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(54) SYSTEM AND METHOD FOR CONSOLIDATING THE GROUND AROUND TUNNELS

(57) A system for manufacturing a service structure for the support of men and means working to consolidate the ground around a tunnel (**G**) overlying a way (**S**), the latter having a longitudinal extension along a first axis (**X**) and at least one opening (**A**) for the passage of one or more vehicles. The system comprises a load-bearing structure (**100**) having an extension along a second axis (**Y**) intended to be positioned above the way (**S**) at the at least one opening (**A**) of the tunnel (**G**) which comprises one or more support areas (**110**) for men or means during the operation, and a protection wall (**200**) designed to be interposed between the load-bearing structure (**100**) and the way (**S**). The protection wall (**200**) is substantially continuous so as to prevent men or objects from falling on the way (**S**).

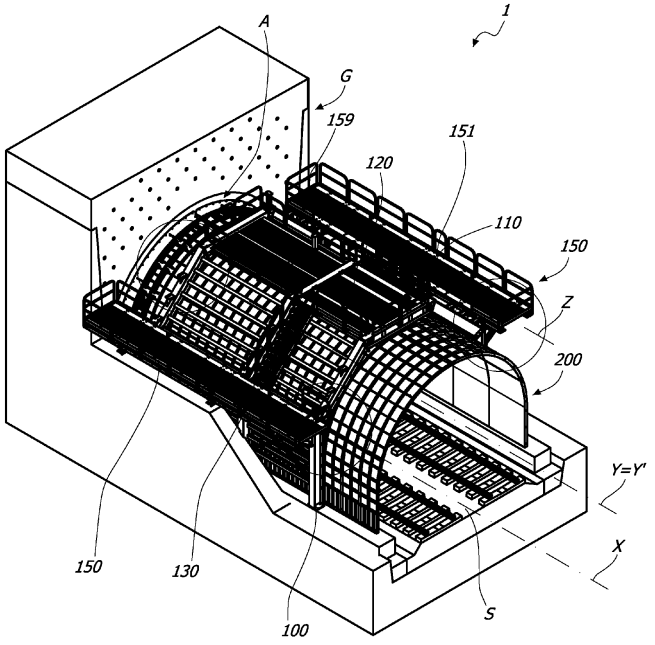

FIG. 1

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Description

Technical field

[0001] The present invention generally relates to the field of systems for building infrastructures, and it relates to a system for consolidating the ground near tunnels.

State of the Art

[0002] Operations for consolidating a tunnel for example in the ground overlying it, provide for driving - into such ground - a plurality of longitudinal bars parallel to the extension of the tunnel, so as to reinforce it.

[0003] Such operation should be carried out both in the event the ground loses solidity - and therefore there is the risk of landslide - and should there arise the need to widen the gap of the tunnel. In particular, in this latter case there shall initially be consolidated the ground and subsequently widen the gap using milling cutters of the per se known type.

[0004] In any case, in order to enable the driving of the longitudinal reinforcement bars, there arises the need to provide a specific machine which drives the bars into the ground. Such machine should therefore be moved at the desired points for driving the longitudinal bars into the ground.

[0005] Therefore, to date there is provided a multistorey scaffolding at the exit of the tunnel to support such machine in multiple positions.

[0006] A drawback of such known system lies in the fact that it does not allow trains or vehicles to pass through during the consolidation steps due to the presence of the scaffolding. Such characteristic entails the full closing of the stretch over the entire duration of the works.

[0007] Furthermore, such known system requires particularly long working times due to the movement difficulties of the machine for the driving of the bars into the ground.

[0008] A further disadvantage of the known systems lies in that they are unsafe, require assembling expertise (the scaffolding must support the particularly heavy machine), and require long times for assembling and disassembling the scaffolding.

[0009] Document CN111794783 discloses a support structure for operations in tunnels.

Summary of the invention

[0010] An object of the present invention is to at least partly overcome the drawbacks illustrated above by providing a system for consolidating tunnels that is highly functional and cost-effective.

[0011] Another object of the invention is to provide a system for consolidating tunnels which allows trains and vehicles to pass through during the consolidation.

[0012] Another object of the invention is to provide a system for consolidating tunnels that is particularly quick to assemble.

[0013] Another object of the invention is to provide a system for consolidating tunnels that is safe.

[0014] Another object of the invention is to provide a system for consolidating tunnels which allows to move the machine for the driving of longitudinal bars into the ground in a simple, quick and safe manner.

[0015] These and other objects which will be more apparent hereinafter are attained by a system for consolidating tunnels as described, illustrated and/or claimed herein.

[0016] The dependent claims define advantageous embodiments of the invention.

Brief description of the drawings

[0017] Further characteristics and advantages of the invention will be more apparent in light of the detailed description of a preferred but non-exclusive embodiment of the invention, illustrated by way of non-limiting example with reference to the attached drawings, wherein:

FIG. 1 is a schematic view of a system **1;**
FIGS. 2A, 2B and **2C** are enlarged views of some details of FIG. 1;
FIG. 3 is a schematic view of a protection wall **200** of the system of FIG. 1;
FIGS. 4 and **5** are a schematic view of the system **1** in different operating steps.

Detailed description of a preferred embodiment

[0018] With reference to the aforementioned figures, herein described is a system **1** for manufacturing a service structure for the support of men and means working to consolidate the ground around a tunnel **G** overlying a way **S.**

[0019] In particular, the latter may have a longitudinal extension along an axis **X** and at least one opening **A** for one or more vehicles to pass through.

[0020] In the attached drawings, there is shown a railway tunnel **G** in which the way is a two-way traffic railway **S** and the vehicle is a train.

[0021] In the description hereinafter, reference will be made to such embodiment. However, it is clear that the tunnel **G** may be configured to allow other types of vehicles such as cars, trams or the like to pass through, without departing from the scope of protection of the present invention.

