

(19)



(11)

EP 3 816 097 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:

07.06.2023 Bulletin 2023/23

(51) International Patent Classification (IPC):

B66F 11/04 ^(2006.01) **B61K 11/00** ^(2006.01)

(52) Cooperative Patent Classification (CPC):

B66F 11/04

(21) Application number: **20203678.6**

(22) Date of filing: **23.10.2020**

(54) MACHINE FOR INSPECTION AND MAINTENANCE OF TRAINS AND TRAMS

MASCHINE ZUR INSPEKTION UND WARTUNG VON ZÜGEN UND STRASSENBAHNEN

MACHINE POUR L'INSPECTION ET L'ENTRETIEN DES TRAINS ET DES TRAMWAYS

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **29.10.2019 IT 201900019924**

(43) Date of publication of application:

05.05.2021 Bulletin 2021/18

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WO-A1-02/100759 WO-A1-03/048024

CN-U- 208 394 727 IT-A1- BO20 090 185

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Description

[0001] The present invention relates to a machine for inspection and maintenance of trains and trams.

[0002] In the train and tram sector it is customary to subject trains and trams to continuous and frequent inspection and maintenance operations.

[0003] The parts of the train or tram that require the most attention in order to be able to operate with the highest ergonomics of safety are the roof, known as "imperial" in the jargon, and the sides.

[0004] Platform machines have therefore been developed which are adapted to allow the reaching of these train parts and, generally speaking, can be divided between fixed platforms and movable platforms.

[0005] The former are characterized substantially by a load-bearing structure which forms a walking surface at a fixed height which extends laterally to the tracks designed to accommodate a train or tram for a length that is comparable with that of said train or tram.

[0006] In order to ensure the safety level necessary to protect the operators, these fixed platforms can be provided with walking surfaces that can be extended in the direction of the train or tram, so as to reduce or eliminate the void between the coach, the platform and all the devices required for operator safety.

[0007] These fixed platforms of the known type, which due to their shape have a high stability of the access surface, are not free from drawbacks, which include the fact that since they have a fixed height they do not allow to determine the ideal conditions for access to all types of trains or trams.

[0008] In other words, they are too high for some, too low for others, and at the right height only for a few.

[0009] Furthermore, another drawback of these fixed platforms resides in that, since they have a non-removable or movable structure, they constitute very often a hindrance and limitations of movement within the room in which the structure is installed.

[0010] The latter instead consist of a pantograph structure that is mounted on a truck so as to allow height adjustments of the access surface.

[0011] In this case also, in order to ensure the safety level necessary to protect the operators, these movable platforms can be provided with walking surfaces that can be extended in the direction of the train or tram so as to reduce or eliminate the void between the coach, the platform and all the devices required for operator safety.

[0012] However, these movable platforms of the known type are not free from drawbacks, which include the fact that they are substantially unstable structures, i.e., subject to oscillations, and have in any case significant space occupations, such as to hinder access to the regions proximate to the footing of the platform. Document CN 208394727 U discloses a movable platform that discloses the features of the preamble of claim 1.

[0013] The aim of the present invention is to provide a machine for inspection and maintenance of trains and

trams that is such as to obviate the drawbacks and overcome the limitations of the background art.

[0014] Within this aim, an object of the present invention is to provide a machine that allows to reach any part of the train or tram, maintaining space occupations that are small or in any case such as to not be a hindrance for access to the regions proximate to the footing of the machine.

[0015] Another object of the present invention is to provide a machine that ensures the highest levels of reliability and safety, being at the same time simple to provide and quick to install.

[0016] This aim, as well as these and other objects which will become better apparent hereinafter, are achieved by a machine for inspection and maintenance of trains and trams, as defined by the scope of the claims.

[0017] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of a machine for inspection and maintenance of trains and trams, according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic lateral elevation view of a machine according to the present invention;

Figure 2 is a schematic front elevation view of the machine shown in Figure 1 during the positioning operations;

Figure 3 is a schematic top plan view of the machine shown in Figure 2;

Figure 4 is a schematic front elevation view of the machine shown in the preceding figures during the inspection and/or maintenance operations;

Figure 5 is an enlarged-scale view of the machine shown in Figure 4;

Figure 6 is a schematic top plan view of the machine shown in Figure 4;

Figure 7 is a schematic perspective view of the platform of the machine shown in the preceding figures.

[0018] With reference to the figures, the machine for inspection and maintenance of trains and trams, generally designated by the reference numeral 1, comprises a first load-bearing structure 2a which is formed by at least one elevated guiding element 3a, which can be installed in a room designed to accommodate a train or tram 4 to be inspected and/or to be maintained at an elevated height with respect to the floor 5, so as to have an orientation that is substantially parallel to the longitudinal extension of the tracks 6 on which the train or tram 4 is to be placed, and by at least one supporting post 7a which is associated with the elevated guiding element 3a by means of a first slider coupling the degree of translational freedom of which lies on a directrix that is oriented substantially parallel to the tracks 6.

[0019] The supporting post 7a is configured so that it rests on the floor 5 by means of a second slider coupling

9a and 9b, the degree of translational freedom of which is oriented substantially parallel to the degree of translational freedom of the first slider coupling 8a.

[0020] Furthermore, a first platform 10a is comprised which is slidably associated with the supporting post 7a along an elevation direction 11 that is substantially normal to the floor 5.

[0021] In greater detail, the first platform 10a is provided with first lifting and lowering and locking means 12a for its positioning and retention at a preset height along the supporting post 7a and with first perimetric delimitation means 13a configured so as to form a safety enclosure within which at least one operator 14 can perform the planned inspection and/or maintenance operations.

[0022] Advantageously, the first load-bearing structure 2a comprises at least one ground guiding element 15a which can be installed on the floor 5 in a manner that is parallel and lateral to the tracks 6, so that the supporting post 7a is associated slidably with said ground guiding element 15a to provide the second slider coupling 9a.

[0023] In the claimed embodiment, the first load-bearing structure 2a comprises at least two supporting posts 7a which are associated with the elevated guiding element 3a, respectively, by means of two first slider couplings 8a and with the ground guiding element 15a, respectively, by means of two second slider couplings 9a.

[0024] As claimed, the first platform 10a is associated slidably with both of the supporting posts 7a so as to form a substantially H-shaped structure in which the first platform 10a is arranged transversely between the two supporting posts 7a.

[0025] In the proposed embodiment, there is a second platform 10b associated with a second load-bearing structure 2b which is substantially mirror-symmetrical to the first load-bearing structure 2a with respect to the tracks 6.

[0026] In other words, what has been described so far for the first load-bearing structure 2a occurs in a similar manner in the second load-bearing structure 2b and its components occur identically to those listed for the first load-bearing structure 2a, maintaining the same reference numerals modified for the index from "a" to "b".

[0027] The second platform 10b is therefore arranged opposite the first platform 10a and is provided with second lifting and lowering and locking means 12b and with second perimetric delimitation means 13b, respectively, which are similar to the first lifting and lowering and locking means 12a and to the first perimetric delimitation means 13a.

[0028] Conveniently, at least one or both of the platforms 10a and 10b are provided with a movable walkway 16 which can be extended in the direction of the train or tram 4 so that it is possible to form a walking surface that is continuous with the train or tram 4 and free from tripping points for the operator 14.

[0029] More specifically, each movable walkway 16 comprises a walkable deck 17 which can be moved, by virtue of movement means with manual or motorized ac-

tuation, toward and away from the train or tram 4 between a retracted position, in which the walkable deck 17 is arranged below the working balcony of the respective platform 10a or 10b, and an extracted position, in which the walkable deck 17 is extended in the direction of and in contact with the outline of the train or tram 4.

[0030] Conveniently, each walkable deck 17 is provided with a rubber-lined profile 18 which is formed at the edge that is designed to make contact with the outline of the train or tram 4.

