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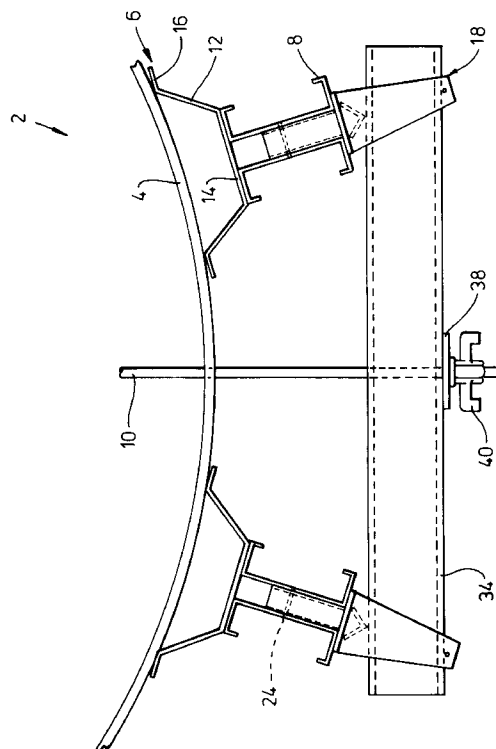
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(54) **Improvements in and relating to concrete formwork.**

(57) Concrete formwork of the type comprising one or more panels supported by soldiers connected thereto is described. The soldiers (8) have bracket means (18) attached thereto whereby a beam (34) can be mounted between a pair of soldiers (8). The beam provides (34) an attachment point for a tie (10) and the number of possible tie locations is therefore increased.

Fig.1.



This invention relates to concrete formwork. It is particularly concerned with formwork of the type employed to produce walls, especially formwork for producing curved walls.

One type of concrete formwork is known from British Patent 2133826. This describes formwork for producing curved walls comprising a deformable panel and a plurality of U-shaped members secured to the panel by their legs and arranged in at least two columns. A soldier, i.e., a structural member comprising two, spaced connected beams with aligned holes therein, spans across two or more support members in the same column and is connected thereto by a way of the faces of the members. The outer faces of two adjacent soldiers are connected by an adjustable tie whereby the distance between the soldiers may be altered to vary the curvature of the panel. Any desired height can be accommodated simply by altering the number of U-shaped members in each column and employing different lengths of soldier. The soldiers provide rigidity. In use, two panels, each supported by a plurality of U-shaped members and soldiers, are positioned a distance apart and concrete is cast between them to form a wall.

In both this known arrangement and in other concrete formwork arrangements, ties are employed which extend between, and beyond the outer sides of, the panels. These ties serve to hold the panels together. Generally they are threaded and, once inserted through the panels, correspondingly threaded nuts are attached to their ends. The nuts are screwed down to pull the panels together and enable them to resist the forces generated by the concrete to be poured therebetween. In the formwork arrangement specifically described above, the bases of the U-shaped members are formed with holes so that the ties can pass through the members and then between the webs of the soldier. The nuts, employed with the ties, are bolted down against the outer pair of flanges of the soldier. The soldiers serve to evenly distribute loads generated by the pressure of the concrete acting on the panels which is passed through the ties and the U-shaped members.

To ensure that the formwork will resist the pressures generated by the concrete to be cast therein, a large number of ties have to be employed. In general, two or three per soldier are employed and there must be a minimum of at least one per soldier. This has the disadvantage that the cast concrete has a correspondingly large number of holes therein which have to be made good.

Concrete formwork in accordance with the invention comprises one or more panels, at least two soldiers for supporting the panel(s) and means for connecting the soldiers to the panel(s) characterised in that the soldiers have bracket means attached thereto whereby at least one beam is mounted therebetween and in that the or each beam is connectible

to the end of a tie.

The advantage of this is that ties can be provided at locations other than at the soldiers, that is, a greater number of possible tie positions are available. Known ties are, in fact, capable of supporting greater loads than those to which they are subjected in known formwork. By enabling them to be positioned between the soldiers, one tie can be used to support a number of soldiers. Therefore the number of ties which has to be employed is less. The resultant reduction in making good which has to be done to a concrete section is significant. In a particularly preferred arrangement, one tie is employed per alternate adjacent pair of soldiers.

Preferably, the beam is formed with a plurality of holes. This allows ties to be placed in a variety of locations along the length of the formwork.

Suitably the bracket means comprise, for each beam, a bracket member which includes an angled portion against the apex of which, in use, the beam abuts. The bracket member may be arranged so that the apex of the angled portion lies between the webs of the soldier to which the bracket member is connected, preferably in the median plane of the soldier. Load transferal to the soldier is therefore along its centre line.

