United States Patent [19]

Diemer

[11] **3,831,336**

[45]***Aug. 27, 1974**

[54] **FRAME TO ASSEMBLE AFTER UNITIZED CONSTRUCTION**

[76] Inventor: **Bodo Diemer,** Schulzenstrasse 22, D-7470 Ebingen, Germany

[*] Notice: The portion of the term of this patent subsequent to Jan. 27, 1989, has been disclaimed.

[22] Filed: **Mar. 6, 1969**

[21] Appl. No.: **804,763**

[52] **U.S. Cl.** **52/648,** 52/263, 403/297, 211/148, 248/239

[51] **Int. Cl.** **E04h 12/00,** A47f 5/00

[58] **Field of Search** ..... 52/648, 280; 312/263, 257 SK; 287/54 B, 54 C; 403/292, 295, 297; 211/148; 248/239

[56] **References Cited**

UNITED STATES PATENTS

2,397,216	3/1946	Stellin	85/45
3,008,741	11/1961	MacCormack	287/54 B
3,087,768	4/1963	Anderson et al.	287/54 B
3,089,716	5/1963	Berkowitz	287/54 B
3,255,721	6/1966	Peterschmidt	287/54 B
3,272,582	9/1966	Anderson et al.	52/280

FOREIGN PATENTS OR APPLICATIONS

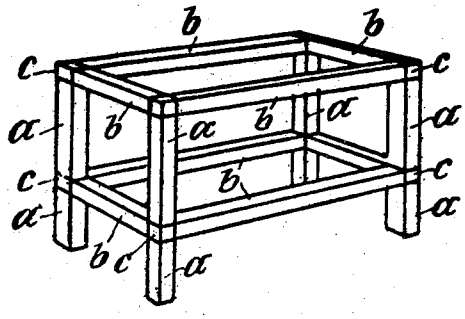
1,433,566	2/1966	France	312/263
414,976	12/1966	Switzerland	312/263

Primary Examiner—Frank L. Abbott
Assistant Examiner—James L. Ridgill, Jr.
Attorney, Agent, or Firm—Flynn & Frishauf

[57] **ABSTRACT**

To lock tubular frame members togethers, such as chair legs, shelf units and the like, a structural element has projecting ends which are profiled to fit within the tubular frame member. The ends are drilled transversely and tapped, and a counter sink is formed at one end of the tapped bore, into which a screw is inserted having a head which preferably has approximately the same diameter as the internal size of the tubular frame member. The drilled end, with the screw completely tightened into the counter sink, is inserted into the frame member which is formed with a small hole to permit access, for example by an Allen head wrench to the screw which is then screwed outwardly, so that the head will bear from the inside against the frame member, and clamp the other side of the insert projection against the opposite inside face of the frame member. To interconnect chair legs, frame members and the like, structural elements having three or more projecting ends may be used.

12 Claims, 5 Drawing Figures



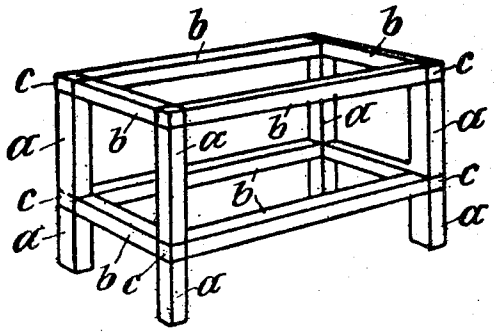


Fig 1

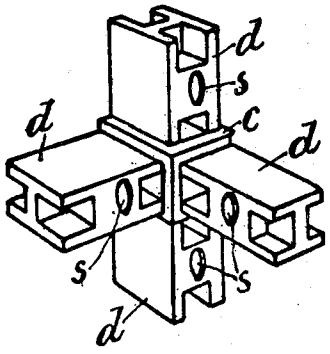


Fig 2

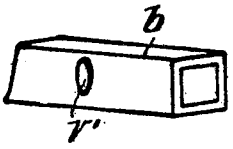


Fig 3

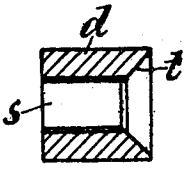


Fig 4

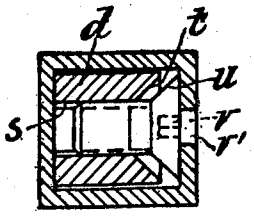


Fig 5

FRAME TO ASSEMBLE AFTER UNITIZED CONSTRUCTION

The invention relates to a frame assembly and locking element, and more particularly to a construction for use with tubular supporting and load-bearing members.

