



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 756 043 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.01.1997 Bulletin 1997/05

(51) Int. Cl.⁶: **E04B 1/68**

(21) Application number: **96111769.4**

(22) Date of filing: **22.07.1996**

(84) Designated Contracting States:
AT CH DE ES FR GB IT LI

(72) Inventor: **Guderzo, Marco**
31100 Treviso (IT)

(30) Priority: **28.07.1995 IT TV950095**

(74) Representative: **Modiano, Guido, Dr.-Ing. et al**
Modiano & Associati S.r.l.
Via Meravigli, 16
20123 Milano (IT)

(71) Applicant: **VOLTECO S.p.A.**
31050 Villorba (Treviso) (IT)

(54) **Waterstop barrier, particularly for concrete structures**

(57) A waterstop barrier, particularly for reinforced-concrete structures (1) that comprise a reinforcement frame (2), the barrier having a modular rigid structure (5) that is composed of a first and a second elements (6a,6b) that can be arranged adjacent to each other,

with the interposition of a water-expanding sealing strip (7), the rigid structure (5) comprising locking means (11) and means (14a,14b,15a,15b) for engaging the reinforcement frame.

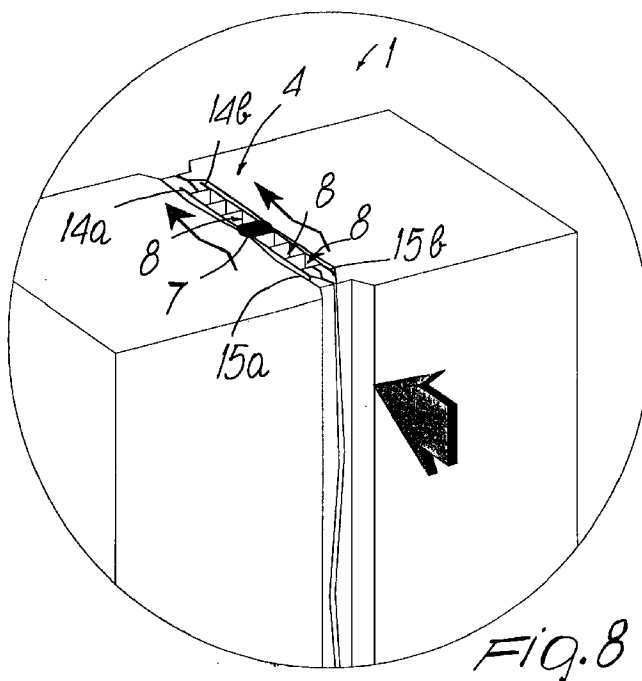


Fig. 8

EP 0 756 043 A1

Description

The present invention relates to a waterstop barrier, particularly for concrete structures comprising a reinforcement frame, which are generally known as reinforced-concrete structures.

The construction of a reinforced-concrete structure currently entails the execution of the following operations: installing the formwork, placing the internal frame, and casting the concrete.

Then, when the concrete starts to harden, the formwork is removed and the structure is thus produced.

Reinforced-concrete structures have the characteristic of being strong and light and are therefore widely used in the construction sector.

However, said reinforced-concrete structures entail drawbacks: the concrete hardens in a short time, but it completely loses its excess water in a very long time; during this settling period, cracks can form along the structure which of course affect the weakest part of said structure.

Said cracks can affect the entire thickness of the structure, i.e., regions where a flow of water can occur, thus possibly entailing infiltrations.

Particularly for structures executed below ground level, these infiltrations are very harmful: the water seeps in more easily, damaging the rods of the frame and interfering with the static behavior of the structure and with its functionality.

In order to obviate this drawback, it would be necessary to produce the structures by interrupting the concrete castings every five or six meters, thus allowing the concrete to harden more uniformly.

However, this system has the drawback that it considerably increases the construction times of the structure with a considerable cost increase, and furthermore does not ensure complete elimination of said cracks, which can form at the joints of the casting.

In structures executed below ground level, the concrete casting joints are conventionally sealed with a sealing strip of water-expanding material, which considerably increases its volume, sealing any cracks, when placed in contact with the water contained in the concrete.

However, this sealing strip has the drawback that in order to perform its function it must be in contact with a compact surface; therefore, it is generally necessary to surround the sealing strip with a metal mesh that is fixed to the structure by means of nails.

In this case, too, it is necessary to perform discontinuous concrete castings, manually associating the sealing strip and the metal mesh with the parts of the structure; otherwise, if the sealing strip is inserted in the formwork before the concrete casting, without being retained, it moves due to the concrete casting and loses its functionality.

The sealing strip is also conventionally insertable in a seat that is formed beforehand at the end of a joined element, which is inserted in the formwork prior to the

concrete casting; the sealing strip is also conventionally arrangeable between two polystyrene elements, which are optionally surrounded by a metal mesh.

Both solutions have the drawback that they are loose within the formwork and are thus subjected to the thrust of the concrete casting; accordingly, they are unstable and bend or rise, with respect to the initial position, becoming further weakening factors for the structure.

