TITLE OF INVENTION

Modular Frame System

FIELD OF INVENTION

The present invention relates to a modular and reconfigurable frame system of vertical supports and support frames fastened together by combinations of joint fastening means and ‘twist and lock’ fastening means.

DESCRIPTION OF RELATED ART

Modular furniture assembly systems usually feature modular inter-fitting pieces which allow the user to add, remove and configure pieces in the assembly of furniture. Often, an important feature of said systems are jointing devices which provide for rapid and convenient assembly of joints, and which, when fitted with other parts of the system, result in a stable structure. Particularly, in table assembly systems, the structure is to be capable of withstanding weight, vibration and movement that is commonly experienced in day-to-day usage.

OBJECT AND SUMMARY OF THE INVENTION

The present invention was made to address and solve the issues and problems above.

An object of the present invention is to provide a modular and reconfigurable frame system comprising at least one hollow vertical support fastened to at least one horizontal spine by fastening means; each spine having at

least one aperture and at least one rail; the fastening means characterised by a jointing system comprising a D-shaped corner bracket with at least one hook, the corner bracket fastened to the vertical support by a fastening means preferably by bolting means, the horizontal spine fastened to the corner bracket by means of the hook of corner bracket inserted into the aperture of the spine and hooked against an edge of the aperture, one end of the spine fastened to a spine end hook which is hooked to an edge of the vertical support.

A further object of the present invention is to provide the frame system with one end of a first spine fastened to the rail of a second horizontal spine by a 'twist and lock' fastening means; the fastening means characterised by a spine end cap with a protruding lock fastened to the end of the first horizontal spine by bolting means, the protruding lock adapted to fit into the rail of the second spine by the rotation of the spine end cap from a horizontal position to a vertical position.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of vertical support 20, corner bracket 30, bracket support 40 with holes 41 and 42, fastening member 70, two primary spines 50, foot glide insert 85 and foot pad 80 and locking member 81. Fig. 1 further shows that vertical support 20 has holes 21 and 26, indentations 29 and surface 23. Fig. 1 further shows that each primary spine 50 has aperture 52 and hook 60 on one end.

Fig. 2 is an exploded perspective view of primary spine 50 assembled with spine end hooks 60 on each end of primary spine 50, further showing aperture 52, top surface 55 and rail 51.

Fig. 3 shows a perspective view of corner bracket 30, showing hooks 38, proturberances 37, surface 32, hole 33, hole 34 and hole 31.

Fig. 4 is a perspective view of a part of the frame system assembled, and showing vertical support 20, two primary spines 50, fastening member 70, two spine end hooks 60, corner bracket 30 and foot pad 80 as assembled.

Fig. 5 is a cross-sectional view of vertical support 20, showing protrusions 24, surfaces 23, rails 22 and indentations 29.

Fig. 6 is an exploded perspective view of secondary spine 59 assembled with left spine end cap 90 on one end and right spine end cap 95 on a further end; Fig. 6 further shows gullies 58, rail 51, top surface 55, hole 53, hole 54, hole 56 and hole 57 of secondary spine 59; Fig. 6 further shows head 103, protrusion 92 and hole 94 of right spine end cap 95; Fig. 6 further shows head 102 of left spine end cap 90.

Fig. 7 is a front perspective view of spine end hook 60, showing hole 64, hole 65 and hook 63.

Fig. 8 is a back perspective view of spine end hook 60, showing protrusion 61, protrusion 62, hole 64 and hole 65.

Fig. 9 is a front perspective view of left spine end cap 90, showing protruding lock 91, trunk 101, head 102, sides 105, sides 106, hole 93, hole 94 and surface 107.

Fig. 10 is a back perspective view of left spine end cap 90, showing protrusion 92, hole 93 and hole 94.

Fig. 11 is a front perspective view of right spine end cap 95, showing protruding lock 104, which comprises of head 103 and trunk 110.

Fig. 12 is a side view of secondary spine 55 fastened to primary spine 50 by means of left spine end cap 90 affixed to one end of secondary spine 55 and in a locked position in relation to rail 51 of primary spine 50 with sides 105 locked in gully 58; Fig. 12 further shows trunk 101 and head 102 of left spine end cap 90; Fig. 12 further shows holes 53, 54, 56 and 57 of primary spine 50.

Fig. 13 shows a perspective view of L-shaped bracket 120 with hole 121 and protruding lock 122.

