Nov. 20, 1951 A. T. SHOTT 2,576,049

JOINT FOR TUBULAR FURNITURE FRAMES

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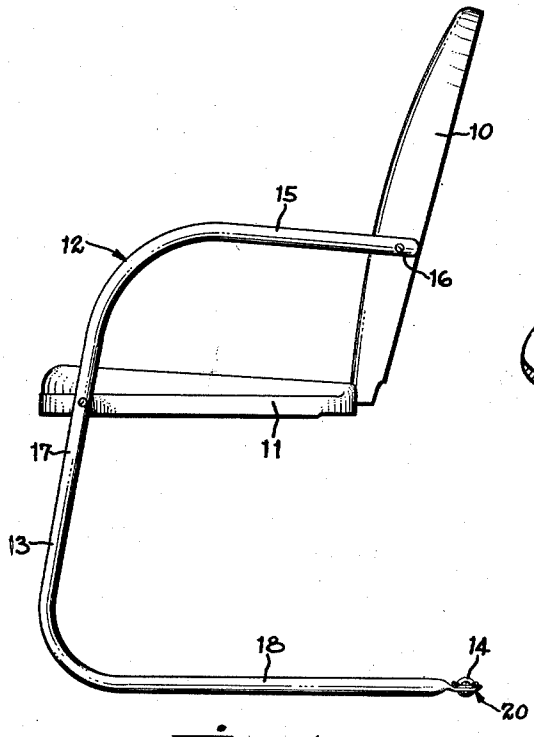


Fig. 1

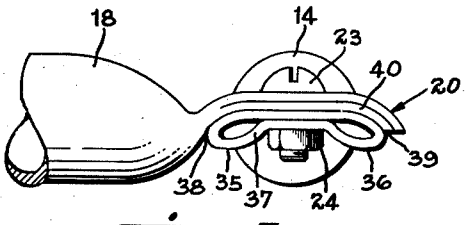


Fig. 5

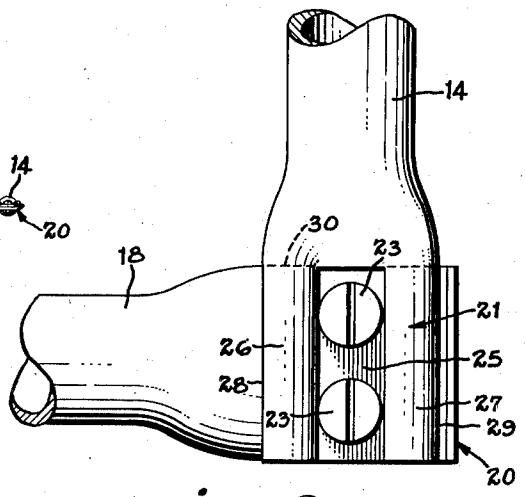


Fig. 2

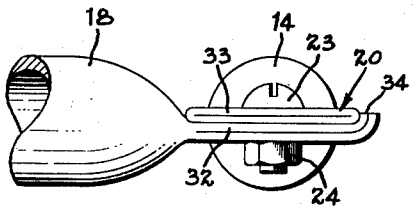


Fig. 4

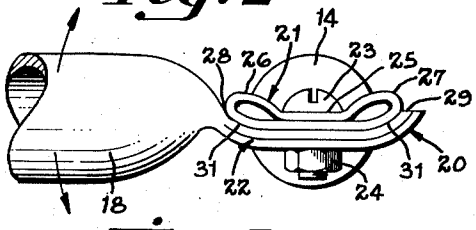


Fig. 3

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JOINT FOR TUBULAR FURNITURE FRAMES

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5 Claims. (Cl. 287—54)

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This invention is directed to tubular metal furniture and is addressed particularly to a new and improved joint for detachably interconnecting various tubular members which form the frame. In order to simplify the disclosure, the invention will be discussed herein in relation to metal chairs, but those skilled in the art will readily appreciate that the invention may be employed in the fabrication of racks, metal tables and articles of similar nature.

