Sept. 13, 1955 H. HOWE 2,717,631

FOLDING APPARATUS

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Fig. 1

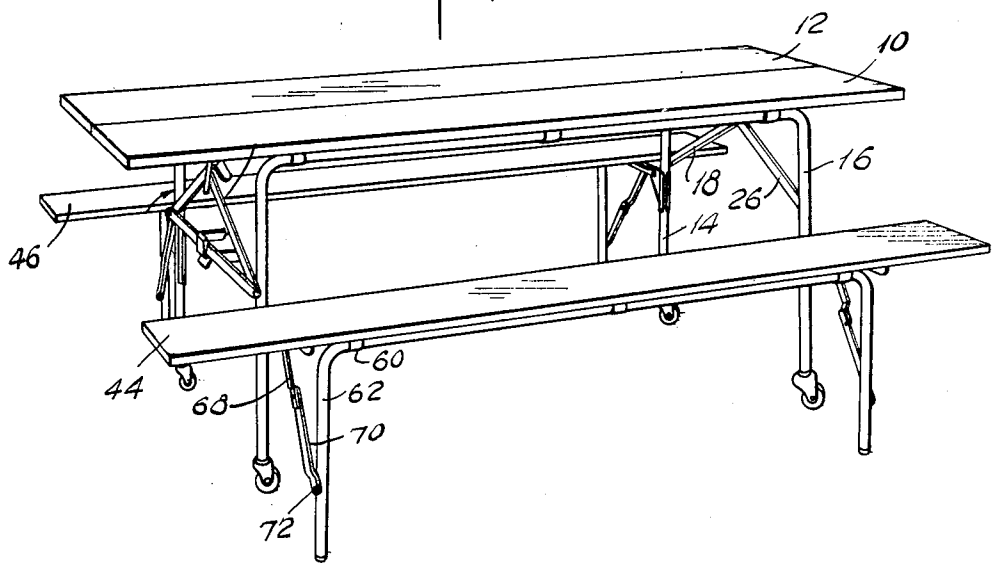
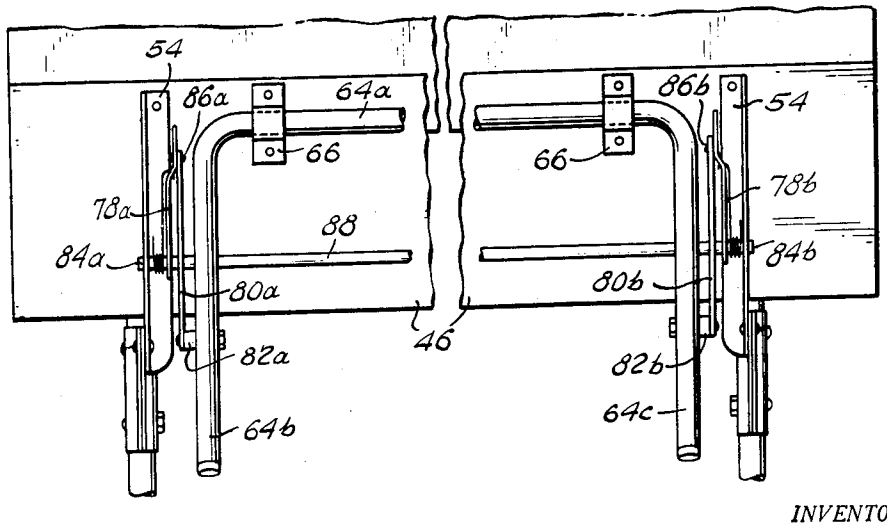


Fig. 3.



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Fig. 2.

