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(54) TRANSPORT ROBOT

(57) A goods and objects transporter robot having two front wheels (3) and one rear wheel (4) operatively coupled to a structural body (5). Such a transporter robot (1) comprises a front axle (8), a propulsive and steering guiding unit (9) operatively coupled to the two front

wheels (3) to obtain movement and direct said transporter robot (1) and a support element (11) of the goods and objects coupled to the transporter robot (1) so as to discharge the load thereof mainly on the front axle (8).

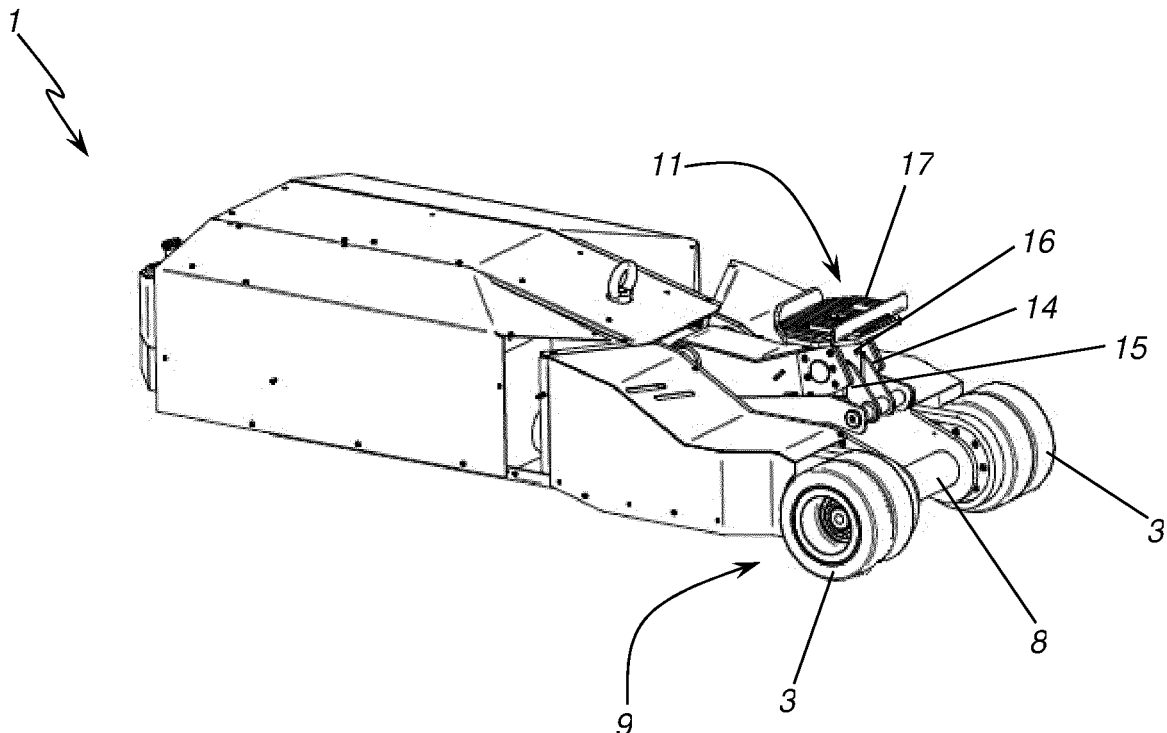


FIG. 3

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Description

Field of application

[0001] The present invention is applicable to the field of industrial logistics and, in particular, it relates to the handling of materials.

[0002] More in detail, the present invention relates to a goods and objects transporter robot for a plurality of applications, but particularly suitable for handling materials in assembly lines.

State of the art

[0003] In the field of goods handling, there is a need to arrange storage and transport systems which ensure simplicity and rapid execution.

[0004] To carry out such operations, in particular the lifting and transport of goods, the use of pallets is known, i.e., portable platforms of standard size generally made of wood, which allow to facilitate storing and handling materials.