A typical tubular steel chair frame comprises a base upon which the chair is supported, legs which rise from the base to elevate and support the seat, and arm rests which extend between the seat and the back. Since the shape of such a frame is unwieldy and awkward for storage and shipping purposes, it is desirable to fabricate the frame from a number of sections which are detachably joined together and which may be disassembled and compactly packaged for future erection by the purchaser or user. When the chair is in use, the joints which connect the frame sections are subjected to compression, tension and torsional forces of varying severity and complexity which change in character and magnitude as the occupant rocks back and forth and shifts from side to side. If the frame joints are not sufficiently strong and rigid to withstand these forces without yielding or loosening, the frame becomes misaligned and the joints become loose. Under these conditions, the chair sags weakly and wobbles from side to side or weaves, in response to the shifting weight of the occupant.

The rounded configuration of the tube walls makes it particularly difficult to connect adjoining tubular sections in a firm, rigid joint, especially when the sections are disposed in angular relationship to each other. It is extremely difficult to form a stable mechanical interlock between the rounded tube walls, and the sections consequently tend to roll or shift out of angular alignment under stress even when they are supported by bolts fastened through the adjoining sections. Moreover, the flat nut and bolt heads do not seat firmly on the curved wall surfaces, and they too tend to loosen for lack of sufficient frictional contact surface with the tube walls. This problem is particularly acute in the frame base where the most critical joints are located. When these joints, which are subjected to the most severe and complex stresses, work loose, the initial misalignment is multiplied throughout the frame with the result that other stresses are imposed on the other joints of the frame

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and these, therefore, soon also become loosened. In my copending patent application for "Chair Structure," Serial No. 14,541, filed March 12, 1948, I have disclosed and claimed an improved joint for articulating the tubular sections which form the base of the chair. The present invention is directed to an improvement over the joint disclosed in that application.

The object of this invention is to provide a stable, rigid joint for tubular frame sections which is capable of withstanding the severe complex stresses imposed on and transmitted by the frame without yielding or loosening. The joint of this invention is particularly adapted to prevent angular displacement of the adjoining frame sections relative to each other, but it also includes improved means for strengthening the frame sections against the longitudinal, transverse, rolling and twisting stresses which tend to part them.

It is a further object of the invention to provide an inexpensive joint which can be quickly and easily manufactured and is susceptible to assembly and disassembly by persons having the most meager mechanical skill.

In recognition of these objectives, the invention contemplates a joint for adjoining tubular frame sections which comprises mechanically interlocking tabs formed respectively on the section ends, which are configurated and dimensioned to abide in mutually supporting, nested relationship, and means for detachably holding said tabs in firm mechanical and frictional engagement with each other. Each tab forms a seat or saddle for the other tab and is provided with a pair of abutments which cooperate with the abutments on the other tab to prevent angular displacement of the sections relative to each other and absorb and distribute tension, compression and torsional forces which otherwise would tend to rupture or loosen the joint. Preferably, the tabs are integral with the tubular body of the section and they can be formed quite inexpensively by collapsing or deforming the end portions of the tube side walls in a single step forming operation.

Other advantages of the invention will become apparent to those skilled in the art from the following detailed description of the drawings in which:

Figure 1 is a side elevation of a typical chair including a tubular frame in which a preferred embodiment of the new joint of this invention is included.

Figure 2 is a top view of a preferred embodiment of the improved joint of this invention.

Figure 3 is a side view of the joint shown in Figure 2.

Figure 4 is a side view of the second embodiment of this invention.

Figure 5 is a side view of the third embodiment of this invention.

Referring to Figure 1, a typical metal chair which embodies the improvement of this invention may include a sheet metal back 10 and a sheet metal seat 11 which are joined together by bolts (not shown) at the rear of the seat. A tubular steel frame, indicated generally at 12, resiliently supports the chair and permits a gentle rocker-line action when the occupant shifts his weight by alternately leaning backward and forward in the seat.

In order to facilitate shipment and storage the frame 12 is divided into sections which can be disassembled and compactly packaged in relatively narrow cartons. Hence, the frame comprises a pair of side sections 13 (only one of which is shown) and a cross arm 14 connecting the side sections at the rear of the chair base. The side sections 13 are substantially identical and while only one is shown in Figure 1, it is apparent that a similar element is fixed on the other side of the chair. Each side member 13 provides an arm rest 15 bolted to the back of the chair as at 16, a leg 17 bolted to the seat of the chair and a base member 18 which contacts the floor and forms a U-shaped base in conjunction with the other base member 18 and the cross arm 14. The ends of the cross arm are connected to the ends of the base members through a pair of substantially identical joints, one of which is shown generally at 20 in Figure 1. This chair may be disassembled by disconnecting the seat and the back pieces, unscrewing the bolts which connect the side pieces to the back and seat, and disconnecting the joints 20.