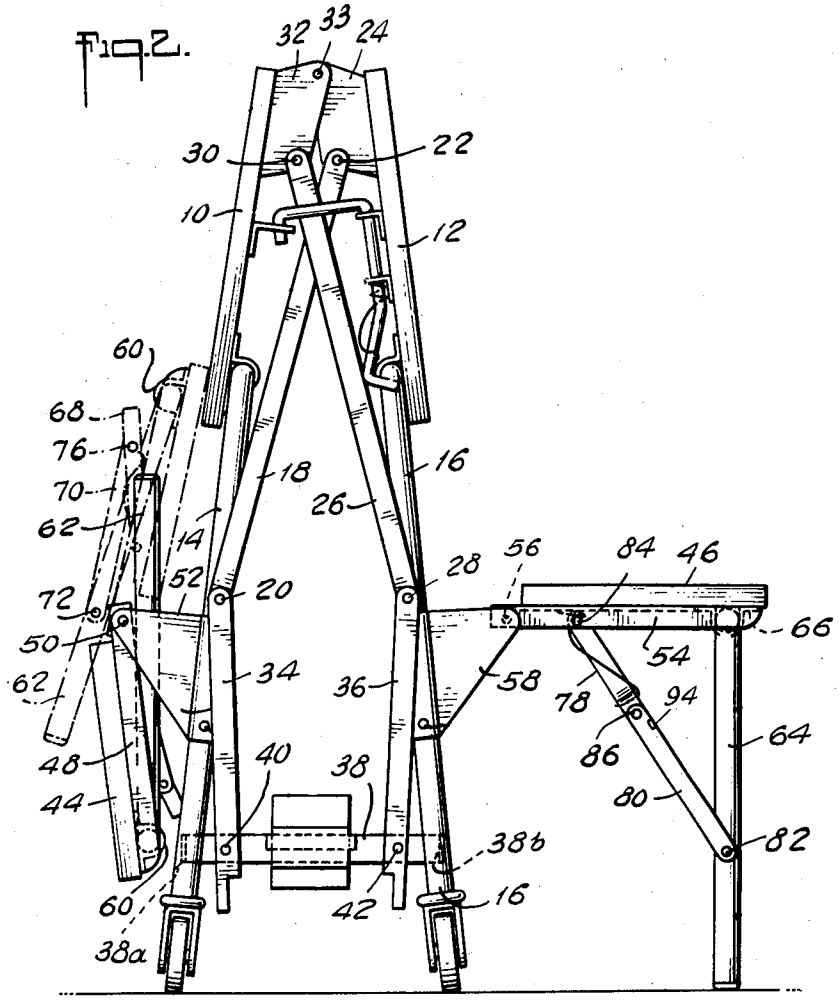
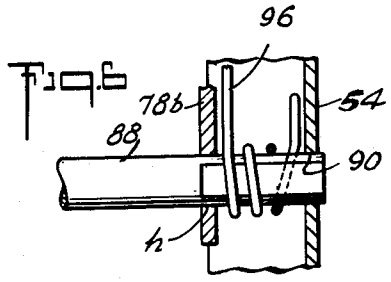


Fig. 6



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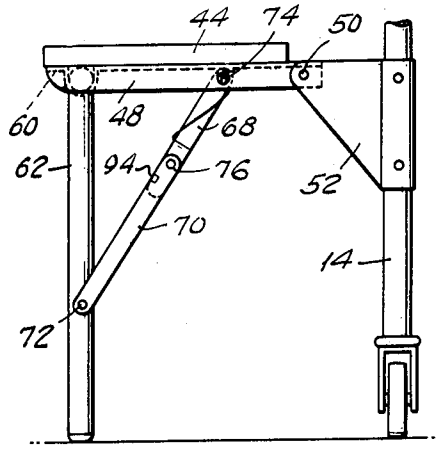


Fig. 4.

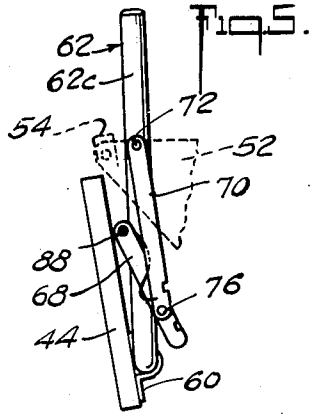


Fig. 5.

