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(54) **METHOD FOR INSTALLING A GUIDE RAIL AND A GUIDE RAIL**

(57) The invention relates to a method for installing a guide rail (1) to an elevator shaft, in which the guide rail (1) is installed to a wall of the elevator shaft through wall brackets (4) by assembly in phases from the bottom of the elevator shaft upwards. The guide rail (1) comprises multiple primary guide rail members (2) and multiple secondary guide rail members (3) connected together for forming the guide rail (1). The invention also relates to a guide rail.

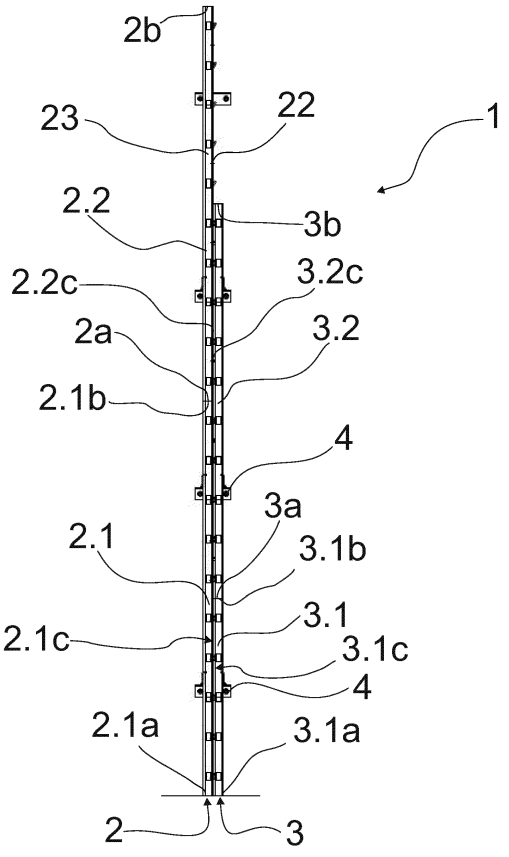

Fig.1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method for installing a guide rail, and more particularly to a method according to the independent claim 1.

[0002] The present invention also relates to a guide rail of an elevator, and more particularly to a guide rail according to the independent claim 10.

BACKGROUND OF THE INVENTION

[0003] Guide rails are used to guide the vertical movement of an elevator in an elevator shaft. There are two guide rails on the opposite walls of the elevator shaft and the elevator is linked to the guide rails through guide shoes or guide rollers facing the guide rails. Guide rails are constructed from multiple guide rail sections that are connected to each other from their vertical ends to form a continuous guiding structure for the elevator. The connection between two adjacent guide rail sections is secured through a connecting element, for example a fishplate that is attached to both guide rail sections through bolts or similar. The guide rails are attached to the walls of the elevator shaft through brackets.

[0004] Guide rails are typically installed in the elevator shaft in a bottom-up manner. The vertical line in which each guide rail should run is first established with the aid of a plumb line or a laser beam. The two bottom-most guide rail sections, one on each opposite wall of the elevator shaft, are then attached to the walls through the brackets. The straightness of the guide rail sections is checked and adjusted through the brackets if necessary. Then, the next pair of guide rail sections is mounted on top of the first pair and attached to the wall as the previous guide rail sections. The straightness of the guide rail sections is checked in relation to the guide rail section below and adjusted through the brackets if necessary. The fishplate is then added at the formed junction and the ends are aligned. The process is repeated until both guide rails are complete.

[0005] Prior art guide rails are usually assembled from multiple long guide rail sections that are made as a solid piece. Problem with these solid and long guide rail sections is that they are heavy and difficult to handle in the elevator shaft when installed. As earlier mentioned guide rails are constructed from multiple guide rail sections that are connected to each other from their vertical ends to form a continuous guiding structure which means that the guide rails although being a continuous guiding structure have also a point of discontinuity in the junction of two adjacent guide rail sections. This point of discontinuity extends the whole width of the guide rail in horizontal direction. Problem with discontinuity extending the whole width of the guide rail is that it may cause vibrations which are unpleasant for the users of the elevator.

BRIEF DESCRIPTION OF THE INVENTION

[0006] An object of the present invention is thus to provide a method for installing a guide rail and a guide rail so as to alleviate the above disadvantages. The objects of the invention are achieved by a method for installing a guide rail and a guide rail which are characterized by what is stated in the independent claims. The preferred embodiments of the invention are disclosed in the dependent claims.

[0007] The invention is based on the idea of providing a guide rail that is assembled from multiple guide rail members forming guide rail sections. The guide rail members are manufactured from metal plate and preferably from laser cutted plate and comprise an attachment structure for connecting the guide rail members together. In one embodiment of the invention the attachment structure is made by punching the metal plate so that claws or nails are formed that will attach together when reversed attachment structures are connected together. The guide rail member is preferably made by bending a metal plate in an angle, for example with an edging press, such that two plate portions are formed in about 90° angles to each other. The other plate portion comprising claws, which can be made by laser cutting and the other plate portion comprises for example a groove or a fold extending the outer edge of the plate. The groove or the fold can be used for connecting the guide rail member to a wall bracket.

[0008] The invention is further based on the idea of installing the guide rail from the bottom of the elevator shaft upwards such that the guide rail is assembled from members that can be easily handled and connected together for forming a continuous guide rail.