A principal aim of the present invention is to solve the described technical problems, eliminating the drawbacks of the mentioned prior art by providing a waterstop barrier that allows to produce structure stress raisers that guide the formation of the cracks.

Within the scope of this aim, an object of the invention is to provide a waterstop barrier that allows to produce uninterrupted horizontal and vertical concrete castings of considerable size.

Another important object is to provide a waterstop barrier that is easy and simple to construct.

Another important object is to provide a waterstop barrier that allows the sealing strip to perform its water-expanding function.

Another object is to provide a waterstop barrier that has a low cost and can be produced with conventional and known machines and equipment.

This aim, these objects, and others which will become apparent hereinafter are achieved by a waterstop barrier, particularly for reinforced-concrete structures that comprise a reinforcement frame, characterized in that it is constituted by a modular rigid structure composed of a first and a second elements that can be arranged adjacent to each other, with the interposition of a water-expanding sealing strip, said rigid structure comprising locking means and means for engaging said reinforcement frame.

Further characteristics and advantages of the invention will become apparent from the following detailed description of a preferred but not exclusive embodiment of the waterstop barrier, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a perspective view of the method of assembly of the barrier;

figure 2 is a perspective view of the barrier fixed to the reinforcement frame;

figures 3 and 4 are detail views of the system for fixing to the reinforcement frame;

figures 5 and 6 are perspective views of a detail of the assembly of two barriers;

figures 7 and 8 are perspective views of the operation of the barrier;

figure 9 is a perspective view of the application of the barrier in a platform;

figures 10 and 11 are, respectively, a sectional view taken along a transverse plane and a front view of the barrier.

With reference to the above figures, the reference numeral 1 designates a concrete structure comprising a reinforcement frame 2.

Said frame 2 is constituted by two grids arranged side by side, which comprise at least a first rod 3a and a second rod 3b, which are arranged vertically and so as to face each other, and between which it is possible to interpose a waterstop barrier 4.

The barrier 4 has a modular rigid structure 5 constituted by a first element 6a and a second element 6b that are mutually identical and preferably panel-shaped and can be arranged laterally adjacent with the interposition of a water-expanding sealing strip 7.

The first element 6a and the second element 6b, preferably produced by extruding plastics, have a plurality of openings 8 that are formed internally and longitudinally and are all parallel to each other; in a sectional view taken along a median plane running transversely to said rigid structure 5, said openings have a rectangular shape.

A first and a second pairs of fins, designated by the reference numerals 9a-9b, 10a-10b respectively, protrude laterally from the first element 6a and from the second element 6b at the sealing strip 7; said fins are parallel, are arranged side by side in pairs, and are adapted to constitute an element for partially containing the sealing strip 7.

The first element 6a and the second element 6b furthermore have locking means 11.

Said locking means 11 are preferably constituted by a plurality of first holes 12 formed internally and transversely, on the same axis, in the first element 6a and in the second element 6b.

A pin 13 can be inserted in each one of said plurality of first holes 12; the pin 13 passes inside the sealing strip 7, which is perforated, and has a length that matches the width of the rigid structure 5.

The first element 6a and the second element 6b furthermore have means for engaging the reinforcement frame 2; said engagement means are constituted by two third fins 14a and 14b and by two fourth fins 15a and 15b protruding respectively from the first element 6a and from the second element 6b on the opposite side with respect to the sealing strip 7.

Said third pair of fins 14a and 14b and said fourth pair of fins 15a and 15b protrude at right angles from the rigid structure 5 and are arranged parallel to each other; said fins are adapted to form, within them, a seat for the first rod 3a and for the second rod 3b respectively.

The third pair of fins 14a and 14b and the fourth pair of fins 15a and 15b respectively have a plurality of second holes 16 and a plurality of third holes 17 that allow, preferably by virtue of the passage of a wire 18, a rigid connection to the first and second rods 3a and 3b.

The wire 18 is preferably of a type similar to the one used for interconnecting the rods which constitute the frame 2, as shown in figure 3.

The rigid structure 5 can have at least two pairs of feet 19 that are connected to the upper and lower ends;

each foot is preferably H-shaped in transverse cross-section and can be partially inserted at one of the openings 8.

Each foot 19 has two pointed ends 20a and 20b that are adapted to allow easy insertion at the opening 8 of each rigid structure 5 if the barrier 4 is constituted by arranging two or more of said rigid structures 5 adjacent to each other.

Operation is as follows: the first element 6a is arranged laterally adjacent to the second element 6b, interposing the sealing strip 7 at the first pair of fins 9a and 9b and at the second pair of fins 10a and 10b; the first pins 13 are inserted at each one of said plurality of first holes 12, in order to produce the rigid structure 5; said rigid structure 5 is then associated with the reinforcement frame 2, at a first rod 3a and at a second rod 3b, which face each other, through the insertion of said rods between the two third fins 14a and 14b and the two fourth fins 15a and 15b; then, through the wire 18, the rigid structure 5 is fixed to the rods.

Of course, according to the height or width of the structure to be produced, it is possible to associate a plurality of rigid structures 5, arranging them one on top of the other and connecting them by interposing a plurality of feet that are partially inserted between them at the openings 8 so as to form the barrier 4.