The bracket member may further comprise a circular rod spaced from the apex of the angled member, the beam in use passing between the circular rod and the angled member. The distance between the rod and the angled member is made approximately equal to the appropriate beam dimension. The advantage of providing a circular rod is that no matter at what angle the beam is to the bracket, it will always be held between a portion of the rod and the apex of the angled member.

The bracket member may be secured to a soldier by pinning it thereto through a hole provided therein and one of the holes of the soldier.

The panels may be deformable and the soldiers may additionally be connected by adjustable length link means. The formwork is then suitable for use in the construction of curved walls.

The invention will now be further described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a plan view of concrete formwork in accordance with the invention; and

Figure 2 is an isometric view of a bracket which forms part of the concrete formwork of Figure 1.

Figure 1 shows a section of concrete formwork 2 comprising a panel 4, U-shaped members 6, soldiers 8 and a tie 10.

The panel 4 forms part of a panelling wall which is connected to a plurality of the U-shaped members 6. The U-shaped members 6 basically comprise two inclined legs 12 joined together by a base flange 14. The members 6 are secured to the panelling wall

through holes in end flanges 16. The plurality of U-shaped members 6 are arranged in a series of columns spaced around the panelling wall. One soldier 8 spans over the U-shaped members 6 in a column to act as a continuity member therefor. The members 6 include support posts (not shown) carried on the base flange 14 thereof. These support posts extend between the webs of the soldiers 8 and are connected thereto. The ends of the support posts extend beyond the soldiers 8 and are arranged to be connected to a turn buckle. Turn buckles are provided between each pair of soldiers and, by employing these to vary the distance between the soldiers, the curvature of the panelling wall can also be varied.

The complete concrete formwork includes a second panelling wall, supported by U-shaped members and soldiers, which is spaced from the first so the concrete can cast therebetween.

The concrete formwork arrangement briefly outlined above, which is of the type employed to produce curved walls, is described and shown in much greater detail in British Patent 2133826 (the subject matter of which is hereby incorporated).

In all concrete formwork, whether for curved or straight walls, ties are employed which extend between the panelling walls, the ties being held in place by securing their ends which lie on the outer sides of the panelling walls. The ties serve to pull the two sections of the formwork together against the pressure exerted by the concrete to be cast therebetween. Once casting is complete, at least a portion of the ties are removed from the cast concrete with the result that this is left with holes which have to be made good.

Hitherto the ties have been attached by way of the panel supports in whatever form these were provided. In the arrangement described in British Patent 2133826, the ties pass through holes in the base flanges 14 of the U-shaped members 6 between the webs of the soldiers 8 and their ends are closed by nuts which are tightened up against the flanges of the soldiers 8. At least one tie per column of U-shaped members 6 has to be provided and often two or three per column are necessary.

In the concrete formwork 2 shown in Figure 1, a bracket 18 is attached to each soldier. The bracket 18 comprises a support post 20 dimensioned to fit between the webs of the soldier 8 and formed with a hole 22. The brackets 18 are connected to the soldiers 8 by passing a pin, see 24, through holes in the soldier 8 and the holes 22 in the support post 20 of the bracket 18. The support post 20 carries a baseplate 26 from which two trapezoidal shaped wings 28 extend, the long edge of the wings 28 being connected to the baseplate 26. At their free ends the wings 28 are connected by a circular rod 30. An angle member 32 is mounted to the baseplate 26 between the other ends of the wings 28.

As noted above, a bracket 18 is mounted to each

soldier 8 by pinning it thereto. With the brackets 18 in place, a beam 34 can be attached between two of the soldiers 8 by passing it through the apertures of the brackets 18 defined by the wings 28, rods 30 and angled member 32. The distance between the rods 30 and the angle member 32 of the brackets 18 can be so arranged that, no matter at what angle the soldiers 8 are to each other, the beam 34 will be held by the brackets 18 between the apices 36 of the angle members 32 and the rods 30.

The beams 34, which are preferably hollow sections, include holes therein through which a tie 10 can be passed. Preferably the beams 34 have a plurality of such holes so that the ties 10 can be provided wherever desired. A tie 10 is held in position relative to a beam by attaching a washer 38 and a nut 40 to its free ends.

The beams 34 provide additional tie locations. A tie 10 is capable of supporting more than one soldier 8 and, by providing the beams 34, a tie 10 can be positioned so that it will do this. Preferably, as shown, a tie 10 is provided between each alternate adjacent pair of beams 34. Therefore the amount of holes in the concrete cast between the first and second panels of the formwork is halved, with a consequent 50% reduction in the necessary "making good".

The angled member 32 of the brackets 18 is positioned so that, when a bracket 18 is connected to a soldier 8, its apex 36 lies on the centre line of the soldier which passes between the webs thereof. Loading on the beam 34 will therefore be transmitted, by the contact thereof with the apices 36 of the brackets 18, through the middle of the soldiers 8. This maximises the strengthening effect of the beams 34.