[0009] In the method for installing a guide rail to an elevator shaft, the guide rail is installed to a wall of the elevator shaft through wall brackets by assembly in phases from the bottom of the elevator shaft upwards. The guide rail comprises multiple primary guide rail members and multiple secondary guide rail members connected together for forming the guide rail. The method comprises the following steps: providing a first primary guide rail member, which the first primary guide rail member comprises a first end and a second end, and an attachment structure arranged between the first end and the second end; providing a first secondary guide rail member, which the first secondary guide rail member comprises a third end and a fourth end and an attachment structure arranged between the third end and the fourth end; connecting the first primary guide rail member and the first secondary guide rail member together through the attachment structures such that the first primary guide rail member and the first secondary guide rail member extend adjacently together and that the fourth end of the first secondary guide rail member is arranged between the first end and the second end of the first primary guide rail member for forming a first guide rail section.

[0010] The guide rail of an elevator comprises a first

guide rail section and one or more second guide rail sections extending from the first guide rail section upwards in an elevator shaft for forming a continuous guide rail. The first guide rail section comprises a first primary guide rail member and a first secondary guide rail member. The first primary guide rail member comprises a first end and a second end, and an attachment structure arranged between the first end and the second end. The first secondary guide rail member comprises a third end and a fourth end and an attachment structure arranged between the third end and the fourth end. The first primary guide rail member and the first secondary guide rail member are connected together through the attachment structures such that the first primary guide rail member and the first secondary guide rail member are arranged to extend adjacently together and that the fourth end of the first secondary guide rail member is arranged between the first end and the second end of the first primary guide rail member for forming the first guide rail section. The second guide rail section comprises a second primary guide rail member and a second secondary guide rail member. The second primary guide rail member comprises a first end and a second end, and an attachment structure arranged between the first end and the second end. The second secondary guide rail member comprises a third end and a fourth end and an attachment structure arranged between the third end and the fourth end. The second primary guide rail member and the second secondary guide rail member are connected together through the attachment structures such that the second primary guide rail member and the second secondary guide rail member are arranged to extend adjacently together and that the fourth end of the second secondary guide rail member is arranged between the first end and the second end of the second primary guide rail member for forming the second guide rail section.

[0011] By a guide rail herein is meant a continuous rail that guides the substantially vertical movement of an elevator shaft. By a guide rail section is meant a section of a guide rail that is attached from its one end to an adjacent guide rail section or from its both ends to two adjacent guide rail sections.

[0012] An advantage of the method and the guide rail of the invention are that the guide rail is installed to the wall of the elevator shaft in short pieces, which are easily transported to the installation site. The short rail guide members save cost in transportation and in logistics as well as in installation due to easier handling inside the building. The short guide rail members are also lighter so they are easy to handle by fitters, which means also less physical load. Another advantage of the guide rail according to the invention is that there is no need for fish plates which are normally added to the formed junction between adjacent rail guide sections. This means cost savings because no need for fish plates nor for bolts and nuts relating to the fish plates and also a lot of cost savings for installation and less material movements on site.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the following the invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings, in which

Figure 1 presents an overview of one embodiment of the invention;
Figure 2 presents a guide rail section as seen from front; and
Figure 3 presents a guide rail section as seen from side.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Figure 1 shows a guide rail 1 according to the invention, which the guide rail 1 comprises multiple primary guide rail members 2 and multiple secondary guide rail members 3 connected together for forming the guide rail 1. The guide rail 1 is installed to the elevator shaft by installing wall brackets 4 to the wall of the elevator shaft.

[0015] Figure 1 shows a first primary guide rail member 2.1 comprising a first end 2.1a and a second end 2.1b, and an attachment structure 2.1 c arranged between the first end 2.1 a and the second end 2.1 b is and a first secondary guide rail member 3.1 comprising a third end 3.1 a and a fourth end 3.1b and an attachment structure 3.1c arranged between the third end 3.1 a and the fourth end 3.1 b, which the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 start the guide rail 1 from the bottom part of the elevator shaft. The first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected together through the attachment structures 2.1c, 3.1c such that the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 extend adjacently together and that the fourth end 3.1b of the first secondary guide rail member 3.1 is arranged between the first end 2.1a and the second end 2.1b of the first primary guide rail member 2.1 for forming a first guide rail section 23.1. In this embodiment of the invention the first secondary guide rail member 3.1 is half the length of the first primary guide rail member 2.1, for example the first having the length of 2 meters and the second having the length of 1 meter, but the invention is not limited to that. Both the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 can be of the same length in which case they are arranged to the wall of the elevator shaft such that they begin from different height levels so that when connected together the fourth end 3.1 b of the first secondary guide rail member 3.1 is arranged between the first end 2.1 a and the second end 2.1b of the first primary guide rail member 2.1. The length difference between the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 can also be something else than the half-length.

[0016] As said above the first primary guide rail member 2.1 and the first secondary guide rail member 3.1

form a first guide rail section 23.1. This is shown in figure 2. In one embodiment of the invention the first guide rail section 23.1. is fitted to the wall bracket 4 and connected there. This means that both the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected together to the wall of the elevator shaft such that the first guide rail section 23.1 is connected to the wall of the elevator shaft through the wall brackets 4. In other words, the method further comprises the step of connecting the first guide rail section 23.1 to the wall of the elevator shaft through the wall brackets 4.

[0017] In another embodiment of the invention the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected to the wall separately such that the first primary guide rail member 2.1 is first connected to the wall of the elevator shaft through the wall brackets 4 and then the first secondary guide rail member 3.1 is connected to the wall of the elevator shaft through the wall brackets 4 and finally the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected together through the attachment structures 2.1c, 3.1c. In other words the method further comprises the steps of connecting the first primary guide rail member 2.1 to the wall of the elevator shaft through the wall brackets 4; and connecting the first secondary guide rail member 3.1 to the wall of the elevator shaft through the wall brackets 4; and connecting the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 together through the attachment structures 2.1c, 3.1c such that the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 extend adjacently together and that the fourth end 3.1b of the first secondary guide rail member 3.1 is arranged between the first end 2.1a and the second end 2.1b of the first primary guide rail member 2.1 for forming a first guide rail section 23.1.