It has thus been observed that the waterstop barrier thus conceived has achieved the intended aim and objects, since it is firmly connected to the reinforcement frame, producing, for the resulting structure, stress raisers that guide the formation of the cracks.

Said waterstop barrier furthermore allows the sealing strip to provide its features in the best possible manner, since it is in itself a barrier for the concrete casting which, in that point, produces a compact surface in front of said barrier and behind it; this applies to both horizontal and vertical concrete castings.

Since said barrier can be associated with the reinforcement frame prior to the concrete casting, and indeed during the manufacture of said reinforcement frame, it is possible to perform a single concrete casting even if the dimensions are considerable; this of course entails a considerable time saving and cost reduction; moreover, the number of barriers and their arrangement are left to the designer's discretion and depend on the specific requirements.

It can furthermore be noted that, since the pins pass within the water-expanding sealing strip, they do not affect the surface of contact between the sealing strip and the concrete and therefore do not interfere with the expansion of the sealing strip; this expansion is in fact necessary to ensure sealing of the crack when water passes.

If horizontal structures are produced, the barrier has a dual function: on the one hand, it allows to contain the concrete castings; on the other hand, it allows to provide watertightness between the joints of successive castings.

The invention is of course susceptible of numerous

modifications and variations, all of which are within the scope of the same inventive concept.

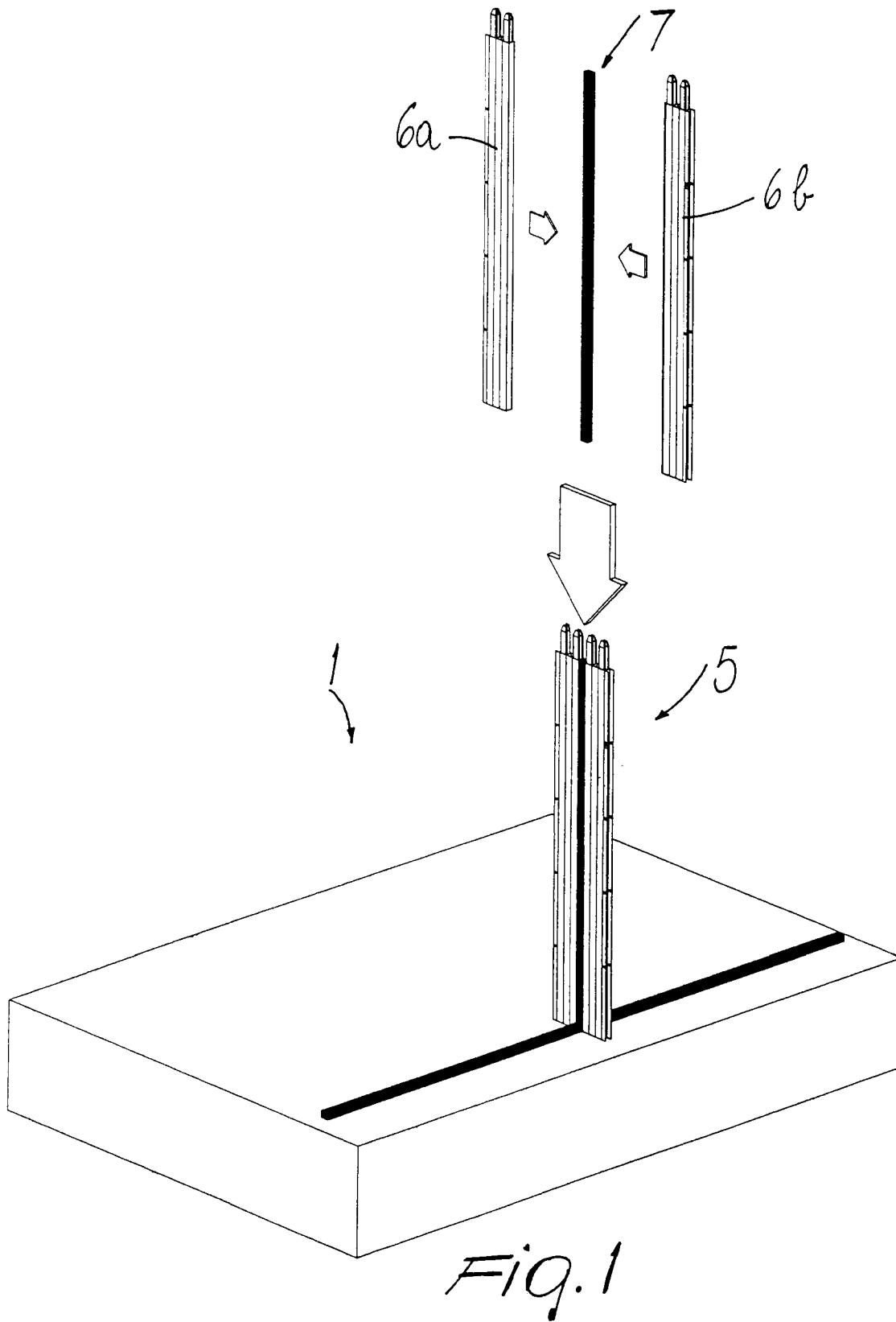
Thus, for example, the sealing strip can be glued laterally to the first and second elements.

