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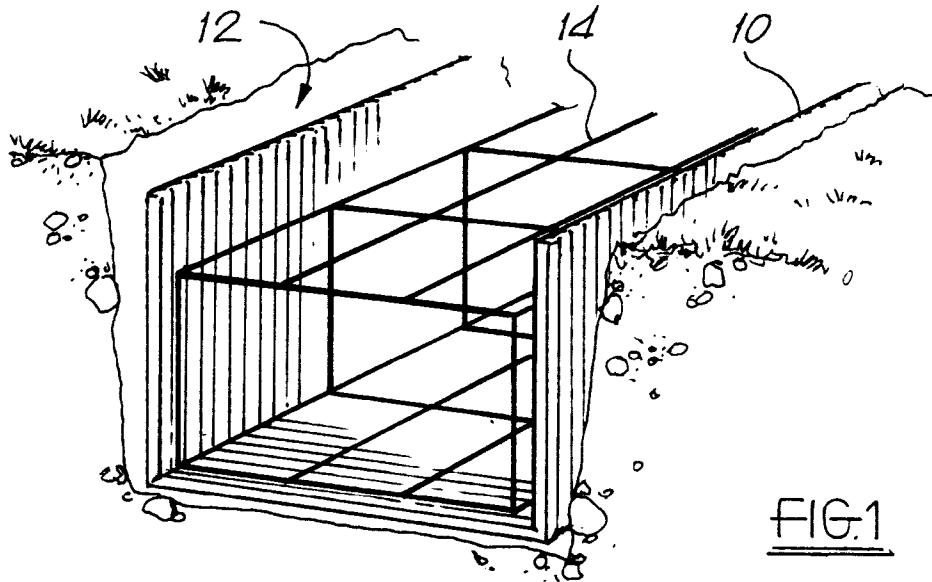
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(54) **Shutters**

(57) There is disclosed a one piece sacrificial shut-

ter comprising a folded section of fluted or corrugated material (10).



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Description

The invention concerns shutters for use in the building industry, with particular, but by no means exclusive, reference to groundbeam shutters.

Typically, groundbeams comprise steel or wooden structures which are positioned in a trench. A steel reinforcement cage can be positioned and the form/shutter filled with concrete. The steel or wooden shuttering is recovered for future use. There are considerable disadvantages associated with such traditional methods, such as the cost of materials and the cost of employing skilled craftsmen on site, such as joiners, to facilitate the process.

Other non-traditional systems include the 'beam form' system (manufactured by RMD, UK), in which two panels of expanded polystyrene are used, which must be positioned relative to one another in the trench. The panels are single sized. An example of a one piece groundbeam system is "PECAFILL" (distributed in the UK by BRC), which comprises a polyethylene coated steel mesh. PECAFILL is bent into the required shape at the manufacturing plant and remains bent until used.

The present invention provides a simple, low cost, flexible sacrificial shutter which is easily erected on site, thereby circumventing the need for employing skilled craftsmen on site. "Sacrificial" in the present context means that the shutter is permanent, i.e. that it is not removed once the concrete has set.

According to a first aspect of the invention there is provided a one piece sacrificial shutter comprising a folded section of fluted or corrugated material.

The material may be plastic. The plastic may be polypropylene or a modified polypropylene.

Alternatively, the material may be paper.

The shutter may be in a structural feature, which may be a groundbeam.

The shutter may be folded along crease lines.

The shutter may be folded on site.

The shutter may further comprise an extruded top section.

According to a second aspect of the invention there is provided a method for making a structural feature using at least one sacrificial shutter according to the first aspect of the invention.

The method may comprise the steps of:

positioning the shutter or shutters in a trench;

folding the shutter or shutters into a desired shape;

backfilling the trench so as to support the shutter or shutters;

and pouring into the folder shutter or shutters, in liquidised form, a settable construction material and allowing same to set.

The order of the first and second steps maybe interchanged; however, preferably, the shutter or shutters are folded on-site.

The settable construction material may be a concrete.

The structural feature may be a groundbeam.

