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2,874,812

KNOCK-DOWN STRUCTURAL MEMBER WITH COLLAPSIBLE MEMBERS

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FIG. 1.

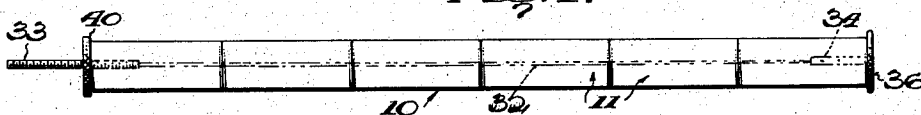


FIG. 2.

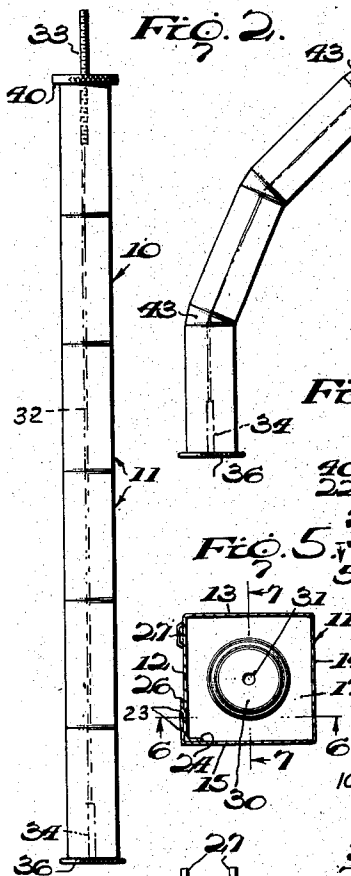


FIG. 3.

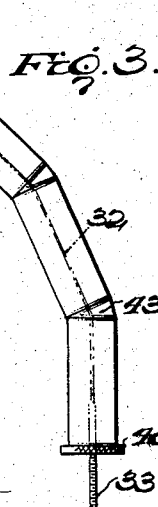


FIG. 4.

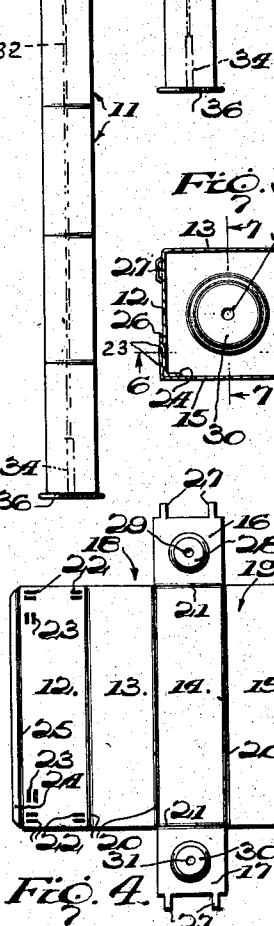


FIG. 5.

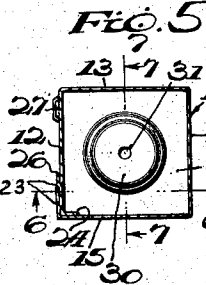


FIG. 6.

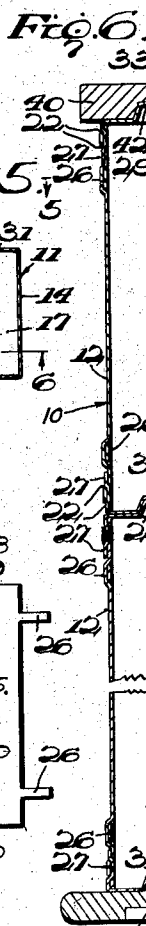


FIG. 7.