[0022] Essentially, as better explained hereinafter, the system **1** of the present invention may allow to carry out the consolidation operations without having to close the tunnel **G** that is without the need to prevent trains from passing through the railway **S.** In other words, there may be provided for trains to pass through the tunnel **G.**

[0023] Suitably, the system **1** may comprise a load-bearing structure **100** for supporting men and/or means during the consolidation operation and a protection wall

200 interposed between the load-bearing structure **100** and the way **S** for preventing mean or objects from falling on the way **S.**

[0024] The means may comprise one or more drilling machines of the per se known type for driving a plurality of metal or plastic bars into the ground near the tunnel **G.**

[0025] Due to such configuration of the system **1** may operate and/or move the means at the load-bearing structure **100** safely. As a matter of fact, men, objects, means or anything else that might fall may impact against the protection wall **200** and this may allow to prevent them from impacting against the way **S** and/or a passing vehicle.

[0026] Such aspect further allows a high safety for the operators given that they prevent them from falling for several metres up to the way **S.**

[0027] A further advantage of the present invention lies in the fact that the protection wall **200** remains external with respect to cables and pipes, for example electrical cables in case of a railway tunnel. In particular, this may allow to prevent men and/or objects from impacting against the power cables.

[0028] Furthermore, unlike the existing scaffolding systems, the electrical cables do not pass through the so-called worksite, that is they do not pass through the support structure and/or the protection wall, but they remain protected in the lower area at the road **S.**

[0029] The protection wall **200** may have an extension along an axis **Y'** intended to be positioned above the way **S** at the opening **A** of the tunnel **G** so that the axes **X** and **Y'** are substantially parallel and mutually coincident.

[0030] The protection wall **200** may have dimensions sufficient to allow one or more vehicles to pass through the tunnel **G.**

[0031] Preferably, the protection wall 200 may be substantially portal-shaped so as to allow the vehicle to pass through the way S below the way in question.

[0032] The protection wall **200** may have a dimension along a plane substantially perpendicular to the axis **Y'** substantially equal to or slightly larger than the dimension of the opening **A** of the tunnel **G** along the plane. For example, as shown in FIG. 3, the protection wall **200** may have a substantially semi-circular cross-section. Preferably, the protection wall **200** may have a pair of substantially planar areas **290** designed to remain on opposite sides with respect to the way **S** and an upper area **291** for connecting the semi-cylindrical-shaped areas **290.** The upper area **291** may be spaced from the way **S** so as to allow the vehicle to pass through beneath it.

[0033] These characteristics may allow the vehicle to pass through the way **S** underlying the protection wall **200** and at the same time the overall dimensions of the latter may be minimum.

[0034] Suitably, the protection wall **200** may be substantially continuous so as to prevent men or objects from falling on the way **S.** The protection wall **200** may therefore be a solid surface or it may be a net. In this case, the meshes of the net may be sufficiently small to prevent men or objects from falling.

[0035] Preferably, the protection wall **200** may have a solid surface so as to prevent even small objects such as screws, bolts or the soil possibly even liquids, glue and paint from falling.

[0036] According to a particular aspect of the invention, the protection wall **200** may comprise a plurality of panels **210.** Possibly, the protection wall **200** may consist of a plurality of panels **210.**

[0037] Thanks to this characteristic, the protection wall **200** may be modular, easy to transport and/or assemble on site.

[0038] It is clear that the panels 210 may be solid or be net-shaped in a manner similar to the description outlined above.

[0039] Advantageously, the panels **210** may have an extension that is planar or substantially planar, that is slightly curved. This allows to obtain the entire portal structure **200** through a plurality of panels **210** which may have an extension that is different with respect to each other. For example, the panels may allow to obtain the areas **290** while the slightly curved panels may allow to obtain the area **291.**

[0040] Furthermore, advantageously, thanks to the planar or slightly curved shape, the panels **210** may have small overall dimensions, preferably substantially planar overall dimensions. This may allow to facilitate transportation and/or storage.

[0041] Furthermore, this may advantageously allow to stack the flat panels with the planes and the curved panels with the curves. This may allow to further facilitate the transportation and/or storage.

[0042] Preferably, the panels **210** may be removably fixed to each other. Thanks to this characteristic, the entire protection wall **200** may be disassembled once through with its function.

[0043] For example, the panels may be fixed to each other through systems with plates and fixing screws of the per se known type.

[0044] As schematically illustrated in FIG. 3, each panel **210** may comprise a highly rigid area **211.** For example, the panels **210** may comprise the perimeter area **211** thickness greater than the central area **212.** For example, the perimeter area **211** may form a perimetric ridge.

[0045] Thanks to this characteristic, the protection wall **210** may guarantee a high tensile strength and/or resistance to impacts like in the case of fall of objects or men.

[0046] Suitably, the panels **210** may be fixed to each other at the high rigidity areas **211.**

[0047] The load-bearing structure **100** may have an extension along an axis **Y** intended to be positioned above the way **S** at the opening **A** of the tunnel **G** so that the axes **X** and **Y** are substantially parallel and mutually coincident.

[0048] The load-bearing structure **100** may comprise one or more areas **110** for supporting men and/or means during the operation. Such areas **110** may comprise or consist of support plates **111, 112.**

[0049] In greater detail, the load-bearing structure **100** may comprise a plurality of beams for forming a lattice structure. For example, as shown in FIG. 1, the load-bearing structure **100** may comprise a plurality of arched beams **102** and a plurality of longitudinal beams **103,** that is parallel to the axis **Y**, for rigidly connecting the arches **102** to each other.

[0050] Suitably, the arches **102** may comprise one or more plates **111, 112** defining the areas **110** for supporting men and/or means. Preferably, such plates **111, 112** may be arranged along the entire length of the arches **102,** for example as shown in FIG. 2C.