The detailed construction of the joint 20 is shown in Figures 2 and 3. It will be observed that the end portions of the cross arm and the base section have been configurated into substantially flattened tabs. In the embodiment shown, the endwise portion of member 18 is dish-shaped longitudinally but is substantially straight in cross-section. The endwise portion of the cross arm 14 is dish-shaped in cross-section but is substantially straight longitudinally. Thus, tab 21 on the end of the cross arm 14 is adapted to fit in nesting relationship with tab 22 on the end of the base section 18. The tabs are held firmly in this position by means of two bolts 23 which extend through holes (not shown) in both tabs and are secured in position by nuts 24.

The tabs which are of double walled thickness may be constructed by deforming or collapsing the side walls of the tubular sections by a single-step forming operation, if suitable dies are used. Tab 21 is configurated so that its central portion 25 is substantially flat to provide a seat for the bolt heads. The edgewise portions of the tab are formed into loops or ears 26 and 27 which curve upwardly from the flat portion and conform to the configuration of tab 22. Thus, the flat portion 25 between the ears constitutes a trough in which the bolt heads are firmly seated and the ears recess and protect the bolt heads. Moreover, the bolt heads serve as stops against angular turning movement of the frame sections relative to each other, in that, if looseness develops in the joint they limit the turning movement of the sections about the joint by abutting the ears 26 and 27.

It will be observed from inspection of Figure 3 that tab 22 does not reside in the plane of the axis of base member 18 but is offset to receive the tab 21 which resides in the plane of the axis of the cross arm 14, thereby permitting the cross arm and the member 18 to be disposed in the same plane and abut the floor evenly. This type of construction is discussed in my co-pending patent application previously referred to, to which attention is invited. However, in the present instance this construction provides an unusual advantage since a pronounced abutment 28 is formed between the main body of the element 18 of tab 22. This abutment extends transversely along the length of ear 26 contacting and supporting the ear. The other edge of tab 22 is upturned to provide an abutment lip 29 which extends transversely across the tab and supports the length of ear 27.

Hence, tab 21 is firmly supported between respective abutments on the opposite ends of tab 22 and is in fact wedged between them when the bolts are fully tightened. It will be observed that if stresses applied to the joint are such that they tend to force the sections 14 and 18 angularly in relation to each other, the abutments 28 and 29 will sustain the ears and prevent movement of either tab relative to the other. If member 18 is forced rearwardly or forwardly while member 14 is held stationary by abutment with a foreign obstacle, the abutments 28 and 29 and the ears 26 and 27 will cooperate to resist the movement and absorb and distribute the stresses which otherwise would tend to shear the bolts. On the other hand, if member 18 is stationary and cross arm 14 is forced laterally outward relative to it, the edge 30 (not fully shown) of tab 22 will contact the abutment formed between the underside of tab 21 and the body of cross arm 14.

The nested relationship of the curved contact areas between the tabs also tends to resist and distribute the forces imposed on the joint when the chair occupant leans forward and backward in the chair to cause a rocking motion. When this occurs it will be observed that bending stresses are imposed on the members 18 in the direction of the arrows shown in Figure 3. Consequently, arm 18 tends to pivot about the joint in accordance with the direction of the bending stress and there is a tendency under repeated flexing for the joint to work loose. However, by virtue of this invention, the loosening action is sharply reduced because the curved contact surfaces distribute the forces imposed on the joint over a substantial area and prevent localized concentration of the separating forces. Consequently, the stresses which tend to separate the tabs are absorbed and distributed by the curved portions indicated at 31—31. Naturally, twisting movement of either section about its own axis and relative to the joint is resisted by the extremely wide transverse contact area existing between the tabs and the cooperating abutments.