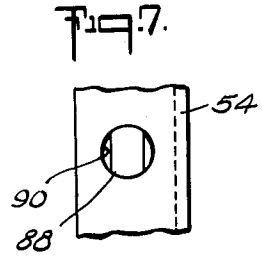


Fig. 7.

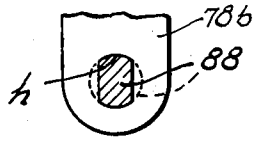


Fig. 8.

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United States Patent Office 2,717,631 Patented Sept. 13, 1955

2,717,631

FOLDING APPARATUS

Harold Howe, Rowayton, Conn., assignor to Howe Folding Furniture, Inc., New York, N. Y., a corporation of New York

Original application September 24, 1953, Serial No. 382,060. Divided and this application August 23, 1954, Serial No. 451,534

4 Claims. (Cl. 155—124)

This invention relates to apparatus for transmitting folding force between a plurality of foldable means. It is disclosed herein as applied to the brace means of a folding bench. This application is a division of copending application Serial No. 382,060, filed September 24, 1953.

An object of the invention is to provide simple and efficient means of transmitting folding force from one pair of braces or links to another pair of braces or links.

Other objects of the invention will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be pointed out in the following description, and the scope of the application of which will be indicated in the following claims.

The invention will best be understood if the following description is read in connection with the drawings, in which,

Figure 1 is a perspective view of a table and bench construction in which the invention is applied for folding each bench;

Figure 2 is an end elevation of the structure shown in Figure 1;

Figure 3 is a side elevational view showing an embodiment of the invention applied under a bench member for transmitting folding and unfolding force from one pair of braces to a second pair of braces;

Figure 4 is an end view of the bench structure shown in Figure 2;

Figure 5 is a side elevational detail view showing a bench and its support means and brace and linkage means;

Figure 6 is a detail view partly in cross section of part of the structure shown in Figure 3 by which remote control of one of a plurality of pairs of braces is obtained for actuating it simultaneously with another pair of braces;

Figure 7 is a detail view taken on the line 7—7 of Figure 6; and

Figure 8 is a detail view taken on the line 8—8 of Figure 6.

The table top shown in Figure 1 comprises the two parts **10** and **12** each pivotally supported on individual support means, indicated generally by the numerals **14** and **16** respectively. Each support means is connected to the other top part, i. e., the part other than the one to which it is directly pivoted, by one or more link members, link members **18** being shown pivotally connected at one end to support means **14** by pivot **20** (Figure 2) and at the other end by pivot **22** to hinge plate **24** extending downwardly from top part **12**; and link members **26** being shown connected at one end to support means **16** by pivot **28** and at the other end connected by pivot **30** to hinge plate **32** depending from the under surface of top part **10**, the hinge plates **24** and **32** being overlapped and pivotally connected by pivot means **33**. Extending between the support means **14** and **16** and desirably pivoted at one end to said members **14** and **16** on said pivots **20** and **28** respectively are the links **34** and **36** which adjacent their other ends respectively are interconnected with a third link **38** by the pivots **40** and **42** respectively. The distance between pivots **40** and **42** determines the spacing between the support means **14** and **16** when the table structure is in folded position, the ends **38***a* and **38***b* of member **38** being bent first rearwardly and then outwardly, providing stops limiting the movement of the support means **14** and **16** toward one another as is illustrated in Figure 5.

Figure 2 illustrates how the top parts **10** and **12** coact with bench means movable toward and away from one another as the table is folded and unfolded, to provide back rest means for the benches. As illustrated, the bench means comprise the seat members **44** and **46**, the seat member **44** having on its under surface one or more angle members **48** pivotally connected by pivot means **50** to bracket means **52** secured on the support means **14** for table top part **10**. Similarly seat means **46** has on its under surface one or more angle members **54** pivotally connected by pivot means **56** to bracket means **58** secured on the support means **16** for table top part **12**.