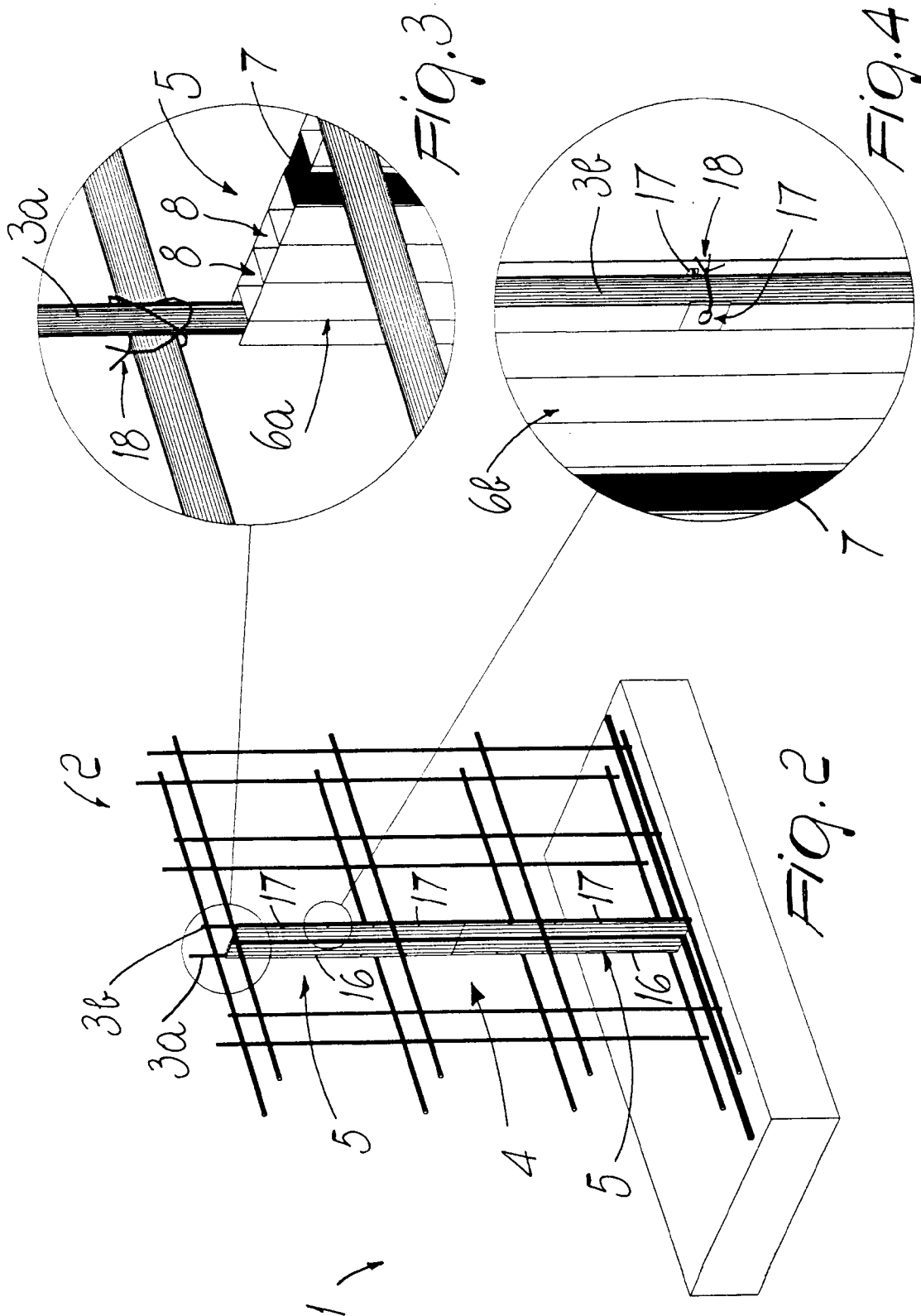
The materials and the dimensions constituting the individual components of the device may of course also be the most appropriate according to the specific requirements.

