



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.06.2009 Bulletin 2009/23

(51) Int Cl.:
E01C 11/22 (2006.01) E03F 3/04 (2006.01)

(21) Application number: **07466026.7**

(22) Date of filing: **29.11.2007**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**
Designated Extension States:
AL BA HR MK RS

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(54) **Replaceable outlet slot tube and the method of its replacement**

(57) The replaceable slot tube is formed by the central segment /1/, two end segments /2/ and /3/, and two closing segments /4/ while the central segment /1/ is made with a section of the original exit slot tube but always shorter than the original slot tube by the length of two end segments /2/ and /3/ while the central segment /1/ is fitted at its both faces with connecting flange /5/ and

the end segments /2/ and /3/ are made with the same section as the exit slot tube while a recess is made on one side of each end segment /2/ and /3/ into which engages the closing segment /4/ that is mounted to the end segment /2/ or /3/, and all the parts as a whole form the final inner and outer shape corresponding to the original drainage slot tube.

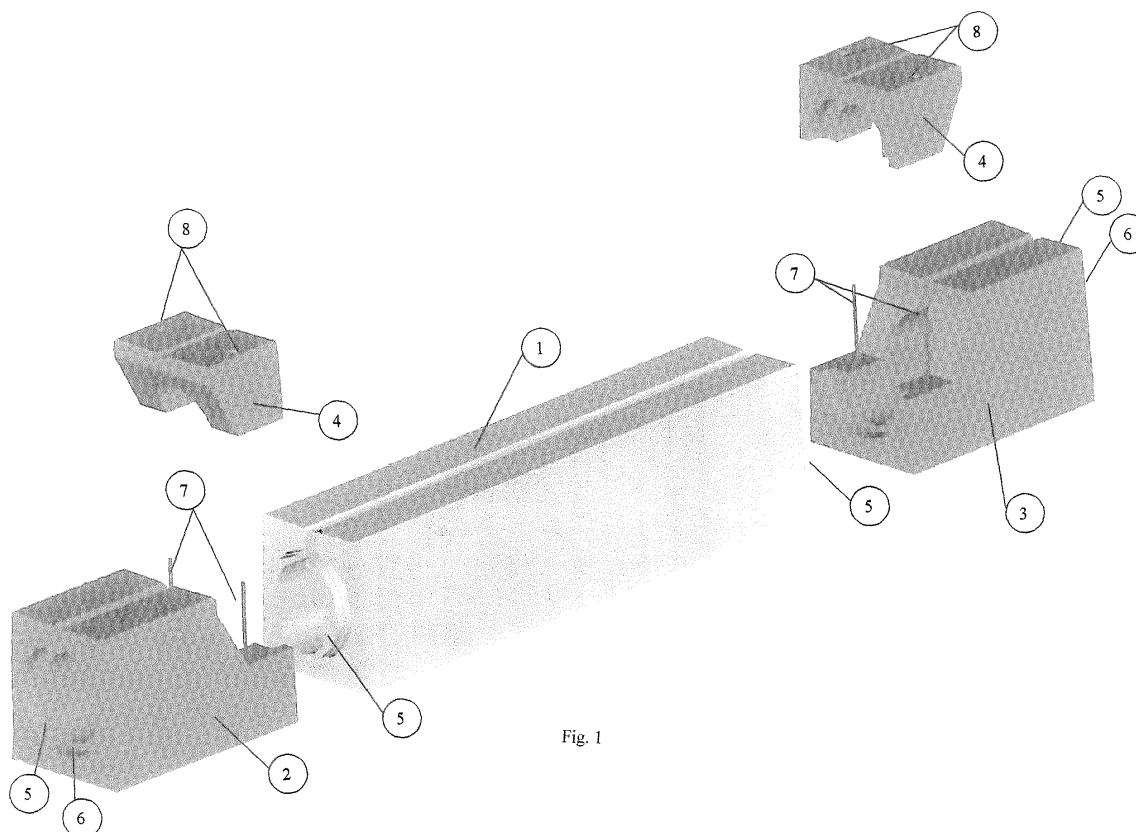


Fig. 1

Description

Field of Technology

[0001] The invention pertains to the structural engineering branch, to be more specific, the dewatering of transport structures - roads, motorways, freeways, layby standings, landing grounds, and so on.