[0051] However, it is clear that the entire lattice girder, that is the beams **102** and/or **103** may support men and/or means therefore defining the support areas **110.**

[0052] Advantageously, there may also be provided for at least one walkway **150** for supporting the men or means during the operation.

[0053] The walkway **150** may have an extension along an axis **Z.** Preferably, the walkway **150** may comprise a base floor **151** for supporting men and/or means. For example, the walkway **150** may support a drilling machine and/or operators.

[0054] The walkway **150** may be positioned at the area **110** for supporting the load-bearing structure **100** so that the support areas **110** support the walkway **150.**

[0055] Preferably, the walkway **150** may be removably positioned on the load-bearing structure **100,** for example they may be removably fixed to the support areas **110** as better explained hereinafter.

[0056] Suitably, the walkway **150** may be positioned at one or more of the plates **111, 112.**

[0057] For example, in the embodiment shown in FIG. 1 there are provided for 3 arches **102** each one comprising a plurality of plates **111, 112.** In particular, with reference to FIG. 1, the plates **111** may be aligned along an axis parallel to the axis **Y** and the plates **112** may be aligned an axis parallel to the axis of the plates **111.**

[0058] The walkway **150** may therefore be supported by 3 plates **111,** one for each arch **102.** In this manner, the walkway **150** may be supported in three points spaced apart conferring high stability thereto.

[0059] In this case, the walkway **150** may therefore be in a longitudinal operative position, that is so that the axis **Z** is substantially parallel to the axis **Y**.

[0060] Although not shown in the attached figures, it is clear that the walkway **150** may be supported by a different number of plates **111.** For example, it may be supported by a pair of plates **111** or by a large number of plates **111,** for example 4 plates.

[0061] In order to constrain the walkway **150** to the load-bearing structure **100** at the plates **111** and/or **112** systems of the per se known type may be provided for.

[0062] For example, the walkway **150** may comprise further plates **152** which may be screwed with the plates **111** and/or **112.** Such type of coupling is not exclusive.

[0063] Connection girder elements **155** may be suitably provided for to connect the walkway **150** with the load-bearing structure **100.** Preferably, such connections **155** may be configured so that the floor **151** of the walkway **150** is substantially horizontal.

[0064] Preferably, each walkway **150** may be coupled with a first row of plates **111** and with a second row of plates **112** so that the walkway **150** has a high stability and tensile strength.

[0065] For example, the girder **155** may comprise a plurality of pairs of plates **152** designed to be coupled by fittingly coupling with a corresponding pair of plates **111, 112** of the same arch **102.**

[0066] In the light of the above, the plates **111, 112** may support the walkway **150** and therefore the men or means thereon.

[0067] Furthermore, the connection girder **155** may have a classic "triangular" structural configuration with two constraint points on the load-bearing structure **100** therefore guaranteeing high structural strength to the entire structure, and in particular high tensile strength of the walkway **150.**

[0068] It is clear that the connection girder **155** may be fixed to the plates **111** and/or **112** in any manner. For example, by fittingly coupling and/or by using screws and bolts and/or by using further abutment plates **152.**

[0069] In any case, once the walkway **150** has been coupled with the support structure **100,** the former may be in an operative position such to allow to carry out the consolidation operations. In particular, when the walkway **150** is in an operative position, it may have an end **159** facing the ground to be consolidated. Preferably, the end **159** may be in proximity of the ground to be consolidated and only slightly spaced apart therefrom. For example, such end **159** may have a distance smaller than 1 metre.

[0070] This characteristic may allow to position the drilling machine on the floor **151** in proximity of the end **159** to carry out the consolidation operations easily.

[0071] The consolidation operations may comprise ground drilling operations and/or operations for driving reinforcement materials or means, such as for example consolidation bars, into the ground.

[0072] According to a particular aspect of the invention, the walkway **150** may be coupled with one or more of the plates **111, 112** in a removable manner.

[0073] This may allow to reposition the walkway **150** in a different operative position. That is the walkway **150** may be de-coupled from the plates **111** and the walkway **150** may be coupled with the other plates **112,** for example with plates **112** in a higher position.

[0074] Thanks to this characteristic, the same walkway **150** may be used to carry out ground consolidation operations easily in multiple areas of the ground.

[0075] Suitably, the connection girder **155** and the plates **111, 112** may be mutually configured so as to allow the mutual coupling/de-coupling.

[0076] It is clear that the connection girder **155** may be removably fixed to the plates **111** and/or **112** in any manner. For example, by fittingly coupling so as to allow the coupling and/or de-coupling of the walkway **150** by trans-

lating the latter along a vertical axis substantially perpendicular to the axis **Y**. During use, such sliding may be substantially vertical upwards.

[0077] Thanks to the particular arched shape of the beams **102,** the walkway **150** may be moved in a plurality of lateral operative positions with respect to the opening **A** of the tunnel G so as to allow to operate on the ground in a plurality of areas. This may allow to easily drive the consolidation bars into the lateral areas of the ground with respect to the opening **A** of the tunnel **G.**

[0078] For example, the walkway **150** may be in a first operative position in which it is engaged with a plurality of plates **111,** for example two or three plates **111** each belonging to a beam **102,** and it may then be moved in a second different operative position in which it is engaged with at least one different plurality of plates **112,** for example two or three plates **112** each belonging to a beam **102.**

[0079] It is clear that should there be provided for a connection girder **150** or generally the walkway **150** is supported by two or more plates **111, 112** for each beam **102,** once the walkway **150** has been moved to the second operative position, the latter may be supported even by some plates which support the walkway in the first operative position.

[0080] Preferably, the beams **102** may comprise a plurality of plates **111, 112,** for example 10, so as to allow to move the walkway **150** in a large number of operative positions, which may correspond to a row of plates.

[0081] Suitably, there may be provided for a plurality of walkway **150.** For example FIG. 1 shows a pair of longitudinal walkways **150,** that is in which the axis **Z** is substantially parallel to the axis **Y**.

