July 24, 1962 H. A. DE LA RAMBELJE 3,045,786

FORM SUPPORTING GIRDER FOR USE IN CONCRETE CONSTRUCTION

Filed March 23, 1960 3 Sheets-Sheet 1

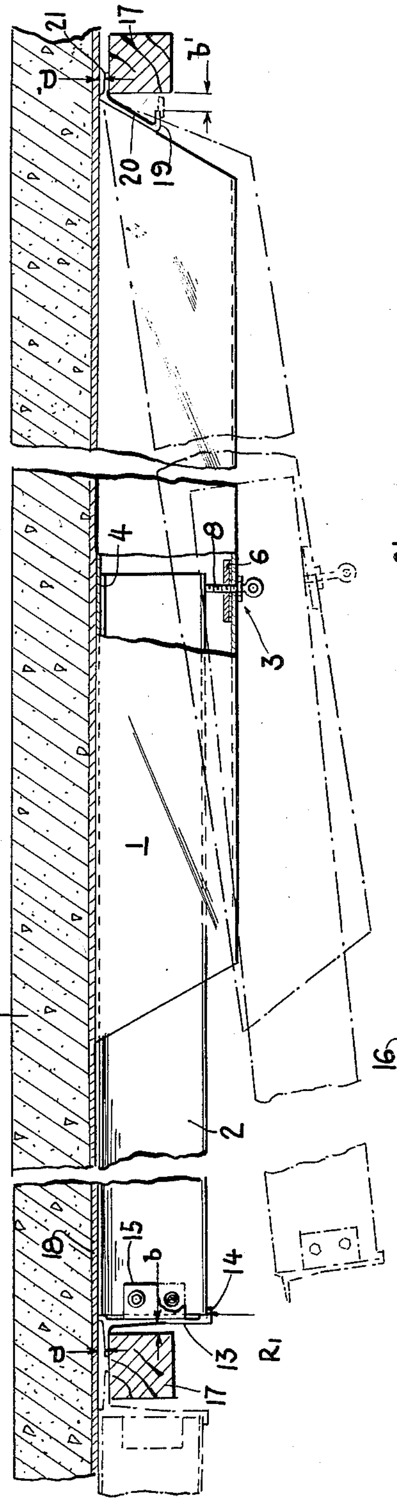

Fig. 1

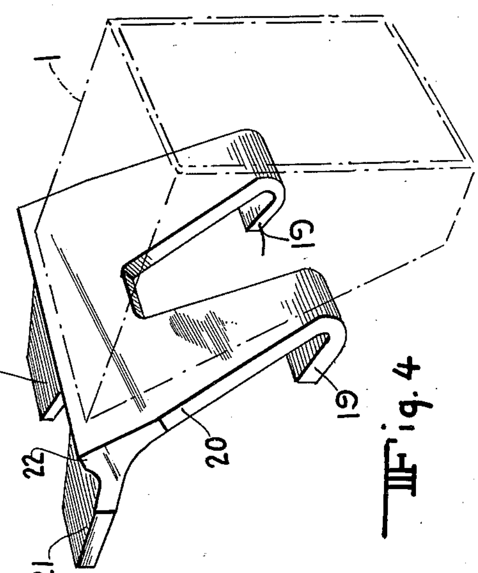

Fig. 4

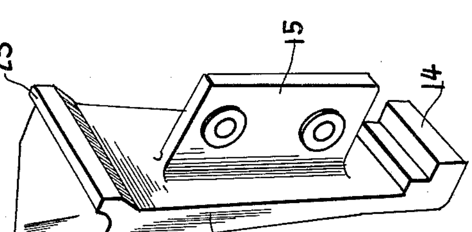

Fig. 3

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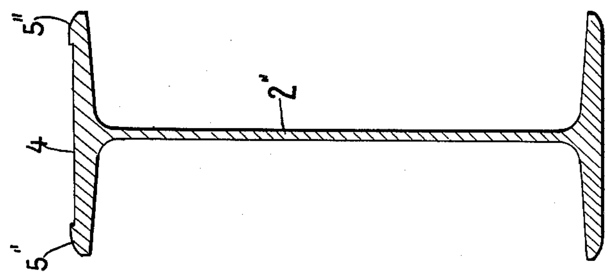

