

INVENTION TITLE: IMPROVED CONSTRUCTION PRODUCTS AND METHODS
TECHNICAL FIELD

The invention relates to improvements in apparatus and methods used in the construction of concrete
5 buildings or structures.

BACKGROUND ART

Presently concrete structures such as columns, walls or the like are built using wooden frames. The wooden frame is used to define the boundaries of the column or
10 wall and is removed after the concrete is poured and set. In the case where the column has been incorrectly constructed and a larger column is required, a new wooden frame must be installed. This is a significant disadvantage.

15 Other methods of construction are also in use such as frames made of simple angle bars interconnected with nuts and bolts. In this case if a larger structure is required the frame is similarly inconvenient since the alignment of the holes for the bolts will not be correct.
20 This means that a new frame is required.

One of the objects of the present invention is to overcome the above difficulties by providing a frame (and components thereof) which is convenient to assemble and is capable of being re-used.

25 **SUMMARY OF THE INVENTION**

In a first aspect the present invention provides an angle bar (1) comprising a first portion (2) and a second portion (3), wherein said first and second portions are disposed at right angles to provide a substantially L-shaped configuration in cross-section, said first portion
30 and said second portion having an outer edge (2a and 3a), the improvement comprising a lip (4) which is located along said outer edge (2a or 3a).

In a second aspect the present invention provides a clip (9) for fastening two pieces of angle bar (1a, 1b) together, said clip (9) comprising two parts (10, 11) and a means (17) for holding said clip parts (10, 11) together
5 characterised in that said clip (9) is adapted to hold together a first and second piece of angle bar (1a, 1b) of the invention such that portions of the angle bar (2 or 3) having a lip (4) are placed back to back, wherein said clip comprises a first part (10), with a face (14a) having a
10 recess (15) adapted to fit over a portion of said lip (4a) of said first piece of angle bar, a second part (11) with a face (14b) having a recess (16) adapted to fit over a portion of said lip (4b) of said second piece of angle bar, and a positive location means (13) comprising a male member
15 (13a) located on one of said parts (10 or 11) and a female member (13b) located on the other of said parts (10 or 11), said male and female members (13a and 13b) adapted to mate wherein said positive location means (13) assists in locating said first and second parts (10 and 11) together.

20 In a third aspect the present invention provides a frame (30) for the construction of concrete buildings said frame having a periphery (31) comprised of edge members (31a to 31d), a first surface (32) in the form of a plate (32a) extending between the edge members (31a to 31d)
25 and a second surface (33) optionally comprising one or more reinforcing members (33a or 33b), the improvement comprising at least one edge member being constructed of the angle bar of the invention wherein said edge member is adapted to be connected to a frame having a similar edge
30 member by the clip (9) of the invention.

In a fourth aspect the invention provides a method of forming a composite frame (50) the improvement comprising that said composite frame (50) is composed of two or more frames (30) of the invention, said method
35 comprising aligning one edge member (31a to 31d) of one frame (30) with one edge member (31a to 31d) of another

frame (30) and connecting said edge members with clips (9) wherein said clips (9) have recesses (15 and 16) compatible with the lips (4a, 4b) of said angle bar (1a, 1b).

BRIEF DESCRIPTION OF THE DRAWINGS

- 5 Fig 1A and B illustrates angle bars according to the invention.
- Fig 2A illustrates an alternative embodiment of the angle bar according to the invention.
- Fig 2B illustrates the angle bar of Fig 2A and suitable
10 clip according to the invention.
- Fig 3A illustrates an alternative embodiment of the angle bar according to the invention.
- Fig 3B illustrates the angle bar of Fig 3A and suitable clip according to the invention.
- 15 Fig 4A illustrates an alternative embodiment of the angle bar according to the invention.
- Fig 4B illustrates the angle bar of Fig 4A and suitable clip according to the invention.
- Fig 5A illustrates an alternative embodiment of the angle
20 bar of the invention.
- Fig 5B illustrates the clip of the invention prior to tightening of the securing means on the angle bar.
- Fig 5C illustrates the two parts of the clip in side and end view with preferred dimensions.
- 25 Fig 6A - 6C are similar to Figs 5A - 5C but show the angle bar of Fig 1B with a suitable clip.
- Fig 7A is a top view of frame No.3.
- Fig 7B is side view of a longitudinal section of frame No.3.
- 30 Fig 7C is a side view of a transverse section of frame No.3.
- Fig 8A is a top view of frame No.4.
- Fig 8B is a side view of a longitudinal section of frame No.4.
- 35 Fig 8C is a side view of a transverse section of frame