Rotatably supported on the under surface of seat member **44** in brackets **60** is the leg or support means **62** movable from unfolded position shown in Figure 4 to the folded position shown on the left hand side of Figure 2, and seat member **46** is similarly provided with support means **64** rotatably mounted in brackets **66** on the under surface of seat member **46**.

Interconnecting the angle means **48** on the bottom of seat **44** with the support means **62** are the brace members **68** and **70** which at their outer ends are respectively pivotally connected to support means **62** and to angle means **48** by pivots **72** and **74** respectively, their inner ends being interconnected by pivot **76**. Similarly the angle means **54** on the bottom of seat **46** is interconnected with the support means **64** by the brace members **78** and **80**, the outer ends of which are connected respectively to the support means **64** by pivot means **82** and to the angle means **54** by pivot means **84**, and which are interconnected at their inner ends by the pivot **86**.

The support means shown herein for the seats **44** and **46** respectively each comprise a plurality of legs each having a pair of folding braces, and means are provided whereby folding and unfolding action of one pair of brace members is communicated to another set of brace members for facilitating folding and unfolding of the support means. Since the means is the same for both seat members **44** and **46** it will suffice to describe the means employed in connection with seat member **46** which, on the right hand side of Figure 2, is shown in unfolded position coacting with folded table top part **12** which in this position constitutes a back rest for the seat **46**. The remote control means for controlling one pair of braces with another is best seen in Figure 3 which shows the under side of seat **46** in its folded position, and in Figures 7 and 8.

As shown in Figure 3 the support means **64** for seat **46** comprises a U-shaped member the intermediate portion **64***a* of which extends through the brackets **66** and the outer portions **64***b* and **64***c* of which constitute legs. Brace member **80***a* is connected at its outer end to leg **64***b* by pivot **82***a*. Brace member **78***a* is connected at its outer end to rod **88** which is rotatably supported in angle member **54** at point **84***a*, and said members are interconnected at their inner ends by the pivot member **86***a*. Similarly leg member **64***c* is connected by pivot **82***b* to the outer end of brace member **80***b* the inner end of which is connected by pivot **86***b* to brace member **78***b* the upper end of which is connected to rod **88** which is rotat-

ably supported in the other angle member 54 at point 84*b*.

The rod 88 extends both through brace members 78*a* and 78*b* and angle members 54. In angle members 54 circular holes 90 are provided through which the rod ends extend, said circular holes providing bearings within which the connecting rod is rotatably supported. The end portions of rod 88 which extend through the brace members 78*a* and 78*b* are rectangular in cross-section and, to receive these end portions, in brace members 78*a* and 78*b* rectangular holes *h* are provided adjacent their outer ends respectively. Rotary motion of connecting rod 88 is thus communicated to said links 78*a* and 78*b* respectively and when the brace means at either end of a seat member is folded or unfolded, to cause folding or unfolding of its support means, the folding or unfolding force is communicated through rod 88 to the other brace members connected to the other leg of the support means for the seat, thus causing folding of both pairs of braces simultaneously and facilitating the folding of the support means for the seat.

As illustrated in Figure 4, one brace member of each pair of braces may comprise a stop member 94 to prevent folding of the brace members except in one direction. As shown in Figure 6, a spring member 96 is provided which, when the bench is unfolded, opposes folding action, thereby preventing inadvertent folding of the seat member and its support means. Springs 96 extend around non-circular portions of connecting rod 88, see Figure 6, between the angle members and the brace members, and press on the respective brace members adjacent their pivoted interconnection.