Fig. 6

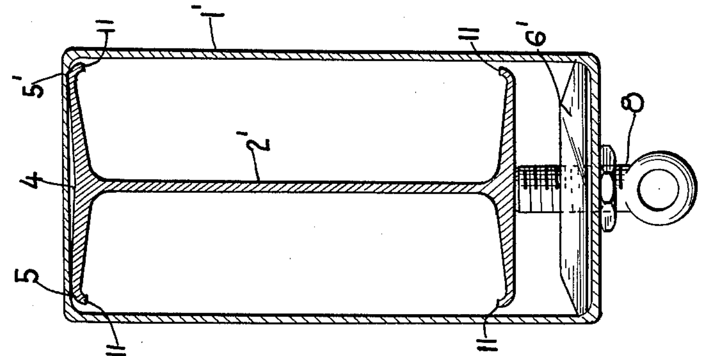

Fig. 5

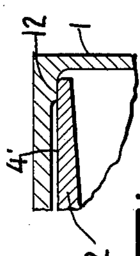

Fig. 7

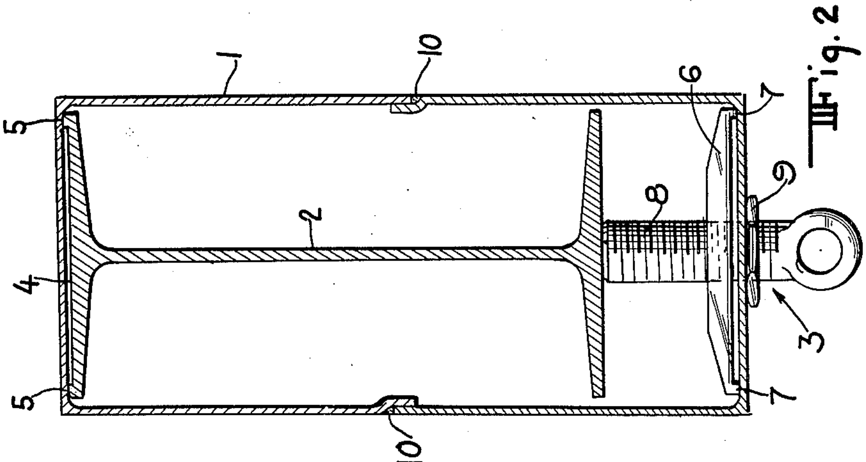

Fig. 2

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FORM SUPPORTING GIRDER FOR USE IN CONCRETE CONSTRUCTION

Filed March 23, 1960 3 Sheets-Sheet 3

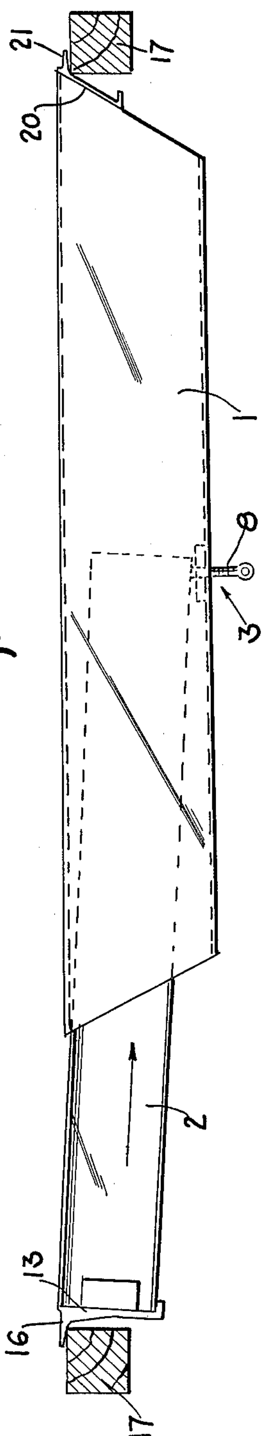

Fig. 8

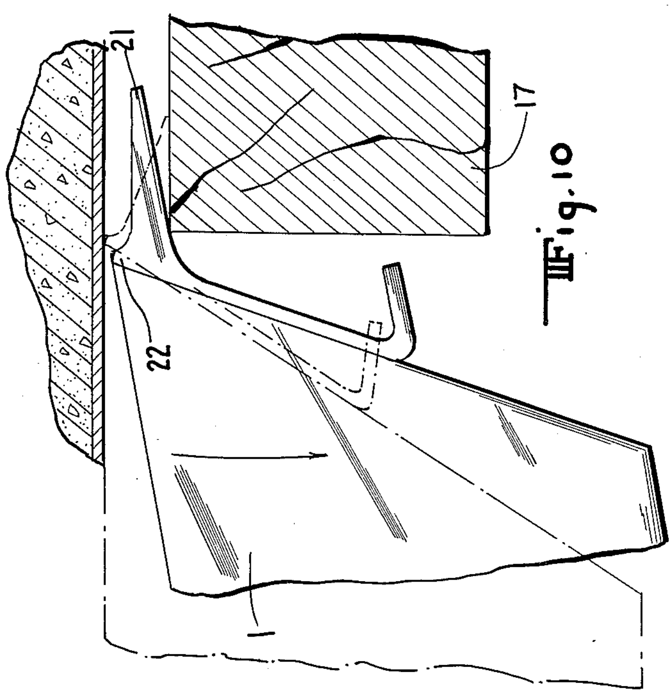

Fig. 10

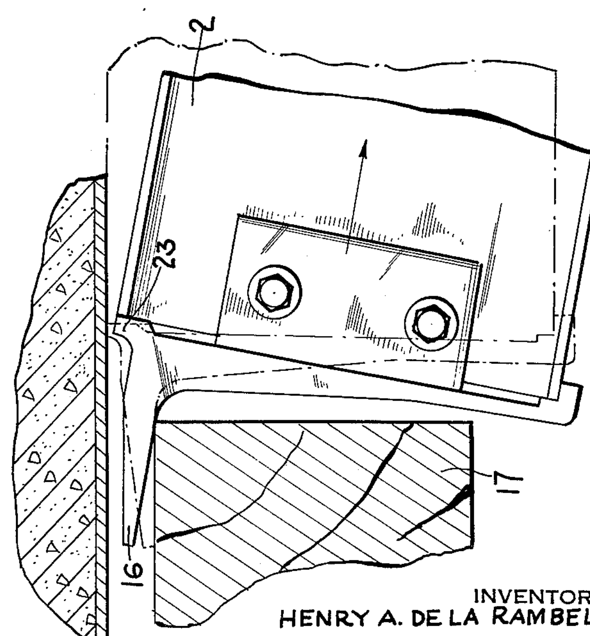

Fig. 9

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3,045,786
FORM SUPPORTING GIRDER FOR USE IN CONCRETE CONSTRUCTION

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Filed Mar. 23, 1960, Ser. No. 17,117
5 Claims. (Cl. 189—37)

The invention relates to adjustable form supporting girders for concrete construction, and more particularly to improvements in girders of the telescopic type.

Form supporting girders are sometimes called temporary, or removable, girders, as they are designed to be removed after the concrete has been poured and has set, and then used on the next construction job. This entails repeated handling of the girders, trucking from job to job or shipment by other carriers. Therefore it is desirable that the girders be made as light in weight as possible. Also it is desirable that the girders be made of corrosion resistant metal to give them a long useful life and avoid need for painting, rust-proofing or other expensive maintenance operations. The best material to satisfy these objectives is a light metal such as aluminum. Aluminum possesses the additional advantage that it can be formed by the extrusion process which is well adapted to the production of box-like sections of special form to be used as the outer section of a telescopic girder.