[0018] In still another embodiment of the invention the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected to the wall separately such that the first primary guide rail member 2.1 is first connected to the wall of the elevator shaft through the wall brackets 4 and then the first secondary guide rail member 3.1 is connected to the first primary guide rail member 2.1 through the attachment structures 2.1c, 3.1c and finally the first secondary guide rail member 3.1 is connected to the wall of the elevator shaft through the wall brackets 4. In other words, the method further comprises the steps of connecting the first primary guide rail member 2.1 to the wall of the elevator shaft through the wall brackets 4; connecting the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 together through the attachment structures 2.1c, 3.1c such that the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 extend adjacently together and that the fourth end 3.1b of the first secondary guide rail member 3.1 is arranged between the first end 2.1a and the second end 2.1 b of the first primary guide rail member 2.1 for forming a first guide rail section 23.1; and connecting the first secondary guide rail member 3.1 to the wall of the elevator shaft through the wall brackets 4.

[0019] As said above and as can be seen from figure 1 the guide rail 1 comprises multiple primary guide rail members 2 and multiple secondary guide rail members 3. The lowest primary guide rail member 2 is called the first primary guide rail member 2.1 because it starts the guide rail 1 and the lowest secondary guide rail member 3 is called the first secondary guide rail member 3.1 for the same reason, i.e. starting the guide rail 1 although the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 can also be arranged such that they do not start from the same height level especially when having the same length. The next primary and secondary guide rail members 2, 3 are called second primary and second secondary guide rail members 2.2, 3.2. When the second primary and second secondary guide rail members 2.2, 3,2 are connected together they form a second guide rail section 23.2. In a preferred embodiment of the invention the first secondary guide rail member 3.1 is shorter than the following one or more second secondary guide rail members 3.2 as shown in figure 1.

[0020] In an embodiment of the invention one or more second guide rail sections 23.2 are connected such that the one or more second guide rail sections 23.2 extend from the first guide rail section 23.1 for forming a continuous guide rail 1. The second guide rail section 23.2 comprises a second primary guide rail member 2.2 and a second secondary guide rail member 3.2. The a second secondary guide rail member 3.2 comprises a third end 3.2a and a fourth end 3.2b and an attachment structure 3.2c arranged between the third end 3.2a and the fourth end 3.2b and the second primary guide rail member 2.2 comprises a first end 2.2a and a second end 2.2b, and an attachment structure 2.2c arranged between the first end 2.2a and the second end 2.2b. The second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2. In other words, the method further comprises the step of installing one or more second guide rail sections 23.2 such that the one or more second guide rail sections 23.2 extend from the first guide rail section 23.1 for forming a continuous guide rail 1, said second guide rail section 23.2 comprising a second primary guide rail member 2.2 and a second secondary guide rail member 3.2. The method still further comprises the steps of providing a second secondary guide rail member 3.2, which the second secondary guide rail member 3.2 comprises a third end 3.2a and a fourth end 3.2b and an attachment structure 3.2c arranged between the third end 3.2a and the fourth end 3.2b; providing a second primary guide rail member 2.2, which the second primary guide rail member 2.2 com-

prises a first end 2.2a and a second end 2.2b, and an attachment structure 2.2c arranged between the first end 2.2a and the second end 2.2b; and connecting the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2.

[0021] In a preferred embodiment of the invention the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structure 2.2c, 3.2c for forming a second guide rail section 23.2. The second guide rail section 23.2. is connected to the first guide rail section 23.1 through the attachment structures 2.1c, 3.2c of the first primary guide rail member 2.1 and of the second secondary guide rail member 3.2 for forming a continuous guide rail 1.

[0022] In another embodiment of the invention the second secondary guide rail member 3.2 is connected to the wall of the elevator shaft through the wall brackets 4 and the second primary guide rail member 2.2 is connected to the wall of the elevator shaft through the wall brackets 4 and then the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2. The second guide rail section 23.2 is connected to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member 2.1 through the attachment structures 2.1 c, 3.2c. In other words, the method further comprises the steps of connecting the second secondary guide rail member 3.2 to the wall of the elevator shaft through the wall brackets 4; and connecting the second primary guide rail member 2.2 to the wall of the elevator shaft through the wall brackets 4; and connecting the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2.

[0023] In another embodiment of the invention the second secondary guide rail member 3.2 is connected to the wall of the elevator shaft through the wall brackets 4, then the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2 and finally the second primary guide rail member 2.2 is connected to the wall of the elevator shaft through the wall brackets 4. The second guide rail section 23.2 is connected to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member 2.1 through the attachment structures 2.1c, 3.2c. In other words, the method further comprises the steps of connecting the second secondary guide rail member 3.2 to the wall of the elevator shaft through the wall brackets 4; connecting the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2.; and connecting the second primary guide rail member 2.2 to the wall of the elevator shaft through the wall brackets 4.

[0024] In still another embodiment of the invention the second secondary guide rail member 3.2 is connected to the wall of the elevator shaft through the wall brackets 4 and the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2 and finally the second primary guide rail member 2.2 is connected to the wall of the elevator shaft through the wall brackets 4. The second guide rail section 23.2 is connected to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member 2.1 through the attachment structures 2.1 c, 3.2c.

[0025] In case there are multiple second guide rail sections 23.2 then the second secondary guide rail member 3.2 is connected to the second primary guide rail member 2.2 of the lower second guide rail section 23.2 through the attachment structures 2.2c, 3.2c. In other words, the method further comprises the step of connecting the second guide rail section 23.2 to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member 2.1 or the second secondary guide rail member 3.2 is connected to the second primary guide rail member 2.2 through the attachment structures 2.1 c, 2.2c, 3.2c.