[0082] This may allow to operate on the ground from both sides of the tunnel **G** at the same time.

[0083] Preferably, the walkways **150** may be symmetrical so that the same walkway **150** may be mounted on the right or left side of the load-bearing structure **110.**

[0084] According to a particular aspect of the invention, the same walkway **150** may be coupled with the load-bearing structure **100** in a substantially transversal operative position, that is in a position in which its axis **Z** is substantially perpendicular to the axis **Y**. In other words, in this manner, the axis **Z** may be substantially parallel to the ground to be consolidated.

[0085] In this case, the walkway **150** may have the entire floor **151** in proximity to the ground. This configuration allows to easily carry out the ground consolidation operations above the opening **A** of the tunnel **G.**

[0086] For example, FIG. 5 shows a system 1 with a pair of walkways **150** arranged longitudinally and a walkway **150** arranged transversely.

[0087] Suitably, there may be provided for a base plate **120** positioned above the load-bearing structure **100** so as to remain substantially horizontal. The support areas **110** may therefore also include the base plate **120.**

[0088] Such base plate **120** may facilitate the operations on the area of the ground above the tunnel. Furthermore, such base plate **120** may be used as an area for depositing the equipment.

[0089] Suitably, there may be provided for ladders **130** or the like to allow operators to move between the walkways **150** and the base plate **120.**

[0090] According to a particular aspect of the invention, the walkways **150** may be moved between the various operative positions using a crane **140.** Preferably, the crane **140** may be positioned on the base plate **120** and they may be fixed to the latter. Preferably, it may be fixed removably.

[0091] In this manner, the crane **140** may move the walkway **150** in a simple manner and without occupying the ground near the way **S.**

[0092] Suitably, the crane **140** may have an arm **141** sized so as to allow the positioning of the walkways **150** in all possible operative positions. Preferably, the crane **140** may be exclusively sized to this end so that it has minimal overall dimensions.

[0093] In this manner, advantageously, the walkways **150** may be moved without blocking the way **S** and/or prevent the vehicles from passing through.

[0094] Preferably, the crane **140** may be configured so as to also allow to move the drilling machine, for example for positioning it on a walkway **150** at the end **159.**

[0095] Suitably, the load-bearing structure **100** may be substantially reticular-shaped as described above with a plurality of arched **102** and longitudinal **103** beams. Should a walkway **150** and/or a drilling machine fall, the weight of the latter will be supported by the load-bearing structure **100** which may therefore also act as protection for the way **S.**

[0096] Therefore, advantageously, the protection wall **200** may be configured to withstand the impact of men and/or small means, while the load-bearing structure **100** may withstand the impact of large means and, as a result, also men.

[0097] Furthermore, the portal-liked arched shape of the load-bearing structure **100** and/or of the protection wall **200** may facilitate the exit of men, objects and/or means toward the external, that is towards areas outside the way **S.** This allows to safeguard the load-bearing structure **100** and/or the protection wall **200** as well as the way **S.**

[0098] In the embodiment shown in the attached figures, the protection wall**200** and the load-bearing structure **100** are two distinct portal structures. In particular, the protection wall **200** may have an inner surface **201** facing the way **S** and an opposite outer surface **202** facing the load-bearing structure **100.** The outer surface **202** and the protection wall **200** may be mutually spaced.

[0099] Although not shown, it is clear that the load-bearing structure **100** and the protection structure **200** may be connected or they may be integrated in a single continuous portal-like load-bearing structure, without departing from the scope of protection of the present invention.

[0100] Operatively, there may therefore be provided

for the system **1** described above and carry out one or more ground consolidation operations steps, for example one or more drilling operations. Suitably, such operation steps may be carried out without closing the tunnel **G** when vehicles pass through, possibly, even when the vehicle passes through, for example when the train passes through.

[0101] Operatively, there may therefore be positioned a walkway **150** in an operative position and carry out a ground consolidation operation in a first area, for example drilling such first area. Subsequently, the walkway **150** may be moved from the first operative position to another operative position, to carry out a ground consolidation operation in a different area, for example drilling such second area of the ground.

[0102] The movement of the walkway **150** may be made with or without the drilling machine.

[0103] Possibly, the drilling machine may therefore be moved from an inoperative position to an operative position on the walkway **150,** preferably in proximity of the end **159,** so as to drill the ground in a corresponding first area and drill the ground. Suitably, such movement of the walkway **150** and/or of the drilling machine may be carried out using a crane **140.**

[0104] The drilling machine may be subsequently moved to the inoperative position, which may for example be an area near the way **S** but outside the latter, the walkway **150** may be moved from the first operative position to another operative position, the drilling machine may be moved on the walkway **150** to carry out a new drilling at a different area of the ground.

[0105] Such operation may be carried out a plurality of times so that the walkway **150** occupies all operative positions so as to allow the drilling of all the ground near the opening **A.**

[0106] Suitably, during the movement step, a walkway **150** may be translated along the arches **102,** turned by 180° so as to be positioned on the opposite side and/or turned by 90° so as to be positioned transversal, substantially parallel to the ground.

[0107] The invention is susceptible to numerous modifications and variants, all falling within the scope of protection of the attached claims. All details can be replaced by other technically equivalent elements, and the materials can be different depending on the needs, without departing from the scope of protection of the invention defined by the attached claims.