The Current State of Technology

[0002] At present the liquids are commonly drained from the transport structure surfaces by using the continuous dewatering systems formed by the arrangement of drainage slot tubes into so-called slotted troughs.

[0003] The outlet slot tube is structurally made of one piece shaped in a form of blockstone with a longitudinal continuous or interrupted slot in the top surface that is interconnected with the inner continuous spillway profile of the actual tube, each outlet slot tube having a branch on one end and a connecting flange for line junction on the other end.

[0004] The drainage slot tubes are laid in such a manner that the top surface plane matches the wearing course of the area to be dewatered.

[0005] The liquid running down the dewatered area weathered to the slot tube enters the slot flowing through the inner continuous spillway profile out into other segments or escape ends into the associated sewerage or another liquid drainage element.

[0006] When forming the line dewatering system from the drainage slot tubes, the assembly usually starts from the escape piece so that each slot tube to follow in order is inserted with its connecting flange into the socket of the previous, already laid slot tube. By using a rubber sealing inserted between the socket of one slot tube and the connecting flange of the other slot tube when these tubes are being joined a waterproof joint of the slot tubes is thus formed to secure water outlet, for example, into a sewerage without a risk of water leakage at the joints, this simultaneously eliminating the possible accidents in both the underbed of the tubes and the area to be dewatered. The slot tubes matched this way to form a slotted trough are covered by the dewatered area's underlying strata from both the longitudinal sides. It is only the top face of the slot tubes that remains exposed, being at the level of the dewatered area's wearing course. The mentioned trough from slot tubes can be formed by several pieces up to several tens of slot tubes.

[0007] When any of the slot tubes joined in a line by the above method through the joining sockets and connecting flanges is damaged, this damaged slot tube cannot be replaced individually. The replacement can be theoretically done presuming all the slotted trough's tubes that follow in the assembly are disassembled. The damaged tube's replacement becomes extremely difficult since the defect of 4 m in length thus expands to a length larger by tens and hundreds of meters of slotted trough.

This makes the replacement of damaged slot tube practically impossible and economically absolutely non-acceptable.

[0008] The drainage slot tubes are usually damaged, for example, by the action of heavy entrenching machinery when underlying strata are formed and compacted, when forming the wearing courses, dewatering, due to the accidents of vehicles moving along the dewatered surface. Deterioration frequently occurs in the slot tubes' low-quality concrete by the action of frost and chemical anti-freeze substances resulting in a loss of their function. Replacement of the damaged pieces without a disassembly of the entire system cannot be implemented. Local reinstating that does not guarantee reversion to the original condition is therefore executed. These reinstating procedures must usually be repeated.

The Invention Principle

[0009] The mentioned imperfections are dealt with by the solution within the invention the essence of which consists in the fact the replaceable exit slot tube is formed by central segment, two end segments, and two closing segments while the central segment is made with the same cross profile as that of the original exit slot tube but always shorter than the original slot tube by the length of two end segments, its both faces fitted with a connecting flange, the end segment is made with the same cross profile as the original exit slot tube while a recess corresponding to the closing segment's shape is created at one side of the end segment forming a part of the socket allowing connection to one end of the central segment; as specified in the design example, this recess is made in such a way that it is led from one edge of the end segment in horizontal plane, and in the axis of the end segment's inner spillway profile to be led in the inclined plane toward the top surface of this end segment. The socket part is created in the end segment's face from the edge with the recess. Each end segment is fitted with connecting members, for instance, screws to attach the closing segment, these screws protruding perpendicularly from the recess' horizontal part along both sides of the inner spillway profile of the end segment. The opposite end of the end segment is fitted either with socket or connecting flange to meet the needs for the connection to the existing slot tubes of the slotted trough to be repaired. The closing segment is made in the shape of the end segment's recess with the top surface of a common slot tube, being equipped with penetrations to allow passage of the mounting elements fitting accurately into the end segment's recess. At the end of the closing segment that matches the segment's end after insertion, the second socket part is created.