Claims

1. Concrete formwork comprising one or more panels, at least two soldiers for supporting the panel(s) and means for connecting the soldiers to the panel(s) characterised in that the soldiers have bracket means attached thereto whereby at least one beam is mounted therebetween and in that the or each beam is connectible to the end of a tie.
2. Concrete formwork as claimed in Claim 1 wherein there is a plurality of soldiers, each of which has bracket means attached thereto, at least one beam being mounted thereby between each alternate adjacent pair of soldiers.
3. Concrete formwork as claimed in either Claim 1 or 2 wherein the or each beam has a plurality of holes therein for receiving one end of a tie.
4. Concrete formwork as claimed in any preceding

Claim wherein the bracket means comprises a bracket member for each beam mounted to a soldier, each bracket member including an angled member on the apex of which the beam abuts.

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5. Concrete formwork as claimed in Claim 4 wherein each bracket member is arranged so that the apex of the angled member thereof lies in the median plane of the soldier to which it is attached.

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6. Concrete formwork as claimed in either Claim 4 or Claim 5 wherein each bracket member defines an aperture, the apex of the angled member constituting a first wall of the aperture.

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7. Concrete formwork as claimed in Claim 6 wherein each bracket member includes a circular rod which constitutes a second aperture wall located opposite the first aperture wall.

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8. Concrete formwork as claimed in any one of Claims 4 to 7 wherein each bracket member includes a mount dimensioned to fit between the webs of the soldier to which the bracket member is attached and having a hole therein whereby it may be pinned to the soldier.

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Fig.1.