[0031] As regards the elevated guiding elements 3a and 3b, each one of them comprises an overhead track which can be associated with at least one from the walls and the ceiling of the room in which the machine 1 is installed, and each first slider coupling 8a and 8b is provided by a first wheelbox 19 provided with first wheels in engagement with the overhead track.

[0032] Conveniently, the first wheels form a sliding interlocking with the overhead track so as to hang from it.

[0033] As regards instead the ground guiding elements 15a and 15b, each one of them comprises a ground track which can be recessed in the floor 5 and each second slider coupling 9a or 9b is constituted by a second wheelbox 20 provided with second wheels 21 of the motorized type in engagement with the ground track and by third wheels 22 of the rubber-lined type and configured to remain selectively suspended or resting on the floor 5 in a manner that is adjacent to the second wheels 21.

[0034] As regards the lifting and lowering and locking means 12a and 12b, they comprise, for each platform 10a and 10b, two racks which are associated with the respective supporting posts 7a or 7b and four pinions associated in pairs with said two racks.

[0035] The pinions are then provided with respective gearmotors 23 which are mutually independent and controlled by electronic control and management means so as to ensure the horizontal arrangement of the platforms 10a and 10b.

[0036] With particular reference to Figure 7, the perimetric delimitation means 13a and 13b comprise extractable handrails 24 and gates 25 which can move toward and away from each other between a maneuvering position, in which the extractable handrails 24 and the gates 25 of each platform 10a and 10b delimit laterally the platforms 10a and 10b independently and separately from each other, so as to form for each one of them a closed enclosure within which the operator 14 can be contained safely during the operations for the movement of the platforms 10a and 10b, and an active position, in which the extractable handrails 24 and the gates 25 of each platform 10a and 10b are extracted and open so as to connect to each other the platforms 10a and 10b and so as to form a single enclosure which delimits laterally a work area of the operator 14 formed at the working balconies of the platforms 10a and 10b, at the walkable decks 17 of the extractable walkways 16 and by the outline of the train or tram 4.

[0037] To complete the machine 1, there are fall pre-

vention devices for the operator 14 and sensor and position means associated with the platforms 10a and 10b, with the perimetric delimitation means 13a and 13b, and with the electronic control and management means for the mutual alignment of the platforms 10a and 10b and for the selective and/or sequential opening of the perimetric delimitation means 13a and 13b, so as to define in each condition of use a closed enclosure around the operator 14.

[0038] The machine 1 described so far can be used for various interventions, including:

visiting the upper parts of trains or trams 4 with limited descents onto the imperial by the operators;
interventions that provide for a longer stay on the imperial for a replacement of faulty elements, using for example a crane with a sliding arm;
interventions on the sides for operations for the maintenance of the body, of the windows and of the doors of the train or tram.

[0039] In the first two cases, the operator is positioned longitudinally with respect to the train or tram 4 at the height of the coach on which he is to intervene, by adjusting the height of the platforms 10a and 10b to the desired working height on the basis of the type of train or tram 4.

[0040] This operation can be set directly from the platform 10a or 10b by means of a dedicated user interface.

[0041] Once the height detected by an adapted sensor has been reached, lifting stops and enables the opening of the sliding gate 25 - on the side of the train or tram 4 -, which allows to exit from the balcony of the platform 10a or 10b and to access the imperial of the train or tram 4.

[0042] However, before opening the gate 25, the operator 14 extends the movable walkway 16 of both platforms 10a and 10b until it makes contact with the contour of the train or tram 4 by means of a manually actuated handle and extends at the same time also the extractable handrails 24 of both platforms 10a and 10b until they make mutual contact.

[0043] At this point the operator 14 can optionally engage the fall prevention devices and freely access the imperial of the train or tram 4.

[0044] In the third case, instead, the operator can be positioned, depending on the requirements of the work to be performed, at any height between the low position and the high position that is set.

[0045] However, in this case he will not be able to open the sliding gate but he will be able to act from the balcony.

[0046] In practice it has been found that the machine according to the invention meets the technical problem described above, allowing to reach all the external parts of a train or tram in a manner that is simple and quick and in full safety.

[0047] The machine for inspection and maintenance of trains and trams thus conceived is susceptible of numerous modifications and variations, all of which are

within the scope of the appended claims.

[0048] All the details may furthermore be replaced with other technically equivalent elements.

[0049] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to the requirements and the state of the art.

[0050] This application claims priority from the Italian Patent Application No. 102019000019924

[0051] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A machine (1) for inspection and maintenance of trains and trams, comprising a first load-bearing structure (2a) formed by at least one elevated guiding element (3a), which can be installed in a room designed to accommodate a train or tram (4) to be inspected and/or to be maintained at a raised height with respect to the floor (5) of said room so as to have an orientation that is substantially parallel to the longitudinal extension of the tracks (6) that are present in said room and on which said train or tram (4) is to be placed, and by at least one supporting post (7a) associated with said at least one elevated guiding element (3a) by means of a first slider coupling (8a), the degree of translational freedom of which lies on a directrix that is oriented substantially parallel to said tracks (6); said at least one supporting post (7a) being configured so as to rest on said floor (5) by means of a second slider coupling (9a) the degree of translational freedom of which is oriented substantially parallel to the degree of translational freedom of said first slider coupling (8a); a first platform (10a) being further comprised which is slidably associated with said at least one supporting post (7a) along an elevation direction (11) that is substantially normal to said floor (5); said first platform (10a) being provided with first lifting and lowering and locking means (12a, 12b) for its arrangement and retention at a preset height along said at least one supporting post (7a) and with first perimetric delimitation means (13a) which are configured so as to define a safety enclosure in which at least one operator (14) can perform the planned inspection and/or maintenance operations, **characterized in that** said first load-bearing structure (2a) comprises at least two of said supporting posts (7a) which are associated with said at least one elevated guiding element (3a), respectively, by means of two of said first slider couplings (8a); said first platform (10a) being associated slidably with both of said at least two supporting posts

(7a) in such a manner as to form a substantially H-shaped structure with said first platform (10a) arranged transversely between said at least two supporting posts (7a).

2. The machine (1), according to claim 1, **characterized in that** said first load-bearing structure (2a) comprises at least one ground guiding element (15a) which can be installed on said floor (5) in a manner that is parallel and lateral to said tracks (6); said at least one supporting post (7a) being associated slid-
ingly with said at least one ground guiding element (15a) to provide said second slider coupling (9a).
3. The machine (1), according to claim 1, **characterized in that** said at least two supporting posts (7a) are associated with said at least one ground guiding element (15a), respectively, by means of two of said second slider couplings (9a).
4. The machine (1), according to one or more of the preceding claims, **characterized in that** it comprises a second platform (10b) which is associated with a second load-bearing structure (2b) which is substantially mirror-symmetrical to said first load-bearing structure (2a) with respect to said tracks (6); said second platform (10b) being arranged opposite said first platform (10a) and being provided with second lifting and lowering and locking means (12b) and with second perimetric delimitation means (13b), which are respectively analogous to said first lifting and lowering and locking means (12a) and to said first perimetric delimitation means (13a).
5. The machine (1), according to one or more of the preceding claims, **characterized in that** at least one of said first platform (10a) and said second platform (10b) is provided with a movable walkway (16) which can be extended in the direction of said train or tram (4) so as to be able to form a continuous walking surface with said train or tram (4), free from tripping points for said at least one operator (14).
6. The machine (1), according to claim 5, **characterized in that** said movable walkway (16) comprises a walkable deck (17) which can move toward and away from said train or tram (4) between a retracted position, in which said walkable deck (17) is arranged below the working balcony of the respective one of said first and second platforms (10a, 10b), and an extracted position, in which said walkable deck (17) is extended in the direction of and in contact with the outline of said train or tram (4).
7. The machine (1), according to claim 6, **characterized in that** said walkable deck (17) is provided with a rubber-lined profile (18) which is formed at the edge designed to make contact with the outline of said

train or tram (4).