Summary to the Figures on the Drawing

[0010] The invention is explained in more detail on the attached drawings where Figure 1 depicts individual

parts of replaceable exit slot tube in space solution.

Figure 2 depicts in section the procedure to replace one damaged exit slot tube in individual steps.

Figure 3 depicts in section the replacement of several damaged elements.

Figure 4 depicts in section the variants for termination of the end segments for diverse applications.

Example of the Invention Variation

[0011] If any defect is present at the original slot tube described in the Current State of Technology chapter, this tube will be replaced with a replaceable drainage slot tube that will be described now in the variation example.

[0012] The replaceable drainage slot tube is composed of the basic parts - central segment 1, two end segments 2 and 3, and two closing segments 4 that make the final appearance peculiar to the original drainage slot tube.

[0013] The central segment 1 is formed to have the same section as the original drainage slot tube but always shorter over the original drainage slot tube by the length of two end segments 2 and 3 where the central segment 1 has both faces fitted with connecting flange 5.

[0014] The end segments 2 and 3 are also made in the same cross section as the original drainage slot tube and central segment 1 while a recess is made to one end of each end segment 2 and 3 that is led from one end of each end segment 2 and 3, firstly in a horizontal plane and in the axis of the segment's inner spillway profile, then in the inclined plane toward the segment's top surface to change at the top surface for the plane perpendicular to the end segment's longitudinal axis while each end segment is fitted with connecting members 7 to mount the closing segment 4, for example with screws that are arranged along both sides of the inner spillway profile's part, in the recess' horizontal portion at right angle to both the portion and also to the longitudinal axis of the end segment 2 and 3. The socket's part 6 is created in the face of the end segment 3 with a recess. The opposite end of the end segment 2 and 3 is equipped with socket 6 or connecting flange 5 as required by the follow-up slot tubes.

[0015] The closing segments 4 are formed in the recess shape in the end segment 2 and 3 having, with the top surface, the shape of the original exit slot tube to be further fitted with penetrations 8 for insertion of the mounting elements 7. Closing segments 4 formed this way engage accurately into the recesses in the end segments 2 or 3 on the condition that the mounting elements 7 of the end segment 2 or 3, for example, screws, will engage into the penetrations 8 made in the closing segment 4. The second part of socket 6 is created at the end of closing segment 4 that, after having been fitted into the recess in the end segment 2 or 3, matches the end of the end segment 2 or 3.

[0016] The Method of Replacement

[0017] The replaceable slot tube as described in the invention can be used for the replacement of the line dewatering system's damaged parts from slot tubes in all the already built dewatering systems formed by the slotted troughs.

[0018] The replacement method is as follows:

[0019] Firstly, the damaged element of the slot tube must be demolished. When removing the damaged element, attention must be paid to the faces of the non-damaged slot tubes. Their appearance must be preserved without making any damage to them.

[0020] The end segment 2 or 3 shall be fitted to the non-damaged faces of the current non-damaged slot tubes using the same principles for the original assembly.

[0021] Consequently, the central segment 1 or the central segment 1 and further whole slot tubes are fitted according to the length of the demolished damaged exit duct in such a way that the top surfaces of all the parts are at the same level. Sealing is applied to the contact surfaces of the elements to be joined according to the common practices.

[0022] Further, the end segments 2 or 3 are fitted with the closing segments 4 so that the mounting elements 7 of the end segments 2 or 3 engage into the penetrations 8 of the closing segments 4.

[0023] The advantageous design of the mounting elements 7 of the end segments 2 and 3 are screws and nuts. After fitting the closing segments 4 on the end segments 2 or 3. Contact surfaces of the end segments 2 or 3 and those of the closing segments 4 are equipped with a waterproof sealing compound. After tightening the nuts of the mounting elements 7 a firm and permanent bond is made between the end segments 2 and 3 and the closing segments 4. A waterproof joint is made and socket 6 is formed in a replaceable slot tube for the waterproof joint of a type commonly obtained when joining the common slot tubes.

[0024] Finally, a pack of replaceable slot tubes is carried out to finalize the process of finishing the compacted surfaces.