No.4.

Fig 9 is a schematic representation of two frames positioned to form a right angle such as would be required to form a corner in a wall.

5 Fig 10A is a top view of frame No.5.

Fig 10B is a side view of a longitudinal section of frame No.5.

Fig 10C is a side view of a transverse section of frame No.5.

10 Fig 11A is a top view of frame No.6.

Fig 11B is a side view of a longitudinal section of frame No.6.

Fig 11C is a side view of a transverse section of frame No.6.

15 Fig 12A is a top view of frame No.7 (which is a mirror image of frame No.6).

Fig 12B is a side view of a longitudinal section of frame No.7.

Fig 12C is a side view of a transverse section of frame No.7.

20 Fig 13A is a top view of frame No.8.

Fig 13B is a side view of a longitudinal section of frame No.8.

Fig 13C is a side view of a transverse section of frame No.8.

25 Fig 14A is a top view of frame No.9.

Fig 14B is a side view of a longitudinal section of frame No.9.

Fig 14C is a side view of a transverse section of frame No.9.

30 Fig 15A is a perspective view of one composite frame (50) of the invention.

Fig 15B is a perspective view of another composite frame (50) of the invention. Square boxes represent clips (9).

35 Fig 16 is a top perspective view of a composite frame (50) with provision for an outside wall (55) and an inside wall

(56) at right angles.

Figure 17A is a side view of a beam comprising the base of a girth truss constructed by the method of the invention.

5 Figure 17B is an end view of the composite frame (50) of the invention used to form the beam shown in Figure 17A.

Figure 18 is a view of the composite frame (50) used to form a room including a ceiling.

10 Figure 19 is a view of a composite frame (50) used to make a room with a window and a door.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The angle bar (1) of the invention comprises a first portion (2) having a back (2b), and a second portion (3) disposed at right angles to first portion (2) each portion having outer edges (2a, 3a). The tips of outer edges (2a, 3a) are preferably blunt, not pointed. Either the first portion (2) or the second portion (3) may have a lip (4) located along the outer edge thereof. The lip is conveniently disposed along the portion facing into the right angle, on the opposite side to the back (2b). The angle bar (1) may be of any length and the lip (4) is conveniently disposed along the whole length of the bar, although for certain applications it may be necessary to only have the lip (4) at certain points along the length of the bar (1). The lip (4) may be in any convenient configuration such as in a hook configuration (6a) as shown in Fig 1A, a solid hook (triangular) configuration (6b), as shown in Fig 1B, substantially square or rectangular in cross section (6c) as shown in Fig 2A, a half diamond configuration (6d) as shown in Fig 3A, half octagonal (6e) as shown in Fig 4A or hemispherical (6f) as shown in Fig 5A. The important feature of the lip is that it provides a convenient structure for clamping by the clip of the present invention.

The dimensions of the angle bar may be any convenient size such as those shown on the drawings.

5 The clip (9) of the invention comprises two parts (10 and 11) having each the shape of a substantially rectangular prism (Fig 5c), means for holding the clip parts together (17) and positive location means (13) (Fig 6).