Notwithstanding the recognized advantages of aluminum, attempts to adapt aluminum to telescopic girder design have encountered many difficulties in practical design and construction. One of the more serious problems has been the phenomenon known as "flare-out." This may be explained as follows with reference to a telescopic girder design employing a more or less conventional hollow tubular outer girder member of box-like cross section and, say, an I-beam inner girder member sliding within the outer member to permit adjustment of the length of the combined girder sections. It has been found that when such a telescopic girder is made of aluminum, pressures developed in the loaded girder between contacting upper and lower portions of the overlapping portions of the two girder sections can produce transverse bending stresses in the top and bottom of the outer box-like section of a magnitude which exceeds the elastic limit of the metal. The resulting strain can cause the top and bottom chords of the outer section to bend into an arch. It is a primary object of my invention to avoid, or to reduce to within practical limits, the strains and undersirable deformations characteristic of such "flare-outs," yet to accomplish this without resorting to the use of unduly heavy metal sections or special reinforcing means.

Another problem encountered with known forms of telescopic form supporting girders is that they are difficult to remove after use. This difficulty is created by the need to partially telescope the girder sections before one end of the girder can be freed from its supporting ledge. My invention comprises means for initially freeing an end of the girder so that the girder sections can be easily telescoped for removal.

According to my invention, a form-supporting girder comprising a box-like section and an I-beam section slidable lengthwise within the box-like section for adjustment

of the length of the girder, and locking means for holding an outer end surface of the I-beam section pressed against an inner surface of the box-like section, is so constructed that at least one of such surfaces is relieved over a substantial central area so that engaging load transmitting areas of said surfaces are confined primarily to corner portions of the box-like section. I have found that this reduces bending stresses transversely of the box-like section. The surface that is relieved over a substantial central area may be one or both of the outer transverse surfaces of the I-beam section, one or both of the inner transverse surfaces of the box-like sections, or all or any combination of such adjacent transverse surfaces. The locking means may comprise a load-bearing clamping plate having a surface pressed against an inner surface of the box-like section, at least one of these last-named surfaces being relieved over a substantial central area so that the engaging load transmitting areas are confined primarily to corner portions of the box-like section. A load-carrying shear bracket is secured to the outer end of one of the girder sections. This bracket has a load-supporting flange for engagement under a horizontal surface of this girder section and an upright flange for attachment to an upright portion of the girder section through a connection in which the attaching means is relieved of shear forces acting in a vertical direction. Through the provision of predetermined clearances above and at the end of the bracket, it becomes possible to free an end of the girder so that the girder sections can be easily telescoped for removal.

In my preferred construction, the I-beam section has upwardly projecting ridges along the outer edge portions of the I-beam flanges. The locking means presses these projecting ridges against the inside surface of the top of the box-like section.

The accompanying drawings illustrate a number of preferred embodiments disclosing the best mode contemplated by me for carrying out my invention.

FIG. 1 is a side elevational view of a girder constructed in accordance with my invention, showing the girder in use.

FIG. 2 is a vertical transverse sectional view of the girder of FIG. 1, drawn to an enlarged scale.

FIG. 3 is a perspective view of the removable load-carrying shear bracket detached from the left hand end of the girder of FIG. 1.

FIG. 4 is a perspective view of the load-carrying shear bracket used at the other end of the girder.

FIG. 5 is a vertical transverse sectional view showing a modified construction of my girder.

FIG. 6 is a vertical transverse sectional view of the inner I-beam section made according to another embodiment of my invention.

FIG. 7 is a detail vertical transverse sectional view of one of the upper corners of a girder utilizing my invention according to another modification thereof.

FIG. 8 is a diagrammatic side elevational view showing the posture of the girder after the first stripping step has been performed.

FIG. 9 is a detail view of the left-hand end of the girder of FIG. 1.

FIG. 10 is a detail view of the right-hand end of the girder of FIG. 1.