A reinforcement cage maybe positioned in the shutter or shutters before the settable construction material is poured.

Methods and shutters in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a view of a shutter when installed in a trench;

Figure 2 is a cross sectional view of a section of fluted plastic;

Figure 3 shows a flat section in a trench, prior to folding; and

Figure 4 shows (a) a mating piece and (b) a reinforcing piece.

Figure 1 shows a one piece sacrificial shutter 10 of the present invention comprising a folded section of fluted or corrugated material.

A preferred material is plastic, and a preferred plastic is polypropylene, since in its fluted or corrugated form it exhibits the necessary mechanical properties and is extremely cost effective to manufacture. A further advantage is that polypropylene is resistant to attack from a wide range of chemicals and minerals, making shutters manufactured in polypropylene suitable for use in contaminated ground. Modified polypropylenes, which have even better chemical resistance, can be used. It is possible to coat the shutters in order to provide enhanced properties, although this increases the cost of manufacture. It will be appreciated that other plastics are within the scope of the invention.

The shutter 10 of Figure 1 is for a groundbeam. However, it is possible to use shutters of the present invention to produce other structural features, such as pile caps. The shutter 10 is located in a blinded, back-filled trench 12, and a reinforcement cage 14 is disposed within the shutter 10. Subsequently, concrete is poured into the shutter 10, which, once the concrete has set, remains in place. Other forms of shuttering are also within the scope of the invention.

Figure 2 is a cross-sectional view of a polypropylene section 16 having flutes 17, the flutes 17 in this example being apertures extending transversely across the length of the section 16. The flutes can, however, comprise grooves formed in the surface of the section. In a related configuration, the section can be corrugated. Extruded polypropylene is a highly suitable material. The precise dimensions and densities used can, of

course, be varied so as to provide shutters suitable for the task envisaged. However, it has been found that sections having thickness/weight characteristics (t/w) in the range 4.0/700 to 6.0/1500 are well suited to a wide range of applications. The thickness is the dimension 't' shown in Figure 2, in millimetres, and the weight 'w' is the weight in grams per square metre.

The extruded section may be creased, or fold lines may be formed by any suitable means, even on site. Such means might comprise a platen equipped with suitably positioned and adapted blades. An advantage of such an approach is that the shutter can be flat packed for transportation and storage, and folded into shape along the crease lines on site.

On site, the flat packed sections may be used in the following manner. A trench is dug and blinded. As shown in Figure 3, the flat sections 18 are disposed in the trench 20. The flat sections have fold lines 22, 24. The joints are secured with an appropriate shuttering tape, or by way of "H" shaped mating pieces 40, shown in Figure 4 (a). Alternatively, shutters might simply overlap one another. In the case of "H" shaped mating pieces 40, the flat sections are slid into slots 42, 44 of the mating piece 40. One or more mating pieces can be used per joint. Spacers, which might be bars or any other suitable arrangement, are placed in the middle portion 18a of the section (which forms the base portion of the shutter) and reinforcement cage lowered to said middle portion 18a. The sides 18b, 18c of the sections 18 are folded along the fold lines to produce upright walls, whilst ensuring that side spacers are fitted to the reinforcement cage. The spoil is then backfilled against the upright walls, thus securing said walls against the side spacers. Concrete is then poured into the shutter. It will be apparent that it is also possible to fold the sections 18 before placing same in the trench 20.

It is possible to make structural features such as groundbeams without using a reinforcement cage. In this instance, spacers can be positioned **in** the folded shutters which are of similar width as the folded shutter and thus maintain the shape of the folded shutter against the pressure of the backfill. The spacers, which might be made from timber, are removed as the concrete is poured in.

The present invention offers numerous advantages. The shutter is quickly and easily assembled, this providing saving on erection times and dispensing with the necessity of providing a skilled person such as a joiner on site. As discussed above, the sections may be conveniently flat-packed before use and delivered on pallets. The shutter is sacrificial, and this provides protection for the eventually produced concrete structure from, for example, any contaminants present in the ground. Furthermore, there is no need to provide release agents, and the shutter may be produced cheaply, making sacrificial use thereof economically enable. Use of the shutter is extremely convenient and flexible, since the nature of the plastic material employed makes alteration of the

design envisaged a simple task. Furthermore, the shutter is lightweight. Additionally, anti clay heave products can be added immediately, since there is no waiting for shutter strip.