[0026] In an embodiment of the invention the second guide rail section 23.2 is connected to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member

2.1 or the second secondary guide rail member 3.2 is connected to the second primary guide rail member 2.2 of the lower secondary guide rail section 23.2 through the attachment structures 2.1c, 2.2c, 3.2c and then the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2.

[0027] In a preferred embodiment of the invention the primary guide rail members 2 and the secondary guide rail members 3 are connected to the wall brackets 4 through guide rail brackets 5a. This means that when connecting the first or second primary guide rail member 2.1, 2.2 or the first or the second secondary guide rail member 3.1, 3.2 to the wall of the elevator shaft through wall brackets 4 the guide rail brackets 5a are connected to the primary and the secondary guide rail members 2, 3 and the guide rail brackets 5a are connected to the wall bracket 4.

[0028] In a preferred embodiment of the invention the primary and the secondary guide rail members 2, 3 are connected to the wall brackets 4 arranged in the wall of the elevator shaft though two guide rail brackets.

[0029] The guide rail 1 of an elevator according to the invention comprises a first guide rail section 23.1 and one or more second guide rail sections 23.2 extending from the first guide rail section 23.1 upwards in an elevator shaft for forming a continuous guide rail 1. The first guide rail section comprises a first primary guide rail member 2.1 comprising a first end 2.1 a and a second end 2.1b, and an attachment structure 2.1c arranged between the first end 2.1 a and the second end 2.1 b and a first secondary guide rail member 3.1 comprises a third end 3.1a and a fourth end 3.1b and an attachment structure 3.1c arranged between the third end 3.1a and the fourth end 3.1b. The first primary guide rail member 2.1 and said first secondary guide rail member 3.1 are connected together through the attachment structures 2.1c, 3.1c such that the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are arranged to extend adjacently together and that the fourth end 3.1b of the first secondary guide rail member 3.1 is arranged between the first end 2.1 a and the second end 2.1 b of the first primary guide rail member 2.1 for forming the first guide rail section 23.1. The second guide rail section 23.2 comprises a second primary guide rail member 2.2 comprising a first end 2.2a and a second end 2.2b, and an attachment structure 2.2c arranged between the first end 2.2a and the second end 2.2b and a second secondary guide rail member 3.2 comprising a third end 3.2a and a fourth end 3.2b and an attachment structure 3.2c arranged between the third end 3.2a and the fourth end 3.2b. The second primary guide rail member 2.2 and said second secondary guide rail member 3.2 are connected together through the attachment structures 2.2c, 3.2c such that the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 are arranged to extend adjacently together and that the fourth end 3.2c of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2. The first guide rail section 23.1 and the next upper second guide rail section 23.2 are connected together such that the second secondary guide rail member 3.2 of the next upper guide rail section 23.2 and the first primary guide rail member 2.1 of the first guide rail section 23.1 are connected together through the attachment structures 3.2c, 2.1 c.

[0030] In an embodiment of the invention the first guide rail section 23.1 comprises a first secondary guide rail member 3.1 having half the length of the first primary guide rail member 2.1.

[0031] As shown in figure 3 the first primary guide rail member 2.1 comprises a first plate portion 12 and a second plate portion 13, which the first and the second plate portions 12, 13 are arranged in an angle to each other. The first plate portion 12 is arranged against the wall of an elevator shaft and the second plate portion 13 comprises an attachment structure 2.1c through which the first primary guide rail member 2.1 and the first secondary guide rail member 3.1 are connected together. Although only the first primary guide rail member 2.1 is shown in figure 3 this applies also to the first secondary guide rail member 3.1 such that the plate portions of the secondary guide member are mirror image to the plate portions of the primary guide member. This applies also to the second primary guide rail member and second secondary guide rail member (although not shown in figure 3) such that the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 comprise a first plate portion 22 and a second plate portion 23, the first and the second plate portions 22, 23 are arranged in an angle to each other, the first plate portion 22 is arranged against the wall of an elevator shaft and the second plate portion 23 comprises an attachment structure through which the second primary and the second secondary guide rail members 2.2, 3.2 are connected together. In other words, the guide rail according to the invention having the primary and the secondary guide rail members 2.1, 2.2, 3.1, 3.2 comprise a first plate portion 12, 13 and a second plate portion 22, 23, the first and the second plate portions 12, 13, 22, 23 are arranged in an angle to each other, the first plate portion 12, 13 is arranged against the wall of an elevator shaft and the second plate portion 22, 23 comprises an attachment structure through which the primary and the secondary guide rail members 2.1, 2.2, 3.1, 3.2 are connected together.

[0032] The guide rail 1 according to the invention further comprises one or more guide rail brackets 5 for connecting the first primary guide rail member 2.1, the second primary guide rail member 2.2, the first secondary

guide rail member 3.1 or the second secondary guide rail member 3.2 to the wall of the elevator shaft. The guide rail brackets 5 comprising a first bracket portion 5.1 comprising an attachment structure for attaching the guide rail bracket 5 to the guide rail member 2.1, 2.2, 3.1, 3.2, a second bracket portion 5.2 comprising a first aperture for connecting the guide rail bracket 5 of a primary guide rail member 2.1, 2.2 and the guide rail bracket 5 of the adjacent secondary guide rail member 3.1, 3.2 together with a connector; and a third bracket portion 5.3 comprising a second aperture 12 for connecting the guide rail bracket 5 to a wall bracket 4 arranged in the wall of the elevator shaft with a connector for connecting the guide rail 1 to the wall of an elevator shaft. The first bracket portion 5.1, the second bracket portion 5.2 and the third bracket portion 5.3 are arranged in an angle with respect to each other for forming an integral guide rail bracket 5.

[0033] The first primary guide rail member 2.1, the second primary guide rail member 2.2, the first secondary guide rail member 3.1 and the second secondary guide rail member 3.2 are made of metal plate and have the length of 1.0 - 2,5 metre. In a preferred embodiment of the invention all the guide rail members have the length of 2 meter except the second guider rail member forming the first guide rail section 23.1 and especially in the case that the guide rail members forming the first guide rail section 23.1 are arranged at the same height level, i.e. starting from the same level. In a preferred embodiment of the invention the guide rail members are laser cutted plate having the thickness of 6 -8 mm and comprising a punching structure as the attachment structure.

[0034] The installation of the guide rails 1 to the elevator shaft can be performed automatically with an installation apparatus comprising an installation platform provided with an industry robot and an apparatus for aligning the guide rails. Preferably the first guide rail section 23.1 is installed manually to the opposing walls of the elevator shaft and then the installation apparatus is arranged between the first guide rail sections 23.1 to be movable with a hoist arranged on the upper part of the elevator shaft. The installation apparatus comprises attachment means to attach the installation apparatus with the attachment means to the guide rail such that the second guide rail section 23.2 can be installed to the wall automatically with the industry robot arranged on the installation platform. The installation of the second guide rail sections 23.2 are performed with the installation apparatus which positions and adjusts the opposing guide rail sections on their places on the wall of the elevator shaft and connects them to the wall of the elevator shaft through the wall brackets 4. The installation apparatus moves to a next height location along the installed guide rail section when the installation of that guide rail section is completed. The installation apparatus may perform measurements, alignments, drilling, fixing and all the tasks that are necessary in installation of the guide rails. The installation apparatus may comprise multiple industry robots that are arranged to operate the tasks necessary to complete the installation work automatically. The guide rail members can be lifted together with the installation apparatus or they may be lifted with another platform arranged in connection with a counterweight guide rails.

[0035] In a preferred embodiment of the invention the method for installing a guide rail 1 to an elevator shaft comprises the step of installing one or more second guide rail sections 23.2 automatically with an installation apparatus comprising at least one industry robot arranged in an installation platform. Said installation apparatus is arranged to perform one or more of the following steps: arranging wall brackets to the wall of the elevator shaft; installing one or more second guide rail sections 23.2 such that the one or more second guide rail sections 23.2 extend from the first guide rail section 23.1 for forming a continuous guide rail 1 and said second guide rail section 23.2 comprising a second primary guide rail member 2.2 and a second secondary guide rail member 3.2; connecting the second primary guide rail member 2.2 and the second secondary guide rail member 3.2 together through the attachment structures 2.2c, 3.2c such that the fourth end 3.2b of the second secondary guide rail member 3.2 is arranged between the first end 2.2a and the second end 2.2b of the second primary guide rail member 2.2 for forming the second guide rail section 23.2; connecting the second secondary guide rail member 3.2 to the wall of the elevator shaft through the wall brackets 4; connecting the second primary guide rail member 2.2 to the wall of the elevator shaft through the wall brackets 4; connecting the second guide rail section 23.2 to the first guide rail section 23.1 or to the next lower second guide rail section 23.2 such that the second secondary guide rail member 3.2 is connected to the first primary guide rail member 2.1 or the second secondary guide rail member 3.2 is connected to the second primary guide rail member 2.2 through the attachment structures 2.1 c, 2.2c, 3.2c.

[0036] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. Method for installing a guide rail (1) to an elevator shaft, in which the guide rail (1) is installed to a wall of the elevator shaft through wall brackets (4) by assembly in phases from the bottom of the elevator shaft upwards, **characterized in that** the guide rail (1) comprises multiple primary guide rail members (2) and multiple secondary guide rail members (3) connected together for forming the guide rail (1), the method comprises the steps of:

    a) providing a first primary guide rail member

(2.1), which the first primary guide rail member (2.1) comprises a first end (2.1 a) and a second end (2.1 b), and an attachment structure (2.1 c) arranged between the first end (2.1 a) and the second end (2.1b);
b) providing a first secondary guide rail member (3.1), which the first secondary guide rail member (3.1) comprises a third end (3.1 a) and a fourth end (3.1b) and an attachment structure (3.1c) arranged between the third end (3.1 a) and the fourth end (3.1b);
c) connecting the first primary guide rail member (2.1) and the first secondary guide rail member (3.1) together through the attachment structures (2.1c, 3.1c) such that the first primary guide rail member (2.1) and the first secondary guide rail member (3.1) extend adjacently together and that the fourth end (3.1b) of the first secondary guide rail member (3.1) is arranged between the first end (2.1 a) and the second end (2.1 b) of the first primary guide rail member (2.1) for forming a first guide rail section (23.1).

2. Method according to claim 1, **characterized in that** the method further comprises the step of:

d) connecting the first guide rail section (23.1) to the wall of the elevator shaft through the wall brackets (4).

3. Method according to claim 1, **characterized in that** the method further comprises the steps of:

e) connecting the first primary guide rail member (2.1) to the wall of the elevator shaft through the wall brackets (4); and
f) connecting the first secondary guide rail member (3.1) to the wall of the elevator shaft through the wall brackets (4);

performing the step e) before the step c) and performing the step f) after the step c); or
performing the steps e) and f) before the step c).

4. Method according to claim 1, **characterized in** by installing one or more second guide rail sections (23.2) such that the one or more second guide rail sections (23.2) extend from the first guide rail section (23.1) for forming a continuous guide rail (1), said second guide rail section (23.2) comprising a second primary guide rail member (2.2) and a second secondary guide rail member (3.2).

5. Method according to claim 4, **characterized in that** the method further comprises the steps of:

g) providing a second secondary guide rail member (3.2), which the second secondary guide rail member (3.2) comprises a third end (3.2a) and a fourth end (3.2b) and an attachment structure (3.2c) arranged between the third end (3.2a) and the fourth end (3.2b);
h) providing a second primary guide rail member (2.2), which the second primary guide rail member (2.2) comprises a first end (2.2a) and a second end (2.2b), and an attachment structure (2.2c) arranged between the first end (2.2a) and the second end (2.2b);
i) connecting the second primary guide rail member (2.2) and the second secondary guide rail member (3.2) together through the attachment structures (2.2c, 3.2c) such that the fourth end (3.2b) of the second secondary guide rail member (3.2) is arranged between the first end (2.2a) and the second end (2.2b) of the second primary guide rail member (2.2) for forming the second guide rail section (23.2).

6. Method according to claim 5, **characterized in that** the method further comprises the steps of:

j) connecting the second secondary guide rail member (3.2) to the wall of the elevator shaft through the wall brackets (4); and
k) connecting the second primary guide rail member (2.2) to the wall of the elevator shaft through the wall brackets (4); and

performing the step j) before the step i) and performing step k) after step i); or performing the steps j) and k) before the step i).

7. Method according to claims 5 or 6, **characterized in that** the method comprises the step of:

l) connecting the second guide rail section (23.2) to the first guide rail section (23.1) or to the next lower second guide rail section (23.2) such that the second secondary guide rail member (3.2) is connected to the first primary guide rail member (2.1) or the second secondary guide rail member (3.2) is connected to the second primary guide rail member (2.2) through the attachment structures (2.1c, 2.2c, 3.2c).

8. Method according to claim 7, **characterized by** performing the step l) before the step i).

9. Method according to any preceding claims, **characterized in that** the method comprises the step of:

m) providing guide rail brackets (5a) for connecting the primary guide rail member (2) and the secondary guide rail member (3) to the wall brackets (4); and

the steps d), e), f), j) and/or k) comprises the steps of:

n) connecting the guide rail bracket (5a) to the primary and the secondary guide rail members (2, 3); and

o) connecting the guide rail bracket (5a) to the wall bracket (4).

10. A guide rail (1) of an elevator, **characterized in that** the guide rail (1) comprises a first guide rail section (23.1) and one or more second guide rail sections (23.2) extending from the first guide rail section (23.1) upwards in an elevator shaft for forming a continuous guide rail (1) in which the first guide rail section comprises:

a first primary guide rail member (2.1), the first primary guide rail member (2.1) comprises a first end (2.1 a) and a second end (2.1b), and an attachment structure (2.1c) arranged between the first end (2.1 a) and the second end (2.1b); and

a first secondary guide rail member (3.1), the first secondary guide rail member (3.1) comprises a third end (3.1 a) and a fourth end (3.1b) and an attachment structure (3.1c) arranged between the third end (3.1 a) and the fourth end (3.1b);

said first primary guide rail member (2.1) and said first secondary guide rail member (3.1) are connected together through the attachment structures (2.1c, 3.1c) such that the first primary guide rail member (2.1) and the first secondary guide rail member (3.1) are arranged to extend adjacently together and that the fourth end (3.1 b) of the first secondary guide rail member (3.1) is arranged between the first end (2.1 a) and the second end (2.1b) of the first primary guide rail member (2.1) for forming the first guide rail section (23.1); and

the second guide rail section (23.2) comprises:

a second primary guide rail member (2.2), the second primary guide rail member (2.2) comprises a first end (2.2a) and a second end (2.2b), and an attachment structure (2.2c) arranged between the first end (2.2a) and the second end (2.2b); and

a second secondary guide rail member (3.2), which the second secondary guide rail member (3.2) comprises a third end (3.2a) and a fourth end (3.2b) and an attachment structure (3.2c) arranged between the third end (3.2a) and the fourth end (3.2b);

said second primary guide rail member (2.2) and said second secondary guide rail member (3.2) are connected together through the attachment structures (2.2c, 3.2c) such that the second primary guide rail member (2.2) and the second secondary guide rail member (3.2) are arranged to extend adjacently together and that the fourth end (3.2c) of the second secondary guide rail member (3.2) is arranged between the first end (2.2a) and the second end (2.2b) of the second primary guide rail member (2.2) for forming the second guide rail section (23.2).

11. A guide rail (1) according to claim 10, **characterized in that** the first guide rail section (23.1) and the next upper second guide rail section (23.2) are connected together such that the second secondary guide rail member (3.2) of the next upper guide rail section (23.2) and the first primary guide rail member (2.1) of the first guide rail section (23.1) are connected together through the attachment structures (3.2c, 2.1 c).

12. A guide rail (1) according to claim 10 or 11, **characterized in that** the first guide rail section (23.1) comprises a first secondary guide rail member (3.1) having half the length of the first primary guide rail member (2.1).

13. A guide rail (1) according to any of claims 10- 12, **characterized in that**

the primary and the secondary guide rail members (2.1, 2.2, 3.1, 3.2) comprise a first plate portion (12, 13) and a second plate portion (22, 23), the first and the second plate portions (12, 13, 22, 23) are arranged in an angle to each other, the first plate portion (12, 13) is arranged against the wall of an elevator shaft and the second plate portion (22, 23) comprises an attachment structure through which the primary and the secondary guide rail members (2.1, 2.2, 3.1, 3.2) are connected together.