In Figure 4, a second embodiment of this invention is illustrated. This form of the invention provides many of the advantages of the first form but it is susceptible to inexpensive manufacturing techniques since the stamping dies used to form the tabs are extremely simple. It will be observed that the tab 32 of section 18 is straight in cross section as well as longitudinally. Moreover, the tab 33 of cross arm 14 is also straight in cross section as well as longitudinally. However, the edge

of tab **32** is upturned as at **34** to provide an abrupt lip which cooperates with the abutment formed between the tab and the body **18** to grasp tab **33** firmly. In this instance, the longitudinal side edges of tab **33** constitute the abutments which cooperate with the abutments of tab **32** to prevent angular displacement of the sections.

It will be apparent to those skilled in the art that the relative positions of the tabs can be reversed without departing from the spirit of this invention. For example in Figure 5, a joint is shown which is similar to the joint shown in Figure 2 except that the longitudinally dish-shaped tab of base member **18** is curved downwardly and is superimposed upon tab of cross arm **14** which is dish-shaped in cross section. While the relative positions of the tabs are reversed, nevertheless the ears **35** and **36** of tab **37** and the abutments **38** and **39** of tab **40** cooperate in much the same manner as they do in the previously described embodiment of Figure 2 to form a firm rigid joint. Other alterations of the basic structure shown in Figure 2 will be apparent to those skilled in the art. For example, the tab of the cross arm can be dish-shaped longitudinally, while the tab on the base member can be dish-shaped in cross section. It will also be apparent that the embodiment shown in Figure 4 is also susceptible to a reversal of the relative positions of the tabs. In other words, the lower tab **32** can be superimposed on the top tab **33** and appropriately configurated to complement this tab if it is so desired.

Having described my invention, I claim:

1. A joint for two angularly disposed adjoining tubular sections comprising; a tab formed on each of said sections, one of said tabs being dish-shaped longitudinally only and the other of said tabs being dish-shaped in cross section only and residing in nested relationship with said longitudinally dish-shaped tab, and means for detachably holding said tabs together in nested relationship.

2. A joint for angularly disposed adjoining tubular members comprising; a tab formed on each of said sections and projecting longitudinally therefrom, one of said tabs being configurated to provide two transversely extending abutments, said abutments being spaced to define a trough constituting a seat for the other tab therebetween, the other of said tabs residing in said seat and being configurated to provide two longitudinal abutments respectively engaging and cooperating with the abutments of the first tab to prevent angular displacement of said members relative to each other, and means for detachably holding said tabs together.

3. A joint for adjoining angularly disposed tubular members comprising; tabs formed on the ends of each member, one of said tabs having a pair of spaced abutments extending transversely thereof and the other of said tabs having a pair of spaced abutments extending longitudinally thereof, the abutments of each tab engaging the abutments of the other tab in interlocking relationship to prevent angular displacement of the tubular members relative to each other, and means for detachably holding the tabs together.

4. A joint for adjoining angularly disposed tubular members comprising; tabs formed on the end of each member and extending lengthwise thereof, one of said tabs having a transversely extending edgewise lip and being configurated to provide an abutment between the tab and the tubular body member and a substantially flat seat for the other tab between the abutment and the lip, the other of said tabs being substantially flat and having two longitudinal edges respectively engaging the lip and abutment of the first tab to prevent angular displacement of the members relative to each other, and means detachably fastening the tabs together in seated interlocking relationship.

5. A joint for two adjoining tubular members comprising; a tab formed on each of said members, one of said tabs being configurated to provide two spaced abutments and a trough constituting a seat for the other tab between said abutments, said tab having a flat surface opposite to said tab seat, the other of said tabs adapted to reside within said seat and being configurated to provide a substantially flat central portion and a pair of abutments adjacent said flat portion and adapted to engage the abutments of the first tab to prevent angular displacement of said members relative to each other, bolts extending through said tabs and detachably locking them together, said bolts having integral heads, nuts adapted to secure said bolts in position, said substantially flat portion of the second tab constituting a recessed, protected seat and the surface of said first tab opposite to said tab seat constituting a flat seat for said nuts and bolt heads.

ALLEN T. SHOTT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,408,907	Booth	Oct. 8, 1946

FOREIGN PATENTS

Number	Country	Date
184,246	Great Britain	of 1922