[0025] The function of one or several replaceable slot tubes in the dewatering duct shall provide the identical function as the original slot tube.

[0026] In the visible surface of the slotted trough there will be only two more slots of newly created joints of the end segments 2 or 3 and the closing segments 4.

[0027] On top of it, the proposed solution enables a first-quality thermal and volume dilatation of the elements allowing handling the products with specified tolerances.

[0028] The entire solution allows the common mechanization to be applied both to remove the damaged tubes and re-assembly the replaceable slot tubes.

[0029] Figure 4 depicts the variants for termination of the end segments 2 and 3 for diverse applications. The standard design of a replaceable slot tube to be used in the line dewatering system has at one of its ends the end segment 3 with connecting flange 5 while its other end is fitted with the end segment 2 with socket 6.

[0030] The replaceable slot tube's design intended for the trough has at its both ends the end segment 2 and 3 with socket 6.

[0031] The replaceable slot tube's design intended for the pipe distribution has at its both ends the end segments 2 and 3 with connecting flange 5.

[0032] The proposed solution's character can be also used for the replacement of individual concrete tubes used in sewerage systems. This replacement method is not limited by the slot tubes only.

Claims

1. The replaceable slot tube and the method of its replacement, **characterized by the fact**, that it is formed by central segment /1/, at least two end segments /2/ and /3/, and two closing segments /4/ while all these parts make the final inner and outer shape corresponding to the original drainage slot tube.
2. The replaceable slot tube and the method of its replacement, as per the claim 1., **characteristic of the fact** that the central segment /1/ is formed to have the section of the original exit slot tube but always of a shorter length' than the original slot tube, by the length of two end segments /2/ and /3/ while the central segment /1/ has both faces fitted with connecting flange /5/.
3. The replaceable slot tube and the method of its replacement, as per the claim 1., **characteristic of the fact**, that the end segments /2/ and /3/ are also made with the same section as the original exit slot tube while a recess is made to one end of each end segment /2/ and /3/ that is led from one end of the end segment /2/ and /3/ in its whole width, partly in a horizontal plane and in the axis of the inner spillway profile, then in the inclined plane that changes for the vertical plane perpendicular to the longitudinal axis of the end segment /2/ and /3/ all the way to the segment's top surface while each end segment /2/ and /3/ is fitted with mounting elements /7/ to connect the closing segment /4/, and these mounting elements /7/ are arranged in the recessed area beyond the inner hole of the end segment /2/ and /3/ while the opposite end of the end segment /3/ is equipped with socket /5/, and the end segment /3/ has the shape of connecting flange /6/.
4. The replaceable slot tube and the method of its replacement, as per the claim 1., **characteristic of the fact that**, the closing segments /4/ are made in the shape of recess in the end segments /2/ and /3/ which they engage into accurately while the closing segments /4/ are fitted with penetrations /8/ for the insertion of mounting elements /7/, end segments /2/ and /3/, and the second part of socket /6/ is formed

at the end of the closing segment 4 that matches the end of the end segment /2/ or /3/ after it has been mounted in the recess in the end segment /2/ or /3/.

5. The replaceable slot tube and the method of its replacement, **characteristic of the fact that**, demolition is firstly made of the damaged slot tube all the way to the non-damaged faces of slot tubes, with the end segment /2/ or /3/ is fitted to the non-damaged faces of the current non-damaged slot tubes using the same principles for the original assembly, then the central segment /1/ or the central segment /1/ and at least one whole slot tube are fitted so that the top surfaces of all the parts are at the same level, again using the original assembly principles, for example, a sealing is fitted to the contact surfaces of both the central segment /1/ and the end segments /2/ and /3/, or, as the case may be, to the contact surfaces of the whole slot tubes in a row, then the closing segments /4/ are fitted on the end segments /2/ and /3/ in such a way that the mounting elements /7/ of the end segments /2/ and /3/ engage into the penetrations /8/ of the closing segments /4/ while a waterproof sealing compound is applied to the contact surfaces of both end segments 2 or 3 and closing segments 4 and after having been fixed with the mounting elements /7/ the end segments /2/ and /3/ are firmly and permanently bonded to the closing segments /4/, a waterproof joint is created and the socket /6/ is formed in the replaceable slot tube for a waterproof joint of a type commonly obtained when joining the common slot tubes, and the function of one or several replaceable slot tubes in the dewatering duct shall provide the identical function offered by the original slot tube.
6. The replaceable slot tube and the method of its replacement, as per the claim 5., **characteristic by the fact that**, the replacement method can be also applied to the replacement of individual concrete tubes used in the sewerage systems.