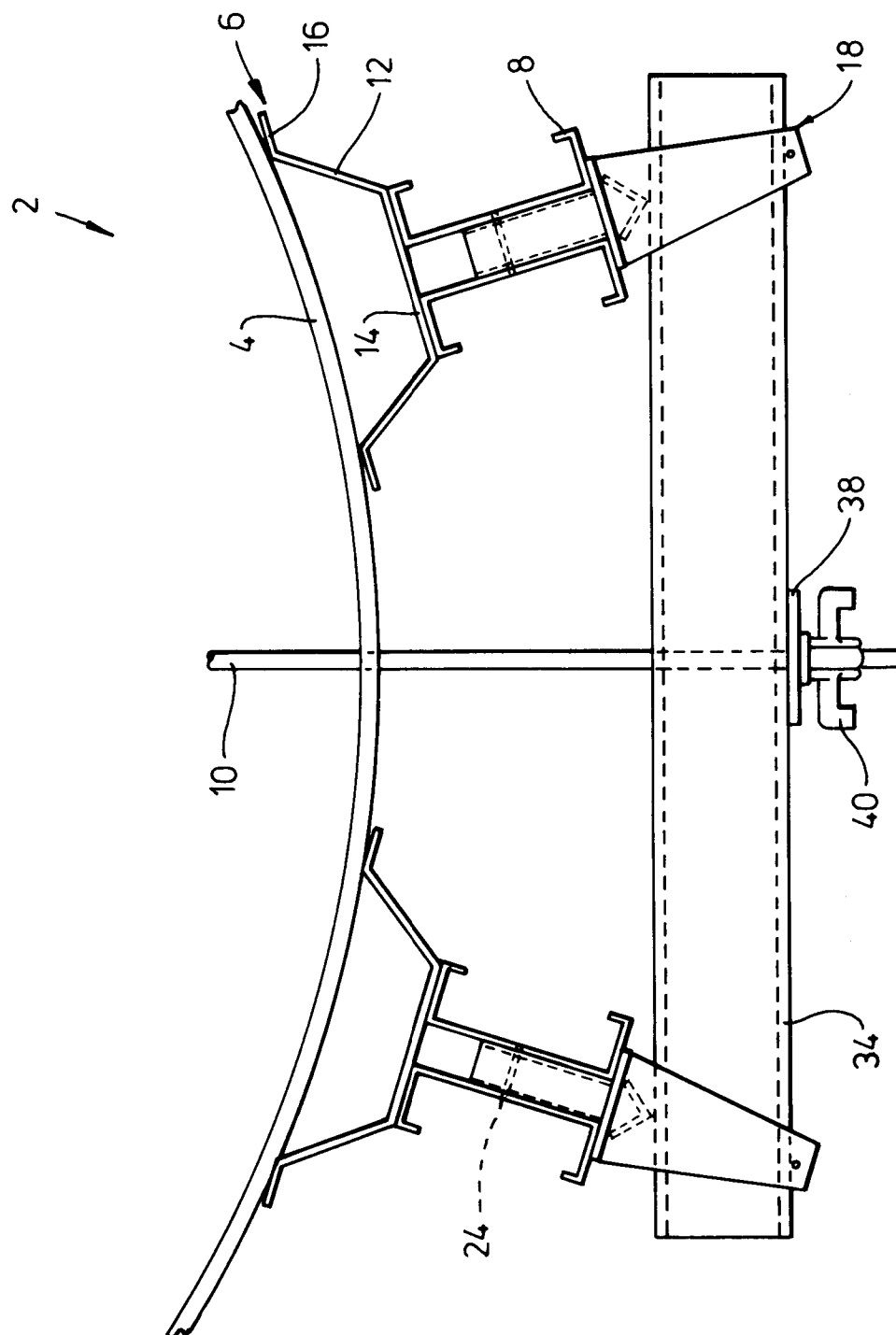
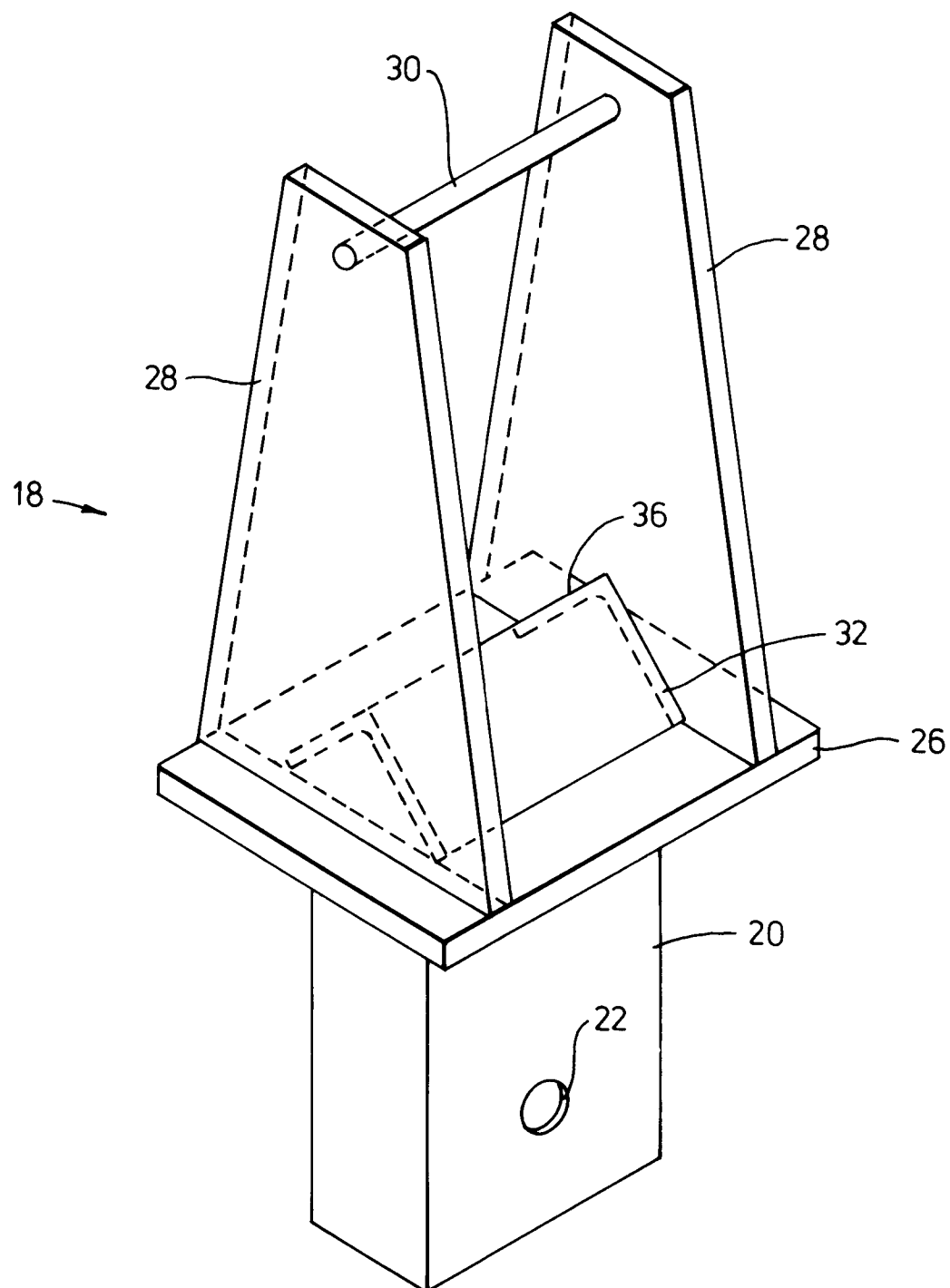


Fig.2.





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 9935

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-2 613 747 (COFFRAGES RICARD) * the whole document *	1-6	E04G11/06 E04G17/14
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05 FEBRUARY 1992	Examiner VIJVERMAN W.C.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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