Fig. 14 shows an exploded perspective view of middle leg 140, being formed by spine rest 130, a foot glide insert 85 fitted into a top end of middle support 25, a further foot glide insert 85 with hole 86 and fitted into a bottom end of middle support 25, and foot pad 80 with locking member 81.

Fig. 15 shows a perspective view of the top of spine rest 130 having hole 134, supports 131 and openings 132.

Fig. 16 shows a perspective view of the base of spine rest 130 having hole 134, indentation 133, supports 131 and opening 132.

Fig. 17 shows an exploded perspective view of a plurality of vertical supports 20, a plurality of primary spines 50, a plurality of secondary spines 59, a plurality of corner brackets 30, and a one middle leg 140 forming a larger frame structure.

Fig. 18 is a exploded perspective view of a plurality of vertical supports 20, a plurality of primary spines 50, a plurality of secondary spines 59, a plurality of corner brackets 30, forming a frame structure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference to Fig. 5 and Fig. 1, vertical support 20 is a hollow, tubular member with a polygonal cross-section. Fig. 5 shows a polygonal shaped cross-section of vertical support 20 and extended protrusions 24 on each corner of the cross-section. Each extended protrusion 24 runs along vertically along the height of vertical support 20. Each protrusion 24 has a surface 23, and each surface 23 has a hole 21 and a hole 26. Vertical support 20 has external rail 22 running vertically on each of its external sides. Vertical support 20 has a plurality of inside rails 28, each of inside rails 28 is adapted to slidably receive bracket support 40 in a position as to align hole 41 of bracket support 40 with hole 21 and to align hole 42 with hole 26. Further, vertical support 20 has a plurality of indentations 29 on each of its ends; preferably, the indentations are rectangular in shape.

In Fig. 1, foot glide insert 85 is of a material and of such dimensions so as to fit firmly into the base end of vertical support 20 and in a manner such that foot glide insert 85 cannot be easily removed. Preferably, a method of fitting foot glide insert 85 into the base of vertical support 20 may be by means of hammering.

Locking member 81 of foot pad 80 is inserted into hole 86 and fastened to foot glide insert 85, preferably by bolting means. Foot pad 80 is rotated in relation to foot glide insert 85 and functions to adjust the distance of foot glide insert 85 and the base of vertical support 20 from the ground. The effect of this is to adjust the height of any vertical support 20 in relation to the rest of the modular frame.

As shown in Fig. 3, corner bracket 30 is a trapezium shaped supporting bracket and has an elongated protuberance 37 extended from each of two sides of corner bracket 30. A hook 38 is extended from each protuberance 37. Each protuberance 37 is adapted to fit and slide horizontally in rail 51 of primary spine 50. Each hook 38 is adapted to fit into aperture 52 of primary spine 50.

As shown in Fig. 3, corner bracket 30 has a surface 32 and through hole 31.

Fig. 1 is an exploded perspective view of vertical support 20, corner bracket 30, primary spines 50, bracket support 40 and fastening member 70. In Fig. 1, corner bracket 30 is fastened to vertical support 20 by a fastening means and in an orientation such that surface 23 and surface 32 are facing each other, and protuberance 37 may be fitted into rail 51 of primary spine 50 when attached to vertical support 20 as provided in this description. Preferably, corner bracket 30 is fastened to vertical support 20 by means of bracket support 40 engaged with inside rail 28 and with a fastening member 70 bolted through hole 31 of corner bracket 30, hole 21 of vertical support 20 and into hole 41 of bracket support 40, as shown in Fig. 1; bracket support 40 is further fastened to vertical

support 20 and stabilized by means of a fastener through hole 26 of vertical support 20 and hole 42 of bracket support 40. Preferably, fastening member 70 and the fastener are bolting agents.

Referring to Figs. 2 and 6, primary spine 50 is a hollow tubular member with a uniform polygonal cross-section. Each end of primary spine 50 has rectangular hole 56, rectangular hole 57, hole 53 and hole 54. The top surface 55 of primary spine 50 is flat in order to receive and support any board or table-top placed upon it. Linear rail 51 is located on each external side of primary spine 50 and runs along the length of primary spine 50. Rail 51 has a uniform gully 58 on each side of rail 51. Rail 51 is to provide other parts of the furniture assembly system a means by which to be affixed to either external vertical side of primary spine 50 and along any part of the length of primary spine 50 and in a rapid and convenient 'twist and lock' manner as described elsewhere in this description.