14. A guide rail (1) according to any of claims 10 - 13, **characterized in that** the guide rail (1) further comprises one or more guide rail brackets (5) for connecting the first primary guide rail member (2.1), the second primary guide rail member (2.2.), the first secondary guide rail member (3.1) or the second secondary guide rail member (3.2) to the wall of the elevator shaft, said guide rail brackets (5) comprising:

a first bracket portion (5.1) comprising an attachment structure for attaching the guide rail bracket (5) to the guide rail member (2.1, 2.2, 3.1, 3.2);

a second bracket portion (5.2) comprising a first aperture for connecting the guide rail bracket (5) of a primary guide rail member (2.1, 2.2) and the guide rail bracket (5) of the adjacent secondary guide rail member (3.1, 3.2) together with a connector; and

a third bracket portion (5.3) comprising a second aperture (12) for connecting the guide rail brack-

et (5) to a wall bracket (4) arranged in the wall of the elevator shaft with a connector for connecting the guide rail (1) to the wall of an elevator shaft,
the first bracket portion (5.1), the second bracket portion (5.2) and the third bracket portion (5.3) are arranged in an angle with respect to each other for forming an integral guide rail bracket (5).

15. A guide rail (1) according to any of claims 10 - 14, **characterized in that** the first primary guide rail member (2.1), the second primary guide rail member (2.2), the first secondary guide rail member (3.1) and the second secondary guide rail member (3.2) are made of metal plate and have the length of 1,0 - 2,5 metre.