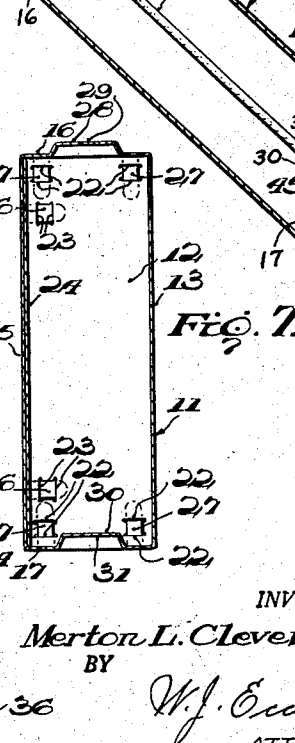
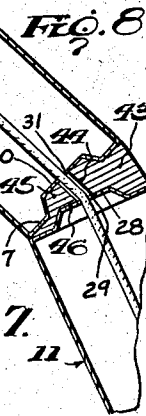


FIG. 8.



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KNOCK-DOWN STRUCTURAL MEMBER WITH COLLAPSIBLE MEMBERS

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1 Claim. (Cl. 189—34)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a knock-down structural member having collapsible or foldable elemental sections.

A primary object of the invention is to provide an extremely lightweight, strong knock-down structural member for use in forming beams, columns, arches and the like in building construction, and the like.

A further object is to provide a structural member of the above-mentioned type which may be rapidly assembled and disassembled with a minimum of time and labor, and without the use of special tools.

A further object is to provide a knock-down construction member having elemental sections or units formed from flat foldable blanks of plastic reinforced cardboard, sheet metal or the like.

Another object is to provide a knock-down construction member which will occupy extremely little space when packaged for shipment or storage while in the disassembled and collapsed condition.

A still further object is to provide a structural member of the above-mentioned type which may be used to form a substantially smooth-surfaced beam, pole or the like, free from surface projections and gaps.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a side elevation of a structural beam, or the like, constructed in accordance with the present invention,

Fig. 2 is a similar view of a column or pole in accordance with the invention,

Fig. 3 is a side elevation of an arch member in accordance with a modification of the invention,

Fig. 4 is a plan view of a sheet material blank utilized to form the elemental sections of the structural member,

Fig. 5 is a transverse horizontal section taken on line 5—5 of Fig. 6,

Fig. 6 is a transverse vertical section taken on line 6—6 of Fig. 5,

Fig. 7 is a similar section taken on line 7—7 of Fig. 5, and

Fig. 8 is an enlarged fragmentary longitudinal vertical section through the arch shown in Fig. 3.

In the drawings, where for the purpose of illustration are shown preferred embodiments of the invention, attention is directed first to Figs. 1, 2, and 4 to 7, inclusive, wherein the numeral 10 designates generally a knock-down, foldable structural member in accordance with the invention, adapted to serve as a beam, joist, rafter, or the like, when arranged horizontally as in Fig. 1, and as a pole, column, or the like when arranged vertically as in Fig. 2.

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The structural member 10 comprises a plurality of separate thin-walled box-like elemental sections 11, arranged in end-to-end interfitted relation, in assembly, as will be fully described. Any desired number of the elemental sections 11 may be employed for making the beam of Fig. 1 or the column or pole of Fig. 2.

Each box-like elemental section 11 is preferably rectangular in transverse cross section, Fig. 5, and includes side walls 12, 13, 14, and 15, as well as end walls 16 and 17. Each box-like section 11 is preferably constructed from a flat foldable blank 18, Fig. 4, formed of plastic reinforced cardboard, paper, sheet metal, or any other suitable sheet material capable of being bent or folded and possessing the desired rigidity and stiffness. The blank 18 comprises a substantially rectangular body portion 19 having three equidistantly spaced parallel fold or score lines 20 extended thereacross for defining in the blank element rectangular sections which are the side walls 12, 13, 14, and 15 when the blank is folded into the box-like section 11, previously mentioned. The blank 18 further embodies a pair of extensions at opposite ends of the blank section or side 14, Fig. 4, foldable upon fold or score lines 21, and these extensions are the end walls 16 and 17 of the assembled elemental box-like section 11.