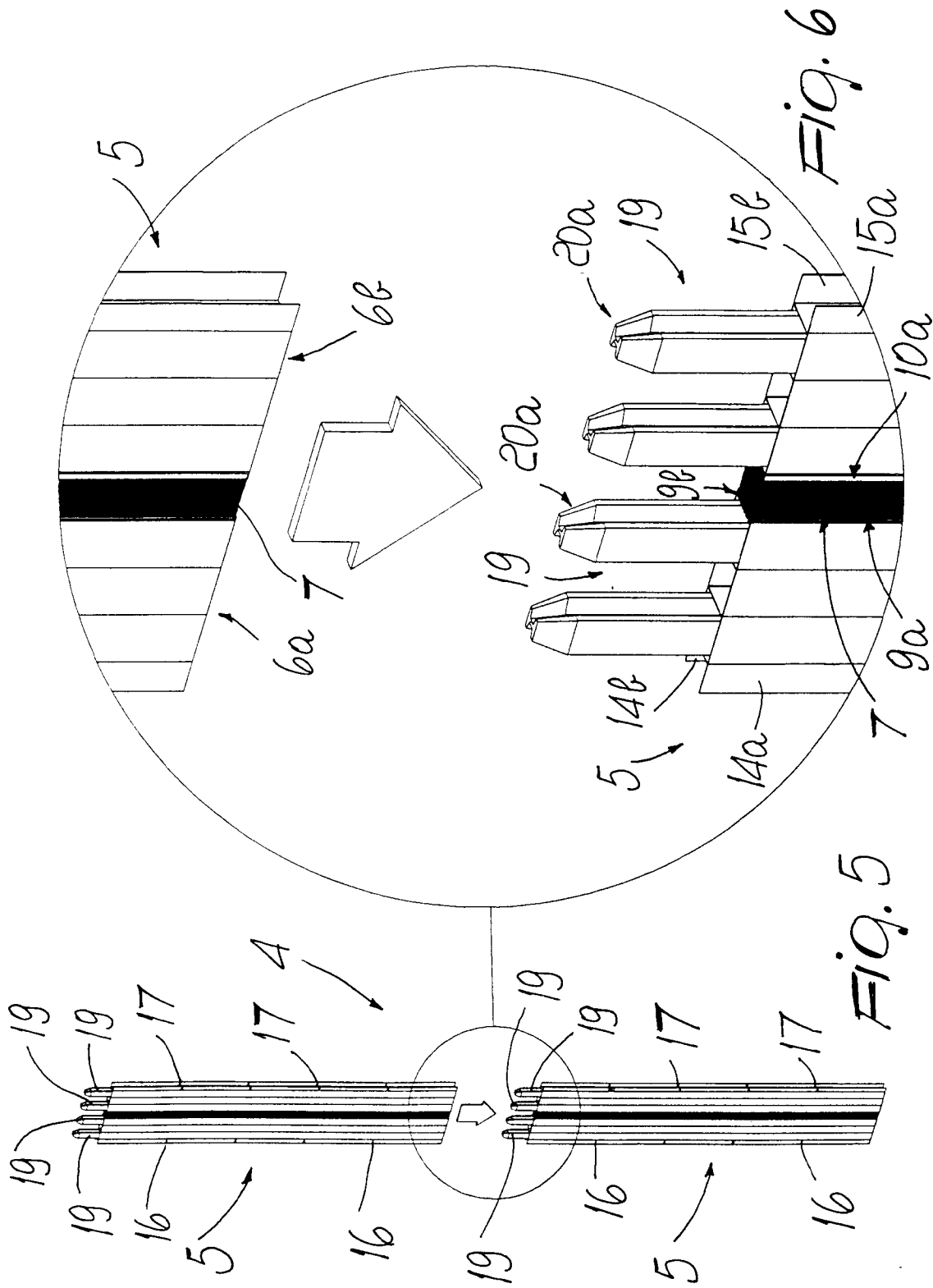
Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

