

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 82306306.0

(51) Int. Cl.³: E 04 G 17/10

(22) Date of filing: 26.11.82

(30) Priority: 27.11.81 GB 8135876

(43) Date of publication of application:
08.06.83 Bulletin 83/23

(84) Designated Contracting States:
AT BE CH DE FR IT LI LU NL SE

(71) Applicant: Macartney, Paul
28 Northumberland Avenue
Kidderminster Worcestershire DY11 7AN(GB)

(72) Inventor: Macartney, Paul
28 Northumberland Avenue
Kidderminster Worcestershire DY11 7AN(GB)

(74) Representative: Lewis, Samuel Hewitt et al,
FORRESTER & BOEHMERT Widenmayerstrasse 4/1
D-8000 München 22(DE)

(54) Shuttering ties.

(57) A shuttering tie (10) for use in the building construction industry to maintain shuttering panels in correct spaced relation is made from resilient steel strip which enables the strip to be provided in roll or coil form (30) and the ties to be cut to the desired length. Such a roll or coil of the material alleviates the necessity of stocking many different lengths of shuttering tie thus facilitating stock control and ensuring that a supply of ties (10) of any desired length is constantly available.

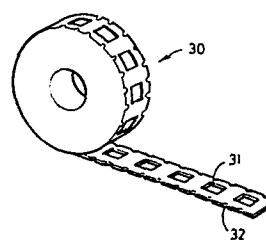


FIG. 2

Title: "Shuttering Ties"

The present invention relates to ties for use with shuttering panels, which panels are used in the building and construction industry and are mounted in spaced relation to provide a cavity therebetween into which concrete or the like is poured and allowed to set before the panels are removed.

It is necessary for the shuttering panels to be held together in spaced relationship to prevent their separation when the concrete is poured into the cavity therebetween. In order to prevent undesirable separation of the panels, shuttering ties are used which extend between and interconnect the spaced panels.

After the concrete has set the ties may be disconnected from the shuttering panels so that the panels may be removed to leave the concrete structure.

Various types of tie systems are known:

1. The through bolt system in which a bolt is used in conjunction with a plastic sleeve, the bolt passing through through bores in the respective shuttering panels through a plastic sleeve extending between the shuttering panels. A nut is then secured to the bolt and the panels secured in spaced relation. After the concrete has been poured into the cavity and has set, the nut will be undone, the bolt withdrawn and the panels removed from the concrete structure.

Such a system has the disadvantage that the sleeve remains in the concrete, and furthermore the structure has a through bore, i.e. the bore of the plastics sleeve.

- 5 2. The she bolt system. A central tie rod of predetermined length corresponding to the distance between the shuttering panels and at a predetermined fixed dimension provided with male threads on each end which engage respective female threads in two she bolts.
- 10 3. The snap tie system. The tie is a flat metal plate or strip which extends between aligned through bores or slots in the edges of two spaced shuttering panels and is keyed or otherwise secured to both panels. The tie remains in the set concrete and after dismantling the key or other connection between the panels and the tie and the panels removed the tie remains in the set concrete but has parts at each end extending outwardly from the surface of the concrete. Such parts may subsequently be broken off.

20 One of the disadvantages of known tie systems is that a large number of ties of different lengths have to be stored on site ready for use in view of the many different thicknesses of concrete required in different parts of a building or structure.

25 Ties are supplied from manufacturers in predetermined lengths, therefore many sets of ties of different lengths have to be kept on a construction site which leads to storage and stock checking problems to ensure that ties of the correct length are always available. Waste can also occur if too many ties of one length have been ordered and likewise problems can occur if an insufficient number of ties of a different length have been stocked.

30 The present invention is primarily concerned with an improvement in the snap tie system.

35 It would be desirable if snap ties could be cut to a desired length by the user on the construction site. Unfortunately such a solution has not been thought to be

practicable since, unless the length of material from which the ties to be made was sufficiently long, several metres for example, the waste that is likely to occur in unused end pieces is likely to be commercially unacceptable.