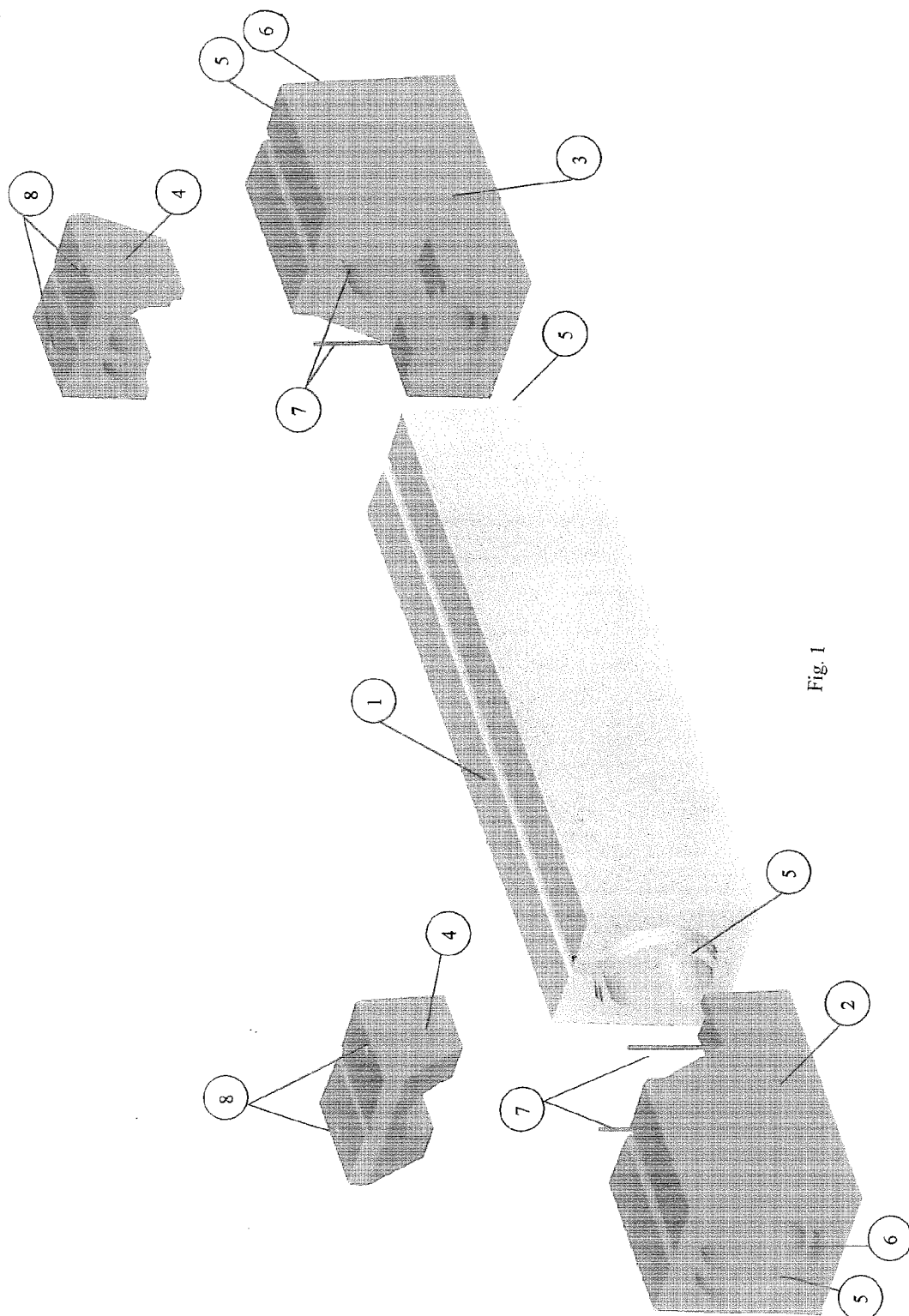


Fig. 1

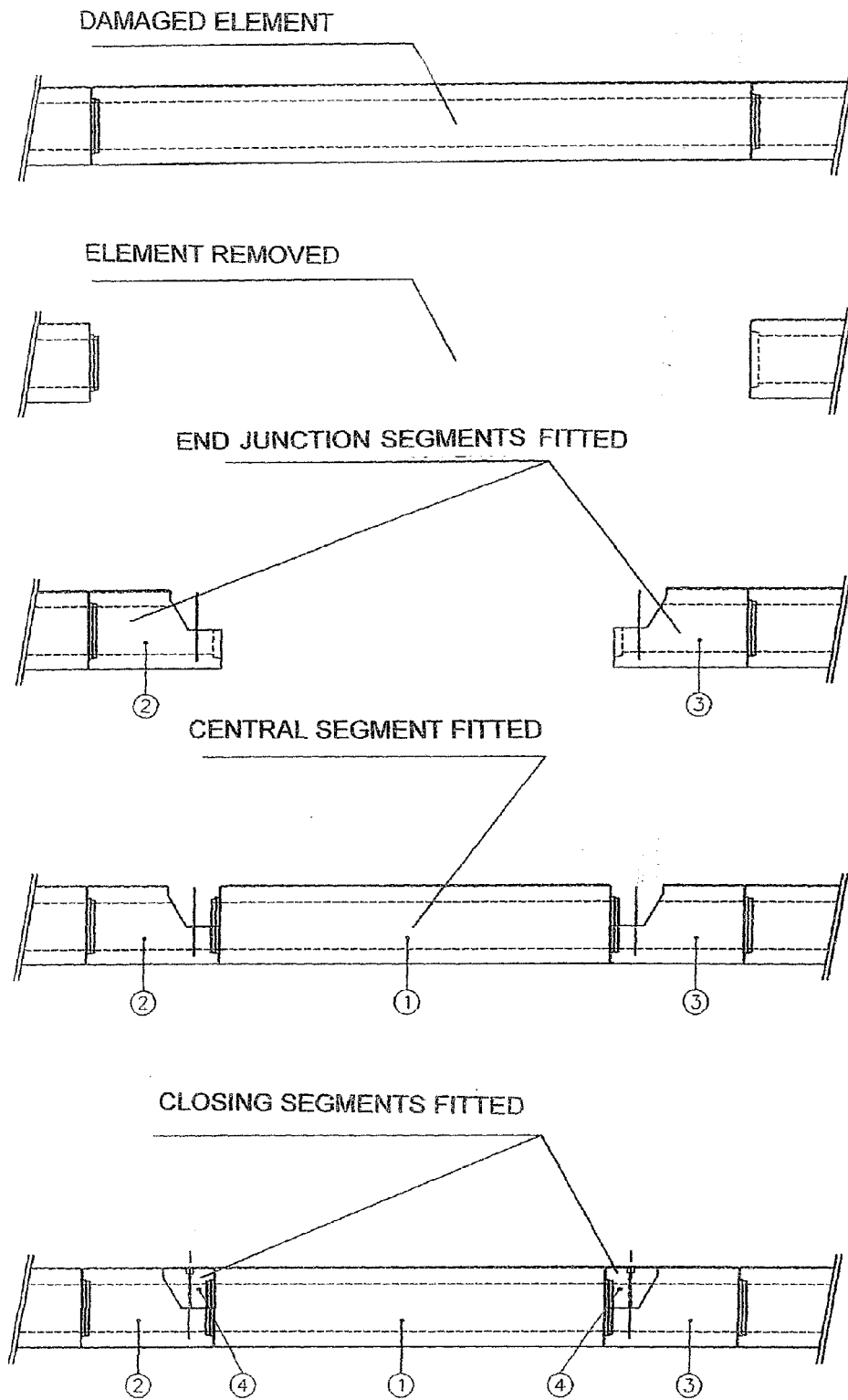


Fig.2

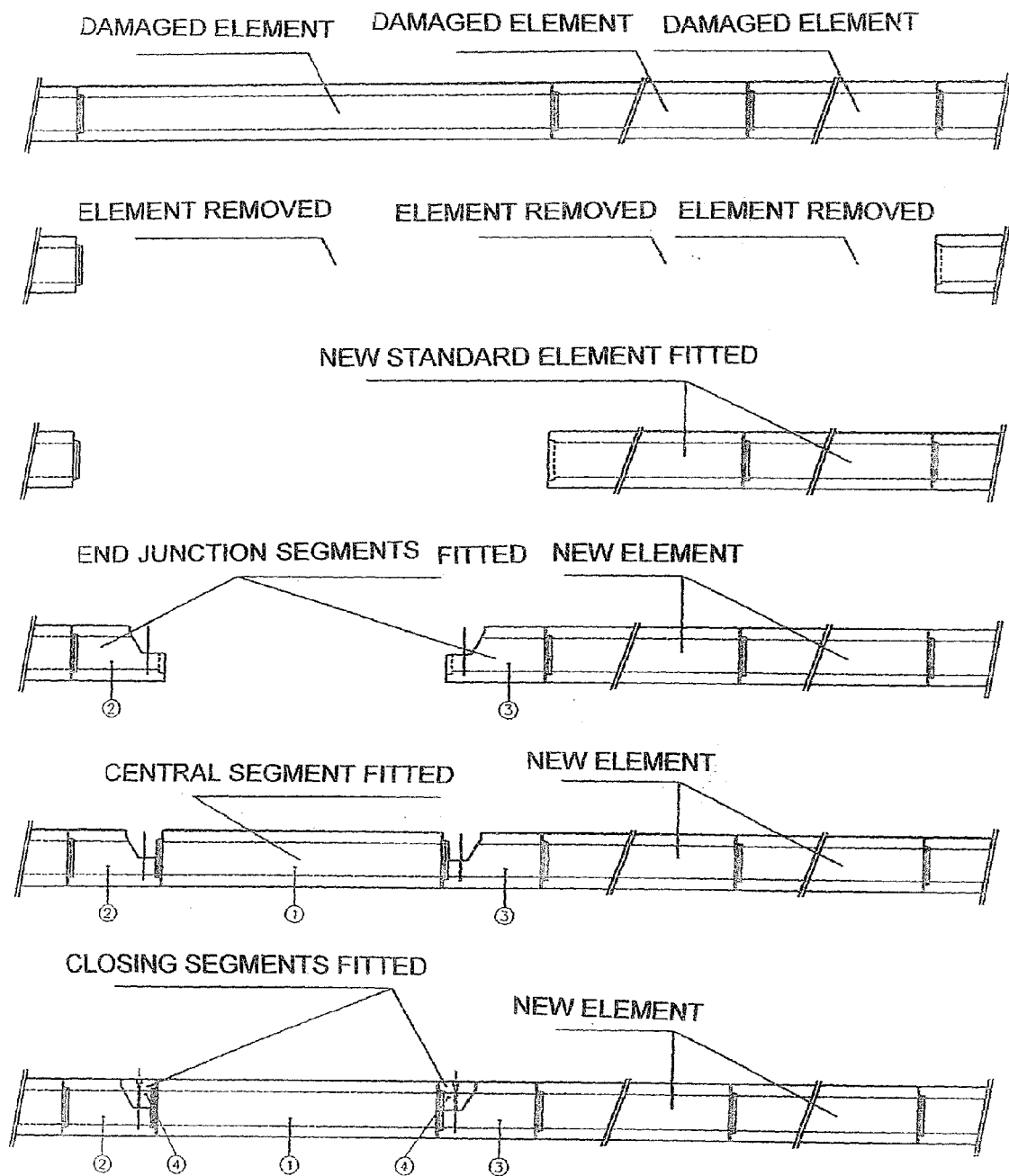