[0005] Such pallets are shaped to allow the introduction of horizontal arms which allow specific equipment to perform lifting and moving operations. Typically, the means used are forklifts and pallet trucks, which for products with high weights can also be large, which are characterised by the presence of the aforementioned horizontal arms for easy coupling with the pallets.

[0006] However, there is often a need to handle goods whose dimensions, weights and/or shapes are not suitable for pallet storage and, consequently, the use of conventional machines such as forklifts and pallet trucks is not suitable for their transport.

[0007] To overcome such problems, in the prior art there are transporters capable of handling such goods whose features do not allow the placement thereof on pallets.

[0008] However, the handling of goods which cannot be palletised, in particular those of significant bulk and weight, require the use of means of dimensions such as to prevent easy manoeuvrability. Such problems are even more relevant considering that the products or parts thereof must often be moved in small spaces such as, for example, inside companies and in particular in the areas used for production.

[0009] Furthermore, the manoeuvrability difficulties of the known transporters entail the risk of collisions with other objects and/or persons present in the place of use and, consequently, implicates compromising the safety of the working environment.

[0010] In addition, US 2004/105747 A1 is known, which describes a loader configured to operate without the direct interaction of a human operator which, however, does not resolve the manoeuvrability drawbacks described above.

[0011] US 2007/040353 A1 is also known, which describes a terrain forklift comprising a pneumatic system

and braking means for providing a synchronised engagement thereof. However, the propulsion of such a forklift is provided by an additional forklift or by a motor installed on the forklift itself. This necessarily implies significant dimensions which prevent the use thereof in confined spaces.

[0012] Still, CN 106239470 A is known, relating to an autonomous vehicle comprising a QR alignment system which simplifies management but does not suggest any solution to overcome the above-mentioned manoeuvrability drawbacks

Presentation of the invention

[0013] The object of the present invention is to provide a transporter robot which allows to at least partially overcome the drawbacks highlighted above.

[0014] In particular, an object of the present invention is to provide a transporter robot adapted to also transport products and objects of dimensions and shapes which cannot be palletised.

[0015] Another object is to provide a transporter robot capable of moving, i.e., lifting and towing or pushing, even goods and objects having significant weights and overall dimensions.

[0016] A further object is to provide a transporter robot which allows easy manoeuvrability even in the presence of small spaces.

[0017] Another object of the present invention is to provide a transporter robot whose easy manoeuvrability allows limiting, if not eliminating, the risk of incurring accidental collisions with objects and people.

[0018] Said objects, as well as others which will become clearer below, are achieved by a transporter robot of goods and objects according to the following claims, which are to be considered an integral part of the present patent.

[0019] In particular, it has at least two front wheels and at least one rear wheel operatively coupled to at least one structural body.

[0020] Furthermore, the transporter robot of the invention also comprises at least one front axle coupled to the at least two front wheels, at least one propulsive and steering guiding unit and at least one support element for goods and objects.

[0021] According to an aspect of the invention, the guiding unit is operatively coupled to the at least two front wheels to obtain the movement of the transporter robot and to direct it.

[0022] According to another aspect of the invention, the support element is coupled to the transporter robot so as to discharge the load of the goods and objects mainly on the front axle.

[0023] Advantageously, the support element is shaped to allow the coupling with goods and non-palletizable objects.

[0024] Furthermore, the guiding unit transmits the propulsive force and directionality to the front wheels, allow-

ing, still advantageously, to easily operate the transporter robot even in small spaces. Consequently, the transporter robot limits, if not eliminates, the risk of accidental collisions with objects and people.

[0025] Still advantageously, the transporter robot of the invention, which discharges the weight of the goods mainly on the front axle, is able to transport objects having significant weights and dimensions, avoiding wheel slip-page.

[0026] According to a further aspect of the invention, the guiding unit comprises a plurality of thrusters each operatively coupled to a respective front wheel.

[0027] The presence of several different thrusters for each wheel allows the latter to rotate at different speeds. This advantageously entails a further facilitation of the manoeuvrability of the transporter robot of the invention, which is able to steer with more accentuated steering angles.