10 Clip part (10) has a face (14a) with a complementary recess (15) adapted to snugly fit over a portion of lip (4) of the angle bar (1). Clip part (11) is similarly shaped having a face (14b) with a recess (16). The faces (14a and 14b) have rebates (14c and 14d) which are suitably sized to accommodate the width of first portion (2) such that lip (4) and part of first portion (2) are enclosed when the clip is applied (Fig 6A).

15 The means (17) for holding the clip parts (10 and 11) together comprise bores (17a and 17b) which extend transversely through the lower section of each clip part (10, 11). The bores (17a and 17b) are positioned such that they meet up to define a continuous bore when the clips are placed together, face (14a) to face (14b). It will be appreciated that other means for holding the parts together could be employed such as a clamp applied to the clip and by welding the parts together or other suitable means.

25 Securing means (12), in the form of a bolt (12a), washer (12b) and nut (12c) secure the two clip parts (10 and 11) together. The bolt (12a) is fitted through bores (17a and 17b) in clip parts (10 and 11) and tightened using washer (12b) and nut (12c) to secure the bolt. It will be appreciated that other fixing means in the form of a shank, plug or the like could also be used.

30 Location means (13) comprises male member (13a) present on face (14a) which is complementary to female member (13b) on face (14b). The male and female members allow the two clip parts to be positively located together when the bolt (12a) is tightened and help prevent movement

of the clip parts (10 and 11). In this manner rotational movement, for example, of first and second parts over the axis of securing means (12) is prevented by location means (13).

5 Thus, in use, two pieces of angle bar (1a and 1b) are located together such that the portions having lips (4a & 4b) are placed back to back, the first and second clip parts (10 and 11) having suitable recesses (15 and 16) are placed over the lips (4a & 4b), the male and female members
10 (13a and 13b) are engaged by pressing the two parts together then the bolt (12a) is threaded through bores (17a and 17b) and appropriate washer (12b) and nut (12c) are used to secure the clamp in position.

15 Preferred dimensions for the angle bar and clamp are shown in Figures 1 to 6.

 The frame (30) of the present invention as shown in Fig 7 may be any suitable shape but is generally rectangular or square. The frame is defined by a periphery (31) having generally four edge members 31a, 31b, 31c, and
20 31d which are made of angle bar welded together at the corners (35). Although welding is a convenient fixing means other fixing means may also be contemplated. The frame (30) comprises a first surface (32) in the form of a plate or sheet material (32a) and a second surface (33). The plate
25 (32a) extends between the periphery (31) and is conveniently made of metal or other suitable material. The second surface (33) optionally comprises reinforcing members (33a and 33b) which either run parallel to, or at right angles to, edge members (31a to 31d) and are
30 conveniently in the form of a grid. Reinforcing members 33a and 33b in the form of mild steel flat bars are disposed at right angles to the plate (32a). In this manner the reinforcing members (33a and 33b) form compartment-like structures (34) which strengthen the frame. Generally the
35 reinforcing members (33a and 33b) are of a suitable width so that when disposed at right angles to the plate (32a)

they do not extend beyond the height of the edge members (31a to d).

At least one edge member (31a to d) of the frame (30) comprises the lipped angle bar (1) of the present invention. The advantage of this is that two separate frames (30) of the invention may be easily connected by using the clips (9) of the invention to form a composite frame (50). The lip (4a) is conveniently located facing into the frame (Figs 7B & 7C). The edge members (31a to d) comprising the lipped angle bar (1) are placed together such that the angle bar portions are back to back, then one or more clips (9) are then used to connect the frames. This means that the frames (30) may be used as "modules" to produce a composite frame (50) which is appropriate structure for building a wall, for example. If the frames are the correct size clearly they may also be used singly.

To construct a long flat frame for a wall (for example) several frames (30) may be aligned such that the lipped angle bar (1) of edge member (31a) lies back to back with edge member (31a) of another frame (30) and the frames are then connected by clips (9) with compatible recesses (15 & 16). To form a composite frame (50) for a wall from two or more frame modules the lipped angle bar (1) comprising the edge member (31a) has to be in the correct position on the frame module. This means the portion of the angle bar (2) comprising lip (4a) has to be disposed at right angles to plate (32a). This will be referred to herein as "angle bar in the normal position". In such an arrangement outer edge (3a) of the angle bar is welded (35a) to the plate (32a).