Claims

1. A system for manufacturing a service structure for the support of men and means working to consolidate the ground around a tunnel **(G)** overlying a way **(S),** such as a roadway, a railway or the like, the way **(S)** having a longitudinal extension along a first axis **(X)** and at least one opening **(A)** for the passage of one or more vehicles, the system comprising:

- a load-bearing structure **(100)** having an extension along a second axis (**Y**) intended to be positioned above the way **(S)** at the at least one opening **(A)** of the tunnel **(G)** so that said first and second axis **(X, Y**) are substantially parallel or mutually coincident, said load-bearing structure **(100)** comprising at least one support area **(110)** for men or means during the operation;
- a protection wall **(200)** intended to be interposed between said load-bearing structure **(100)** and the way **(S),** said protection wall **(200)** being substantially continuous so as to prevent men or objects from falling on the way **(S).**

2. System according to claim 1, wherein said protection wall **(200)** has dimensions sufficient to allow one or more vehicles to pass through the tunnel **(G).**

3. System according to claim 1 or 2, wherein said protection wall **(200)** is substantially portal-shaped.

4. System according to any one of claims 1 to 3, wherein said protection wall **(200)** has an inner surface **(201)** facing the way **(S)** and an opposite outer surface **(202)** facing said load-bearing structure **(100),** the latter and said protection wall **(200)** being mutually spaced.

5. System according to any one of claims 1 to 4, further comprising at least one walkway **(150)** for supporting the men or means during the operation, said at least one walkway **(150)** being suitable to be removably positioned at said at least one support area **(110).**

6. System according to the preceding claim, wherein said at least one support area **(110)** of said load-bearing structure **(100)** has a first plurality of support plates **(111)** and at least one second plurality of support plates **(112),** said at least one walkway **(150)** having at least one operative portion **(152)** which can be alternatively selectively removably engaged with said first or second plurality of support plates **(111, 112)** so that the latter support said at least one walkway **(150)** in a respective first or second operative position.

7. System according to the preceding claim, wherein said at least one walkway **(150)** has a longitudinal shape defining a third axis **(Z),** said walkway **(150)** being suitable to be selectively removably engaged with said load-bearing structure **(100)** in said at least one first or second operative position in which said third axis **(Z)** is substantially parallel to said second axis (**Y**) of said load-bearing structure **(100)** or in at least one third operative position wherein said third axis **(Z)** is substantially perpendicular to said second axis (**Y**).

8. System according to any one of the preceding claims, wherein said protection wall **(200)** comprises a plurality of panels **(210)** which can be mutually coupled to each other in a removable fashion.

9. System according to any one of claims 5 to the preceding, comprising a crane **(140)** for moving said at least one walkway **(150)** between at least said first, second or third operative position, said load-bearing structure **(100)** having a base plate **(120),** said crane **(140)** being fixed with said base plate **(120).**

10. System according to any one of the preceding claims wherein said load-bearing structure **(100)** and said protection wall **(200)** form a single structure.

11. A method for consolidating the ground around a tunnel **(G)** overlying a way **(S)** such as a roadway, a railway or the like, the way **(S)** having a longitudinal extension along a first axis **(X)** and at least one opening **(A)** for the passage of one or more vehicles, the method comprising the steps of:

- preparing a system **(1)** which comprises a load-bearing structure **(100)** having an extension along a second axis (**Y**) intended to be positioned above the way **(S)** at the at least one opening **(A)** of the tunnel **(G)** so that said first and second axis **(X, Y**) are substantially parallel or mutually coincident, said load-bearing structure **(100)** comprising at least one support area **(110)** for men or means during the operation;
- consolidating the ground in at least one area thereof;

wherein said consolidation step can be carried out during the passage of the one or more vehicles through said system **(1).**

12. Method according to the preceding claim, wherein said preparation step comprises the preparation of a system according to any one of claims 1 to 10.

13. Method according to claim 12, wherein said consolidation step comprises a working step for drilling the ground carried out using a drilling machine, the method comprising the steps of:

- positioning at least one walkway **(150)** for supporting the men or means during the operation on the load-bearing structure **(100)** in a first operative position;
- drilling the ground in a corresponding first area by means of said drilling machine;
- movement of said at least one walkway **(150)** from said first operative position to a second operative position on the load-bearing structure **(100);**
- drilling the ground in a corresponding second area by means of said drilling machine.

14. Method according to claim 13, wherein said load-bearing structure **(100)** has a base **plate(120)** and a crane **(140)** fixed with said base plate **(120),** the movement of said drilling machine and the movement of said at least one walkway **(150)** being attained by means of said crane **(140).**