Numerous modifications to the embodiments described above are possible. For example, it is convenient to produce the shuttering of the present invention in plastic of a standard colour, for ease of identification. Additionally, it is possible to produce an extruded, generally "U" shaped reinforcing piece 46, shown in Figure 4b. The piece 46 is positioned on the longitudinal edges of the adjacent sides 18b, 18c, the sides 18b, 18c eventually forming the side walls of the shutter. In this way, the rigidity of the side walls is enhanced, and the shutter is better able to withstand the concrete forming process if the trench is not backfilled completely. It may be possible to utilise other materials than plastics. An example is paper - preferably, of course, a stiff paper such as cardboard. The paper can be coated with suitable coatings, such as wax or lacquer, to improve properties such as water resistance. It might even be possible to utilise non-fluted or corrugated materials such as a rigid plastic, e.g. rigid polypropylene.

Claims

1. A one piece sacrificial shutter comprising a folded section of fluted or corrugated material.
2. A shutter according to claim 1 in which the material is plastic.
3. A shutter according to claim 1 in which the plastic is polypropylene or a modified polypropylene.
4. A shutter according to claim 1 in which the material is paper.
5. A shutter according to any of claims 1 to 4 in a structural feature.
6. A shutter according to claim 5 in which the structural feature is a groundbeam.
7. A shutter according to any of claims 1 to 6 folded along crease lines.
8. A shutter according to any of the previous claims which is folded on site.
9. A method for making a structural feature using at least one sacrificial shutter according to any of claims 1 to 8.
10. A method according to claim 9 comprising the steps of:

positioning the shutter or shutters in a trench;

folding the shutter or shutters into a desired shape;

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backfilling the trench so as to support the shutter or shutters;

and pouring into the folded shutter or shutters in liquidified form, a settable construction material and allowing same to set.

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11. A method according to claim 9 or claim 10 in which the shutter or shutters are folded on-site.

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12. A method according to claim 10 or claim 11 in which the settable construction material is a concrete.

13. A method according to any of claims 9 to 12 in which the structural feature is a groundbeam.

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14. A method according to any of claims 10 to 13 in which a reinforcement cage is positioned in the shutter or shutters before the settable construction material is poured.