The side or section 12 of the blank 18 is provided near its opposite ends with companion pairs of slits 22, and near and inwardly of its outer edge with longitudinally spaced pairs of slits 23. The blank section 12 also carries a narrow longitudinal flap 24 at its outer longitudinal edge, foldable upon a fold or score line 25. The blank section 15 carries at its outer longitudinal edge a pair of longitudinally spaced tabs 26, insertable through the pairs of slits 23 when the blank is folded to make the elemental box-like section 11. The blank extensions or ends 16 and 17 are similarly provided at their extremities with transversely spaced tabs 27, insertable through the pairs of slits 22 when the blank is folded for making the elemental box-like sections 11 of the structural member 10.

The blank extensions 16, which as previously stated are the end walls 16 of the sections 11 are suitably embossed to form thereon short conically tapered truncated projections or hollow bosses 28, integral therewith. Each projection 28 has a central aperture 29 formed in its end wall, as shown. The extension 17 of each blank 18 is likewise centrally embossed to provide in the end wall 17 of each elemental section 11 a conically tapered truncated hollow projection or boss 30 having a central aperture 31 formed therein as shown, for axial alignment with the aperture 29 in the folded blank.

In constructing each box-like elemental section 11, the blank sections 13 and 15, Fig. 4, are folded upwardly along the score lines 20 and the blank section 12 is then folded along one score line 20 until it is arranged opposite the blank section 14 and at right angles to the blank sections 13 and 15. The narrow flap 24 is now turned inwardly at right angles to the section 12 and disposed upon the inner side of the side wall 15, Fig. 5. The tabs 26 are now passed through the pairs of slits 23 in the manner shown in the drawings. The blank extensions 16 and 17 are now folded on the score lines 21 to opposed parallel relation, at right angles to the sections or sides 12, 13, 14, and 15, and the tabs 27 are passed through the pairs of slits 22 in the manner shown in the drawings for completing the construction of the hollow box-like elemental section 11.

The completed elemental section 11, Fig. 7, is somewhat elongated and rectangular in transverse cross section and is generally similar in shape to the well-known wax-coated paper quart milk carton. In the completed section 11, the hollow boss or projection 28 projects be-

yond or outwardly of the end wall 16, Fig. 7, and the hollow projection 39 projects inwardly of the end wall 17 to form in the corresponding end of the elemental section 11 a conically tapered truncated recess adapted to snugly receive the projection 28 of a companion elemental section 11 in the structural member 10.

In the member 10, means are provided for securing the elemental sections 11 together under tension in end-to-end interfitting relation. Such means comprises a flexible cable or element 32 of desired length, having permanently secured to one end thereof by any suitable means a cylindrical screw-threaded rod 33. The opposite end of the cable 32 has a cylindrical pin 34 permanently secured thereto by any suitable means, and the pin 34 is provided at its outer end with a flat circular head 35, preferably formed integral therewith.

A desired number of the box-like sections 11 are placed in end-to-end relation with the tapered projections 28 at corresponding ends thereof interfitting with the recesses in the other corresponding ends of the sections, afforded by the projections 30. The sections 11 are oriented so that their side walls form on the structural member 10 four continuous and substantially smooth or uninterrupted side walls, whereby the entire member 10 is rectangular in cross section.

A base or end plate 36 is provided for one end of the member 10, and this base plate is provided upon one side with a conically tapered truncated projection 37, corresponding in shape and size to each projection 28, and adapted to fit within the recess afforded by the projection 30 of the endmost elemental section 11 of the member 10. The end plate 36 has an opening 38 formed axially therethrough, and is further provided in its outer side with a counterbore or recess 39, receiving the head 35, whereby the head is flush with the outer side of the end plate 36.