[0028] Furthermore, the presence of multiple motors allows to increase the driving power of the transporter robot without increasing the power of a single motor. Advantageously, this allows to reduce production costs as well as the overall dimensions and shaping of the transporter robot.

Brief description of the drawings

[0029] Further features and advantages of the invention will become more evident in light of the detailed description of a preferred but not exclusive embodiment of a transporter robot according to the invention, illustrated by way of non-limiting example with the aid of the accompanying drawings, in which:

FIG. 1 shows a transporter robot according to the invention in top view;

FIG. 2 shows a side view of the transporter robot of FIG. 1;

FIG. 3 shows an axonometric view of the transporter robot of FIG. 1.

Detailed description of some preferred embodiments

[0030] With reference to the aforementioned figures, a transporter robot **1** for goods and objects according to the invention is described. It comprises two front wheels **3** and one rear wheel **4** operatively coupled to a structural body **5**.

[0031] Obviously, the number and materials of the wheels, both front and rear, must not be considered limiting for the invention.

[0032] In addition, the transporter robot **1** also comprises a front axle **8**, coupled to the two front wheels **3**, a propulsive and steering guiding unit **9** and a support element **11**.

[0033] According to another aspect of the invention, the guiding unit **9** is operatively coupled to the two front wheels **3** to obtain the movement and direct the trans-

porter robot **1**. That is, the guiding unit **9** transfers the propulsive force to the front wheels **3**, which act as driving wheels. Furthermore, the guiding unit **9** transmits the steering to the aforementioned front wheels **3** which thus also assume a steering function, so as to control the directionality of the transporter robot **1**.

[0034] Advantageously, the particularity of the transporter robot **1** of being characterised by front driving and steering wheels **3** allows to improve the manoeuvrability thereof compared to equivalent transporters of the prior art. In fact, attributing both the task of propulsion and that of managing directionality to the front wheels **3** allows, still advantageously, to easily manoeuvre the transporter robot **1** even in small spaces where the use thereof is typically necessary.

[0035] Still advantageously, the easy directionality of the transporter robot **1** allows to move products and objects while safely limiting, if not eliminating, the risk of incurring accidental collisions with people and objects.

[0036] According to the described embodiment, the guiding unit **9** comprises two thrusters **12** each operatively coupled to one of the respective two front wheels **3**.

[0037] The presence of two thrusters **12** allows to transmit the motion to the two front wheels **3** making them independent of each other, so that they can perform a different number of revolutions in curves.

[0038] Advantageously, the ability of the transporter robot **1** to transmit a different rotation speed to the front wheels **3** allows to further improve the manoeuvrability of the transporter robot **1**, allowing in particular to develop steering with a much more accentuated curving angle than what occurs in the known equivalent handlers.

[0039] Still advantageously, the presence of two thrusters **12** allows the transporter robot **1** of the invention to have small dimensions, especially in height. This makes it particularly suitable, for example, for use in the nautical field for handling boats placed on cradles with wheels, or for lifting and towing motor vehicles, even damaged.

[0040] Obviously, such an aspect must not be considered limiting for different embodiments of the invention where, for example, the transporter robot comprises only one or more than two thrusters and if they do not control the driving wheels independently.

[0041] In the case of embodiments with more than two thrusters, advantageously, they allow limiting the overall dimensions occupied by the thrusters with respect to the dimensions required by a single thruster of equal power. Furthermore, the presence of several small thrusters allows the distribution thereof within the transporter robot so as not to compromise the shape of the transporter robot, thus maintaining the dimensions thereof, in particular the height thereof, contained.

[0042] According to an alternative embodiment of the invention, not shown in the figures, the guiding unit comprises a pair of variable control transmissions. Advantageously, such a pair allows to transmit the motion to the front wheels independently of each other if there are no

more thrusters capable of ensuring the possibility of a rotation differential.

[0043] According to a further aspect of the described embodiment, the two thrusters **12** are electric motors.

[0044] Advantageously, the use of electric motors allows to limit the overall dimensions due to the presence of the thrusters **12** with the same power and, consequently, to limit the dimensions of the transporter robot **1**, in particular the height thereof.