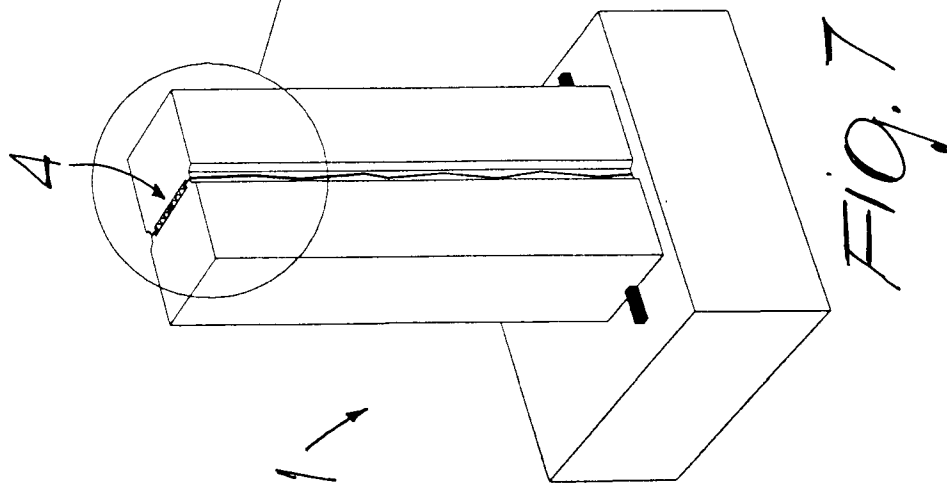
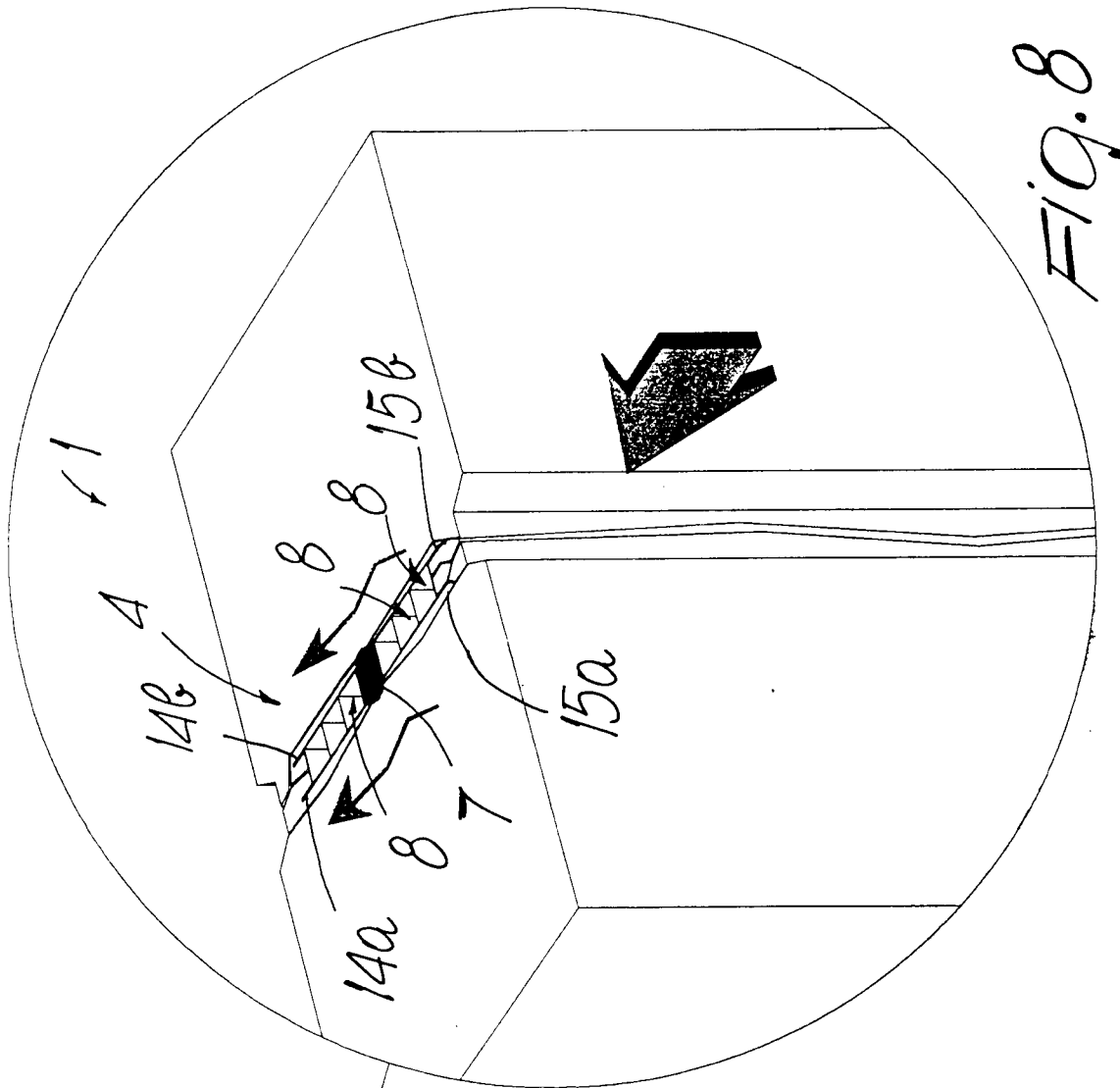
Claims

1. A waterstop barrier, particularly for reinforced-concrete structures that comprise a reinforcement frame, characterized in that it is constituted by a modular rigid structure composed of a first and a second elements that can be arranged adjacent to each other, with the interposition of a water-expanding sealing strip, said rigid structure comprising locking means and means for engaging said reinforcement frame.
2. A waterstop barrier according to claim 1, characterized in that said first and second elements are identical to each other, are panel-shaped, and are produced by extruding plastics, said first and second elements having a plurality of openings that are formed internally and longitudinally, are all parallel to each other, and have a rectangular shape in a cross-section taken along a median plane lying transversely to said rigid structure.
3. A waterstop barrier according to claim 1, characterized in that a first and a second pairs of fins protrude laterally from said first and second elements at the location of said sealing strip, said fins being mutually parallel and facing each other in pairs and being adapted to constitute an element for the partial containment of said sealing strip.
4. A waterstop barrier according to claim 1, characterized in that said locking means are preferably constituted by at least one pin and a plurality of first holes formed internally and transversely along a same axis in said first and second elements, said at least one pin being insertable in each one of said plurality of first holes.
5. A waterstop barrier according to claim 4, characterized in that said sealing strip is perforated, and in that said pin passes inside said sealing strip and has a length that approximately matches the width of said rigid structure.
6. A waterstop barrier according to claim 1, characterized in that said engagement means are constituted by two third fins and two fourth fins, which protrude respectively from said first element and from said second element on opposite sides with respect to the location of said sealing strip.
7. A waterstop barrier according to claim 6, characterized in that said third and said fourth pairs of fins protrude at right angles from said modular rigid structure, are arranged parallel to each other, and are adapted to form, inside them, a seat for a first and a second brackets respectively.
8. A waterstop barrier according to claims 1 and 7, characterized in that said rigid structure is interposed between first and second rods that form said reinforcement frame.
9. A waterstop barrier according to claim 7, characterized in that said third and fourth pairs of fins respectively have a plurality of second and third holes allowing a rigid connection to said first and second rods, said rigid connection being provided by a wire.
10. A waterstop barrier according to claim 1, characterized in that said rigid structure has at least one foot that is connected to the upper and/or lower ends, is preferably H-shaped in transverse cross-section, and can be partially inserted at one of the openings of another analogue rigid structure.
11. A waterstop barrier according to claim 10, characterized in that said at least one foot has two pointed ends that allow easy insertion at said opening provided in at least another rigid structure.