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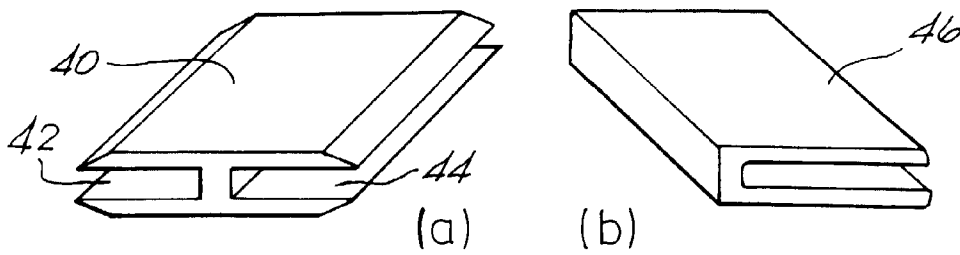
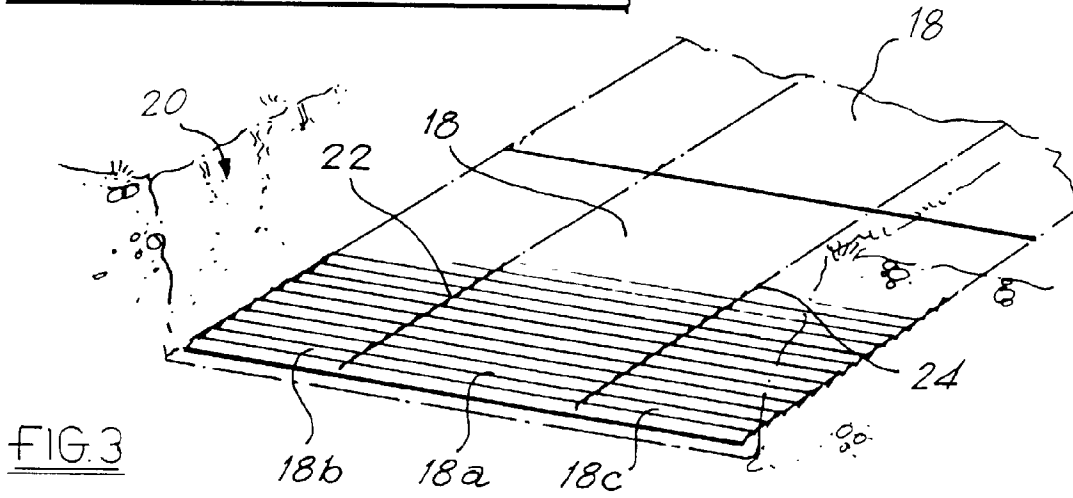
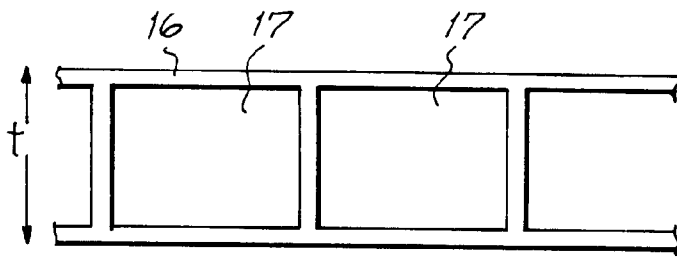
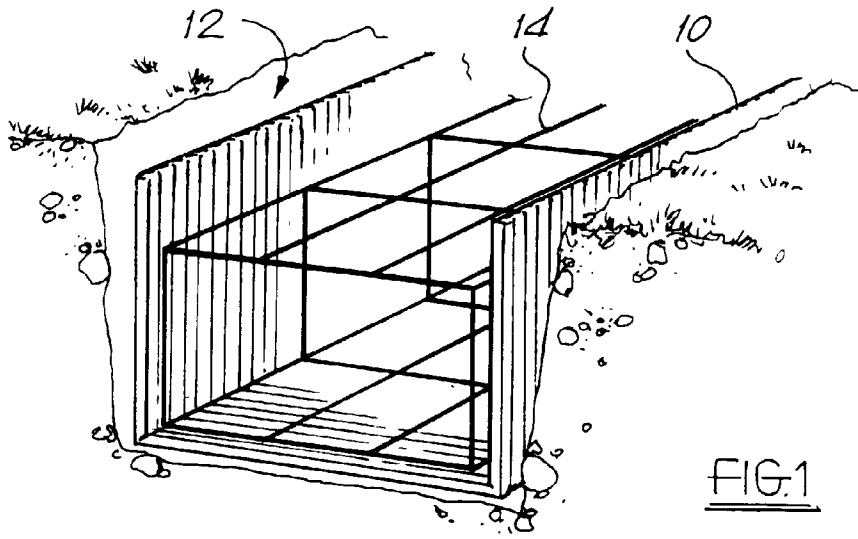


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 2006

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.6)
X	FR 2 581 678 A (BRAMI) 14 November 1986 * page 2, line 4 - page 5; figures * ---	1,2,4-14	E04G13/00 E04G9/08 E02D27/02
X	GB 2 235 235 A (DUFAYLITE DEV.) 27 February 1991	1,4-9	
A	* page 3, line 29 - page 9; figures * ---	10-14	
X	DE 90 14 214 U (CONSTRUMAT) 10 January 1991	1,4-9	
A	* the whole document * -----	10-14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04G E02D
Place of search	Date of completion of the search	Examiner	
THE HAGUE	26 June 1998	Vijverman, W	
CATEGORY OF CITED DOCUMENTS		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	
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