In assembling the structural member 10, the screw-threaded rod 33 and cable 32 are threaded axially through the interiors of all of the box-like sections 11 and through all of the openings 29 and 31 of the projections 28 and 30 which register in assembly. The pin 34 will engage through the opening 38 of the end plate 36, and through the opening 31 of the endmost elemental section 11, Fig. 6. The end plate 36 preferably has a swiveled connection with the pin 34.

After the cable and rod 33 are threaded entirely through all of the elemental sections 11, a large nut 40 having a central screw-threaded opening 41 formed therethrough is applied to the screw-threaded rod 33. This nut 40 is provided in its inner face with a truncated conically tapered recess 42, snugly receiving the projection 28 of the adjacent endmost elemental section 11, Fig. 6. When the nut 40 is tightened, it bears against the adjacent end of the endmost section 11 and the cable 32 is placed under tension and the end plate 36 is drawn against the adjacent end of the other endmost section 11. This firmly secures the several sections 11 together in end-to-end interfitting relation, and the resulting beam or pole shown in Figs. 1 and 2, respectively, is substantially rigid and very strong, so as to have utility in building construction, aircraft construction and the like.

I also contemplate forming the projections 28 and 30 other than circular or conical in cross section, and these projections may be formed rectangular or in the shape of truncated pyramids in cross section, if desired. If this is done, the interfitting projections 28 and 30 will automatically orient the flat sides 12, 13, 14, and 15 of the elemental sections 11 in parallelism in assembly, and it will be unnecessary to assemble the member 10 on a

flat surface or otherwise arrange the sections 11 by hand so that the completed member 10 will be rectangular in cross section and have substantially smooth or continuous sides, free of gaps or projections.

In Figs. 3 and 8, I have shown a modification of the invention, wherein a desired number of the elemental sections 11 may be utilized to form an arch member 10' for building construction or the like. To facilitate this, I provide between the ends of each adjacent pair of sections 11 tapered or wedge-like spacer elements 43 formed of molded plastic material, or the like. Each spacer 43 has a central opening 44 formed therethrough for registration with a pair of the openings 29 and 31 in assembly, and adapted to receive the cable 32. Each spacer element 43 is further provided upon one face with a truncated conically tapered projection or boss 45 which snugly interfits within the recess afforded by the embossed projection 30 of one adjacent elemental section 11. The opposite side of each spacer element 43 has a truncated conically tapered recess 46 formed therein to receive the projection 28 on the end of the other adjacent elemental section 11.

It is thus seen that the use of the spacer elements 43 enables the same elemental sections or units 11 employed in the straight structural member 10 to be utilized with the same cable 32 and associated parts for forming a curved arch member or beam such as the arch member 10', Fig. 3.

All other parts and their functions are identical with corresponding parts shown described in connection with the first form of the invention.

It is to be understood that the forms of the invention, herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claim.

I claim:

A knock-down arch or the like comprising a plurality of hollow box-like elemental sections having ends provided with openings, projections formed upon corresponding ends of said sections, the other corresponding ends of the sections having recesses formed therein, wedge-like spacers arranged between adjacent ends of said sections and having openings formed therethrough registering with the openings of said ends, projections formed upon corresponding sides of said spacers and interfitting with said recesses of corresponding ends of the sections, the other sides of the spacers having recesses interfitting with said projections of corresponding ends of said sections, a flexible element extending through the interiors of said sections and through the openings of said ends and spacers, and means connected with said flexible element for tensioning the same and thereby drawing said sections and spacers rigidly together in end-to-end interfitting relation.

References Cited in the file of this patent

UNITED STATES PATENTS

233,271	McLean et al.	Oct. 12, 1880
511,472	Sumovski	Dec. 26, 1893
1,110,157	Stewart	Sept. 8, 1914
2,705,015	Langlais	Mar. 29, 1955

FOREIGN PATENTS

21,680	Sweden	Dec. 15, 1906
377,715	France	July 19, 1907
746,138	France	Feb. 27, 1933
1,052,362	France	Sept. 23, 1953