It will be appreciated that the lipped angle bar (1) of the frame (30) may be disposed in any convenient manner. Where it is desired to construct a composite frame (50) which has a corner then the position of the lipped angle bar (36b & 36c) is that shown in Fig 8 (frame No.4). The portion of the angle bar (2) comprising lip (4a)

extends in the same direction as plate (32a) (Fig 8c). This will be referred to as "angle bar in an extended position" (36a & 36b). In this case the back (2b) of the angle bar is welded (35b) to the plate (32a). A composite frame (50) which has a corner is produced by joining the frames (30) of Figures 7 and 8 such that the edge members having the lipped angle bar (1) are placed back to back, as shown schematically in Fig 9 and joined by clips (9). The smooth surface of the plate, surface 32 is faced such that the concrete is poured on to this side into this structure. The composite frame (50) can be removed after the concrete has set.

In some cases the edge member (41a) comprising lipped angle bar (1) in the frame (30) is positioned such that the portion of the angle bar comprising the lip (2) is spaced from, and disposed parallel to, the plate (32a) with the lip facing in towards the second surface (33) (Fig 12). This will be referred to herein as "inward facing angle bar" (41a). In this case the outer edge (3a) of the angle bar (1) is welded to the plate. This type of edge on the frame (30) may also be used to form corners like the angle bar in an extended position on the frame (36b & 36c).

The frames of the present invention may have lipped angle bar (1) disposed differently along its periphery such as in frames No.4 to 9 (Figures 8 and 10 to 14).

Although the frames of the invention may be constructed in any convenient configuration frames No. 3 to 9 are preferred. These will now be described in detail.

Frame No. 3 (fig 7) comprises a rectangular shape with two long edges 31a & 31b and two short edges 31c and 31d. In this frame all of the edges comprise the angle bar in the normal position. Preferred spacings for reinforcing members (33a) are shown in the figure.

Frame No. 4 (Fig 8) is similarly rectangular in shape. Short edges (37a and 37b) comprise the angle bar in

the normal position. Long edges (36a and 36b) comprise the angle bar in the extended position.

5 Frame No. 5 (Fig 10) has one long edge (38a) and two short edges (38c and 38d) with angle bar in the normal position. The remaining long edge (38b) has angle bar in the extended position.

10 Frame No. 6 (Fig 11) has one short edge (40a) and one long edge (40c) has inward facing angle bar. The remaining short edge (40b) and long edge (40d) have the angle bar in the normal position.

15 Frame No. 7 (Fig 12) has one short edge (42b) and one long edge (41a) with inward facing angle bar. The remaining edges (42a and 41b) have angle bar in the normal position.

20 Frame No. 8 (Fig 13) is similar to frame No. 7 but only has one short edge (44a) with an inward facing angle bar. The remaining edges have angle bar in the normal position.

25 Frame No. 9 (Fig 14) has one edge (46b) with inward facing angle bar, two edges (45a and 45b) with angle bar in the extended position and the remaining edge (46a) with the angle bar in the normal position.

30 Composite frames (50) are made in the manner described above. For square or rectangular columns two frames No.3 and two frames No.4 are connected as shown in Fig 15B. Where widening or lengthening of columns is required existing composite frames (50) may be widened or lengthened using No.3 frames or No.5 frames.

35 In case of walls for buildings No.3 and No.4 frames may be used to form a composite frame (50) as shown in Figure 16 having outside wall (55) and an inside wall (56) disposed at right angles thereto.

40 The frames may also be used to make beams (70) which are used to form girth trusses. Two No 8 and a No 3 frame can be used to form such a horizontal beam. Wooden strips may be used to provide extra support as shown in

Figure 17B. Similar arrangements may be used to produce beams (70) as shown in Figure 18. Combinations of various frames (30) may be used composite frames (50) which provide doorways and window openings such as shown in Figure 19.