8. The machine (1), according to one or more of the preceding claims, **characterized in that** each one of said ground guiding elements (15a, 15b) comprises a ground track which can be recessed in said floor (5) and **in that** each one of said second slider couplings (9a, 9b) is provided by a second wheelbox (20) which is provided with second wheels (21) which engage said ground track and third wheels (22) configured to remain selectively suspended or resting on said floor (5) adjacent to said second wheels (21).
9. The machine (1), according to claim 8, **characterized in that** said second wheels (21) are of the motorized type and **in that** said third wheels (23) are of the rubber-lined type.
10. The machine (1) according to one or more of the preceding claims, **characterized in that** said first and second lifting and lowering and locking means (12a, 12b) comprise, for each one of said first and second platforms (10a, 10b), two racks which are associated with the respective said supporting posts (7a, 7b) and four pinions which are associated in pairs with said two racks; said pinions being provided with respective gearmotors (23) which are mutually independent and controlled by electronic control and management means so as to ensure the horizontal arrangement of said first and second platforms (10a, 10b).
11. The machine (1), according to one or more of the preceding claims, **characterized in that** said first and second perimetric delimitation means (13a, 13b) comprise extractable handrails (24) and gates (25) which can move toward and away from each other between a maneuvering position, in which said extractable handrails (24) and said gates (25) of each one of said first and second platforms (10a, 10b) laterally delimit said first and second platforms (10a, 10b) in a mutually independent and separate manner, so as to define, for each one of said first and second platforms (10a, 10b), a closed enclosure within which said at least one operator (14) can be contained safely during the operations for moving said first and second platforms (10a, 10b), and a working position, in which said extractable handrails (24) and said gates (25) of each one of said first and second platforms (10a, 10b) are extracted and open so as to mutually connect said first and second platforms (10a, 10b) and so as to form a single enclosure which delimits laterally a work area of said at least one operator (14) which is defined at the working balconies of said first and second platforms (10a, 10b), at said walkable decks (17) of said extractable walkways (16) and by the outline of said train or tram (4).

12. The machine (1), according to one or more of the preceding claims, **characterized in that** it comprises sensor and position means associated with said first and second platforms (10a, 10b), with said first and second perimetric delimitation means (13a, 13b), and with said electronic control and management means for the mutual alignment of said first and second platforms (10a, 10b) and for the selective and/or sequential opening of said first and second perimetric delimitation means (13a, 13b) in such a manner as to define, in any condition of use, a closed enclosure around said at least one operator (14).
13. The machine (1), according to one or more of the preceding claims, **characterized in that** it comprises fall prevention devices for said at least one operator (14).

Patentansprüche

1. Eine Maschine (1) zur Inspektion und Wartung von Zügen und Straßenbahnen, die eine erste Last tragende Struktur (2a) umfasst, bestehend aus mindestens einem erhöhten Führungselement (3a), die in einem Raum installiert werden kann, der dazu dient, eine(n) zu untersuchende(n) und/oder zu wartende(n) Zug oder Straßenbahn (4) auf einem mit Bezug auf den Boden (5) des Raumes erhöhten Niveau aufzunehmen, um eine Ausrichtung zu haben, die im Wesentlichen parallel zur Längserstreckung der in dem Raum vorhandenen Schienen (6) ist, auf welche der Zug oder die Straßenbahn (4) positioniert werden soll; und aus mindestens einem Stützpfeiler (7a), der mit dem mindestens einen erhöhten Führungselement (3a) über eine erste Schiebverbindung (8a) verbunden ist, deren Grad an Translationsfreiheit auf einer Direktrix liegt, welche im Wesentlichen parallel zu den Schienen (6) ausgerichtet ist; wobei der mindestens eine Stützpfeiler (7a) ausgebildet ist, um über eine zweite Schiebverbindung (9a) auf dem Boden (5) zu ruhen, deren Grad an Translationsfreiheit im Wesentlichen parallel zum Grad der Translationsfreiheit der ersten Schiebverbindung (8a) ausgerichtet ist; wobei weiter eine erste Plattform (10a) umfasst ist, die gleitend entlang einer Hubrichtung (11), die im Wesentlichen senkrecht zu dem Boden (5) ist, mit dem mindestens einen Stützpfeiler (7a) verbunden ist; wobei die erste Plattform (10a) mit ersten Hub-, Absenk- und Arretiermitteln (12a, 12b) ausgestattet ist, zum Zwecke ihrer Anordnung und Befestigung auf einer vordefinierten Höhe entlang dem mindestens einen Stützpfeiler (7a), und mit ersten Umfangs-Eingrenzungsmitteln (13a), die ausgebildet sind, um eine Sicherheits-Umzäunung zu bestimmen, in welcher mindestens ein Bediener (14) die geplanten Inspektions- und/oder Wartungsarbeiten durchführen kann; da-

durch gekennzeichnet, dass die erste Last tragende Struktur (2a) mindestens zwei der Stützpfeiler (7a) umfasst, die entsprechend über zwei der ersten Schiebverbindungen (8a) mit dem mindestens einen erhöhten Führungselement (3a) verbunden sind; wobei die erste Plattform (10a) auf solche Art gleitend mit beiden der mindestens zwei Stützpfeiler (7a) verbunden ist, dass eine im Wesentlichen H-förmige Struktur gebildet wird, in der die erste Plattform (10a) quer zwischen den mindestens zwei Stützpfeiler (7a) angeordnet ist.

2. Die Maschine (1) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die erste Last tragende Struktur (2a) mindestens ein Bodenführungselement (15a) umfasst, das auf dem Boden (5) auf eine Art aufgebaut werden kann, die parallel und seitlich zu den Schienen (6) ist; wobei der mindestens eine Stützpfeiler (7a) gleitend mit dem mindestens einen Bodenführungselement (15a) verbunden ist, um die zweite Schiebverbindung (9a) zu bilden.
3. Die Maschine (1) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die mindestens zwei Stützpfeiler (7a) mit dem mindestens einen Bodenführungselement (15a) entsprechend über zwei der zweiten Schiebverbindungen (9a) verbunden sind.
4. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie eine zweite Plattform (10b) umfasst, die mit einer zweiten Last tragenden Struktur (2b) verbunden ist, welche mit Bezug auf die Schienen (6) im Wesentlichen spiegelsymmetrisch zu der ersten Last tragenden Struktur (2a) ist; wobei die zweite Plattform (10b) der ersten Plattform (10a) gegenüber angeordnet und mit zweiten Hub-, Absenk- und Arretiermitteln (12b) und mit zweiten Umfangs-Eingrenzungsmitteln (13b) ausgestattet ist, welche analog zu den ersten Hub-, Absenk- und Arretiermitteln (12a) beziehungsweise zu den ersten Umfangs-Eingrenzungsmitteln (13a) sind.
5. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die erste Plattform (10a) und/oder die zweite Plattform (10b) mit einem beweglichen Laufsteg (16) ausgestattet sind, der in Richtung des Zuges oder der Straßenbahn (4) verlängert sein kann, um eine durchgehende Lauffläche mit dem Zug oder der Straßenbahn (4) bilden zu können, frei von Stolperstellen für den mindestens einen Bediener (14).
6. Die Maschine (1) gemäß Anspruch 5, **dadurch gekennzeichnet, dass** der bewegliche Laufsteg (16) ein begehbare Deck (17) umfasst, das sich zu dem Zug oder der Straßenbahn (4) hin oder von ihr fort bewegen kann zwischen einer eingezogenen Posi-

tion, in welcher sich das begehbare Deck (17) unterhalb des Arbeitsbalkons der ersten oder der zweiten Plattform (10a, 10b) befindet, und einer herausgezogenen Position, in welcher das begehbare Deck (17) in Richtung des und in Kontakt mit der Außenlinie des Zugs oder der Straßenbahn (4) verlängert ist.