Fig. 3

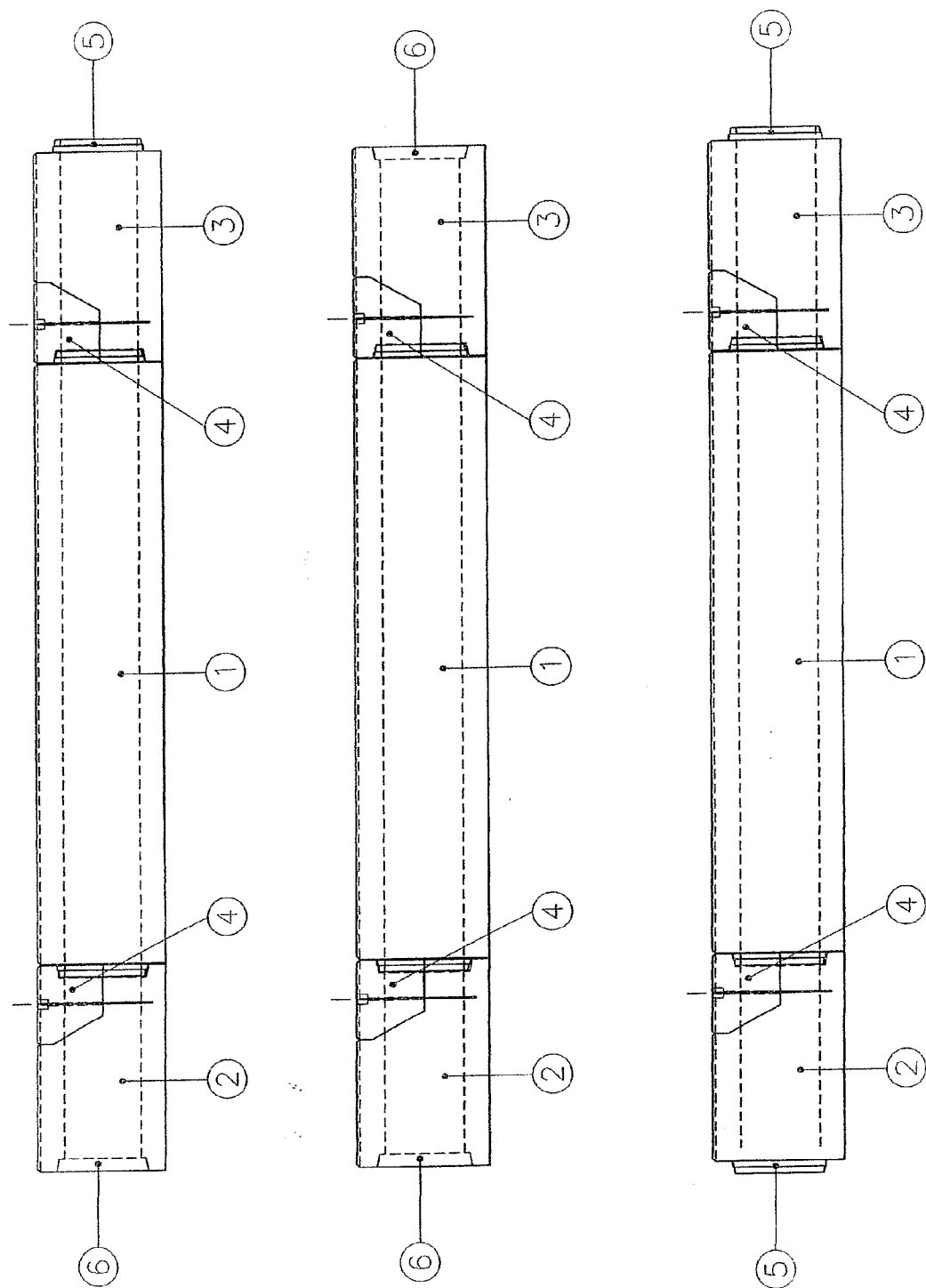


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 46 6026

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		8 May 2008	Flores Hokkanen, P
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 46 6026

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08-05-2008

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