[0045] Still advantageously, the reduced dimensions of the transporter robot **1** allow it to be easily inserted below loading forklifts for handling goods and objects, especially of large dimensions.

[0046] According to another aspect of the invention, the support element **11** comprises an arm **14** coupled on a first side **15** to the transporter robot **1** and on a second side **16** to a platform **17**. Such a platform **17** is configured to receive goods and objects in support.

[0047] Advantageously, the platform **17** is shaped to receive goods with non-palletizable dimensions and shapes, thus making the transporter robot **1** of the invention suitable for handling any object.

[0048] Obviously, such an aspect must not be considered limiting for different embodiments of the invention where, for example, the support element comprises several platforms and/or one or more self-propelled cranes shaped for lifting and moving materials.

[0049] According to a further aspect of the invention, the transporter robot **1** comprises, although not shown in the figures, a radio control operatively connected to the guiding unit **9** to operate it remotely.

[0050] Advantageously, the radio control allows the operator to move while guiding the transporter robot **1**, so as to be able to have a better view in the manoeuvres to be performed, which is even more relevant in the case of handling very bulky goods such as, for example, boats and/or motor vehicles.

[0051] Operationally, the transporter robot **1** is positioned by the operator below, for example, a boat. Subsequently, the support element **11** is operated, which receives the products to be moved in support.

[0052] At this point, the operator controls the movement of the objects, i.e., the lifting and towing, or pushing thereof.

[0053] During steering manoeuvres, the transporter robot **1** commands one of the front wheels **3** to decrease the rotational speed, even until it stops, so as to allow much more accentuated curvature angles than the known equivalent handlers.

[0054] In light of the foregoing, it is understood that the transporter robot of the invention achieves all the intended objects.

[0055] In particular, the transporter robot of the invention allows to move goods and objects having dimensions and shapes such as not to be palletizable.

[0056] Furthermore, the transporter robot of the invention allows easy manoeuvrability even in the presence of reduced spaces.

[0057] Consequently, the transporter robot of the invention allows to limit, if not eliminate, the risk of incurring accidental collisions, improving safety.

[0058] The invention might be subject to many changes and variants, which are all included in the appended claims. Moreover, all the details and steps may furthermore be replaced by other technically equivalent elements, and the materials may be different depending on the needs, without departing from the protection scope of the invention defined by the appended claims.

Claims

1. A goods and objects transporter robot having at least two front wheels **(3)** and at least one rear wheel **(4)** operatively coupled to at least one structural body **(5)**, said transporter robot **(1)** comprising:
 - at least one front axle **(8)** coupled to said at least two front wheels **(3)**;
 - at least one propulsive and steering guiding unit **(9)** operatively coupled to said at least two front wheels **(3)** to obtain movement and direct said transporter robot **(1)**;
 - at least one support element **(11)** of the goods and objects coupled to said transporter robot **(1)** so as to transfer the load thereof mainly on said at least one front axle **(8)**.
2. Transporter robot according to claim 1, **wherein** said at least one guiding unit **(9)** comprises one or more thrusters **(12)**.
3. Transporter robot according to claims 1 or 2, **wherein** said at least one guiding unit **(9)** comprises a plurality of said thrusters **(12)** each operatively coupled to one of said at least two front wheels **(3)**.
4. Transporter robot according to claims 2 or 3, **wherein** said thrusters **(12)** are electric motors.
5. Transporter robot according to claims 1 or 2, **wherein** said guiding unit comprises at least one pair of variable control transmissions.
6. Transporter robot according to any one of the preceding claims, **wherein** said support element **(11)** comprises at least one arm **(14)** coupled on a first side **(15)** to said transporter robot **(1)** and on a second side **(16)** to at least one platform **(17)** shaped to receive the goods and objects in support.
7. Transporter robot according to any one of the preceding claims, **wherein** said support element comprises at least one self-propelled crane shaped for lifting and moving materials.

8. Transporter robot according to any one of the preceding claims, comprising a radio control operatively connected to said guiding unit **(9)** for operating said transporter robot **(1)** remotely.