The bench means when folded as has been described will take substantially the position illustrated in full lines on the left hand side of Figure 2. Also in this folded position the locking spring 96 acts as a past center pressure means to prevent the legs of the bench from unfolding during handling or transportation. In this position the leg means will be projecting upwardly. For unfolding, the upwardly extending leg means may be grasped and rotated inwardly, or the seat means may be lifted and rotated outwardly, thus raising the seat means to unfolded position, after which a pull on either leg 64*b* or 64*c* will be communicated from one pair of leg braces to another by connecting rod 88, making it possible to unfold a bench assembly with a minimum of effort.

The table and bench structure shown herein has the two part function of either providing a table and seats usable for example for dining, or for work or school purposes generally, etc., or as a seat and back rest combination usable for example in lecture halls, for spectators watching an athletic event, or for any of a great variety of occasions. With both benches and top parts folded a plurality of seat and back rest means are provided back to back. With the top and one bench folded a seat and back rest is provided which may be moved against a wall, thus using a minimum of floor space when placed against a wall, for example a gymnasium wall; with one bench and the top unfolded a two-tier bleacher is provided.

These structures are readily convertible for different uses and may be easily moved. When folded they occupy a minimum of space and they are thus particularly well adapted for use in rooms which serve different purposes successively as for example in assembly halls and gymnasiums which may be used at different times for gatherings, lectures, exhibitions, sporting events, etc. The convertibility between coactive seat and back rest means and table and bench means greatly increases the utility of the structure.

It will thus be seen that there has been provided by this invention a method and apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. The folding bench structure which comprises a seat member, support means for the seat pivoted to the seat and movable from a position substantially at right angles to the seat to a plane substantially parallel with the seat, foldable brace means interconnecting said support means and seat member comprising two members pivotally interconnected at their inner ends, the other end of one member being pivoted to said seat and the other end of the other member being pivoted to said support means, a second pair of brace members interconnecting said seat and support means similar to said first mentioned pair of brace members, and means for communicating folding and unfolding forces from one of said pair of members to the other for folding and unfolding of said seat comprising a connecting rod having portions which are non-circular in cross section, and bracket means on the under surface of said seat having a substantially circular hole therein providing a bearing for said rod, like members of said pairs of links having non-circular holes corresponding to, and positioned to receive, said non-circular portions of said rod respectively.

2. The folding bench construction which comprises support means, support arms pivotally connected to said support means for movement from a substantially horizontal position when unfolded to a substantially vertical position when folded, a seat connected to said arms and movable with said arms, leg means pivotally connected to said seat and movable from a plane substantially at right angles to said seat to a plane substantially parallel to said seat when the seat is in folded position, a plurality of pairs of braces interconnected between said leg means and said seat, a rod having portions which are non-circular in cross-section, and bearing means for said rod on the under surface of said seat, like members of said pairs of brace members having non-circular holes corresponding to, and positioned to receive, said non-circular portions of said rod respectively.

3. In a structure comprising a second member movable relative to a first member from a plane substantially parallel to said first member to a plane substantially perpendicular to said first member, a plurality of pairs of braces interconnecting said members, a connecting rod extending between said pairs of braces and having portions which are non-circular in cross-section, bracket means on one of said members having a substantially circular hole therein providing a bearing for said rod, like members of said pairs of braces having non-circular holes corresponding to, and positioned to receive, said non-circular portions of said rod respectively.

4. In a structure comprising a second member movable relative to a first member from substantially abutting relation to said first member to a plane substantially perpendicular to said first member, a plurality of pairs of braces interconnecting said members, a connecting rod extending between said pairs of braces and having portions which are non-circular in cross-section, bracket means on one of said members having a substantially circular hole therein providing a bearing for said rod, like members of said pairs of braces having non-circular holes corresponding to, and positioned to receive, said non-circular portions of said rod respectively.

References Cited in the file of this patent

UNITED STATES PATENTS

1,576,034	Butt	Mar. 9, 1926
2,558,465	Seymour	June 26, 1951