7. Die Maschine (1) gemäß Anspruch 6, **dadurch gekennzeichnet, dass** das begehbare Deck (17) mit einem gummibeschichteten Profil (18) ausgestattet ist, das an der Kante geformt ist, die dazu bestimmt ist, in Kontakt mit der Außenlinie des Zugs oder der Straßenbahn (4) zu stehen.
8. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** jedes der Bodenführungselemente (15a, 15b) ein Bodengleis umfasst, das in den Boden (5) eingelassen werden kann, und dadurch, dass jede der zweiten Schieb Kupplungen (9a, 9b) mit einer zweiten Achsbuchse (20) ausgestattet ist, die mit zweiten Rädern (21) versehen ist, welche mit dem Bodengleis in Eingriff stehen, und dritten Rädern (22), ausgebildet, um wahlweise frei schwebend oder aufliegend auf dem Boden (5), angrenzend an die zweiten Räder (21), zu bleiben.
9. Die Maschine (1) gemäß Anspruch 8, **dadurch gekennzeichnet, dass** die zweiten Räder (21) vom motorisierten Typ sind, und dadurch, dass die dritten Räder (23) vom gummibeschichteten Typ sind.
10. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die ersten und zweiten Hub-, Absenk- und Arretiermittel (12a, 12b) für sowohl die erste als auch die zweite Plattform (10a, 10b) zwei Zahnstangen umfassen, die mit den jeweiligen Stützpfeuern (7a, 7b) verbunden sind, und vier Ritzel, welche in Paaren mit den beiden Zahnstangen gekoppelt sind; wobei die Ritzel mit entsprechenden Getriebemotoren (23) ausgestattet sind, die unabhängig voneinander und von elektronischen Steuerungs- und Verwaltungsmitteln gesteuert sind, um die horizontale Anordnung der ersten und der zweiten Plattform (10a, 10b) zu gewährleisten.
11. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die ersten und zweiten Umfangs-Eingrenzmittel (13a, 13b) ausziehbare Geländer (24) und Schranken (25) umfassen, die sich zueinander hin und voneinander fort bewegen können zwischen einer Manövrierposition, in welcher die ausziehbaren Geländer (24) und die Schranken (25) sowohl der ersten als auch der zweiten Plattform (10a, 10b) die erste und die zweite Plattform (10a, 10b) unabhängig

und separat voneinander seitlich begrenzen, um sowohl für die erste als auch für die zweite Plattform (10a, 10b) eine geschlossene Eingrenzung zu bestimmen, innerhalb derer der mindestens eine Bediener (14) während der Arbeiten zum Bewegen der ersten und zweiten Plattform (10a, 10b) sicher eingezäunt sein kann, und einer Arbeitsposition, in welcher die ausziehbaren Geländer (24) und die Schranken (25) sowohl der ersten als auch der zweiten Plattform (10a, 10b) herausgezogen und offen sind, um die erste und die zweite Plattform (10a, 10b) miteinander zu verbinden und um eine einzelne Eingrenzung zu bilden, welche einen Arbeitsbereich des mindestens einen Bedieners (14) seitlich begrenzt, der an den Arbeitsbalkonen der ersten und der zweiten Plattform (10a, 10b), an den begehbaren Decks (17) der herausziehbaren Brücken (16) und durch die Außenlinie des Zuges oder der Straßenbahn (4) bestimmt ist.

12. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Sensor- und Positionsmittel umfasst, verknüpft mit der ersten und der zweiten Plattform (10a, 10b), mit den ersten und zweiten Umfangs-Eingrenzmitteln (13a, 13b) und mit den elektronischen Steuerungs- und Verwaltungsmitteln, zum Zwecke der Ausrichtung der ersten und der zweiten Plattform (10a, 10b) miteinander und zum selektiven und/oder sequentiellen Öffnen der ersten und zweiten Umfangs-Eingrenzmittel (13a, 13b), um so, in jedem Bedienungszustand, eine geschlossene Einzäunung um den mindestens einen Bediener (14) herum zu bestimmen.
13. Die Maschine (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Fallschutzvorrichtungen für den mindestens einen Bediener (14) umfasst.

Revendications

1. Machine (1) pour l'inspection et l'entretien de trains et de tramways, comportant une première structure porteuse de charge (2a) formée par au moins un élément de guidage élevé (3a), qui peut être installé dans un local conçu pour recevoir un train ou tramway (4) à inspecter et/ou à entretenir à une hauteur surélevée par rapport au plancher (5) dudit local de manière à avoir une orientation qui est sensiblement parallèle à l'extension longitudinale des voies (6) qui sont présentes dans ledit local et sur lesquelles ledit train ou tramway (4) doit être placé, et par au moins un poteau de support (7a) associé audit au moins un élément de guidage élevé (3a) au moyen d'un premier accouplement coulissant (8a), dont le degré de liberté de translation se situe sur une directrice

- qui est orientée de manière sensiblement parallèle auxdites voies (6), ledit au moins un poteau de support (7a) étant configuré de manière à reposer sur ledit plancher (5) au moyen d'un second accouplement coulissant (9a) dont le degré de liberté de translation est orienté de manière sensiblement parallèle au degré de liberté de translation dudit premier accouplement coulissant (8a), une première plate-forme (10a) étant en outre comprise qui est associée de manière coulissante audit au moins un poteau de support (7a) le long d'une direction d'élévation (11) qui est sensiblement normale audit plancher (5), ladite première plate-forme (10a) étant pourvue de premiers moyens de montée et de descente et de blocage (12a, 12b) pour son agencement et sa retenue à une hauteur préétablie le long dudit au moins un poteau de support (7a) et de premiers moyens de délimitation périmétrique (13a) qui sont configurés de manière à définir une enceinte de sécurité dans laquelle au moins un opérateur (14) peut exécuter les opérations d'inspection et/ou d'entretien planifiées, **caractérisée en ce que** ladite première structure porteuse de charge (2a) comporte au moins deux desdits poteaux de support (7a) qui sont associés audit au moins un élément de guidage élevé (3a), respectivement, au moyen de deux desdits premiers accouplements coulissants (8a), ladite première plate-forme (10a) étant associée de manière coulissante à deux desdits au moins deux poteaux de support (7a) de telle manière à former une structure sensiblement en forme de H avec ladite première plate-forme (10a) agencée transversalement entre lesdits au moins deux poteaux de support (7a).
2. Machine (1) selon la revendication 1, **caractérisée en ce que** ladite première structure porteuse de charge (2a) comporte au moins un élément de guidage au sol (15a) qui peut être installé sur ledit plancher (5) d'une manière qui est parallèle et latérale auxdites voies (6), ledit au moins un poteau de support (7a) étant associé de manière coulissante audit au moins un élément de guidage au sol (15a) pour fournir ledit second accouplement coulissant (9a).
 3. Machine (1) selon la revendication 1, **caractérisée en ce que** lesdits au moins deux poteaux de support (7a) sont associés audit au moins un élément de guidage au sol (15a), respectivement, au moyen de deux desdits seconds accouplements coulissants (9a).
 4. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'elle** comporte une seconde plate-forme (10b) qui est associée à une seconde structure porteuse de charge (2b) qui présente une symétrie pratiquement spéculaire par rapport à ladite première structure porteuse de charge (2a) par rapport auxdites voies (6), ladite seconde plate-forme (10b) étant agencée opposée à ladite première plate-forme (10a) et étant pourvue de seconds moyens de montée et de descente et de blocage (12b) et de seconds moyens de délimitation périmétrique (13b), qui sont respectivement analogues auxdits premiers moyens de montée et de descente et de blocage (12a) et auxdits premiers moyens de délimitation périmétrique (13a).
 5. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'au moins** une plate-forme parmi ladite première plate-forme (10a) et ladite seconde plate-forme (10b) est pourvue d'une passerelle mobile (16) qui peut être déployée dans la direction dudit train ou tramway (4) de manière à pouvoir former une surface de marche continue avec ledit train ou tramway (4), exempte de point de trébuchement pour ledit au moins un opérateur (14).
 6. Machine (1) selon la revendication 5, **caractérisée en ce que** ladite passerelle mobile (16) comporte un pont praticable à pied (17) qui peut se rapprocher ou s'éloigner dudit train ou tramway (4) entre une position rétractée, dans laquelle ledit pont praticable à pied (17) est agencé sous la coursoive de travail de la plate-forme respective parmi lesdites première et seconde plates-formes (10a, 10b), et une position étendue, dans laquelle ledit pont praticable à pied (17) s'étend dans la direction du contour dudit train ou tramway (4) et en contact avec celui-ci.
 7. Machine (1) selon la revendication 6, **caractérisée en ce que** ledit pont praticable à pied (17) est pourvu d'un profilé revêtu de caoutchouc (18) qui est formé sur le bord conçu pour faire contact avec le contour dudit train ou tramway (4).
 8. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** chacun desdits éléments de guidage au sol (15a, 15b) comporte une voie au sol qui peut être évidée dans ledit plancher (5) et **en ce que** chacun desdits seconds accouplements coulissants (9a, 9b) est fourni par un second passage de roues (20) qui est pourvu de deuxièmes roues (21) qui s'engagent dans ladite voie au sol et de troisièmes roues (22) configurées pour rester sélectivement suspendues ou en appui sur ledit plancher (5) au voisinage desdites deuxièmes roues (21).
 9. Machine (1) selon la revendication 8, **caractérisée en ce que** lesdites deuxièmes roues (21) sont du type motorisé et **en ce que** lesdites troisièmes roues (23) sont du type revêtu de caoutchouc.
 10. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdits

premiers et seconds moyens de montée et de descente et de blocage (12a, 12b) comportent, pour chacune desdites première et seconde plates-formes (10a, 10b), deux voies qui sont associées auxdits poteaux de support (7a, 7b) respectifs et quatre pignons qui sont associés par paires auxdites deux voies, lesdits pignons étant pourvus de moteurs à engrenages (23) respectifs qui sont mutuellement indépendants et commandés par des moyens de commande et de gestion électroniques de manière à assurer l'agencement horizontal desdites première et seconde plates-formes (10a, 10b).

11. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdits premiers et seconds moyens de délimitation périmétrique (13a, 13b) comportent des garde-corps extractibles (24) et des portillons (25) qui peuvent se rapprocher et s'éloigner les uns des autres entre une position de manoeuvre, dans laquelle lesdits garde-corps extractibles (24) et lesdits portillons (25) de chacune desdites première et seconde plates-formes (10a, 10b) délimitent latéralement lesdites première et seconde plates-formes (10a, 10b) d'une manière mutuellement indépendante et séparée, de manière à définir, pour chacune desdites première et seconde plates-formes (10a, 10b), une enceinte fermée à l'intérieur de laquelle ledit au moins un opérateur (14) peut être contenu en toute sécurité pendant les opérations pour déplacer lesdites première et seconde plates-formes (10a, 10b), et une position de travail, dans laquelle lesdits garde-corps extractibles (24) et lesdits portillons (25) de chacune des première et seconde plates-formes (10a, 10b) sont extraits et ouverts de manière à relier mutuellement lesdites première et seconde plates-formes (10a, 10b) et de manière à former une seule enceinte qui délimite latéralement une zone de travail dudit au moins un opérateur (14) qui est définie sur les cour-sives de travail desdites première et seconde plates-formes (10a, 10b), sur lesdits ponts praticables à pied (17) desdites passerelles extractibles (16) et par le contour dudit train ou tramway (4).
12. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comporte des moyens de détection et de positionnement associés auxdites première et seconde plates-formes (10a, 10b), auxdits premiers et seconds moyens de délimitation périmétrique (13a, 13b) et auxdits moyens de commande et de gestion électroniques pour l'alignement mutuel desdites première et seconde plates-formes (10a, 10b) et pour l'ouverture sélective et/ou séquentielle desdits premiers et seconds moyens de délimitation périmétrique (13a, 13b) de telle manière à définir, dans toute condition d'utilisation, une enceinte fermée autour dudit au moins un opérateur (14).

13. Machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comporte des dispositifs antichute pour ledit au moins un opérateur (14).