5 Furthermore, the difficulties of transport and handling on site of a long piece of material is likely to cause considerably more problem than problems associated with known ties.

10 A further problem is the weight of such a length of material which, if the length of material was to be of a length that is commercially viable in that wastage is not significant, the weight of the material could again cause problems in handling thereof, which weight in combination with the large length making such a proposition quite
15 unfeasible.

If the material from which the ties was to be made was bent so as to overcome the problem of the inordinate length, then the material commonly used, mild steel, would have to be carefully straightened before use as a
20 tie otherwise if it was inserted between the ties in anything but a perfectly straight condition, after pouring of the concrete into the cavity between the shuttering panels, the outwardly directed force exerted by the concrete may or may not cause the tie to
25 straighten out. There could therefore be no guarantee that the concrete structure formed was of the correct thickness.

Thus the provision of ties in anything but perfectly straight lengths would appear to have such problems that
30 anyone considering such an idea would be forced to the conclusion that it was simply not feasible.

It is an object of the present invention to provide a new or improved snap tie for use with shuttering panels.

35 According to one aspect of the present invention, I provide a shuttering tie comprising a steel strip adapted

to permit of co-operation with connecting means to connect said tie to shuttering panels arranged in relative spaced relationship characterised in that said tie is made from a resilient steel.

5 Preferably said resilient steel strip comprises a spring-type steel.

 Preferably said means for connecting said tie to shuttering panels comprises holes or slots formed therein at spaced intervals therealong, which slots may be used
10 in conjunction with keys and/or wedges adapted for use on that side of each shuttering panel remote from the cavity to prevent movement of the shuttering panels in a direction to increase the width of the cavity.

 Considerable unexpected advantages are gained by
15 the use of resilient steel strip. Resilient steel strip is considerably stronger than steel strip of the same dimension. Thus to provide a shuttering tie of a strength equal to a conventional steel shuttering tie, a considerably thinner piece of steel strip may be used
20 which leads to the further advantage that the tie is lighter in weight than a conventional steel tie.

 According to a still further aspect of the present invention, I provide a method of manufacturing shuttering ties of a predetermined desired length comprising the
25 steps of separating discrete ties from a roll or coil of resilient steel strip, said roll or coil being provided with holes or slots to permit of co-operation between said tie and connecting means to connect said tie to a pair of shuttering panels arranged in relative spaced
30 relation.

 Alternatively, the holes or slots may be formed simultaneously with or as a separate step to separation of each discrete tie from said roll or coil of resilient steel.

35 The decrease in thickness of the tie of the present invention compared with the thickness of a conventional steel tie enable the resilient steel tie to extend between opposed shuttering panels adjacent the edges of said panels.

It is another object of the present invention to provide shuttering ties in a form which enables the ties to be cut to the desired length off a store of material from which the tie is made.

5 According to a second aspect of the present invention, I provide a plurality of shuttering ties existing in end-to-end relationship, said ties being formed into a roll or coil in a manner to permit of separation from said roll or coil of discrete ties having
10 a predetermined desired length, said ties comprising a resilient steel.

 The resilience of the steel is preferably such that when a tie is cut from the roll it is substantially straight and curvature would, in use of the tie, be
15 substantially eliminated.

 Preferably the material from which the ties are made comprises a spring-type steel.

 Preferably said spring-type steel is provided with a plurality of holes or slots between its edges and extend-
20 ing along its length. Said holes or slots are conveniently of a dimension to enable the use of wedges and/or keys to secure ties to shuttering panels.

 Preferably said roll or coil of ties are provided with marking means to facilitate the separation of ties
25 from said roll or coil into desired lengths.

 Conveniently, said array of ties may be provided with frangible portions at intervals along its length, said frangible portions may be evenly spaced from each other or may differ in spacing from each other to
30 facilitate in the separation of discrete ties from said array at predetermined similar or different lengths from each other.