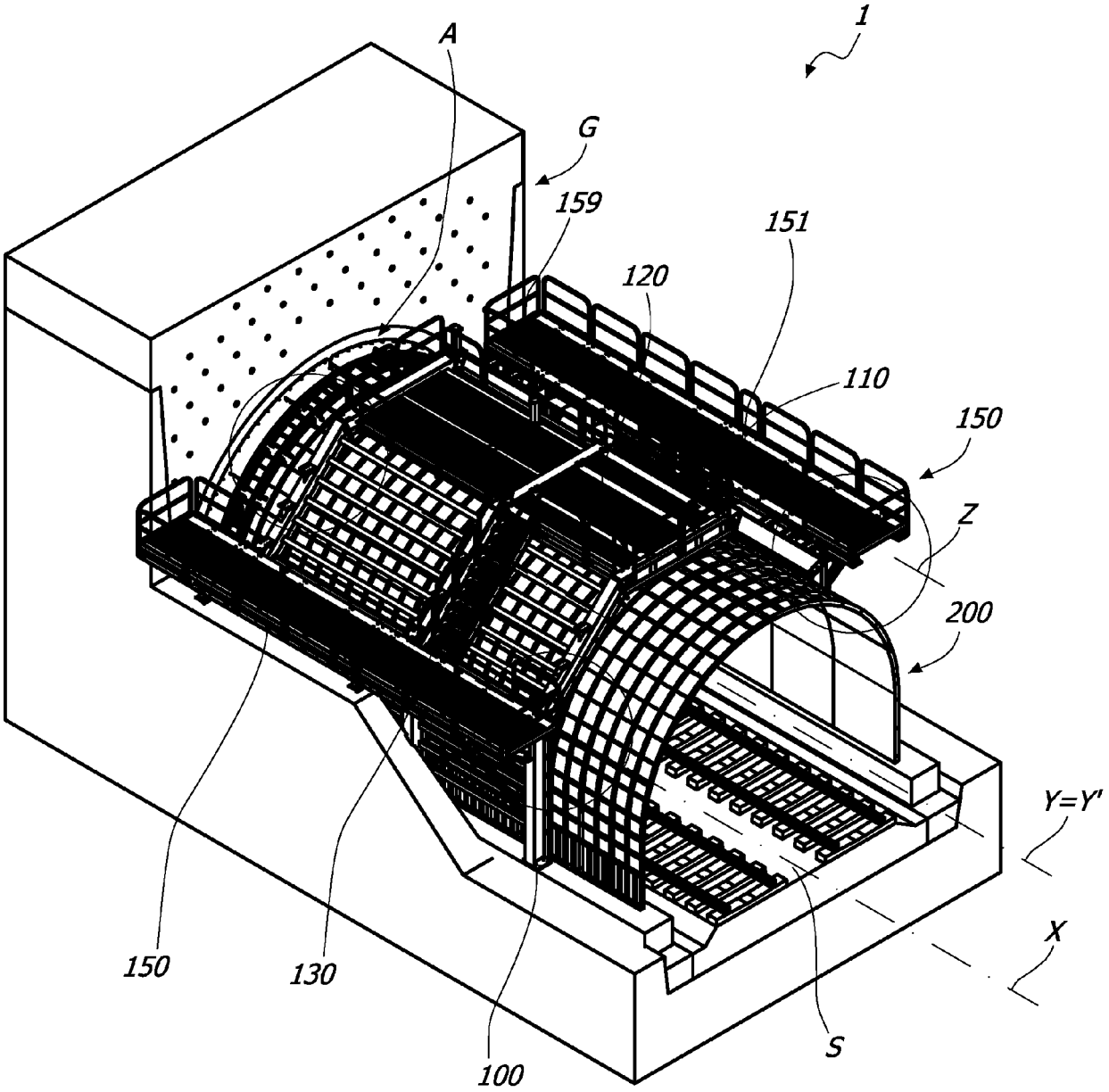

FIG. 1

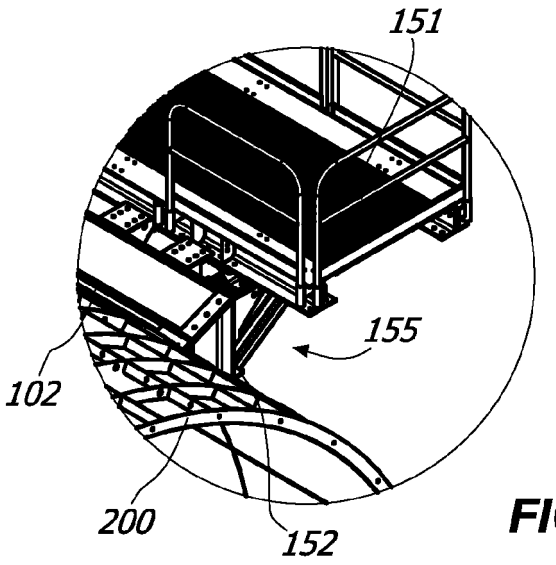

FIG. 2A

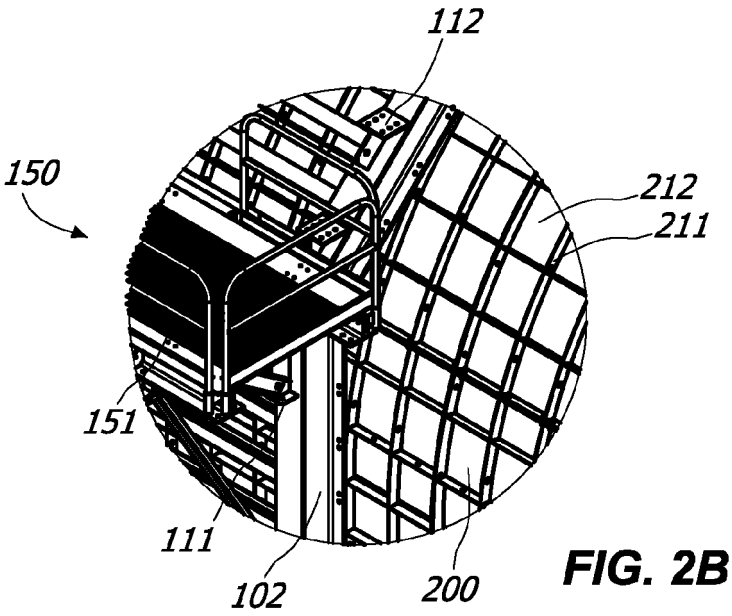

FIG. 2B

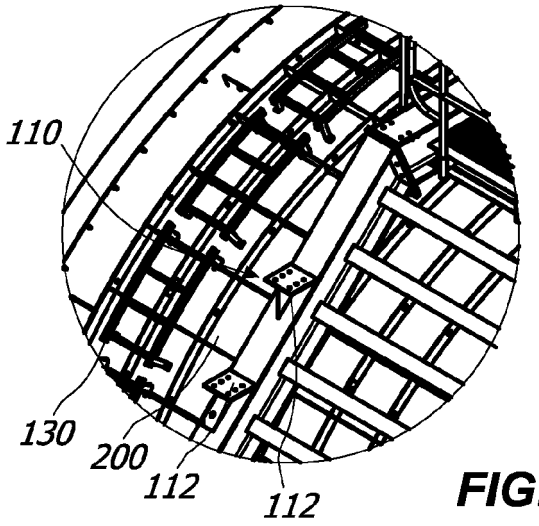

FIG. 2C

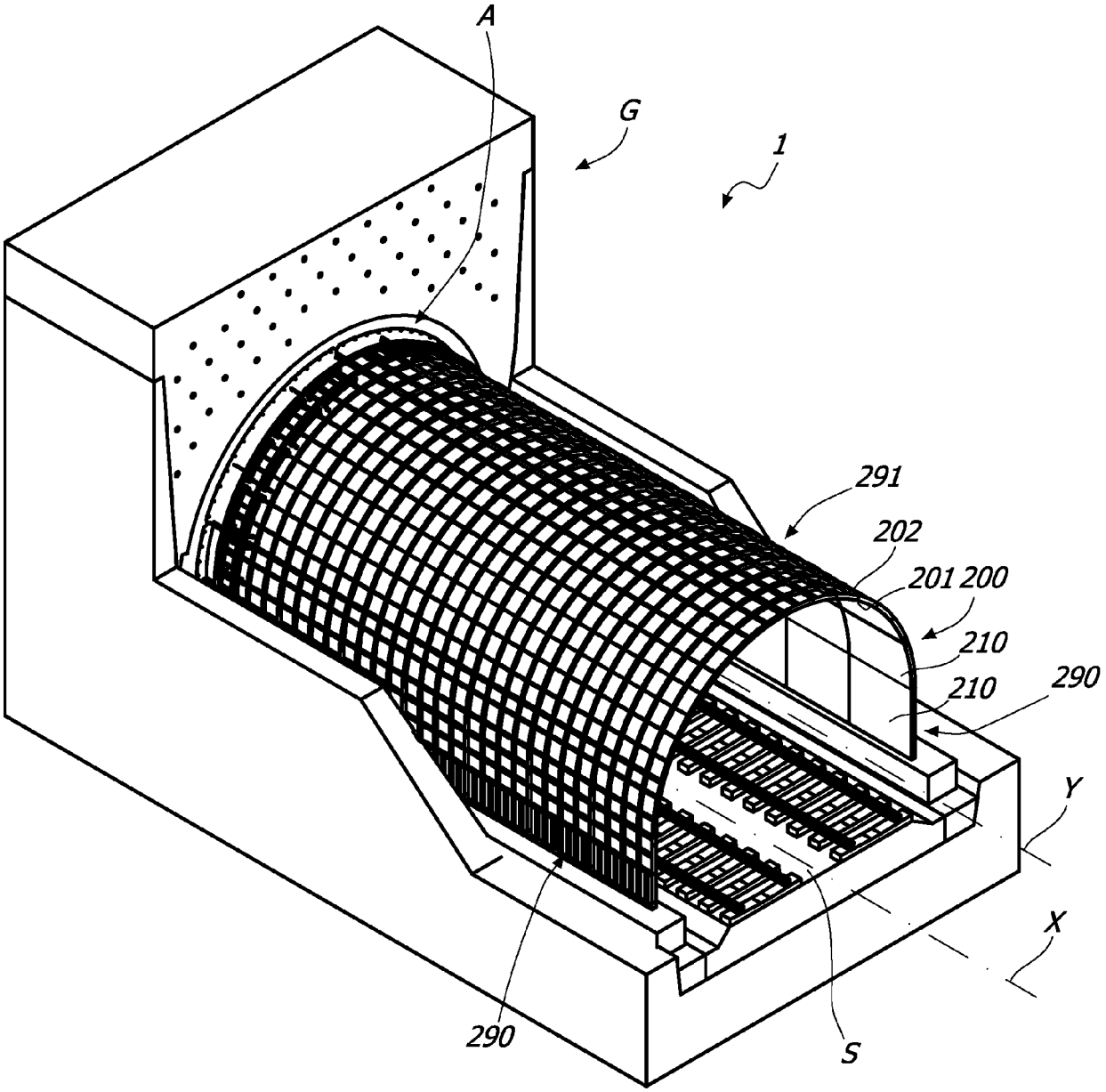

FIG. 3

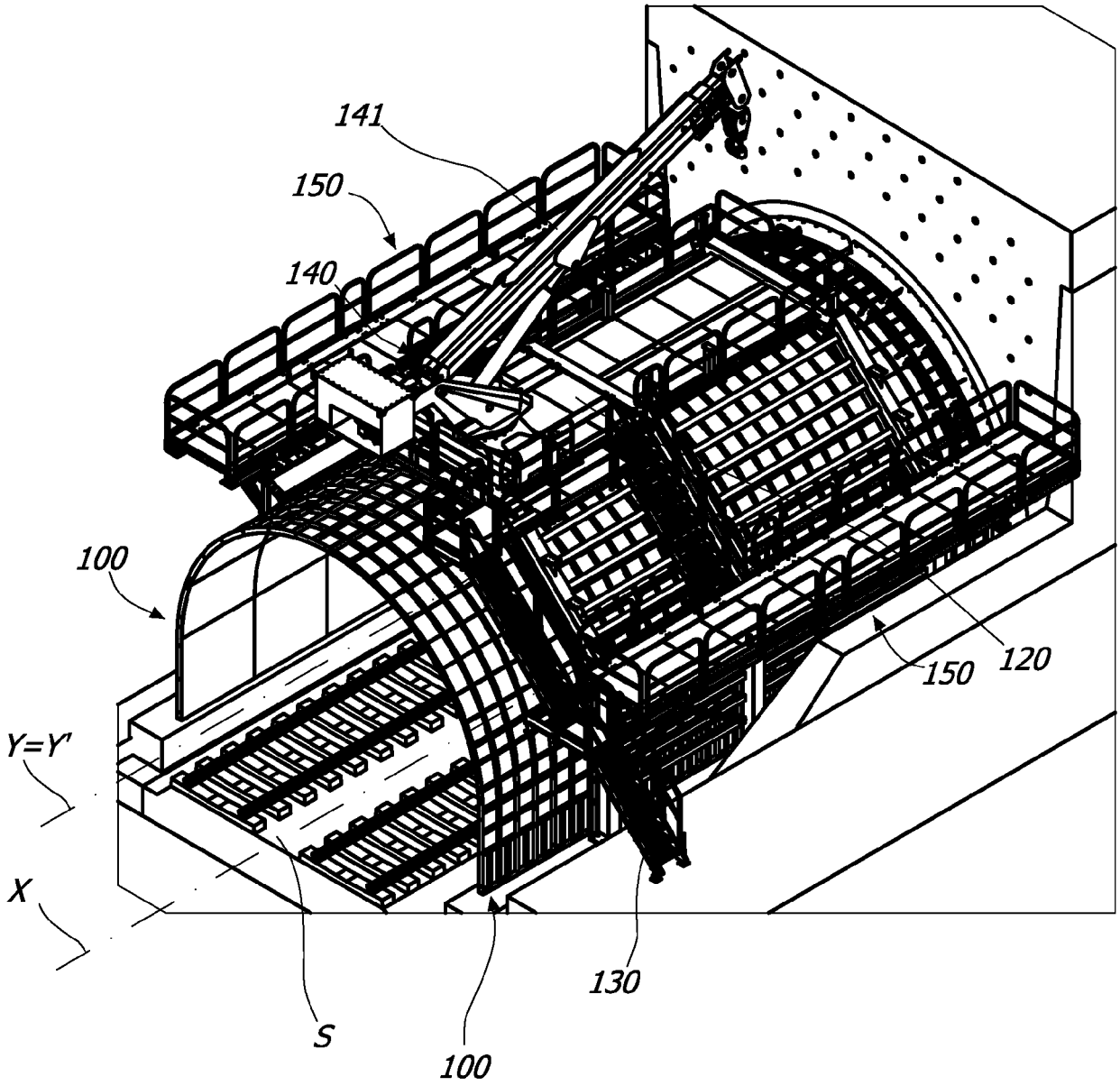

FIG. 4

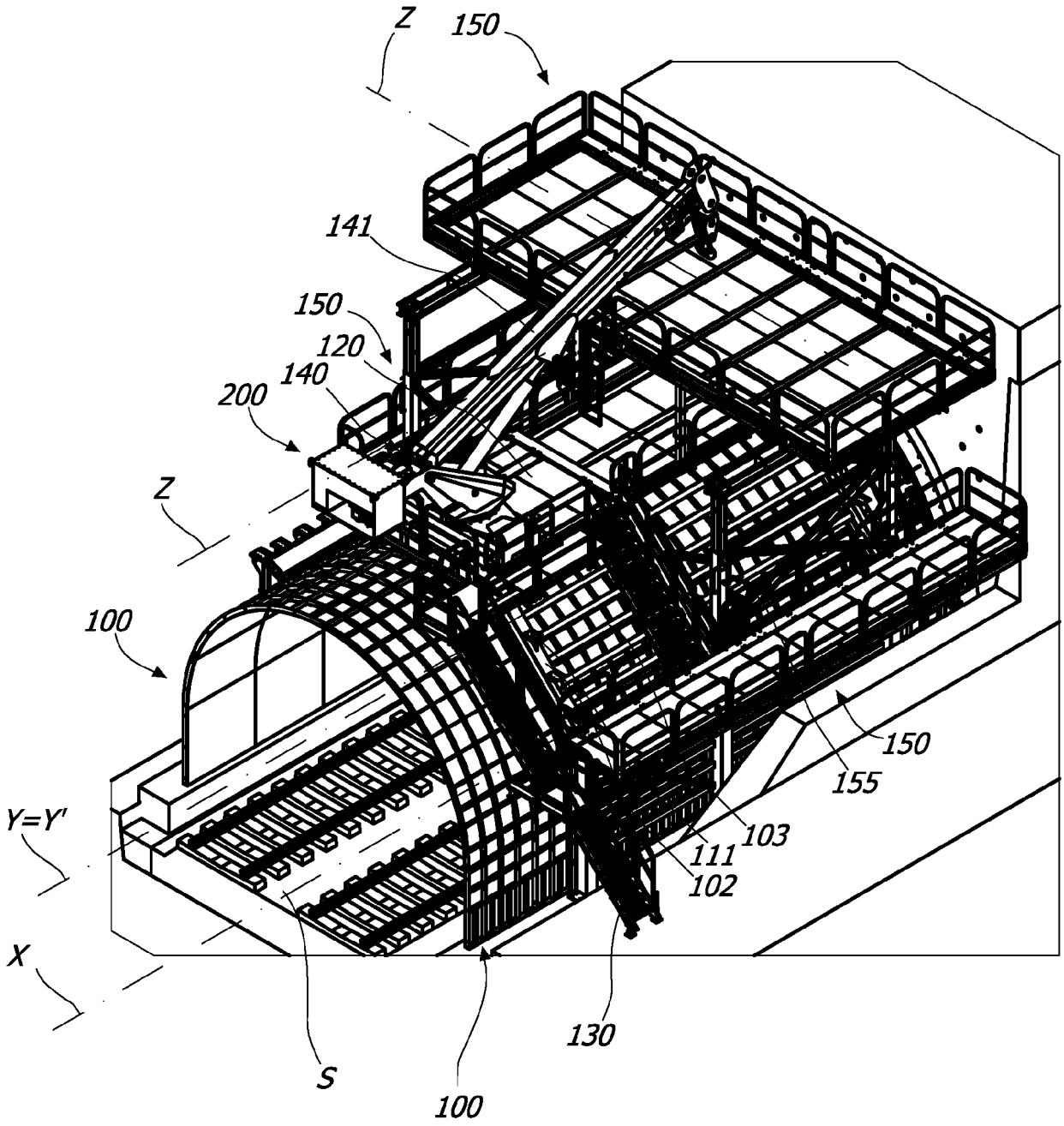

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 3954

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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	20 October 2023	Morrish, Susan

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