIG. 2. The curvature of the member 26 illustrated in FIG. 2 serves to accommodate a curved seat assembly which is especially comfortable.

The seat assembly 12 can be secured to the base assembly 14 in numerous ways. However, a mortise and tenon joint is preferred since it provides the greatest ease of the fabrication, the fewest number of parts, easiest assembly, and the desired stability. The mortise is formed by providing a pair of slots 34 in each crossmember 26. The slots in the opposing crossmembers can be brought into registry when the leg units 22 are joined together to form the base assembly 14, giving rise to a mortise or generally rectangular cavity. In the preferred embodiment, two such mortises are provided. A heavier section may be provided in the portion of the crossmember in which the slots 34 are formed.

Each L-shaped frame member 16 is provided with an integral depending tenon 36 along its horizontal section or part. The position of the tenon 36 along the horizontal part is determined by the size of the seat and expected location of the center of gravity of the user. The size and shape of the tenon is such that it can be matingly engaged in the mortise. Normally, the seat assembly and base assembly are constructed separately and the tenons are then inserted into the mortises so as to mount the seat assembly to the base assembly. An alternative procedure would be to make the mortise slightly smaller than the tenon, so as to require the larger tenon to be force fitted into the smaller mortise.

Referring to FIG. 2, open-ended holes 35 are provided which extend through the tenon 36. When the mortise and tenon are matingly engaged, the holes 30 and 35 in the crossmember and tenon are aligned. A locking bolt 32 is threaded into the aligned holes in the crossmembers and tenon for locking the pieces together. The bolt may then be secured by a nut or by a threaded internal connection. Thus, the base assembly can be erected and the seat assembly mounted thereto in a single, simple operation.

In order to stack chair 10, the outer edges of the seat assembly 12 must be displaced inwardly of the outer sides of the base assembly 14. This inward displacement of the seat assembly allows the legs of a second chair to fit over the first chair for stacking. The chairs 10 can be stacked also by setting one on top of another in which case the crossmember of one chair would rest on the seat or against the L-shaped frames of a lower chair. However, such an arrangement is undesirable since the chairs and seat could be scratched, marked or otherwise disfigured. To prevent such possible disfiguration of the chairs, stacking bosses 38 are provided along the opposed faces of the front and rear legs, that is, the front faces of the rear legs and rear faces of the front legs. The bosses have a generally horizontal bottom surface over which a plastic insert is installed so that when a chair is stacked, the plastic insert rests on the top surface of the leg shoulder therebelow thus providing nondamaging plastic-to-metal contact. The boss is positioned along the length of the leg at a point such that a space will be provided between the seat of lower chair and crossmember of the upper chair. Furthermore, the bosses maintain each chair in a fixed horizontal position so as to reduce the tipping tendency of the stack of chairs.

The chairs 10 are shown stacked in FIG. 3. Chairs 10a through 10d are stacked one upon another and it is seen that the stacking bosses 38a rest upon the top surface or shoulder

of the legs 24b of the next lower chair 10b. From this view it can be seen that the only contact between chairs is at the stacking boss and leg shoulder, thus avoiding disfiguring of the chairs when they are stacked.

A plurality of ganged or coupled chairs in side-by-side relation is shown in FIG. 4. Such coupling allows the chairs to be temporarily arranged in fixed rows for the seating of large audiences. By virtue of the construction of these chairs, a very simple ganging device is provided. This device can be characterized as an I-shaped crosshead 40. The leg shoulders 25 are slotted along the inner faces 28 and the under surface of the shoulder. Thus, when two leg assemblies are brought together, the slots 42 are in registry and provide a cavity in which one end of the "I" may be received. Thus, when one chair, having the crosshead in position, is brought in side-by-side relation to a second, the projecting end of the "I" may be inserted into the ganging slot 42 in the base assembly of the second chair. The crosshead 40 may be constructed of a resilient material such as plastic and the slots 42 may have appropriate detents or projections therein so as to releasably secure the crosshead in place. Thus, crosshead can be inserted into the slot after the base assembly has been constructed.

If it is desired to fixedly secure the crosshead 40 to the chair, the ganging slots are provided with reentrant angles and one end of the "I" is tapered in conformity with the slots. Thus, once the chair has been assembled and the crosshead is secured in place at its tapered end, it cannot be removed. A slot having a reentrant angle with the tapered end of the crosshead 40 disposed therein is depicted in cross section in FIG. 6. From the view it can be appreciated that the crosshead is firmly secured in place and cannot be removed except by disassembling the chair. The untapered end of the crosshead releasably engages a ganging slot in an adjacent chair. As is apparent from FIG. 7, the untapered end can be fitted into the ganging slot through the opening in the bottom and removed in a similar fashion. FIG. 5 shows the crosshead in place in two adjacent ganging slots. From that view, the connection between adjacent chairs by means of the crosshead is readily apparent.