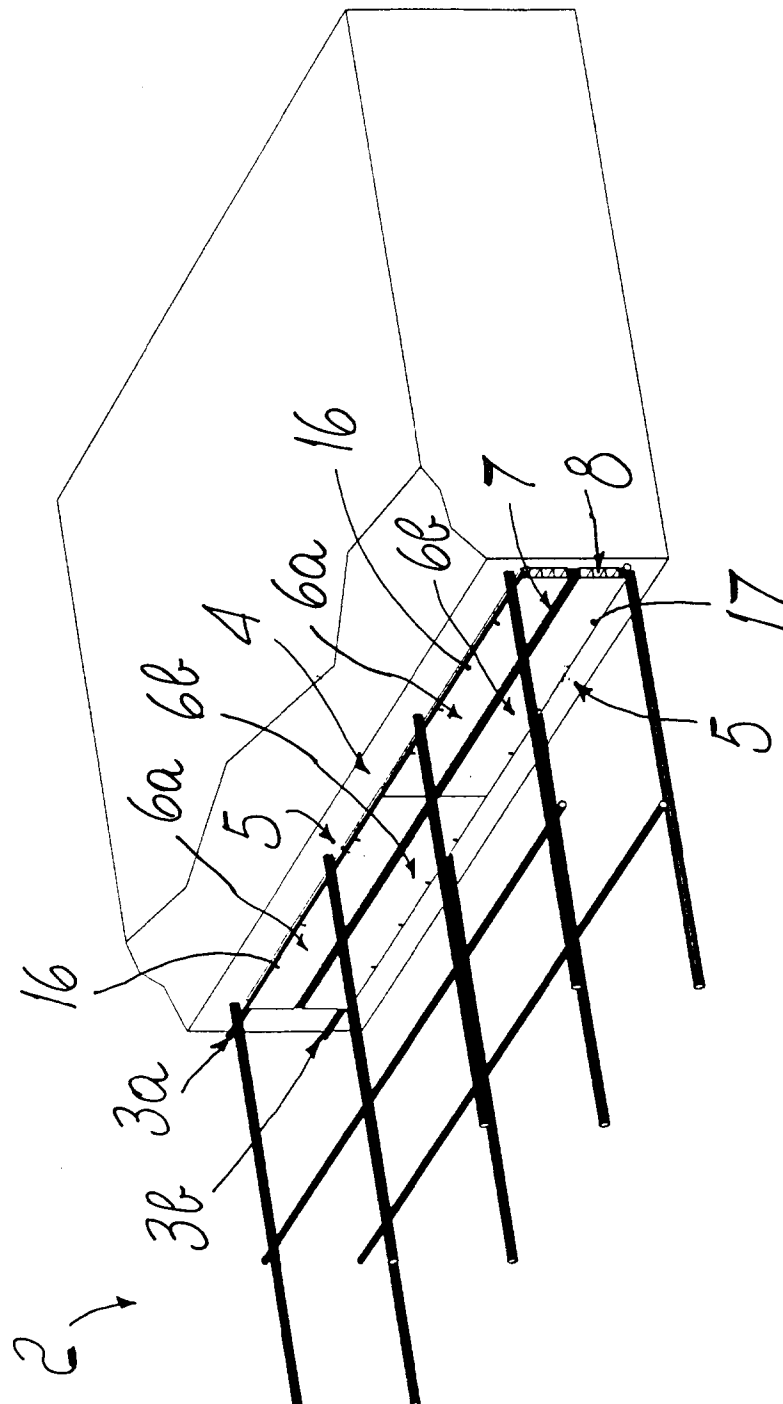
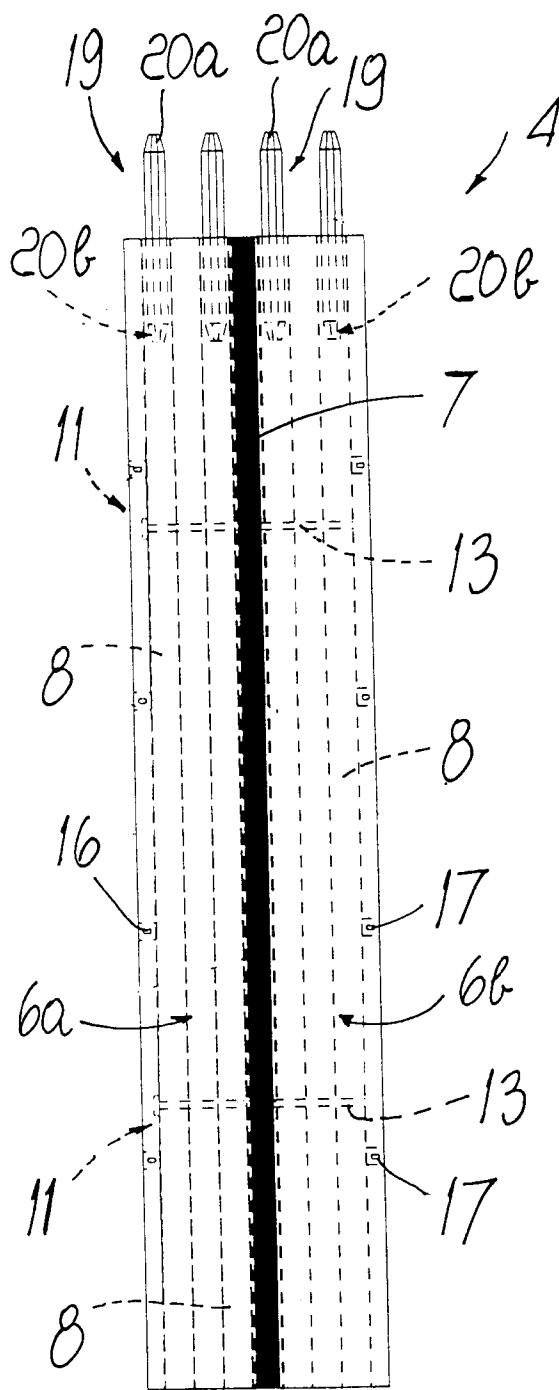
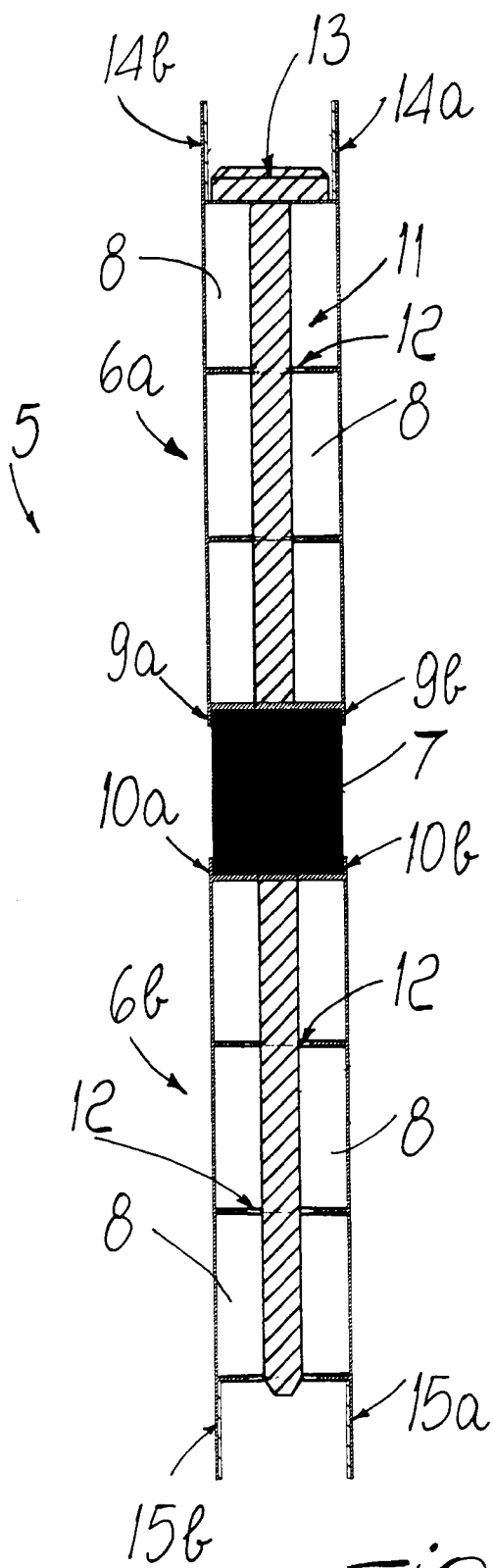


Fig. 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 11 1769

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	DE-U-94 13 613 (FIRMA ROLF PFLIEGER) * the whole document *	1	E04B1/68

A	DE-U-93 02 711 (FIRMA ROLF PFLIEGER) * page 1, line 1 - page 2, line 25 *	1	

A	EP-A-0 304 415 (INSOND GMBH) * the whole document *	1	

A	DE-A-44 04 933 (A. H. ERB) * the whole document *	1	

A	US-A-3 439 592 (J. R. MCAUSLAND) * the whole document *	1	

A	GB-A-2 205 872 (W. R. GRACE LTD) * the whole document *	1	

			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04B E02D E01C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		8 November 1996	Delzor, F
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			

EPO FORM 1503 03.82 (P/MCOI)