My adjustable form-supporting girder comprises in its general arrangement a box-like section **1** and an I-beam section **2** slidable lengthwise within the box-like section for adjustment of the length of the girder, locking means **3** for holding an inner end surface of the I-beam section pressed against an inner surface of the box-like section, at least one of said surfaces being relieved over a substantial central area **4** (FIG. 2) so that engaging load transmitting areas of said surfaces are confined primarily to corner portions of the box-like section, thereby reducing bending stresses transversely of the box-like section. In the construction shown in FIG. 2 the surface that is relieved over a substantial central area is one of the outer transverse surfaces of the I-beam section, the I-beam section having upwardly projecting ridges **5** along the outer edge portions of the I-beam flanges. The locking means **3** holds these projecting ridges pressed against the inside surface of the top of the box-like section **1**. The locking means shown comprises a rectangular plate **6** having downwardly projecting ridges **7** along the outer edge portions thereof, and a clamping bolt **8** having threaded engagement with the plate. If desired a lock nut **9** may also be provided.

The girder section **1** may be formed as two identical aluminum extrusions welded together as **10**. Girder section **2** likewise may be made as an aluminum extrusion, making it possible to provide upwardly projecting ridges **5** without any separate machining operation. The same is true with respect to the plate **6** which can be made as an extrusion and then cut off into short lengths suitable for the use indicated.

In the modified construction shown in FIG. 5, girder section **1'** is formed as a single extrusion and the flanges of the I-beam section **2'** have their edges strengthened by provision of the inwardly turned edges **11**. In this girder the plate **6'** is made to so fit into the lower corners of girder section **1'** that the load transferred from the underside of I-beam section **2'** to bolt **8** to plate **6'** is then transferred directly to the lower inner corners of girder section **1'** as shown.

The I-beam girder section shown in FIG. 6 is similar to that in FIG. 2 except that the edges of the upwardly projecting ridges **5''** are curved in a manner to fit the inner top corners of a box-like girder section similar to that shown in FIG. 5.

In producing the outer box-like girder section as an extrusion it is also possible for the surface that is relieved over a substantial area to be the top inner surface of the outer girder section. This is accomplished by providing shoulders **12** (FIG. 7) in the upper corners of such girder section so that there will be a relieved area over a substantial portion of the top surface of the I-beam.

Referring to FIGS. 1 and 3 we see a load-carrying shear bracket **13** adapted to be secured to the outer end of one of the girder sections (here the I-beam section **2**) this bracket having a load supporting flange **14** for engagement under a horizontal surface of the girder section and an upright attaching flange **15** with bolt holes for attachment to an upright portion of the girder section, i.e., to the web of the I-beam. The bolt holes in the flange **15** or in the web of the I-beam, or in both, are made enough larger than the size of the bolt so that the connection between flange **15** and the I-beam will not be loaded in vertical shear, all of the vertical shear load being carried, therefore, on the flange **14** of the bracket as indicated by the force of reaction R in FIG. 1. The upper horizontal flange **16** of the bracket rests on a suitable supporting structure such as a beam or the ledger **17**. Attention is directed to the fact that a predetermined clearance is provided at *a* between the underside of the plywood form **18** and the top of flange **16** of the bracket. This space will facilitate stripping operations. Also a clearance is provided at *b* between the vertical part of the bracket and the side of ledger **17**. With this arrangement, after the concrete C has set and it comes time to remove the girder, the clamping means **3** are released by loosening bolt **8**, relieving stresses on the girder. By reason of the predetermined clearances provided at *a* and *b* it is now possible for the girder to sag or bow downwardly, as shown in FIG. 8, without binding, and in this condition it is not at all difficult to slide section **2** a little way into section **1** after which the left hand end of the girder can be dropped downwardly as indicated by the dot-dash lines in the lower part of FIG. 1. Angling of the girder in this fashion is possible by reason of the clearances provided at *a'* and *b'* at the right hand end of the girder. If desired, this operation can be reversed, i.e., girder section **1** may be pushed to the left as viewed in FIG. 1 to release the top bearing flanges **21** from the top of ledger **17**, after which the girder can be angled downwardly with a clockwise movement around its left hand end. In this case the predetermined clearances provided at *a* and *b* make this angling of the girder possible. Thus both the clearances *a* and *b*, and the clearances *a'* and *b'*, serve a dual function: (1) to provide free angling of the grider ends when the clamping means **3** is released so that the girder can sag downwardly as shown in FIG. 8, and (2) to provide for further angling of either end of the girder when the other end is dropped downwardly in the manner shown in FIG. 1. Because the flanges **16** or **21**, cannot bind when the girder assumes the posture shown in FIG. 8, the girder sections can be telescoped easily by inserting a pinch bar into the space at *b* or *b'* and wedging the one section away from ledger **17** sufficiently to free the bracket flanges from the ledger . The angled positions of the brackets **13** and **20** assumed according to functions (1) or (2) above are shown in FIGS. 9 and 10 respectively, the normal positions of these brackets being shown in these views by dot-dash lines.