Frames are known in which plugs which are slightly conical, hold together supporting and load-bearing members by a clamping effect on the plugs. Profiled plastic jackets may be used, slipped on the plugs, the plastic jackets being compressed when the tubular supporting and load-bearing members are slipped on so that a rigid connection should be obtained.

SUBJECT MATTER OF THE INVENTION

Briefly, an insert element is insertable into tubular frame members, the insert element having projecting ends which have bores drilled therein. The bores are tapped, and the ends of the bores are countersunk. Screws, with heads fitting into the countersink, are inserted into the bores, and the insert element can then be slipped into the ends of tubular frame members. The tubular frame members are formed with small holes, big enough to pass a turning tool to engage the screw therethrough, for example, an Allen wrench. The screw is then screwed outwardly, to clamp the insert against the inner walls of the tubular frame member, the rear wall of the insert bearing against one side of the frame member and the screw against the other side thereof.

In accordance with a preferred embodiment, the head of the screw is approximately of the same diameter as the inside width of the tubular frame member, to provide a maximum amount of bearing surface. To interconnect frames for shelving, and the like, or chair legs, three or more projecting ends can be provided on the insert, angled in appropriate directions.

DRAWINGS

FIG. 1 is a general view of the frame according to the invention;

FIG. 2 is a perspective view of a corner connector;

FIG. 3 is a perspective view of the tubular end of a supporting and load-bearing member;

FIG. 4 is a detail cross-sectional view through a plug of a corner connector; and

FIG. 5 is a cross-sectional view through an assembly connection with tightened setscrew.

The frame as per the examplified embodiment of FIG. 1 has a tubular supporting and load-bearing members *a* and *b* with rectangular, e.g., square profiles, and of corner units *c* with square prismatic plugs *d* (FIG. 2), arranged perpendicularly to one another, to fit into the square support members, the plugs *d* fitting exactly into the tubular ends of members *a* and *b*. The outer measurements of the plugs *d* preferably correspond to the inner dimensions of the tubular ends to that the assembled parts of the frame will have a perfect fit.

Using units with suitably arranged plugs, a frame may be constructed extending vertically or horizontally, as desired. The load-bearing members *b* may carry leaves, or shelves, or may be integral therewith.

Plugs d of the corner linkages have a tapped hole drilled therein (FIGS. 3, 4) which is countersunk on one side, as seen at *t*. A flat head screw *u* with a hexagonal recess *v* in its face is screwed in the hole. The head

of the screw has the same diameter as the outside dimension of the plugs. Before assembly of the frame, and in the completely assembled state of the corner elements, the clamping screws *u* are entirely screwed into the plugs *d* so that the heads of the screws *u* are even with the surfaces of the plug.

The plugs *d* need have a full profile only in the region neighborhood of the taphole *s* and may otherwise, as shown in FIG. 2, present another convenient profile, e.g., as I sections, in order to save material and weight.

The supporting and load-bearing elements a and b respectively are formed with bore holes *v* on one side of the wall, as shown at *r*, in FIG. 3. The borehole, when the frame is assembled, aligns with the hexagonal recess *w* of the clamping screw *u* and serves for the insertion of a screw driver.

To assemble the frame, the tubular ends of the supporting and load-bearing members *a* and *b* are slipped on the elements *c*, ready to be fixed to the corresponding plugs *d*. At each connection, the clamping screw *u* is screwed outwardly against the inner side of the tube wall which is facing the screw head (FIG. 5) to clamp the plug *d* against the opposite tube wall. For the ease of illustration, the clearance between plug and tube profile has been exaggerated; in practice however the best possible close-tolerance work should be used to provide corner connections of the frame which are extraordinarily rigid.

Relatively low surface pressure produces a high clamping force and thereby a rigid corner connection secure against tension especially if, according to a preferred embodiment of the invention, the head diameter of the countersunk screws *u* is chosen nearly as large as the size of the plug, in order to obtain the largest possible area of engagement. Distortion of the tube walls is thereby prevented. The boreholes *r* in the tube walls can be small so that the stability of the frames is not impaired.

The mounting of a frame is easy; a fraction of a screw revolution is usually enough to obtain a sufficient clamping effect so that even those clamping screws which are less accessible may be turned effectively with a single motion of the hand.