 Said ties may be formed with further frangible portions to enable the breaking off of those parts of the
35 ends of the ties extending from a concrete structure after use of the tie.

By making the ties of the present invention from a resilient steel, it is possible to provide ties in roll form since there is no longer a necessity for the ties to be perfectly straight during assembly provided the length
5 of the tie extending between the structure is known, and the resilience of the steel is such that in use of the tie, it becomes straight so that the thickness of the concrete can be accurately governed by the shuttering.

In view of the considerable decrease in weight of
10 the ties of the present invention compared with conventional rigid steel ties, the weight problem associated with conventional ties is largely overcome.

It is a still further object of the present invention to provide a new or improved method of
15 assembling shuttering for a concrete structure.

According to a further aspect of the present invention, I provide a method of assembling shuttering for a concrete structure comprising the steps of:

- 20 1. assembling shuttering panels in spaced relation to provide a cavity therebetween;
2. connecting a resilient steel tie between said shuttering panels;
3. securing said tie to said shuttering panels in a manner to prevent separation of said shuttering
25 panels beyond a predetermined dimension dictated by the length of tie extending between the shuttering panels.

Preferably each of said resilient steel ties extends between spaced shuttering panels in juxta-position with
30 an edge region of said spaced panels.

Preferably the resilient strip may be supplied in coil form on reels.

The slots or holes may have been pre-punched in the strip at intervals, for example 75mm intervals, 50mm
35 intervals, 25mm intervals or a combination thereof, for receiving conventional fastening keys and wedges to engage with the surface of the shuttering panel remote from the surface providing the boundary to the cavity.

5 The frangible portions may comprise laterally opposite pairs of notches to facilitate the separation of individual ties from the array. The marking means may comprise a surface marking or a formation provided in the strip to enable simple visual determination where separation from the array should be made to form a tie of a predetermined desired length.

10 Whereas it is envisaged that material may be preformed with slots or holes and notches, it is further envisaged that such slots or notches may be formed by the user before or after the tie is separated from the array.

15 The thickness and the width of the resilient steel strip from which the ties are made may depend on the strength required and for use with low strength shuttering panels (soffit panels) the thickness of the strip used may be as little as 0.5mm thick and may be up to 100mm wide.

20 For use with stronger shuttering panels where the forces involved after the pouring of concrete are likely to be greater, forces being determined largely by the thickness of the concrete structure required the pour rate, the temperature and its height, the thickness of the resilient steel strip may be a little in excess of 1mm, and the width may also be increased to any suitable size.

25 Conveniently the resilient steel strip is about 1.3mm thick and may have a width between 20-40mm, e.g. 25mm and 32mm.

30 The dimensions and the specification of the material from which the resilient steel strip is made may be such as to provide a break load of or above 50kg (500 Newtons) per square millimetre.

35 When the forces involved are likely to be high, it may be desirable to provide a shear reinforcement plate in conjunction with the tie. Such a reinforcement plate prevents tearing of the tie in the region of its slots or holes by the wedge or key. The provision of a reinforcement

ment plate does not necessarily prevent positioning of the ties between the panel edges and does not unduly space the panel edges. In some shuttering systems it is conventional to provide opposite recesses in adjacent panel edge regions which co-operate to form a slot for receiving the tie. As aforementioned, since the ties of the present invention may be considerably thinner than conventional ties, such recesses or cut-outs do not always have to be provided.

The present invention will now be described by way of example with reference to the accompanying drawings wherein:-

FIGURE 1 is an exploded view of a tie of the present invention and part of two shuttering panels;

FIGURE 2 is a first embodiment of ties provided in roll form;

FIGURE 3 shows a second embodiment of ties provided in roll form;

FIGURE 4 illustrates a length of tie material;

FIGURE 5 illustrates ties of the present invention for use with timber shuttering.

Referring first to Figure 1, a tie 10 in the form of a resilient metal strip 11 has longitudinal slots 12 at 50mm intervals and frangible portions formed by edge notches 13 on each edge at locations opposite each end of each slot 12.

Shuttering panels 14 each include a shuttering board 15 and a steel edge member 16. The panels 14 may alternatively be constructed completely from steel. The edge members 16 have aligned slots 17, some of which are used to secure the members 16 together, and simultaneously to secure the tie 11 to the shuttering panel.

The tie is secured to the shuttering panel by a flat slotted T-shaped key 18 which passes through both members 16 so that its slot 19 can receive a tapered wedge member 20. The wedge member 20 can be tapped into position into the slot 19 to provide a rigid structure.

5 The tie 11 may be provided with a reinforcement plate shown in dotted outline at 23 which may be secured, for example by crimping in position, on the tie 11 so that the slot formed therein is aligned with the slot 12 provided in the tie and the key 18 is then passed through the slot in the tie and the reinforcing member 23 and is tightened in position by the wedge member 20. The reinforcing plate prevents any tearing of the tie 11, which may occur when the pressure is exerted by the concrete on the shuttering.

10 Two lengths of tie may be connected to each other in end-to-end or overlapping arrangement to form a tie of "non-standard" length. Any suitable means, for example a connecting clip, may be used to connect the tie lengths to enable the formation of a tie of any desired length.

15 The notches 13 provide a frangible portion at different intervals along the length of the tie 11 to assist in the breaking off of those parts of the tie which, after setting of the concrete, project from the concrete structure.

20 The tie may be provided with a collar 26 of suitable material, for example plastics foam material, (polystyrene) which remains embedded in the concrete after setting of the concrete. When the projecting parts of the tie are broken away, the collar 26 prevents damage to the concrete structure.

25 Furthermore, the depth of the collar provides the facility to break back the tie at a predetermined position behind the surface of the concrete. If the tie is for example 38mm wide, the collar may be 50mm in diameter and 25mm deep.

30 Referring now to Figure 2, an array of ties joined in end-to-end relationship to form a roll is illustrated. The roll 30 comprises a roll of spring type steel having a width between 15mm to 100mm and a thickness typically between 0.5mm to 1.75mm and may be many metres in length, the length being determined from a practical point of

view of ease of handling on site. The roll 30 is pre-formed with elongate slots 31 which may be the same configuration of similar configuration to the slots 12 provided in the tie 11 and is further formed with notches 32 which once again may be the same as notches 13 formed in the tie 11 or may be of a different configuration and spacing.

In use, the roll 30 is cut into predetermined desired lengths that are required at the time and used in a manner shown in Figure 1.

The roll may be cut to lengths by use of a guillotine or metal cutting shears or any other suitable means.

Referring now to Figure 3, an alternative embodiment is shown and comprises a roll 35 which is not pre-formed with any notches or slots but may if desired include some visual indication along its length to facilitate the cutting of the roll 35 into predetermined desired lengths.

A stamping machine 36 may be provided for punching the slots and/or notches in the strip and may also include a guillotine or other cutting member so that the punched slot may be formed at the same time as the strip is cut into its predetermined lengths in order to ensure that the slot is formed in the correct spaced relationship with the end of the tie. It is further envisaged that the notches enable breaking off of the parts of the tie which will extend from the concrete structure may also be formed at the same time.

It is further envisaged that indexing means may be provided which may be preset to permit of at least semi-automatic cutting of the roll into predetermined lengths to provide ties.

Referring now to Figure 4, part of a shuttering tie is illustrated, the tie comprising a resilient metal strip 40 having a series of slots generally indicated at 41, most of which are spaced from adjacent slots by the

same amount with the exception of slot 42 which is spaced from one of its adjacent slots 43 by a different dimension to facilitate the cutting of ties to predetermined lengths to give a greater range of desired lengths.

Visual indicating means of any suitable form such as the letters 44 are provided to provide means to facilitate the cutting of the strip into ties of desired lengths.

Referring now to Figure 5, the application of ties of the present invention to wooden shuttering is shown, the wooden shuttering comprising respective pairs of opposed wooden panels 50, 51, 52, 53, 54 and 55, each of the panels is provided with a reinforcing wooden framework generally indicated on the panel 52 at 56.

The edge regions on opposed ends of each panel are provided with a pair of spaced metal brackets such as those shown at 57 and 58 on panel 52 and 59 and 60 on panel 54.

The brackets 58 and 60 are shown in large detail and these comprise respective first parts 61 and 62 secured to the framework of the panel and second parts 64 and 65 extending substantially at right angles to the first parts and provided with respective slots one of which is shown at 67. In use, the tie 70 extends between the second parts of each bracket and has its slot therein aligned with the slots provided in the second parts of the brackets, and a key 71 tightened by a wedge member (not shown) is inserted in a manner similar to that as shown in Figure 1.

Since the ties 70 have a thickness in the region of 1mm there is no need for slots to be provided in the edge regions of the shuttering panels thereby securing a faster and more economical assembling of the shuttering.

The material from which the ties of the present invention are manufactured may comprise any suitable resilient steel, the dimensions of which and weight of which enables supply in roll form while maintaining adequate strength in use.

CLAIMS:

1. A shuttering tie comprising a steel strip adapted to permit of co-operation with connecting means (16,18,20) to connect said tie (10) to shuttering panels (15) arranged in relative spaced relationship characterised in that said tie (10) is made from a resilient steel.
2. A shuttering tie as claimed in Claim 1 characterised in that said resilient steel strip comprises a spring-type steel.
3. A shuttering tie as claimed in Claim 1 or Claim 2 characterised in that said tie is provided with a plurality of holes (12) or slots formed therein at spaced intervals, which slots are adapted to be used in conjunction with keys (18) and/or wedges (20) to connect said tie (10) to said shuttering panels (15).
4. A shuttering tie as claimed in any one of the preceding claims characterised in that said resilient steel strip is formed with notches (32) to provide frangible portions at spaced intervals along its length to facilitate the breaking of said tie (10) at any one of said frangible portions.
5. A shuttering tie as claimed in any one of the preceding claims characterised in that said tie is made from a spring-type steel strip having a width of between 15mm and 100mm.
6. A shuttering tie as claimed in any one of the preceding claims characterised in that said tie is made from a spring-type steel having a thickness between 0.5mm to 3mm.

7. A shuttering tie as claimed in any one of the preceding claims characterised in that said tie has a thickness of between 1mm and 1.5mm and a width of between 20mm to 35mm.

5 8. A shuttering tie as claimed in any one of the preceding claims characterised in that it is in combination with a plurality of other shuttering ties, all of said ties extending in end-to-end relationship and being in the form of a roll or coil (30) so as to enable
10 separation from said roll or coil (30) of discrete ties of a predetermined desired length.

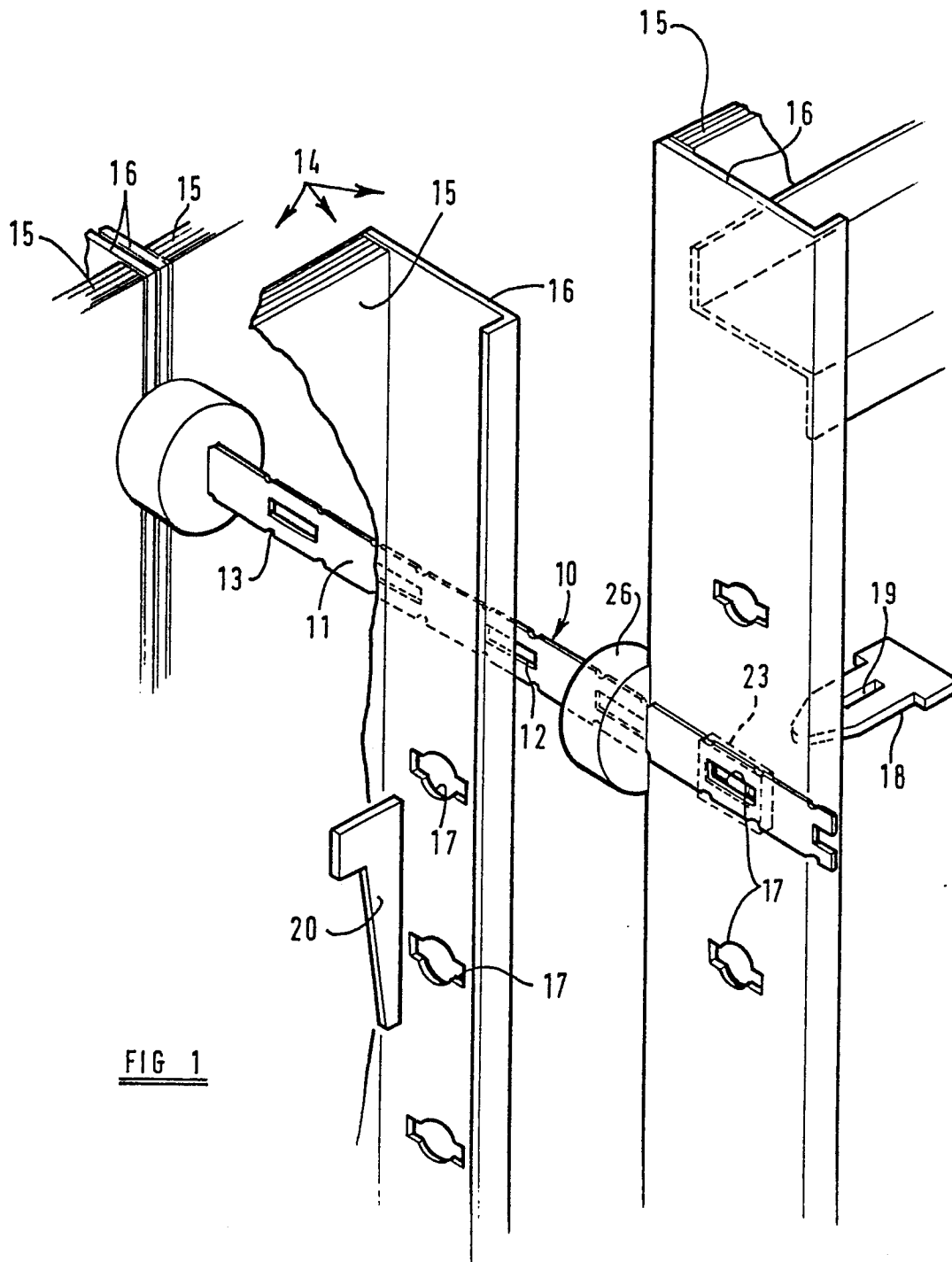
9. A plurality of shuttering ties as claimed in Claim 9 characterised in that the roll or coil comprises spring-type steel strip having a plurality of holes or slots
15 (42,43) formed therein at spaced intervals along its length, said holes or slots permitting of co-operation with keys (18) and/or wedges (20) to secure each discrete tie separated from said roll or coil (30) to respective pairs of shuttering panels (15) and in that said steel
20 strip is provided with a plurality of frangible portions at spaced intervals along its length, the spacing between said frangible portions in the direction along the length of the spring-type steel strip is different between some frangible portions than between others.

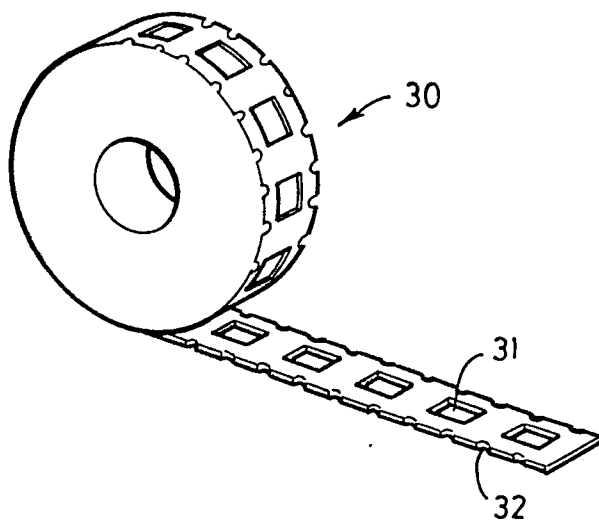
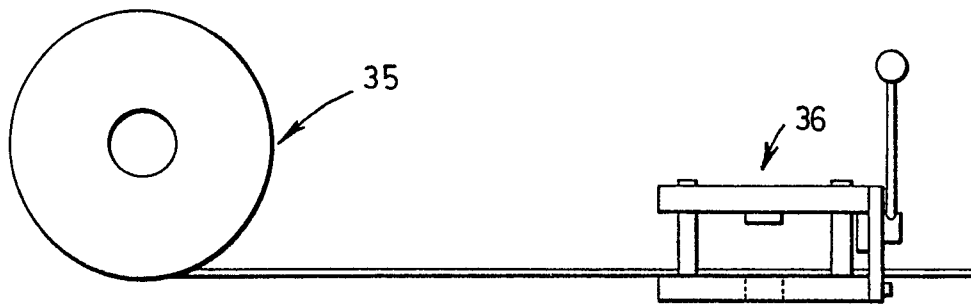
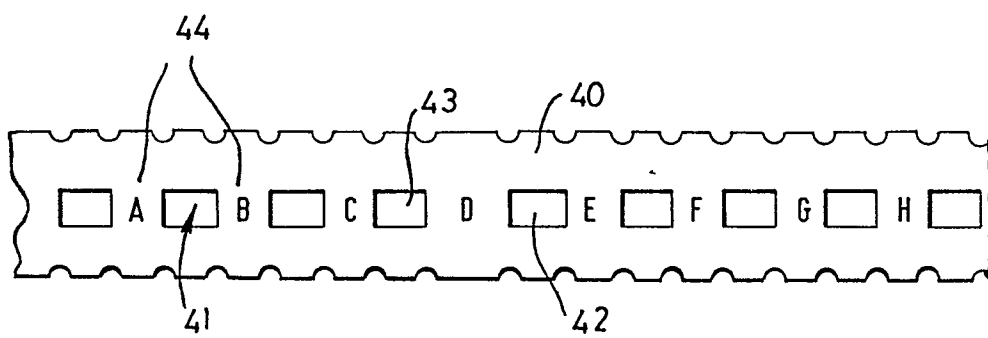
25 10. A shuttering tie as claimed in any one of the preceding claims for use in a method of casting concrete characterised in that the steps comprise:

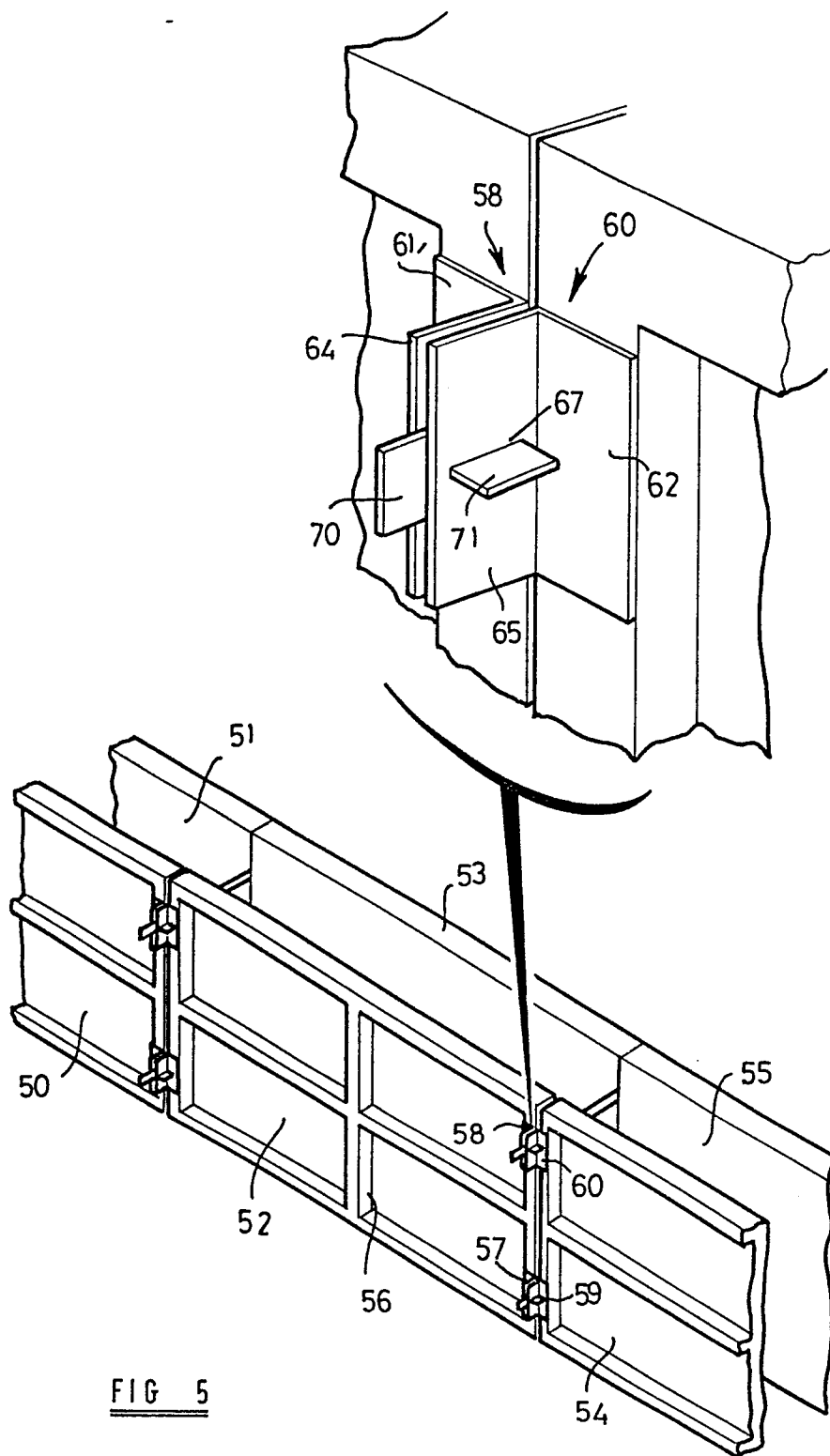
1. assembling shuttering panels (15) in spaced relationship to provide a cavity therebetween;
- 30 2. connecting a resilient steel tie (10) between said shuttering panels (15);
3. securing said tie (10) to said shuttering panels (15);

4. substantially eliminating any curvature present in said tie by pouring concrete into said cavity;
5. removing said shuttering panels (15) after setting of the concrete.

5

FIG 1

FIG 2FIG 3FIG 4

FIG 5



European Patent
Office

EUROPEAN SEARCH REPORT

0080871

Application number

EP 82 30 6306

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. 3)
A	--- US-A-3 362 678 (G.F. BOWDEN) * Complete document *	1,3,4, 8-10	E 04 G 17/10
A	--- US-A-2 825 116 (W.H. KENNEY) * Complete document *	1,3,4, 8-10	
A	--- FR-A-1 501 871 (C. WAKENHUT) * Figure 10 *	1,3	
A	--- CH-A- 603 953 (F. & L. BACHMANN AG) * Column 2, line 16 *	6	
A	--- FR-A-2 053 938 (SANDOZ & CIE) * Figure 1 ; page 2, lines 16, 17 * -----	8	TECHNICAL FIELDS SEARCHED (Int. Cl. 3) E 04 G 17/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 26-01-1983	Examiner KRABEL A.W.G.
CATEGORY OF CITED DOCUMENTS 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 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			