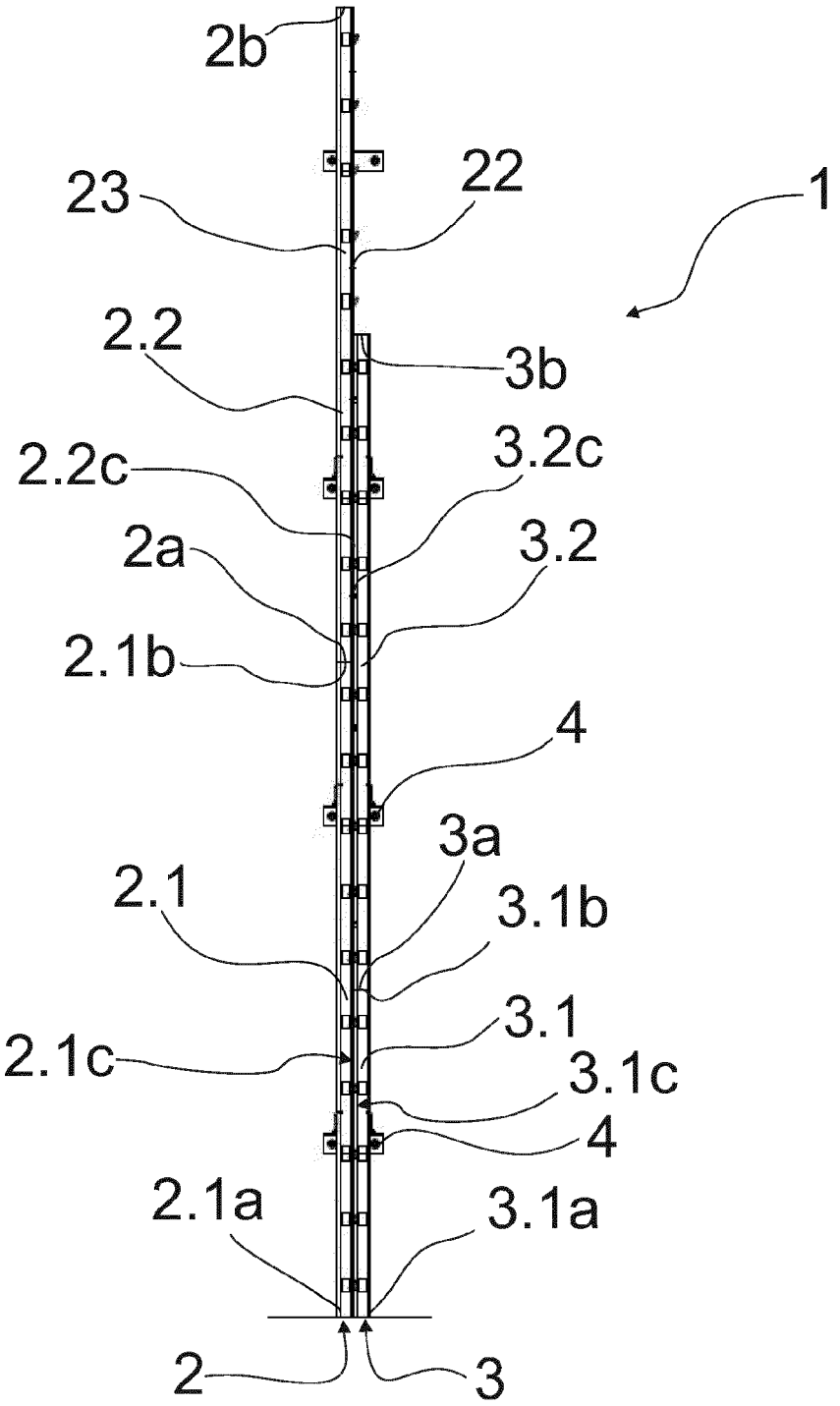

Fig.1

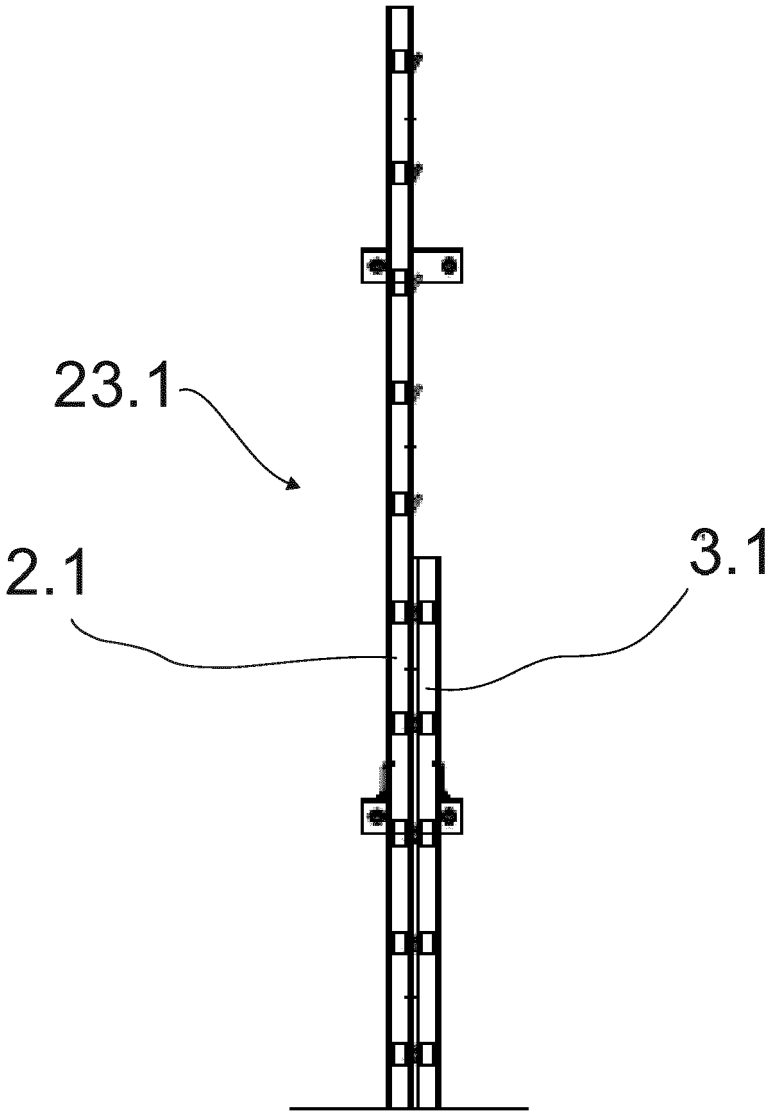

Fig.2

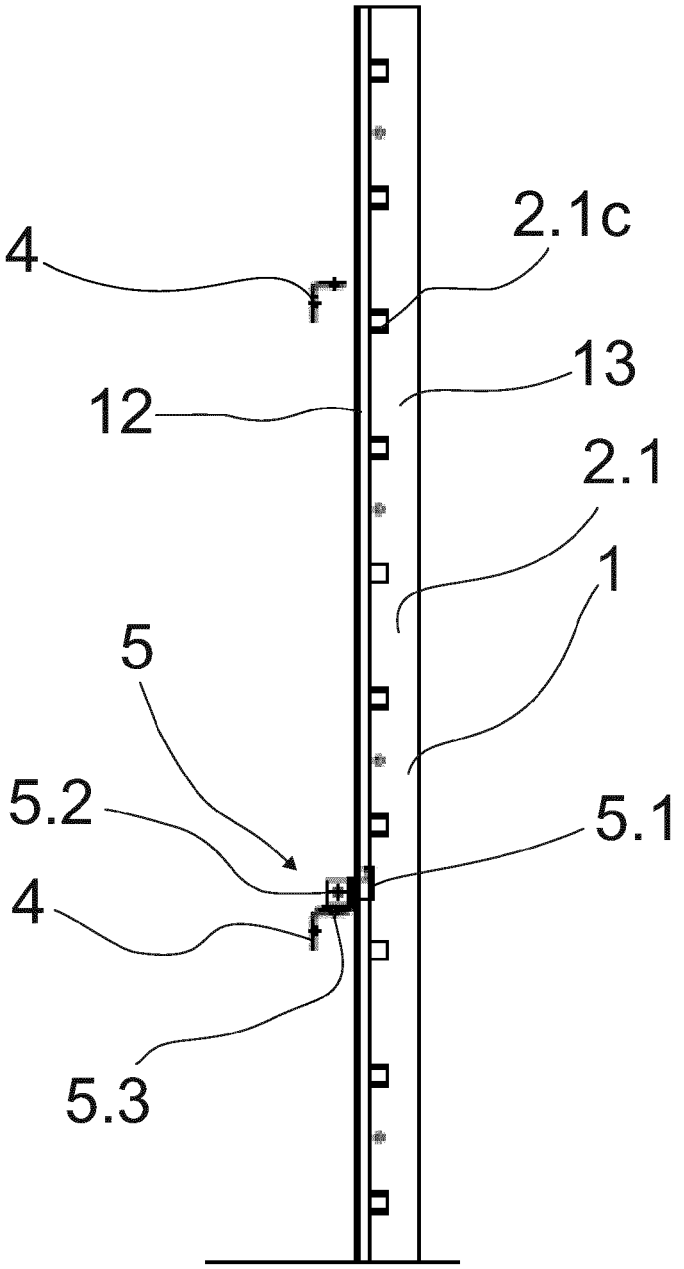

Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 4050

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	JP H10 203747 A (OTIS ELEVATOR CO) 4 August 1998 (1998-08-04) * abstract; figures 1-5 * -----	1,2,4,5, 7,8, 10-12,15 3,6,9, 13,14	INV. B66B19/00 B66B7/02
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TECHNICAL FIELDS SEARCHED (IPC)

B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 August 2015	Lenoir, Xavier

CATEGORY OF CITED DOCUMENTS

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26-08-2015

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