What is claimed is:

1. Interconnection arrangement for tubular frame members comprising

a rigid, unitary structural element having at least two projecting ends, the ends being shaped to correspond to and fit into the ends of the frame members for connection thereto;

said structural element being formed with a threaded bore extending transversely with respect to the direction of the projection, and additionally formed with a countersink at the end of the bore;

screw means threadedly engaged in said bore, said screw means having a head shaped to be receivable at least in part within the countersink at the end of the bore and having a length which is such that the entire screw can be received within the bore, with the head substantially flush with the outer side of the projection of the structural element;

tool receiving means formed on said screw means to effect rotation thereof within the threaded bore;

said frame member having an opening formed therein alignable with the tool receiving means to permit rotation of the screw means in the threaded

bore, the opening being of such size that a turning tool, fitting into the tool receiving means can be inserted through said opening, the frame member overlapping the screw head at least in part to permit tightening of the screw head directly against the inside of the frame member.

2. Arrangement according to claim **1,** wherein the structural element is a corner fitting having at least three projections, each of square outline in cross section, and extending at 90° from each other.

3. Arrangement according to claim **1,** wherein the countersink is conical and the screw means is a flat head screw, the means to effect rotation thereof being a polygonal recess.

4. Arrangement according to claim **1,** wherein the projecting ends are square in cross section and the head of the screw means is essentially circular and has a diameter approximately equal to the transverse dimension of the projecting end.

5. Arrangement according to claim **1,** in combination with a frame member adapted to surround and seat against the element, the opening in said frame member being spaced from the end of the frame member by a distance corresponding to the distance of the center of the bore in the element from the seat of the frame member against the element.

6. Arrangement according to claim **1,** in combination with a frame member and secured to the element; said frame member surrounding the element, the screw means having a head profiled to fit the inside surface of the frame member and being screwed slightly out of the bore, the head bearing against the inside surface of the frame member to clamp the side remote from the countersunk side of the projection on the structural element against the inside of the frame member, and engage the head of the screw means against the opposite inside surface portion of the frame member.

7. Arrangement according to claim **6,** wherein the frame member has a square cross section, the structural element has a square outline, and the head of the screw means has a bearing face of essentially the same diameter as the inside dimension of the frame member, to bear thereagainst.

8. Arrangement according to claim **1,** wherein the means to effect rotation of the screw means comprises a profiled recess formed in the head of the screw means.

9. Arrangement according to claim **8,** wherein the opening is of substantially smaller area in cross-section than the surface area of the head to provide a bearing surface of the portion of the member surrounding the opening.

10. A tubular framework comprising at least three

hollow frame members of square cross section;

a rigid, unitary corner fitting having at least three legs, each of square outline in cross section, said legs being fixedly joined at **90°** to one another and each fitting into and being inserted in the respective one end of said frame member

threaded holes extending into each of said legs of the corner fitting across the longitudinal axis thereof;

screw means located threadedly connected in said holes, said screw means having a head at one end, the screw means being each formed with a tool engagement means thereon;

each of said hollow frame members having an opening extending across the longitudinal axis of said member located in alignment with said screw means to permit application of a tool for turning said screw means, the frame member having a portion located opposite the head which, at least in part, covers and overlaps the head to permit, upon turning of the screw forcing the head of said screw means against the inner wall of said hollow frame member to effect internal clamping action of the head, and a surface of the leg against the inside of the frame member to provide a rigid frictionally engaged tubular framework.

11. Framework according to claim **10,** wherein the hole has a recessed terminal end with a final diameter approaching the transverse diameter of the respective leg;

and the screw means has a head fitting into the recess and having a maximum diameter approaching the transverse dimension of the leg to permit pressing of the head against the inside of the frame member and provide for a bearing surface extending essentially across the inside width of the frame member and avoid buckling of the frame member at the point of engagement of the screw means.

12. Framework according to claim **11,** wherein the head is formed on the tool engagement end of the screw means, the leg being clamped within the frame member by outward turning of the screw means to clamp the head against one inside surface of the respective frame member, and to effect clamping of the surface on the leg opposite the head, against the opposite inside surface of the frame member, the opening in the frame member being small with respect to the size of the head to leave a bearing surface on the portion of the frame member adjacent the opening and opposite the head which is being tightened against the inside of the frame member.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,831,336 Dated August 27, 1974

Inventor(s) Bodo Diemer

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

On page 1, insert as follows: -- [30] Foreign application priority data

March 11, 1968, Germany, 17 53 034.6 --.

Change title to read -- FRAME ASSEMBLY AND LOCKING ELEMENT THEREFOR --.

In the specification, Column 1, line 51, delete "a".

Column 2, line 13, change "v" to -- v' --.

Column 2, line 14, change "r" to -- v' --.

Column 2, line 16, change "w" to -- v --.

Signed and sealed this 7th day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.