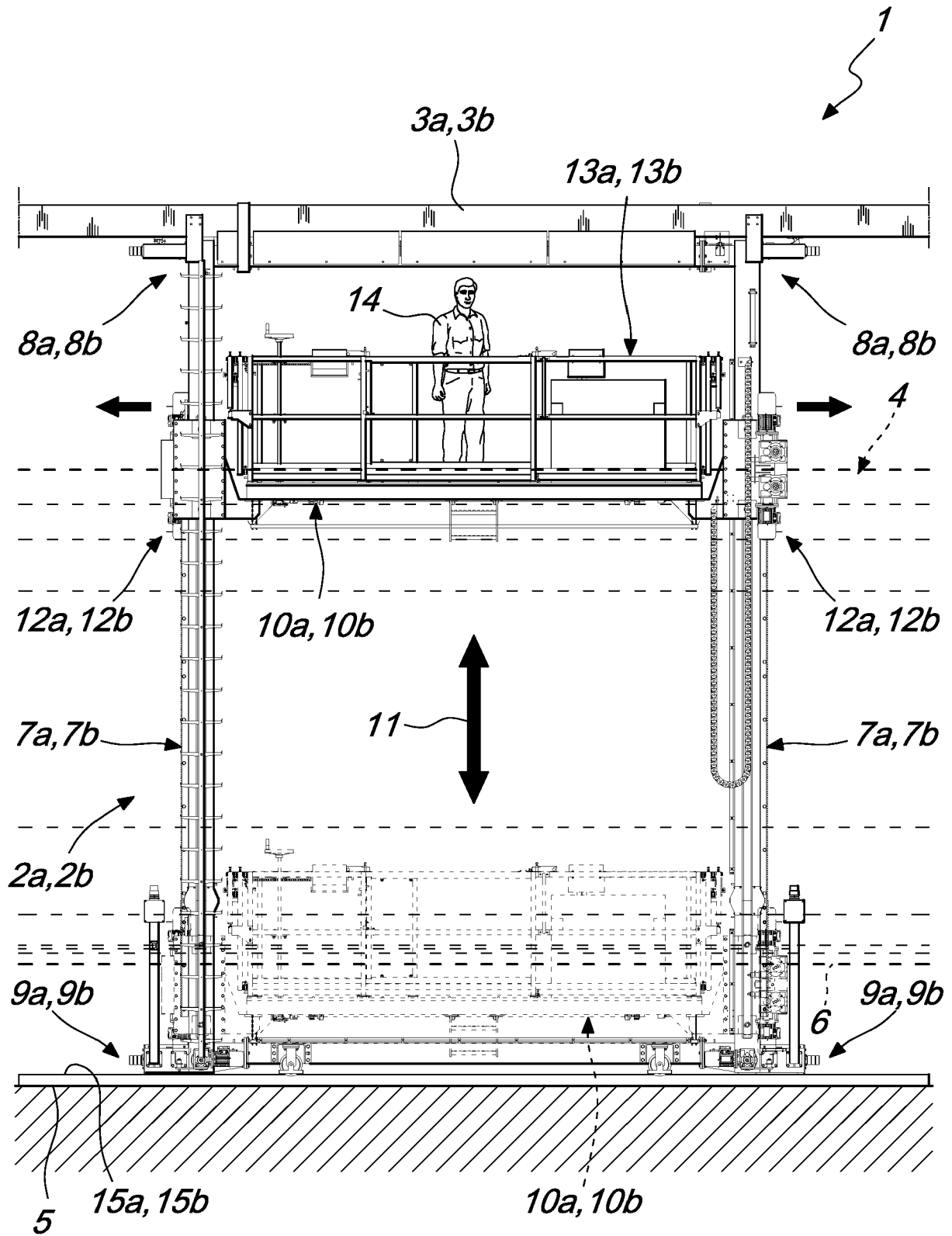


Fig. 1

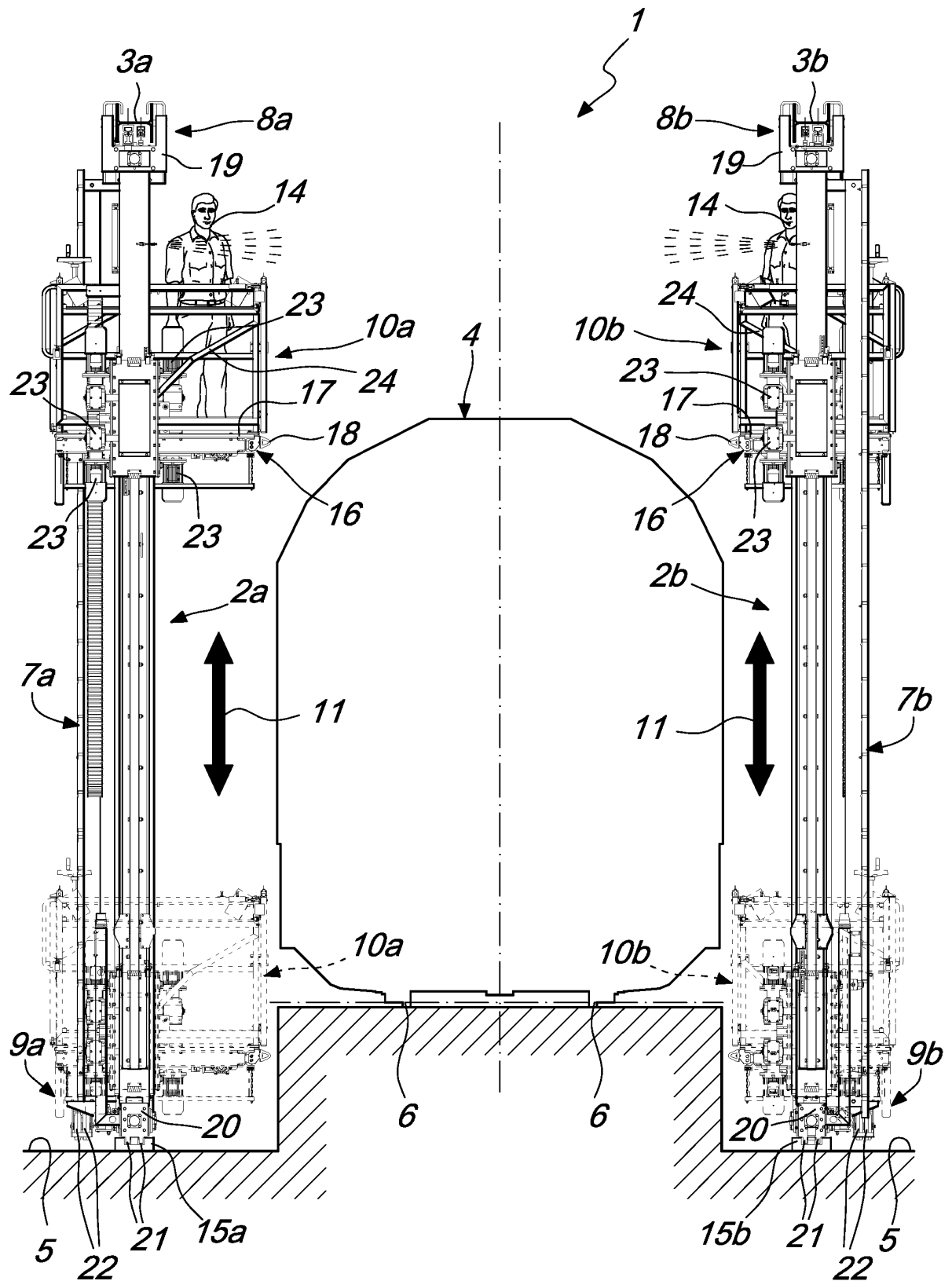


Fig. 2

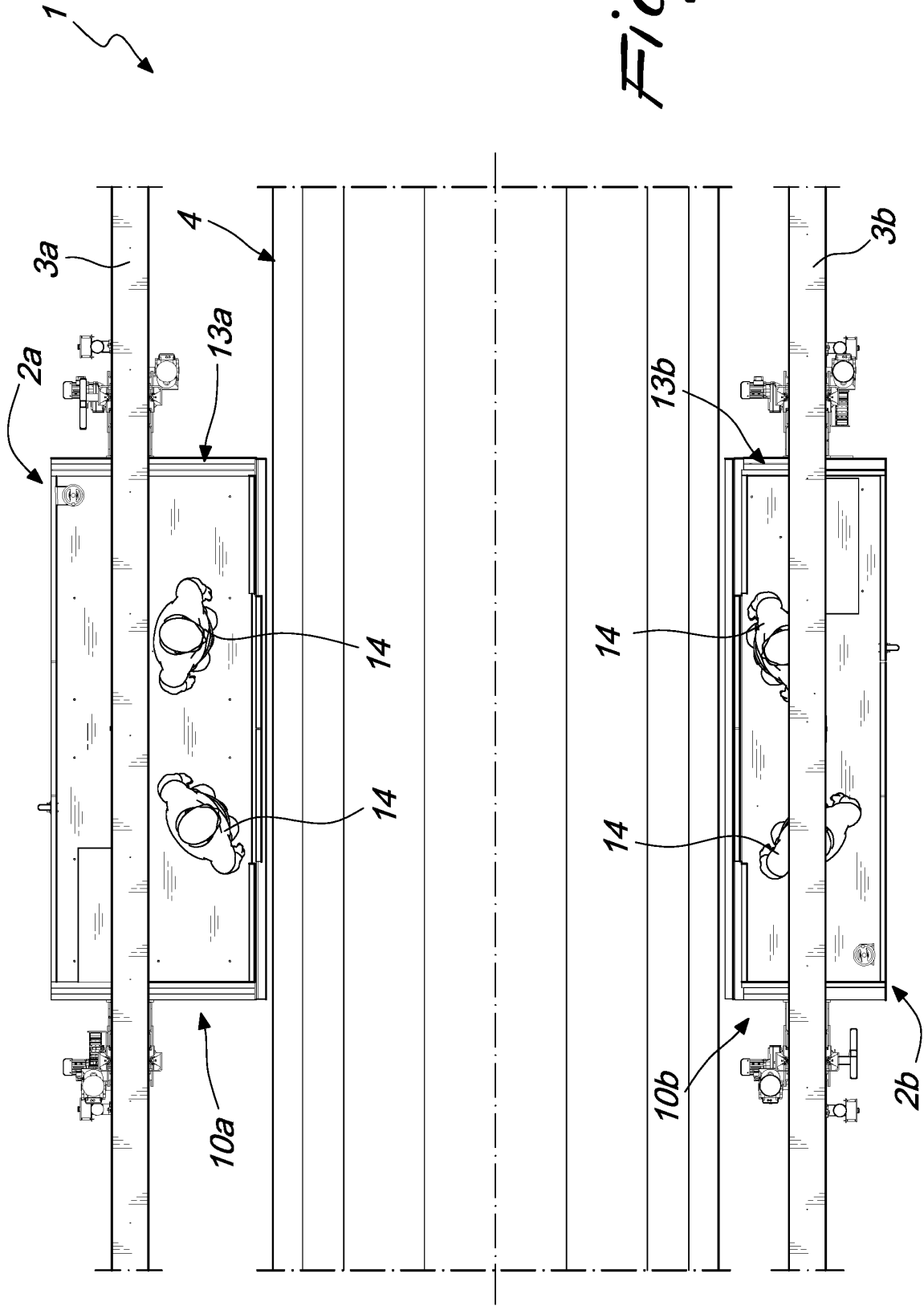


Fig. 3

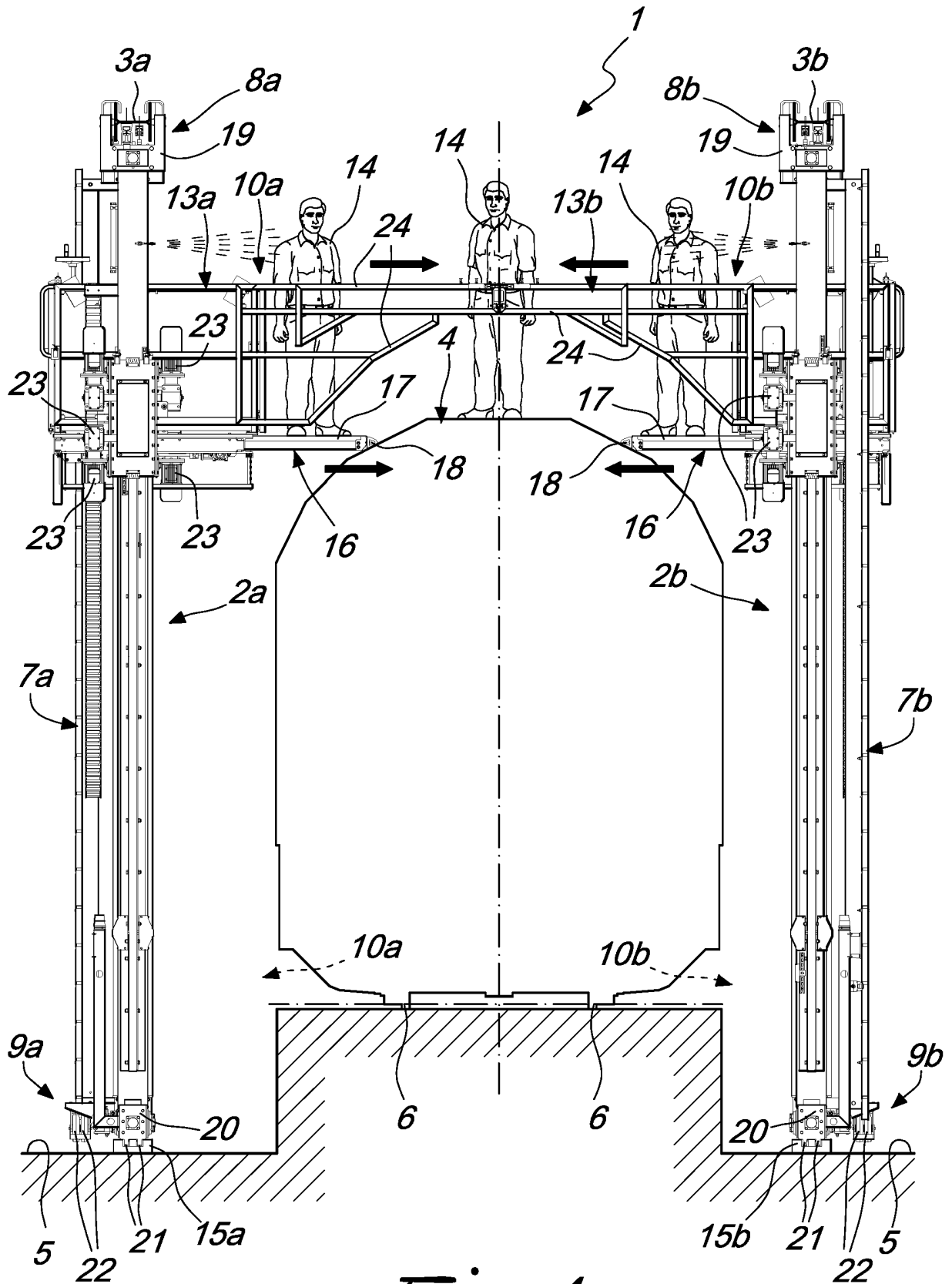


Fig. 4

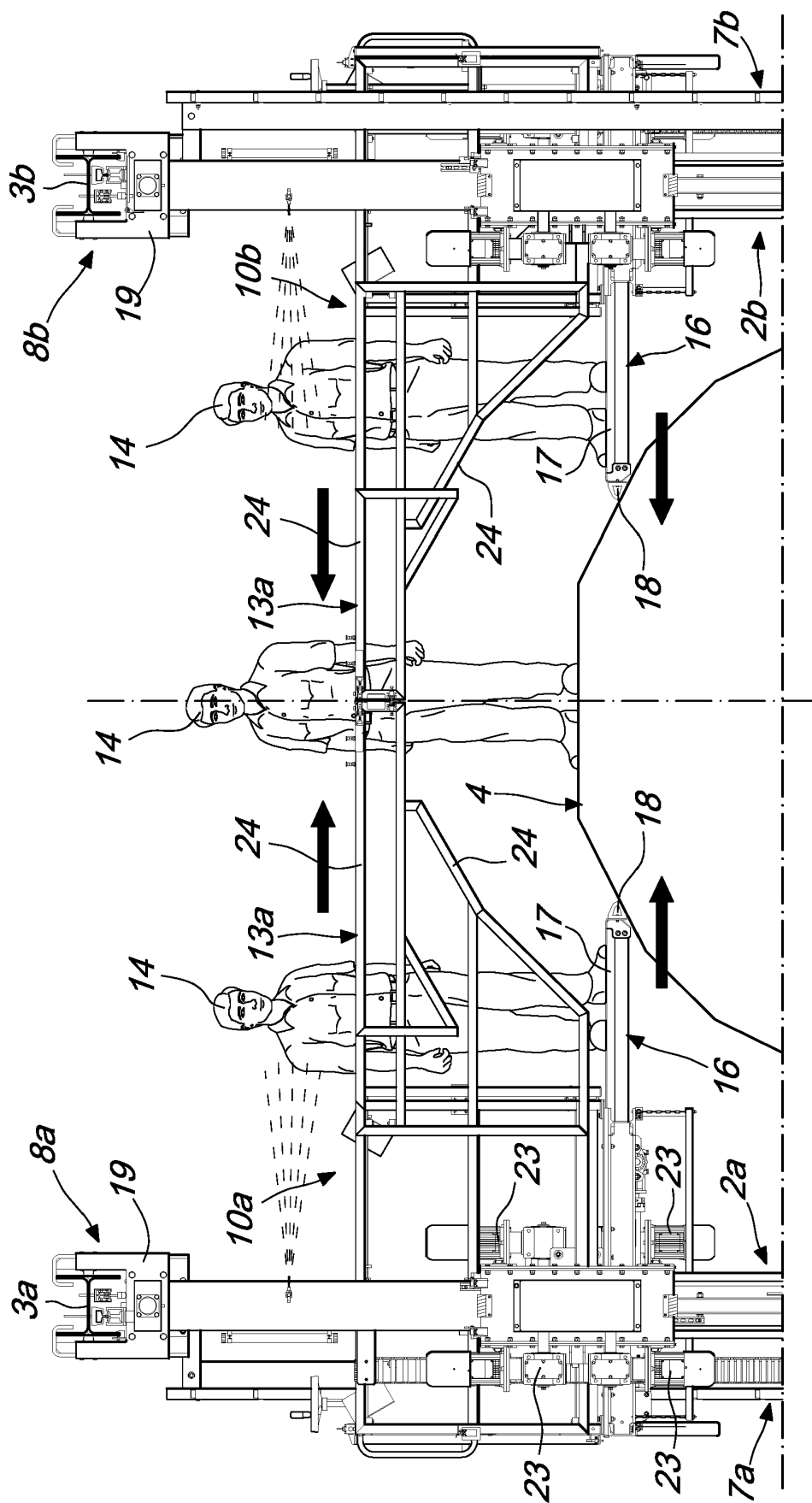
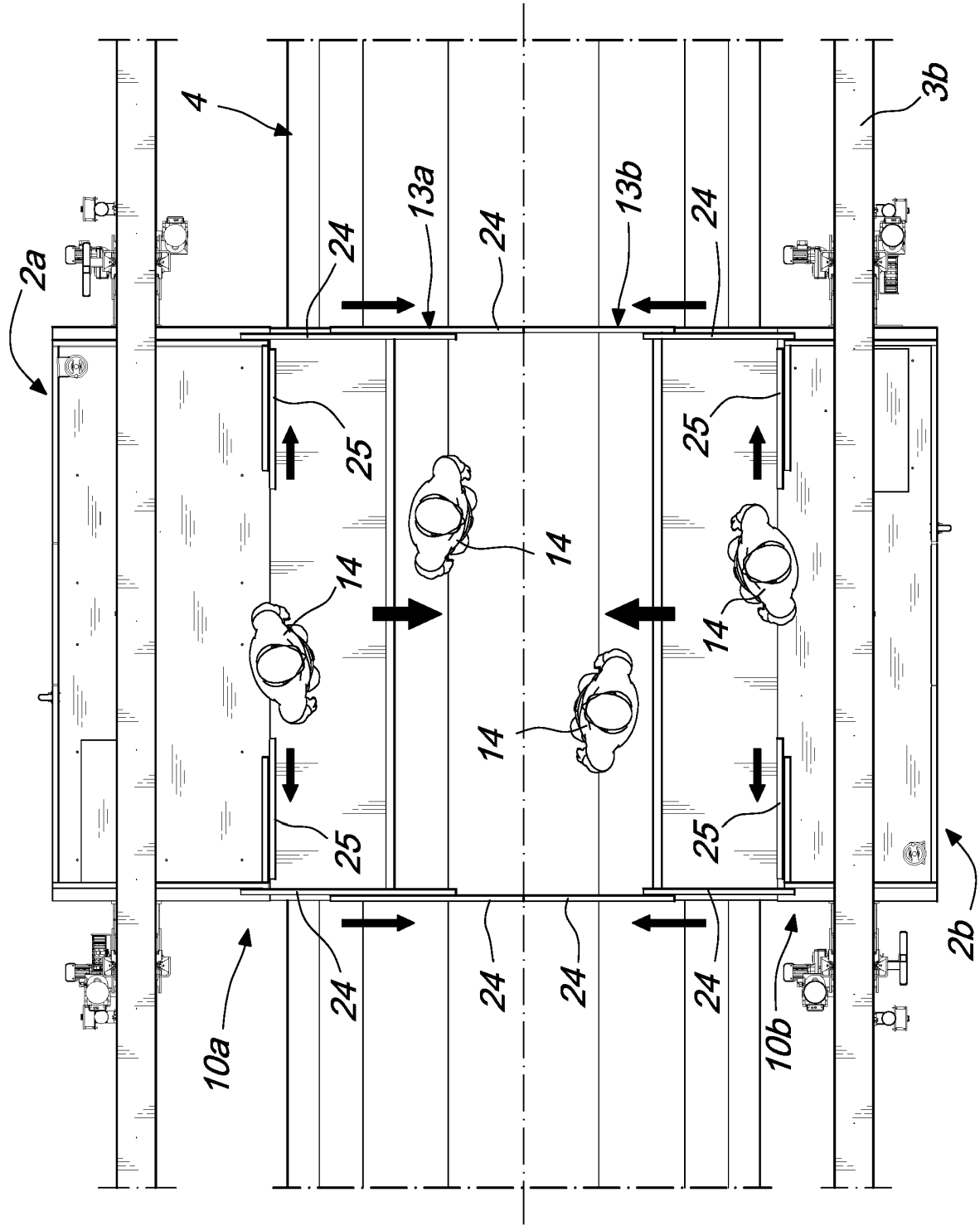
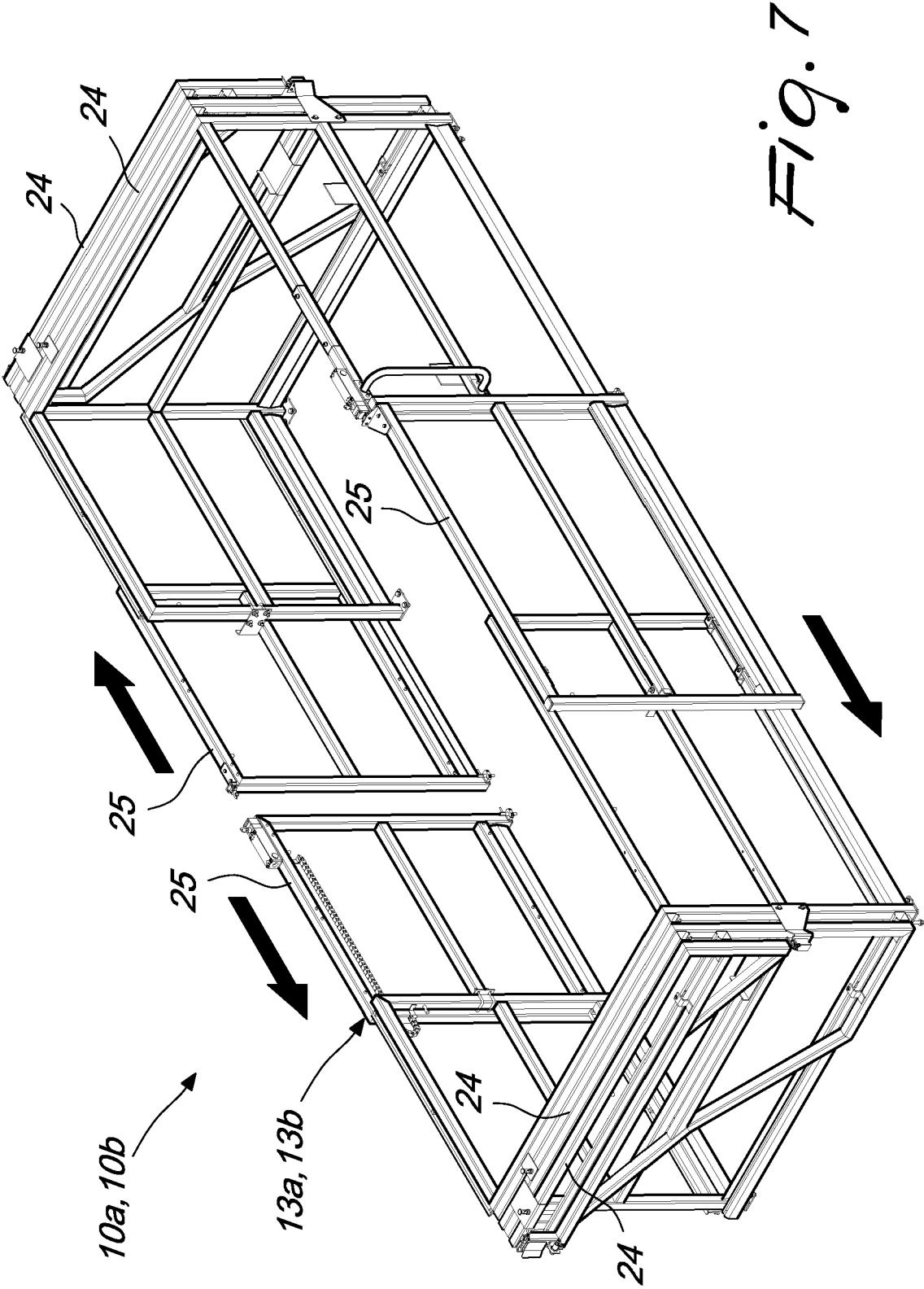


Fig. 5

Fig. 6





REFERENCES CITED IN THE DESCRIPTION

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