One of the great advantages of the chair disclosed herein is that it is constructed of few parts, many of which are identical. For example, the leg units are identical members, either of which can be the front or rear leg unit. Thus, the base structure is formed from two members which are essentially identical and need not be oriented in their manufacture. The frame members for the seat assembly are identical and, similarly, do not require orientation when fabricated. Furthermore, the seat assembly may be secured to the base assembly by means of only two bolts. The structural member elements used in making the chair 10 of the invention may be die cast thereby eliminating multiple manufacturing and assembling procedures with attendant material and significant cost savings.

Using the basic construction as described above, the chair 10 can be modified to accommodate armrests and/or writing table attachments integral therewith. The vertical support member 50, shown in FIG. 9, can be used to support either the armrest or table. The upper end of the support 50 has protruding horizontally oriented flanges 52 on which the armrest or table member is secured. The member 50 is secured at its lower end to the base assembly 14 by an integral inwardly projecting connecting head 54, similar to the crosshead 40. The head 54 has a tapered end which can be fixed in position in the reentrant ganging slots 42. Thus, the support member 50 is secured to the base assembly in the same manner as the tapered end of crosshead 40; by virtue of this connection the flange member is located outboard of the leg assembly so as not to interfere with the stacking of the chairs. The outboard side of the lower end of the support 50 is provided with a downwardly opening slot 56 which may be used to engage an end of the crosshead 40 for ganging. If one armrest is secured to the same side of a plurality of chairs, they can be stacked and ganged as previously described. However, if two armrests

are used with each chair, they may be stacked but not ganged, because ganging slots in which the tapered end of the crosshead 40 can be fixedly secured are not provided due to dimensioned limitations.

A chair having a writing table member on one side normally is not provided with an armrest on its opposite side. Thus, the chair can be ganged in the fashion described for a chair having one armrest. In order to stack such a chair, the table member is pivotally secured to the upper flanges 52 so that it may be rotated about a horizontal axis upwardly and outwardly from the chair, thereby vertically orienting it outboard of the support member. The stacking of such chairs is depicted in FIG. 11. Releasable locking mechanisms can be provided to lock the writing table member in its vertical position for stacking and in its horizontal position for writing or use.

What is desired to be secured by Letters Patent of the United States is:

1. A chair frame assembly comprising, a base frame and a seat frame;
 - a. said base frame comprising a pair of similar integral leg units each of which comprises;
 - i. a pair of legs joined to a crossmember at shoulder formations at the upper ends of said legs;
 - ii. the crossmember having an inner face from which said legs are cantcd downwardly and in a direction away from the inner face;
 - iii. the leg units being arranged in back-to-back relation along abutting inner faces of the crossmembers;
 - b. the seat frame comprising a pair of similar L-shaped integral frame members adapted to mount
 - i. a seat between horizontally oriented sections of the frame members and
 - ii. a backrest between vertically oriented sections of the frame members; and
 - c. means for mounting the seat frame to the base frame, said means including said crossmembers having at least a pair of upwardly opening mortises on opposite sides of said opposed inner faces thereof and said seat frame members each having an integral depending tenon matingly engageable in a said mortise for holding same upright on the base frame in position to mount said seat and backrest.
2. The assembly as recited in claim 1 in which said leg units and L-shaped frame members respectively are integral, cast-metal members.
3. The assembly as recited in claim 1 wherein the leg units are assembled together by mechanical fasteners engaged with the crossmembers.
4. The assembly as recited in claim 1 wherein the cross members are concave in cross section and the seat is of conforming configuration for mounting thereon in a cantilever-type support position.
5. The assembly as recited in claim 4 wherein the width of the frame assembly is less than the width of the base frame.
6. The assembly as recited in claim 1 wherein the width of the seat is less than that of the base and the seat frame is mounted to the base frame inside the shoulder formations with said formations exposed.
7. The assembly as recited in claim 1 wherein the leg unit is a unitary piece.
8. The assembly as recited in claim 1 wherein the L-shaped frame member is a unitary piece.
9. The assembly as recited in claim 1 wherein the base frame has a pair of ganging slots provided in the underside of the shoulder formations, and I-shaped crosshead connector members are engaged in said ganging slots.
10. The assembly as recited in claim 9 wherein said connector members are resiliently and releasably engaged in the ganging slots.
11. The assembly as recited in claim 1 having at least one vertical support member secured to the base frame at a side thereof.
12. The assembly as recited in claim 1 wherein at least one armrest is secured to said vertical support.