- 5 Thus the composite frame (50) can be easily assembled and disassembled using the clips (9) of the invention. Once the concrete has been poured and set the composite frame (50) may easily be disassembled and reused.



CLAIMS

1. An angle bar (1) comprising a first portion (2) and a second portion (3), wherein said first and second portions are disposed at right angles to provide a substantially L-shaped configuration in cross-section, said first portion and said second portion having an outer edge (2a or 3a), the improvement comprising a lip (4) which is located along said outer edge (2a or 3a).
2. The angle bar of claim 1 wherein said lip (4) extends along the outer edge (2a or 3a) of one portion (2 or 3) only.
3. The angle bar of claim 1 wherein said lip (4) has substantially one of the following shapes in cross-section : hook shaped (6a), triangular (6b), square or rectangular (6c), half diamond (6d) half octagonal (6e) or hemispherical (6f).
4. A clip (9) for fastening two pieces of angle bar (1a, 1b) together, said clip (9) comprising two parts (10, 11) and means (17) for holding said parts (10, 11) together characterised in that said clip (9) is adapted to hold together a first and second piece of angle bar (1a and 1b) defined in claim 1 such that the portions of the angle bar (2 or 3) having a lip (4) are placed back to back wherein said clip comprises
 - a first part (10), with a face (14a) having a recess (15) adapted to fit over a portion of said lip (4a) of said first piece of angle bar,
 - a second part (11) with a face (14b) having a recess (16) adapted to fit over a portion of said lip (4b) of said second piece of angle bar and,
 - a positive location means (13) comprising a male member (13a) located on one of said parts (10 or 11) and a female member (13b) located on the other said parts (10 or 11), said male and female members (13a and 13b) adapted to mate wherein said positive location means (13) assists in locating said first and second parts (10 and 11) together.



5. The clip of claim 4 wherein said recesses (15 and 16) are adapted to fit over a portion of the lips of any one of said angle bars of claim 3.

6. The clip of claim 4 wherein said first and second parts (10, 11) comprise rebates (14c and 14d) adjacent to said recesses (15 and 16), wherein each rebate (14c or 14d) is adapted to accommodate part of said first portion (2) of the angle bar adjacent to lip (4).

7. The clip of claim 4 wherein said positive location means is located on said faces (14a and 14b).

8. The clip of claim 4 wherein said means (17) for holding said parts (10, 11) together comprises a bore on each of said clip parts (10 and 11) which is securable by a bolt or other appropriate fixing means.

9. A frame (30) for the construction of concrete buildings said frame having a periphery (31) comprised of edge members (31a to 31d), a first surface (32) in the form of a plate (32a) extending between the edge members (31a to 31d) and a second surface (33) optionally comprising one or more reinforcing members (33a or 33b) the improvement comprising at least one edge member being constructed of the angle bar of claim 1 wherein said edge member is adapted to be connected to a frame having a similar edge member by the clip of claim 4.

10. The frame of claim 9 wherein the portion of the angle bar comprising the lip (4) is positioned at right angles to the plate (32a), extends in the same direction as the plate (32a) or is spaced from, and disposed parallel to, the plate (32a).

11. A composite frame (50) comprising two or more frames (30) of claim 9 connected by the clips (9) of claim 4 to form a structure into which concrete may be poured.

12. A method of forming a composite frame (50) the improvement comprising that said composite frame (50) is composed of two or more frames (30) of claim 9 said method comprising one aligning edge member (31a, 31b, 31c or 31d)



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of one frame (30) with one edge member (31a, 31b, 31c or
31d) of another frame (30) and connecting said edge members
with the clips (9) of claim 4 wherein said clips (9) have
recesses (15 & 16) compatible with the lips (4a, 4b) of
5 said angle bar (1a, 1b).