Primary spine 50 has aperture 52 on each of its vertical sides and in the proximity of each of its ends; preferably, aperture 52 is rectangular in shape.

With reference to Fig. 7 and Fig. 8, spine end hook 60 is flat in shape and has protrusion 61 and protrusion 62 extending from one surface and hook 63 extending from the top of the opposite surface. Spine end hook 60 further has hole 64 and hole 65. Preferably, hook 63 is a rectangular hook.

Secondary spine 59 is identical in all respects to primary spine 50 with the exception that secondary spine 59 does not have aperture 52.

Spine end hook 60 may be fastened to one end of a secondary spine 59 by a fastening means. Preferably, the fastening means is the fitting of protrusion 61 and protrusion 62 in rectangular hole 56 and rectangular hole 57 respectively, resulting in the alignment of hole 64 with hole 53 and the alignment of hole 65 with hole 54; a bolt is fitted through hole 64 and locked firmly to hole 53, and a further bolt fitted through hole 65 and locked firmly to hole 54.

In an assembled state, as shown in Fig. 4 one end of a first primary spine 50 is fastened to a vertical support 20. Preferably, one end of the first primary spine 50 is fastened to a spine end hook 60 with its hook 63 hooked into indentation 29 of vertical support 20; hook 38 of corner bracket 30 is inserted into and hooking an edge of aperture 52 of primary spine 50; the combinatory effect of corner bracket 30 fastened to vertical support 20 by bolting means and hook 38 applying a pulling force towards vertical support 20 firmly clamps first primary spine 50 to vertical support 20. A second primary spine 50 is fastened to the vertical support 20; preferably by similar means.

With reference to Fig. 9 and Fig. 10, left spine end cap 90 has protruding lock 91 extending from an external surface, protrusion 92 extending from an inside surface of the end cap 90, hole 93 and hole 94.

Left spine end cap 90 is adapted to be fastened to one end of secondary spine 59 by a fastening means. In one embodiment, with reference to Fig. 6, the fastening means is the fitting of protrusion 92 into rectangular hole 56, resulting in the alignment of hole 93 with hole 53 and the alignment of hole 94 with hole

54; a bolt is inserted through hole 93 and locked firmly to hole 53, and a further bolt inserted through hole 94 and locked firmly to hole 54.

Protruding lock 91 comprises a trunk 101 supporting a flat, rectangle-shaped head 102 with two opposing corners of head 102 being rounded. When seen from the view shown in Fig. 9, the top left and bottom right corners of head 102 are right-angled; and the top right and bottom left corners are rounded.

Left spine end cap 90 is fastened to any point along rail 51 of secondary spine 59 by placing protruding lock 91 into rail 51 with left spine end cap 90 in a horizontal position and rotating left spine end cap 90 in an anti-clockwise direction until it is in a vertical, locked position in relation to rail 51.

This locking mechanism is described as follows. Head 102 is adapted to fit into rail 51. The thickness of head 102 is adapted to fit firmly into gullies 58 of rail 51. Fig. 12 is a side view showing left spine end cap 90 in a locked position in relation to rail 51. Each of opposing sides 105 is adapted to fit firmly into each gully 58; and each of opposing sides 106 is adapted to fit perpendicularly across rail 51 when left spine end cap 90 is in a locked position. The head 102 of left spine end cap 90 is locked into rail 51 of primary spine 50 by rotating left spine end cap 90 from a horizontal position to a vertical position ninety degrees in an anti-clockwise direction; the right-angled corners of head 102 prevent left spine end cap 90 from being rotated in an anti-clockwise direction beyond its vertical locked position. Trunk 101 is of a length so as to allow surface 107 to be in firm contact with an external surface of secondary spine 59 when left spine end cap 90 is in the locked position, thus preventing any

unintended movement of left spine end cap 90 in relation to secondary spine 59. To detach, left spine end cap 90 is simply rotated ninety degrees in a clockwise direction, releasing sides 105 from gully 58, and allowing its removal from rail 51. The above results in a 'twist and unlock' mechanism for rapid and convenient assembly and disassembly of left spine end cap 90 to and from secondary spine 59.

Fig. 11 shows right spine end cap 95 with protruding lock 104 which comprises of trunk 110 and head 103. Protruding lock 104 of right spine end cap 95 is different to that of protruding lock 91 of left spine end cap 90. When seen from the view provided in Fig. 11, the top left and bottom right corners of head 103 are rounded; and the top right and bottom left corners are right-angled. The head 103 of right spine end cap 95 is locked into rail 51 of secondary spine 59 by rotating right spine end cap 95 from a horizontal position to a vertical position ninety degrees in a clockwise direction. In contrast, the top left and bottom right corners of head 102 are right-angled; and the top right and bottom left corners are rounded. The 'twist and lock' mechanism of right spine end cap 95 to secondary spine 59 is similar to that of left spine end cap 90 as described above with the exception that right spine end cap 95 is locked into rail 51 by rotating it from a horizontal position to a vertical position ninety degrees in a clockwise direction, and correspondingly unlocked by rotation in an anti-clockwise direction.

Right spine end cap 95 is identical to left spine end cap 90 in all other respects.

In this manner, a secondary spine 59 with one end affixed to a left spine end cap 90 or a right spine end cap 95 may be subsequently affixed to the rail 51 of any other secondary spine 59 or primary spine 50. In an extension to this, a first secondary spine 59 with one end affixed to a left spine end cap 90 and its other end affixed to a right spine end cap 95 may be then attached to other spines, whether such are secondary spines 59 or primary spines 50 or a combination of both, on both of its ends.

External rail 22 of vertical support 20 is identical in all respects to rail 51 of primary spine 50, so that left spine end cap 90 and right spine end cap 95 may be affixed to external rail 22 in the same manner described above.

Fig. 13 shows a perspective view of L-shaped bracket 120. Bracket 120 has hole 121 and protruding lock 122. Protruding lock 122 is identical in all respects to protruding lock 91 of left spine end cap 90; thus, bracket 120 may be attached to any point along rail 51 of secondary spine 59 and to any point along rail 22 of vertical support 20 in the same 'twist and lock' manner as that of left spine end cap 90, and may be similarly detached in a similar 'twist and unlock' manner.

Figs. 15 and 16 show the top and base of spine rest 130 respectively. Spine rest 130 is a broad, elongated member having a rectangular centre with an upward facing C-shaped open support 135 on one side and a further upward facing C-shaped open support 136 on a further opposing side. Support 135 has opening 137 located at the outward arm of C-shaped open support 135; correspondingly, support 136 has opening 138 located at the outward arm of C-

shaped open support 136. Further, the base of spine rest 130 has indentation 133 and spine rest 130 has through hole 134; preferably at the centre of spine rest 130. Indentation 133 is adapted to receive the base of foot glide insert 85.

Middle support 25 is identical to vertical support 20 in all respects except that middle support 25 is shorter in height than that of vertical support 20 when assembled. The comparatively shorter height of middle support 25 is to accommodate for the height of spine rest 130 so that the top of the frame structure should be horizontal when assembled, and as described below.

When assembled, as shown in Fig. 14, the base of a spine rest 130 is fastened to a middle support 25 by fastening means. Preferably, the fastening means is the base of foot glide insert 85 fitted securely into indentation 133 and firmly clamping spine rest 130, foot glide insert 85 to the top end of middle support 25 by means of a bolt through hole 134 of spine rest 130, hole 86 of foot glide insert 85; the fitting of the base of foot glide insert 85 into indentation 133 prevents any unintended horizontal movement of spine rest 130 in relation to middle support 25. The assembly described above forms a structure referred to in this document as middle leg 140.

Preferably, a second foot glide insert 85 is fitted tightly into the base of middle support 25 with locking member 81 of foot pad 80 inserted into hole 86 and fastened by bolting means.

As shown in Fig. 17, middle leg 140 is used in the support of the middle portion of the frame structures. When assembled, a first secondary spine 59 rests on and along the width of one C-shaped support 131; a second secondary spine

59 is fastened to the first secondary spine 59 and has its fastened end resting on C-shaped 131 through opening 132. A third and fourth secondary spine 59 are assembled in a similar manner a second C-shaped support 131 of spine rest 130.

A plurality of vertical supports 20, primary spines 50, secondary spines 59 and corner brackets 30 are assembled to form a simple frame structure as shown in Fig. 18.

A board or table-top, not shown, adapted for the dimensions of the frame structure is placed flatly upon the frame structure and is attached to brackets 120 by a fastening means; preferably by means of a bolting agent through hole 121 of each bracket 120. The fastening of brackets 120 to the board prevents the detachment or loosening of any of brackets 120 from their respective spines 50 by any unintended rotation of bracket 120. The board is further fastened to each corner bracket 30 by a fastening means, preferably by means of a bolting agent through each of hole 33 and hole 34.

The combinatory effect of the fastening of the board to brackets 120 and to corner brackets 30 prevents any unintended movement of the board in relation to the frame structure.

A plurality of vertical supports 20, primary spines 50, secondary spines 59, corner brackets 30 and at least one middle leg 140 are assembled to form a larger frame structure as shown in Fig. 17.

It is to be understood that the embodiments described herein are for the purposes of description and not of limitation. The means and materials

pertaining to the disclosed functions may take alternative forms without departing from the present invention.

CLAIMS

1. A modular and reconfigurable frame system comprising

a tubular vertical support (20) having a polygonal cross-section, and having two or more vertical external rails (22), two or more indentations (29), and having one or more cross-sectional protrusions (24) each with surface (23),

a corner bracket (30) having two protuberances (37), and having hook (38) extending from each protuberance (37), corner bracket (30) further having surface (32),

two horizontal primary spines (50), each primary spine (50) having a linear rail (51) located lengthwise on each vertical side of each primary spine (50), and each primary spine (50) having aperture (52) adapted to receive hook (63), and each primary spine (50) having a hook (63) fastened to each end of primary spine (50), and hook (63) is adapted to hook and fit into aperture (52),

a fastening means by which to fasten corner bracket (30) to a side of vertical support (20) and to fasten one end of each primary spines (50) to vertical support (20),

characterized in that

corner bracket (30) is fastened to a cross-sectional protrusion (24) of vertical support (20) wherein surface (32) of corner bracket (30) is placed firmly against a surface (23) of a cross-sectional protrusion (24) of vertical support (20),

one end of a first primary spine (50) fitting into and against a first external rail (22) of vertical support (20) by means of a first hook (63) fitting onto a first indentation (29), a first hook (38) of corner bracket (30) fitting into a aperture (52) of the first primary spine (50), and a first protuberance (37) of corner bracket (30) fitting into a rail (51) of the first primary spine (50),

one end of a second primary spine (50) fitting into and against a second external rail (22) vertical support (20) by means of a second hook (63) fitting onto a second indentation (29), a second hook (38) of corner bracket (30) fitting into an aperture (52) of the second primary spine (50), and a second protuberance (37) of corner bracket (30) fitting into a rail (51) of the second primary spine (50).

2. A modular frame system as claimed in claim 1 wherein corner bracket (30) has a through hole (31), and wherein cross-sectional protrusion (24) of vertical support (20) has a hole (21), and wherein said fastening means is a bolting means by way of a bolting agent through hole (31) and hole (21).

3. A modular frame system as claimed in claim 2 further comprising a bracket support (40) having a hole (41) and a hole, and wherein each cross-sectional protrusion (24) of vertical support (20) has an inside rail (28), and bracket support (40) is fitted into and fastened to inside rail (28) and by means of a bolting agent through hole (41), hole (21) of protrusion (24) and hole (31) of corner bracket (30) and a further bolting agent through hole (26) and hole (42).

4. A modular frame system as claimed in claim 1 wherein each hook (63) is rectangular and each indentation (29) of vertical support (20) is rectangular.

5. A modular frame system as claimed in claim 1 further comprising a foot glide insert (85) fitting firmly into the base end of vertical support (20) and adjustable foot pad (80).

6. A modular frame system as claimed in claim 1 comprising four vertical supports (20), four primary spines (50) and four corner brackets (30), fastened by said fastening means and assembled to form a rectangular frame to support a board placed and fastened upon said frame.

7. A modular frame system as claimed in claim 6 further comprising a plurality of vertical supports (20), a plurality of primary spines (50) and a plurality of corner brackets (30), fastened by said fastening means and assembled to form a frame to support a plurality of boards placed and fastened upon said frame.

8. A modular frame system as claimed in claim 6 further comprising a secondary spine (59) with a linear rail (51) located lengthwise on each vertical side of said secondary spine (59) and wherein a first end of secondary spine (59) is fastened to a point along rail (51) of a first primary spine (50) by a first

fastening means, and a second opposite end of secondary spine (59) is fastened to a point along rail (51) of a second primary spine (50) by corresponding second fastening means.

9. A modular frame system as claimed in claim 8 further comprising

a left spine end cap (90) with protruding lock (91) adapted to be capable of insertion into any point along rail (51) of any primary spine (50) or of any secondary spine (59) when in a horizontal orientation, protruding lock (91) is further adapted to fit and be fastened firmly into rail (51) when in a vertical orientation, and protruding lock (91) is further adapted to be locked firmly into rail (51) when inserted into a point along rail (51) of any primary spine (50) or of any secondary spine (59) and rotated in an anti-clockwise direction until left spine end cap (90) is in a vertical orientation, and unlocked from rail (51) by rotation in a clockwise direction until left spine end cap (90) is horizontal,

a right spine end cap (95) with protruding lock (104) adapted to be capable of insertion into any point along rail (51) of any primary spine (50) or of any secondary spine (59) when in a horizontal orientation, protruding lock (104) is further adapted to fit and be fastened firmly into rail (51) when in a vertical orientation, and protruding lock (104) is further adapted to be locked firmly into rail (51) when inserted into a point along rail (51) of any primary spine (50) or of any secondary spine (59) and rotated in a clockwise direction until right spine end cap (95) is in a vertical orientation, and unlocked from rail (51) by rotation in an anti-clockwise direction until right spine end cap (95) is horizontal,

and wherein left spine end cap (90) is fitted onto a first end of secondary spine (59) and right spine end cap (95) is fitted onto a second opposite end of secondary spine (59),

and wherein the first fastening means referred to in Claim 8 is protruding lock (91) inserted into a point along rail (51) of the first primary spine (50) and rotated in a clockwise direction until locked,

and wherein the second fastening means referred to in Claim 8 is protruding lock (104) inserted into a point along rail (51) of the second primary spine (50) and rotated in a clockwise direction until locked.

10. A modular frame system as claimed in claim 9 wherein rail (51) has two opposing gullies (58), and wherein protruding lock (91) of left spine end cap (90) comprises trunk (101) and a rectangular-shaped head (102) with two diagonally opposing rounded corners and two diagonally opposing perpendicular corners adapted so that head (102) will lock into gullies (58) when rotated in an anti-clockwise direction and correspondingly unlocked from gullies (58) when rotated in a clockwise direction, and wherein head (102) is of a thickness adapted to fit firmly into gullies (58) of rail (51).

11. A modular frame system as claimed in claim 9 wherein rail (51) has two opposing gullies (58), and wherein protruding lock (104) of right spine end cap (95) comprises trunk (110) and a rectangular-shaped head (103) with two diagonally opposing rounded corners and two diagonally opposing perpendicular

corners adapted so that head (103) will lock into gullies (58) when rotated in a clockwise direction and correspondingly unlocked from gullies (58) when rotated in an anti-clockwise direction, and wherein head (103) is of a thickness adapted to fit firmly into gullies (58) of rail (51).

12. A modular frame system as claimed in claim 8 further comprising a plurality of secondary spines (59) wherein

one end of each secondary spine (59) is fastened to a point along rail (51) of a primary spine (50) or of a secondary spine,

and a second opposite end of each secondary spine (59) is fastened to a point along rail (51) of a second primary spine (50),

assembled to form a frame to support a board placed and fastened upon said frame.

13. A modular frame system as claimed in claim 12 further comprising a vertical middle leg (140) to provide further vertical support to said frame and wherein the top of middle leg (140) is fastened to secondary spines (59) of said frame and in parts of the frame where further vertical support is necessary.

14. A modular frame system as claimed in claim 13 wherein middle leg (140) comprises of

a spine rest (130) in the shape of a rectangular slab (139) with a first upward facing C-shaped open support (135) on one end and a second upward facing C-shaped open support (136) on a second end,

a tubular vertical middle support (25) having a polygonal cross-section,

and wherein base of spine rest (130) is fastened to a top end of middle support (25), and wherein a first secondary spine (59) affixed to said frame is placed upon and along the lateral axis of C-shaped open support (135) and a second secondary spine (59) affixed to said frame is placed on and along the lateral axis of C-shaped open support (136).

15. A modular frame system as claimed in claim 13 wherein support (135) has opening (137) located at outer circular arm of C-shaped support (135), and support (136) has opening (138) located at outer circular arm of C-shaped support (136), and wherein a third secondary spine (59) is placed in opening (137) with one end fastened perpendicularly to the first secondary spine (59), and wherein a fourth secondary spine (59) is placed in opening (138) with one end fastened perpendicularly to the second secondary spine (59).

16. A modular frame system as claimed in claim 13 wherein base of spine rest (130) has indentation (133) adapted to receive the top of middle support (25), and wherein the top of middle support (25) is inserted into indentation (133) and fastened to the base of spine rest (130) by bolting means.