13. The assembly as recited in claim 1 wherein a writing table attachment is mounted to the support member.

14. The assembly as claimed in claim 1 in which said mounting means include means to hold said crossmembers together with the tenons engaged in said mortises.

15. The assembly as claimed in claim 14 in which said last-named means cooperate with said tenons and mortises for holding said inner faces together in said abutting relationship.

16. The assembly as recited in claim 5 wherein a plurality of stacking bosses is provided, one boss projecting from each leg toward the opposed leg and each boss having a horizontal surface for stacking contact.

17. The assembly as recited in claim 16 wherein the stacking bosses are arranged to contact the upper surfaces of the leg shoulder formation of a lower assembly upon which said assembly is stacked such that when the assemblies are stacked, a space is provided between the seat and seat frame member of the lower assembly and the lower surface of the crossmember of the upper assembly.

18. A chair comprising, a base assembly and a seat assembly;

- a. said base assembly including a pair of similar leg units each of which comprises;
 - i. a pair of legs joined to a crossmember at shoulder formation at the upper ends of said legs;
 - ii. the crossmember having an inner face from which said legs are cantcd downwardly and in a direction away from the inner face;
 - iii. the leg units being secured in back-to-back relation along opposed inner faces of the crossmembers;
 - iv. said crossmembers having mortise means;
 - b. the seat assembly having a pair of similar L-shaped frame members including,
 - i. a seat mounted between horizontally oriented sections of the frame members and
 - ii. a backrest mounted between vertically oriented sections of the frame members;
 - iii. depending tenon means matingly engaged in said mortise means for supporting the seat assembly upright on the base assembly; and
 - c. the seat assembly being secured to the base assembly by means of a fastener passing through each said crossmember and tenon means.
19. A chair comprising, a base assembly and a seat assembly;
- a. said base assembly including a pair of similar leg units each of which comprises;
 - i. a pair of legs joined to a crossmember at shoulder formations at the upper ends of said legs;
 - ii. the crossmember having an inner face from which said legs are cantcd downwardly and in a direction away from the inner face;
 - iii. the leg units being secured in back-to-back relation along opposed inner faces of the crossmembers;
 - b. the seat assembly having a pair of similar L-shaped frame members and including,
 - i. a seat mounted between horizontally oriented sections of the frame members and
 - ii. a backrest mounted between vertically oriented sections of the frame members;
 - c. means for mounting the seat assembly to the base assembly; and
 - d. said base assembly having a pair of ganging slots provided in the underside of the shoulder formations, each ganging slot being provided with a reentrant angle, and I-shaped crosshead connector members engaged in said ganging slots.

20. The chair as recited in claim 19 wherein one end of the crosshead is tapered and shaped to matingly engage the ganging slot and be secured therein and the other end is untapered and of a size to slidably engage the ganging slot.

21. A chair comprising, a base assembly and a seat assembly;

- a. said base assembly including a pair of similar leg units each of which comprises;
 - i. a pair of legs joined to a crossmember at shoulder formations at the upper ends of said legs;
 - ii. the crossmember having an inner face from which said legs are canted downwardly and in a direction away from the inner face;
 - iii. the leg units being secured in back-to-back relation along opposed inner faces of the crossmembers;
- b. the seat assembly having a pair of similar L-shaped frame members and including,
 - i. a seat mounted between horizontally oriented sections of the frame members and
 - ii. a backrest mounted between vertically oriented sections of the frame members; and
- c. means for mounting the seat assembly to the base as-

- sembly.
 - d. the base assembly having at least one vertical support member secured thereto at a side thereof, said vertical support member having, at its lower end, an integral inwardly projecting connecting head, having an "I" shape and a downwardly tapered end flange, and said base assembly having at least one ganging slot in the underside of the leg shoulder formation, said slot having a reentrant angle and adapted to engage the tapered end of the connecting head thereby securing the support member outboard of the base assembly.
22. The chair as recited in claim 21 wherein the support member has a downwardly opening ganging slot provided in its lower end.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,610,686 Dated October 5, 1971

Inventor(s) Jerome Carmel Caruso

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 54, before "frame" insert --seat--. Column 5, line 56, after "seat" insert --frame--. Column 5, line 56, after "base" insert --frame--. Column 6, lines 25 and 26, after "shoulder" change "formation" to --formations--.

Signed and sealed this 9th day of May 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents