(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 368 653 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **89311591.5**

(51) Int. Cl.5: **E01C 9/00, E04G 21/10**

(22) Date of filing: **09.11.89**

(30) Priority: **09.11.88 GB 8826206**

(43) Date of publication of application: **16.05.90 Bulletin 90/20**

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

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(54) **Concrete screed rails.**

(57) A concrete screed rail having generally parallel spaced top and bottom edges (1,3), at least the upper one (1) of which is provided with a finished surface, there being at least one and preferably a plurality of recesses (17) in a web portion (5) of the rail and wherein the recesses (17) in the web portion (5) are closed off by a thin layer of concrete (19), the concrete, including that of said layer (19) being reinforced by a plurality of short fibres. The screed rail may be in the form of a straight beam of I-section (Fig.3) or alternatively of generally L-shaped cross-section (Figs. 4 & 5). If desired, additional reinforcement (13 or 23) may be incorporated in the rail.

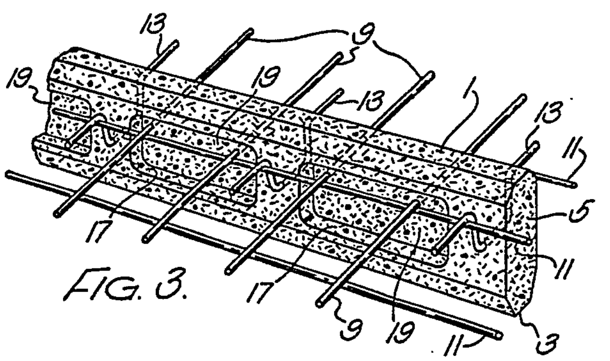


FIG. 3.

EP 0 368 653 A1

CONCRETE SCREED RAILS

This invention relates to concrete screed rails, which are increasingly being accepted by the construction industry in place of traditional shuttering or formwork to assist in the placing of in situ concrete slabs and screeds.

Wooden formwork suffers from the disadvantage that it has to be sawn to size and assembled by carpenters on site, and then struck (i.e. stripped out) after a concrete pour has partly cured. It is therefore time consuming to use, and hence expensive. Furthermore, it can normally be used only once, and then becomes scrap.

The main advantage of concrete screed rails is that they are formed of the same material as the finished slab, and can therefore be left in position to form part of the slab. They also ensure that top quality concrete is provided at a slab edge, and when left in situ, they ensure a good bond with the adjacent concrete pour. Furthermore, they are easy to use, especially with reinforcement rods, and save up to 50% in time compared with timber formwork.

Concrete screed rails are already known, but these are heavy to handle and transport and are costly to transport. One known type of rail has preformed apertures in the web between the top and bottom flanges for the passage of reinforcement bars, dowels, pipework and other conduit (see EP-A-0168205 and WO/81/02600), but in practice the apertures are of the wrong size or in the wrong location. This problem is normally overcome by knocking out, with a hammer, part of the web, which will result in poured concrete leaking through the rail, and perhaps significantly weakening the rail. One version of this type of rail is known as the PERMABAN leave-in-place screed rail.

Another known concrete screed rail, the subject of EP-B-0124532, has preformed apertures in its web, and areas of reduced thickness concrete called knock-outs, which can be removed by knocking away the concrete with a hammer; again, too much concrete is usually removed, which causes leakage of poured concrete.

It has also been proposed in GB-A-480259 to produce a concrete screed rail with preformed, spaced apertures for the passage of reinforcement rods, and recesses formed in each face of the web of the rail so that it will form a key with the concrete poured on either side of the rail.

We have now developed a concrete screed rail which has all the advantages of known concrete screed rails, but does not suffer from the major disadvantages associated with such known screed rails.

According to the present invention, we provide a concrete screed rail having at least substantially parallel spaced top and bottom edges with a web portion between said edges, at least the upper edge being provided with a finished surface, and wherein a reinforcement of short fibres is provided within the concrete of the rail, there being at least one recess in the web portion, with a thin layer of fibre reinforced concrete extending across said recess.

Preferably, a plurality of recesses are provided, across each of which a thin layer of fibre reinforced concrete extends.

The thin layer of concrete reinforced with fibres extending across each recess is supported by the reinforcement, but can be knocked out as required to allow transverse reinforcement bars to extend through the recesses. The screed rail may be in the form of a straight beam of I-section, or alternatively of generally L-shaped cross-section. Beams of L-shaped section are particularly suited to provide a border or edge regions of the slab.

If desired, additional reinforcement is incorporated in the rail, and a small aperture may be provided in each web portion separating each recess.

Several screed rails in accordance with the present invention are now described by way of example with reference to the accompanying drawings, in which:-

FIGURE 1 is a side elevation of a first embodiment of rail;

FIGURE 2 is an end elevation of the rail of Figure 1;

FIGURE 3 is a perspective view of an alternative embodiment of rail, showing how reinforcement bars can easily be used with it;

FIGURE 4 is a perspective view of another alternative embodiment of rail, and

FIGURE 5 is a section on the line V-V of Figure 4, to an enlarged scale, through the rail of Figure 4.

In the various views, like parts are identified with the same reference numerals.

Referring to the drawings, each of the screed rails has a finished top edge 1, and in spaced, generally parallel relationship thereto, a bottom edge 3. Located between the top and bottom edge regions is a web portion 5. Since the screed rails are specifically designed to remain in situ in the poured concrete slab, the top edge 1 is finished smooth, and will be co-planar with the top surface of the slab.

Normally, in situ concrete slabs are poured in rectangular sections, and with the present invention, each section is defined by longitudinal screed rails and transverse stop ends. Central sections could be defined by a selection of any of the illustrated rails, but normally the same rails would be used. For an edge section however, the boundary edge of the section would normally be defined by one of the rails shown in Figures 4 and 5, with the flange 7 turned inwardly.

To use the rails, they are first placed in situ, and supported at the correct level on a few dabs of concrete, care being taken to ensure that the top edge 1 is set at the desired finished level of the slab. At the same time as the rails are being set in position, reinforcement bars, such as bars 9 and 11 shown in Figure 3, are also placed in position as will hereinafter be explained. Then, the concrete can be poured into a rectangular space defined by the rails, and can be tamped or vibrated as necessary, using the aligned top edges of the rails as a levelling guide.

Referring now specifically to Figures 1 and 2, the rail shown therein is of inverted T-shaped cross-section, with an enlarged bottom flange 15, and a plurality of recesses 17 are provided in the web portion 5, spaced apart by portions of the web which are approximately of the same width as the top edge region of the rail. The whole rail is reinforced throughout its length by a plurality of short fibres. These may be formed of polypropylene and may be about 12mm long, and mixed in with the other constituents of the concrete. Two suitable mixes of fibres are those sold as DOLANIT by Hoechst Chemicals and FIBREMESH by Fibremesh Limited of Chesterfield, and a suitable concrete mix is made up as follows:-

One part by weight ordinary Portland cement
From .002 to .02 parts by weight fibres
One part by weight sand
Two parts by weight aggregate
.5 part by weight water
plus the usual additives (water disperser, hardener, plasticiser).

Normally, from about 1kg to 10kg of fibres would be used in a cubic metre of concrete,

By way of such a mix, it is found that it can be turned out of the mould within 10-15 minutes of being poured and vibrated. Wetter mixes must be left for many hours before turning out.

Additional reinforcement bars or the like may be incorporated in the rail, such as the bars 21 and 23 shown in the embodiment of Figures 4 and 5.

The rail shown in Figure 3 is a symmetrical rail with identical top and bottom edge regions, and provided both the top edge 1 and the bottom edge 3 are given a smooth finish, it can be used either way up. This rail is provided with cast in reinforcement restraining bars 13, but in place of these, apertures may be provided in the web portions between recesses 17.

The screed rail shown in Figures 4 and 5 is specifically designed as an edge rail, and has an L-shaped cross-section. L-shaped reinforcement bars 23 extend through each web portion 5.

In all the constructions illustrated, a plurality of spaced recesses 17 with fibre reinforced thin concrete membranes 19 therein are illustrated. However, the shape and size of these recesses can be changed, and it is even envisaged that pairs of vertically spaced windows could be provided. Such an arrangement could be very suited to deep webbed screed rails.

In all constructions, the recesses are totally masked or "curtained" with a thin layer or membrane 19 of fibre reinforced concrete. This ensures no escape of "fat", e.g. concrete fines, from the poured slab when it is being tamped or vibrated. Obviously, this is important in the edge rail shown in Figures 4 and 5, since it ensures a smooth edge finish to the concrete slab.

The fibre reinforced concrete membrane(s) 19 is/are sufficiently thin not to impede the placing of the reinforcement rods. They are simply pushed through it.

It will thus be appreciated that the desired arrangement of reinforcement rods 9, 13 can be "threaded" in position to unite different pours, the membraned recess(es) offering a wide choice of location for each rod 9 and helping also to support it.

From the foregoing, it will be appreciated that the present invention provides pre-cast concrete screed rails which are designed to improve the placing of in situ concrete slabbing and associated reinforcement. The rails are designed to become an integrated part of the whole slab, and give improved edge finish to a completed floor. The rails may be of any desired length, e.g. 3 metres, and in various heights. Ideally, the rail has recesses 17 at 300mm centres covering the significant face area of the web form, to allow the free passage of reinforcement, dowels and conduit of varying sizes, but still retain the fresh concrete during pouring or placing.

Furthermore, the concrete membrane filled recesses also allow full bond area to any connecting reinforcement passing through. This eliminates problems associated with bars passing through holes as in known concrete screed rails where full compaction is not achieved around the holes, thus weakening the finished product. Freedom of design is available to the engineer to place all reinforcement and services passing through concrete joints at their required position.

The use of the rail provides superior concrete material at the edges of slabs, eliminating problems sometimes associated with poorly placed concrete in this area.

The rail would normally be constructed of 40MN/MM^2 concrete, reinforced with X MM HT wire and with the fibre reinforcement located throughout the unit, thus providing crack control as well as performing its other function of supporting the concrete membranes 19 in the recesses 17.

Being of pre-cast concrete, there is improved quality control, and as a result, a product can be achieved which is constant in line and section, as written into a contract, being of particular benefit where super flat floors are required.

When shimmed to level and secured in line by dabs of wet concrete, the rail will provide a secure form for tamping and screeding in both longitudinal and transverse joints or finished edges, giving the contractor complete control over the work without having to puncture any sub-surface membrane.

The largest rail would normally weigh approximately 30Kg making it easy for one operator to fix. When compared to traditional methods, the savings in time in setting up and stripping out are approximately 50%, thus speeding the work on the whole project.

Furthermore, rails such as those shown in Figures 4 and 5 can be used back to back with expansion jointing material incorporated between them. This ensures that these joints are properly constructed and that both edges are sound.

A further advantage of the screed rails of the present invention is that, because of the recesses, they require about 20% less concrete for their manufacture than known concrete screed rails. This means they are easier to use. Also, there tends to be less grout loss than occurs with traditional stop-end shuttering.

In the course of construction, the rails are used as screed rails. However, in the finished work, a superior edge finish is obtained, which is particularly advantageous where high wheel loadings can be expected on slab edges and joints. Also, the rails can be used to form construction, isolation, slab edge, expansion or contraction joints. Thus the rails also provide a comprehensive jointing for concrete slabs.

Instead of using a standard ferrous steel reinforcing rod in the top edge region of the screed rail (such as the rail 21 shown in Figure 5) it is preferred to use a helically wound stainless steel rectangular bar having a cross-sectional dimension of approximately 7mm x 1mm and a helix pitch of about 15mm. Such reinforcing bars are manufactured by Helix Reinforcements Limited and do not rust. Because the fibres are incorporated in the concrete mix, impact resistance is increased in the screed rails. It is also preferred that sharp corners are rounded off on the screed rail and a radiused edge be provided to the underside of the top edge portion to allow the release of entrapped air in the recesses during manufacture of the screed rails.

It will of course be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

Claims

1. A concrete screed rail having at least substantially parallel spaced top and bottom edges (1,3) with a web portion (5) between said edges (1,3), at least the upper edge (1) being provided with a finished surface, and wherein a reinforcement of short fibres is provided within the concrete of the rail, there being at least one recess (17) in said web portion (5), characterised in that a thin layer of fibre reinforced concrete extends across said recess (17).

2. A concrete screed rail according to claim 1, characterised in that a plurality of recesses (17) are provided, across which a thin layer of fibre reinforced concrete extends.

3. A concrete screed rail according to claim 1 or 2 characterised in that the thin layer of fibre reinforced concrete extending across the or each recess is supported by the fibre reinforcement but can be knocked out as required to allow transverse reinforcement bars (19) to extend through the recesses.

4. A concrete screed rail according to claim 1, 2 or 3 which is in the form of a straight beam of I-section.

5. A concrete screed rail according to claim 1, 2 or 3 characterised in that the rail is of generally L-shaped cross-section.

6. A concrete screed rail according to any one of claims 1-5 characterised in that additional reinforcement (13 or 23) is incorporated in the rail.

7. A concrete screed rail according to any one of claims 1-6 characterised in that a small aperture is provided in each web portion separating each recess.

8. A concrete screed rail according to any one of claims 1-7 wherein a helically wound rectangular stainless steel reinforcement bar is incorporated in an upper edge region of the rail.

9. A concrete screed rail according to any one of the preceding claims wherein the short fibres are formed of polypropylene and are about 12mm long.

10. A concrete screed rail according to any one of the preceding claims wherein from .002 to .02 part by weight of short fibres are incorporated in a concrete mix comprising one part by weight of ordinary Portland cement, one part by weight of sand, two parts by weight of aggregate and .5 parts by weight of water.

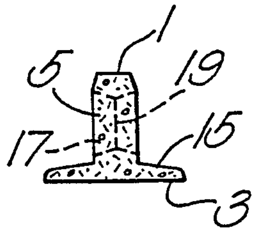


FIG.2.

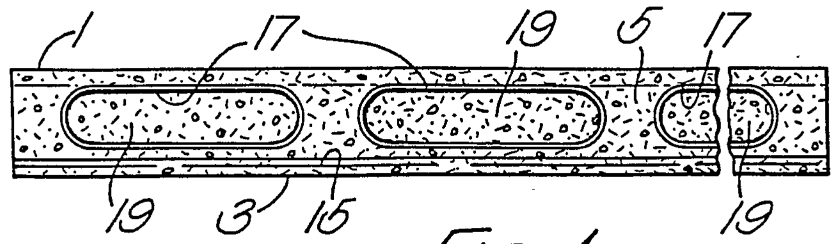


FIG.1.

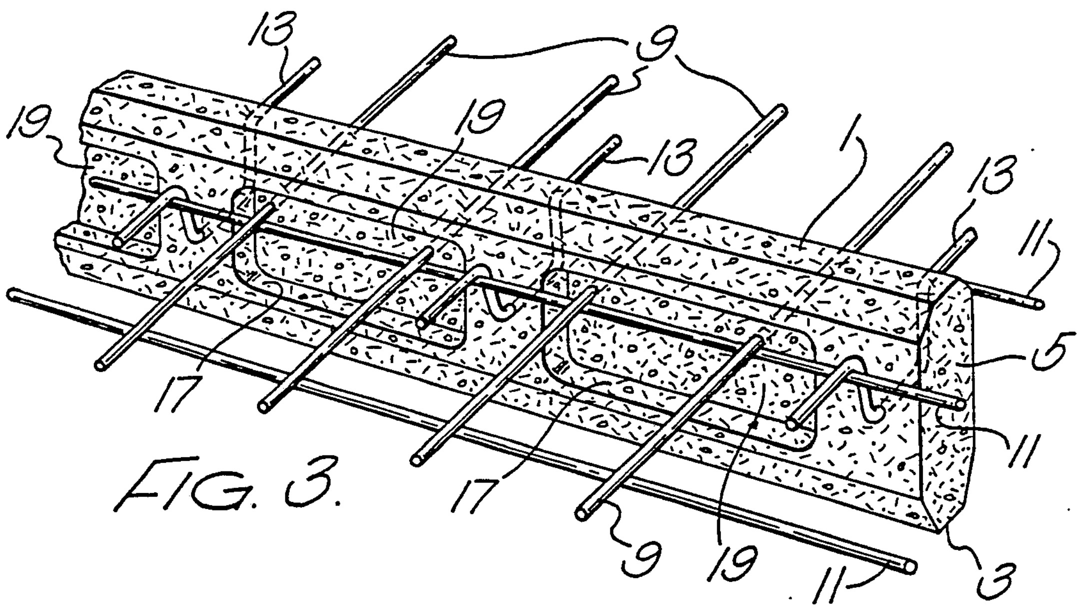


FIG. 3.

FIG.4.

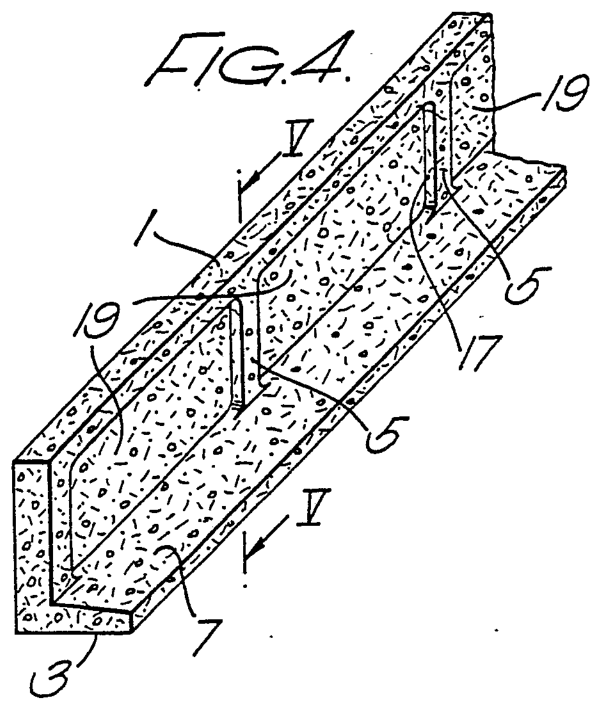
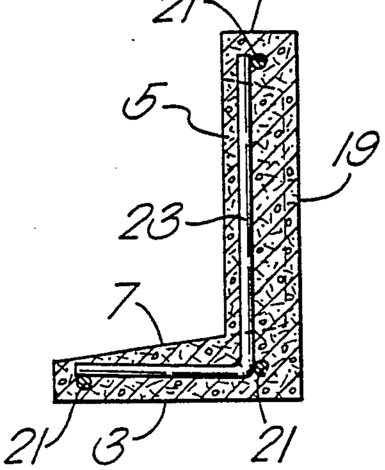


FIG.5.



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EUROPEAN SEARCH REPORT

Application Number

EP 89 31 1591

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)
Y	EP-A-0 289 261 (CLIFFSTONE) * Column 1, line 55 - column 2, line 10; column 2, line 46 - column 4, line 34; column 5, line 7 - column 6, line 11; figures 1-4 * ---	1-9	E 01 C 9/00 E 04 G 21/10
D,Y	EP-A-0 168 205 (SQUARE GRIP) * Page 6, line 4 - page 7, line 5; page 12, line 16 - page 13, line 8; figures 12,14,16 * ---	1-9	
D,A	EP-A-0 124 532 (TREMIX) * Column 2, lines 25-29,42-53; column 4, lines 25-53; figure 1 * ---	1-4	
D,A	GB-A- 480 259 (G.F.X. HARTIGAN) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E 01 C E 04 G E 04 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08-02-1990	VERVEER D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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