The terms and expressions which I have employed are used in a descriptive and not a limiting sense, and I have no intention of excluding such equivalents of the invention described as fall within the scope of the claims.

I claim:

1. An adjustable form-supporting girder for concrete construction comprising a box-like section and an I-beam section slidable lengthwise within the box-like section for adjustment of the length of the girder, locking means for holding an outer end surface of the flanges of the I-beam section pressed against an inner surface of the box-like section, at least one of said surfaces being relieved over a substantial central area so that engaging load transmitting areas of said surfaces are confined primarily to corner portions of the box-like section, thereby reducing bending stresses transversely of the box-like section, said locking means including a load-bearing clamping plate having a surface pressed against an inner surface of the box-like section to distribute stresses across said inner surface and said locking means further including a clamping bolt having a threaded engagement with said clamping plate.

2. An adjustable form-supporting girder according to claim 1 in which the surface that is relieved over a substantial central area is one of the outer transverse surfaces of the flanges of the I-beam section.

3. An adjustable form-supporting girder according to claim 1 in which the surface that is relieved over a substantial central area is one of the inner transverse surfaces of the box-like section.

4. An adjustable form-supporting girder for concrete construction comprising a generally rectangular box-like section and an I-beam section slidable lengthwise within the box-like section, the I-beam section having upwardly projecting ridges along the outer edge portions of the upper I-beam flanges, and locking means for holding said projecting ridges pressed against the inside surface of the top of the box-like section, said locking means including a load-bearing clamping plate having a surface pressed against an inner surface of the box-like section to distribute stresses across said inner surface and said lock-

ing means further including a clamping bolt having a threaded engagement with said clamping plate.

5. An adjustable form-supporting girder for concrete construction comprising a box-like section and an I-beam section slidable lengthwise within the box-like section for adjustment of the length of the girder, said I-beam section having transverse upper flanges extending upwardly and outwardly from their juncture with the central web portion of the I, said transverse upper flanges having downwardly extending reinforcing flanges along their edges, and locking means for holding the reinforced edges of said transverse upper flanges against the inside upper surface of the box-like section, said locking means including a load-bearing clamping plate having a surface pressed against an inner surface of the box-like section to distribute stresses across said inner surface and said locking means further including a clamping bolt having a threaded engagement with said clamping plate.

References Cited in the file of this patent

UNITED STATES PATENTS

850,662	Lorenz	Apr. 16, 1907
1,415,554	Hatch	May 9, 1922
2,386,161	Hawes	Oct. 2, 1945

FOREIGN PATENTS

479,029	Great Britain	Jan. 25, 1938
1,175,837	France	Apr. 2, 1958

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,045,786

July 24, 1962

Henry A. de la Rambelje

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 19, for "grider" read -- girder --; column 6 line 14, for "Apr. 2, 1958" read -- Nov. 17, 1958 --.

Signed and sealed this 18th day of December 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents