FORM SUPPORTING GIRDERS
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Filed Feb. 2, 1965, Ser. No. 429,798
2 Claims. (Cl. 52—632)

ABSTRACT OF THE DISCLOSURE
An adjustable length girder wherein an I-beam is telescoped in a cambered box beam and has secured at its inner end a stiffener plate including a high rib secured to the I-beam web and a low rib spaced therefrom to provide a channel in which inner end edge portions of the web are seated.

The present invention relates to longitudinally adjustable form supporting girders, or the like, advantageously employed in concrete construction.

Inasmuch as girders of this type serve as temporary supports in pouring concrete and are removed after each operation for similar use elsewhere after the poured slab has set, economy in weight is an important factor. Accordingly, girder parts of suitable aluminum alloys, or equivalents, can be so employed when shaped, as by extrusion, and assembled for optimum rigidity and load supporting capacity. An object of the invention, therefore, has been to provide a girder which, in effect and for the purposes indicated, has substantially the strength and durability of a steel part but with the lighter weight of aluminum or other suitable material.

In ordinary practice where a composite girder comprising a box beam and an I-beam telescoped therein is employed, maximum compressive or other deforming forces develop at approximately mid-portions longitudinally thereof and adjacent to a plane defined by the inner end edge of the I-beam web. In addition to being subjected thus to forces generated by the load, inner end portions of the I-beam web are under compression from clamping devices designed to hold the I-beam and enclosing portions of the box beam securely in operative extended condition, as where the I-beam is clamped against under surface portions of the top wall of the box beam.

It has been a further object of the present invention to provide a girder construction of the type indicated which is capable not only of being substantially completely assembled in the shop but which is also designed to resist buckling and other impairment when subjected to compressive forces in use on the job.

A girder embodying the invention comprises, in general, a box beam of substantially rectangular cross sectional contour including a lower member having a bottom wall and opposed side walls extending upwardly therefrom, each including an inwardly offset top edge portion and an upper member having a top wall and opposed side walls extending downwardly therefrom with lower edge portions of said side walls arranged in overlapping engagement with and secured to said offset upper edge portions of said side walls of the bottom member. Opposed longitudinally extending angles project inwardly from the side walls of the upper member to form opposed channels; and said overlapping portions of said members are permanently secured together with the upper edges of the offset portions of the lower member side walls operatively engaged in said opposed channels to restrict lateral play between the side walls of said upper and said lower members respectively.

An I-beam having a web and top and bottom flanges is telescoped in said box beam with the top flange of said I-beam pressed against the under side of the top wall of the upper member, with the bottom flange spaced above the bottom wall of the lower member of the box beam, and with its inner end exposed within said box beam. An end reinforcing plate or brace is secured across the inner end edge of said web of the I-beam.

A beam locking device is carried by the bottom wall of said lower member of the box beam and includes clamping means having portions arranged inside the box beam and adapted to operatively engage under side portions of said bottom flange of the I-beam to press the top flange of the latter into frictional locking contact with under surface portions of the top wall of the upper member of the box beam. Means for actuating said locking device include portions extending through said bottom wall of the box beam and accessible outside thereof for manual operation.

A stop plate extends laterally from a side surface of the I-beam in position to be intercepted by inner end portions of a stop bolt, or the like, which is adjustably mounted to extend through a side wall of the box beam into the path of movement of said stop plate when said I-beam is moved in a direction to be disengaged from the box beam.

Other objects and distinctive features of the present invention not above defined or referred to will appear from the following specification and claims and from the accompanying drawings wherein

FIG. 1 is a side view with parts broken away to show a stop pin and cooperating stop plate for limiting the extent of disengaging movement between the box beam and the I-beam telescoped therewith for use in a typical form supporting operation.

FIG. 2, a transverse vertical section, on enlarged scale, from the line 2—2 of FIG. 1;

FIG. 3, a fragmentary view in horizontal section on the line 3—3 of FIG. 2; and

FIG. 4 is a fragmentary view in horizontal section on the line 4—4 of FIG. 3.

As seen in the drawings, an adjustable girder embodying the invention comprises a box beam 1 and an I-beam 2 preferably of extruded aluminum or other relatively light weight suitable material. Said box beam includes an elongated upper member or cover of generally U-shaped cross section having a top wall 3 advantageously cambered to resist bending under a load and opposed spaced side walls 4, each said side wall including an inwardly extending angle 5 longitudinally coextensive with said wall and which forms therewith a channel 6 opening downwardly as seen in FIG. 2.

Box beam 1 also includes an elongated lower member of generally U-shaped cross section having a bottom wall 7 and opposed spaced side walls 8. Each of said side walls 8 is offset inwardly along its top edge portion, as at 9, to form a shoulder 10 coextensive with the length of the lower member.

The bottom wall 7 has a keyhole shaped opening 11, FIG. 4. A not preferably in the form of a base plate 12 is formed with a boss 13 which extends through engaging 11 and is threaded to receive the shank of a bolt 14 which has a flattened head 15. For convenience in assembling, the threaded portion of bolt 14 is engaged with base plate 12; and head 15 is passed through the keyhole opening 11 by aligning the major dimension of head 15 with the major axis of the opening 11. Means for releasably retaining said boss 13 of base plate 12 in operative engagement with opening 11 include a split ring retainer 16 having its inner edge portion engaged in a peripheral groove 17 of boss 13 and having its outer peripheral edge operatively engaging outer surface portions of bottom wall 7 which surround the circular part of opening 11.
A pressure transmitting plate 18 is mounted at the inner end of bolt 14 between bottom flange 23 of the I-beam and bottom wall 7 of the box beam and is adjustable upwardly and downwardly by turning said bolt.

One of the side walls, as 8, of the lower member has a hole which is threaded to receive a threaded stop pin 19 having a head 20 by which it may be adjusted inwardly to operative stop position and outwardly in relation to said wall 8 to inoperative position in relation to a stop plate 24 on the I-beam. Said I-beam 2 which is advantageously cambered to resist bending under a load includes a web 21 and top and bottom flanges 22 and 23, respectively. As seen in FIGS. 1 and 2, said stop plate 24, conveniently in the form of an angle iron, is secured to web 21 in position to be intercepted by stop pin 19 when the component beams are in operative fully extended condition substantially as seen in FIG. 1.

In use, when said beams are thus positioned, they are clamped or locked together by turning bolt 14 which presses plate 18 upwardly upon the wall surface of the bottom flange 23 of I-beam 2. As seen in FIG. 1, with the parts dimensioned and proportioned approximately as shown, this clamping action effected by bolt 14 develops substantially compressive forces across web 21 additional to those imposed by the load and which would, under some conditions, cause end portions of said web to buckle. Accordingly, a brace or web stiffener is provided, conveniently in the form of a plate 25, FIG. 3, having a high rib 26 and low rib 27 parallel therewith and spaced therefrom to provide a channel 28 substantially as wide as the thickness of the web. Inner end portions of web 21 are snugly seated in channel 28 and the brace is secured on said web by suitable means, as rivets 29.

An advantageous feature of the above described girder, in addition to its superior strength in use, is that it may be assembled at the shop and thereafter handled and transported as a complete unit. Preliminarily the hole 11 is provided at the proper place in bottom wall 7. The head 15 of bolt 14, while assembled with plate 12, is passed outwardly through hole 11; and split ring 16 is applied to boss 13 as shown in FIG. 2 to hold this sub-assembly in place on the box beam. Plate 18 is mounted at the inner end of bolt 14 which is adjusted so that the bottom flange of I-beam 2 may readily be moved over and past said plate when the I-beam is inserted in the box beam.

To complete box beam 1, the upper and lower members thereof are assembled with the longitudinal edge of offset 9 of the lower member closely engaged in channel 6 of the upper member. Holes are punched through the overlapping side wall portions of said members to receive rivets, as 30, or other suitable means for permanently connecting said parts. This operation is facilitated by the reinforcing effect of angle 5 and the increased rigidity of the assembly where the top edge of wall 8 is in effect backed up by the angle 5 when drilling or punching pressure is applied from the outside to produce the rivet holes to embrace the rivets.

I-beam 2 is equipped for its assembly with box beam 1 by securing thereto at a predetermined distance from its inner end the stop plate 24. Also, the stiffening plate 25 is secured to said inner end of web 21 as previously described. With pressure plate 18 sufficiently retracted and with stop pin 19 withdrawn to permit passage of stop plate 24, I-beam 2 may be moved to full telescoping position or to such other position wherein the reinforced end of I-beam 2 is telescoped into box beam 1 to an extent whereby stop plate 24 is moved past the inner end of stop pin 19 which is then adjusted inwardly to prevent I-beam 2 from accidentally disengaging from box beam 1.

For handling and transportation it will usually be advantageous to bring I-beam 2 into fully telescoped relation to box beam 1 where it may be releasably locked by advancing bolt 144 sufficiently to clamp I-beam 2 between plate 13 and the top wall 3 of the box beam. In use, when the beams are in extended relation, as in FIG. 1, they are clamped or locked together in a similar manner but with the web stiffener or brace 25 positioned preferably in the maximum load zone.

We claim:

1. An adjustable length girder wherein an end of an I-beam telescopes in an end of a box beam and means are provided for clamping portions of the I-beam at different positions of longitudinal adjustment within the box beam, said I-beam having at its inner end a web stiffener comprising a plate extending across portions of the inner end web of the I-beam web, a relatively high rib extending from said plate and rigidly secured to said web in close overlapping contact with inner end portions thereof adjacent said inner end edge, and a relatively low rib extending from said plate substantially parallel with and spaced from said first rib to provide between said ribs a channel wherein said inner end edge of the I-beam web is operatively engaged to resist buckling of the I-beam web when compressive force is applied to the I-beam through said clamping means.

2. A longitudinally adjustable form supporting girder for use in concrete construction comprising a box beam and an I-beam telescoping therewith, said box beam including an upper member and a lower member, said upper member having a top wall and substantially parallel spaced side walls and said lower member having a bottom wall and substantially parallel spaced side walls, each side wall of the upper member having an inwardly projecting longitudinally extending angle arranged opposite to the angle on the other side wall, said angles providing substantially parallel longitudinal channels opening downwardly within said upper member, said side walls of the lower member having opposed edge portions of their side walls offset inwardly to form outwardly exposed longitudinally extending shoulders, said upper and lower members being assembled with lower edge portions of the side walls of the upper member engaging said shoulder closely and overlapping the offset portions of the side walls of the lower member, and with the edges of said side walls of the lower member operatively engaged in said opposed channels of the upper member, whereby said side walls are reinforced against deformation by forces applied transversely of the girder, and said overlapping portions of said side walls being secured together at each side of the box beam between said channels and said longitudinal shoulders, said I-beam having at its inner end a web stiffener comprising a plate secured to and extending across portions of the inner end edge of the I-beam web.