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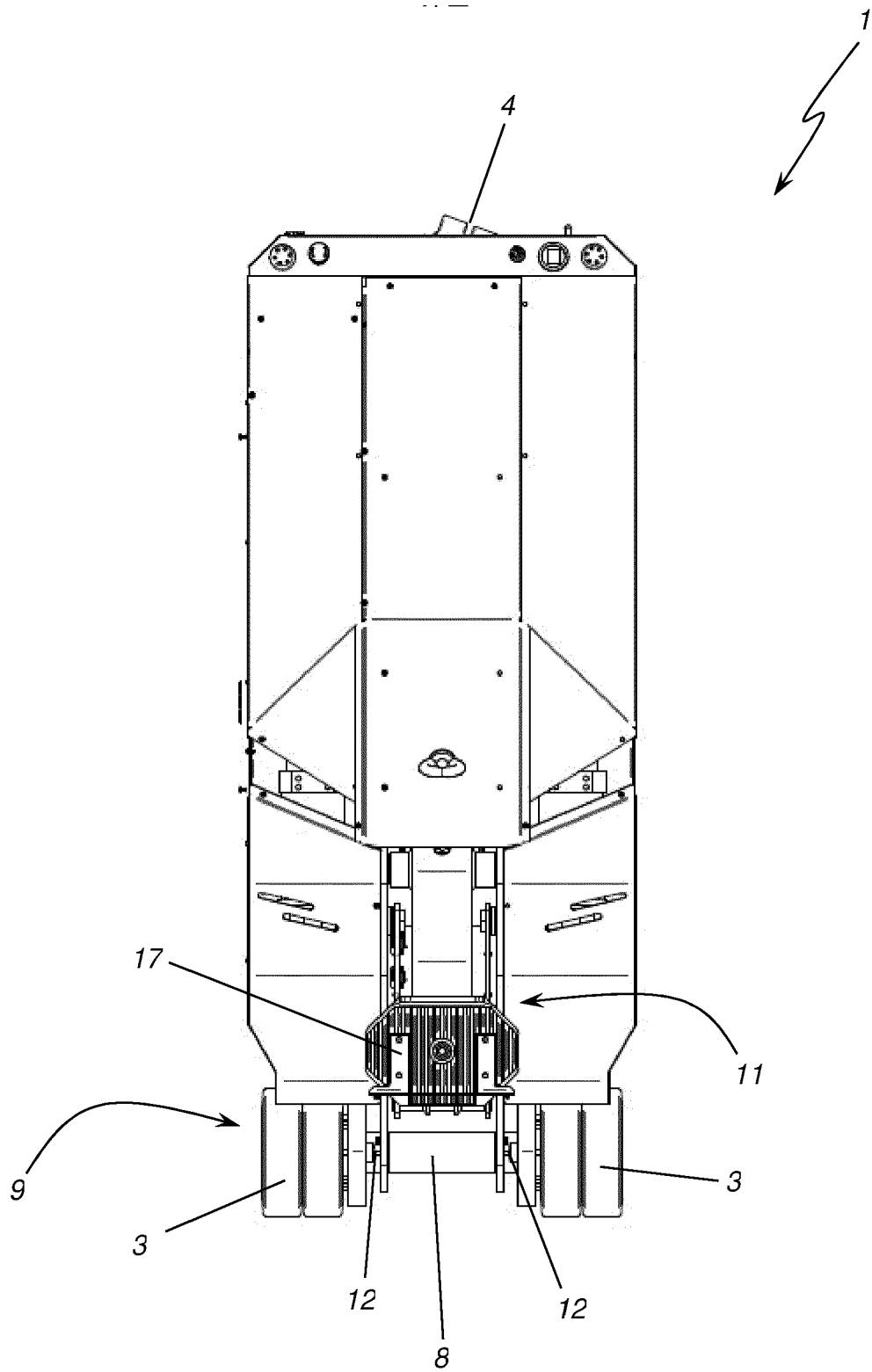


FIG. 1

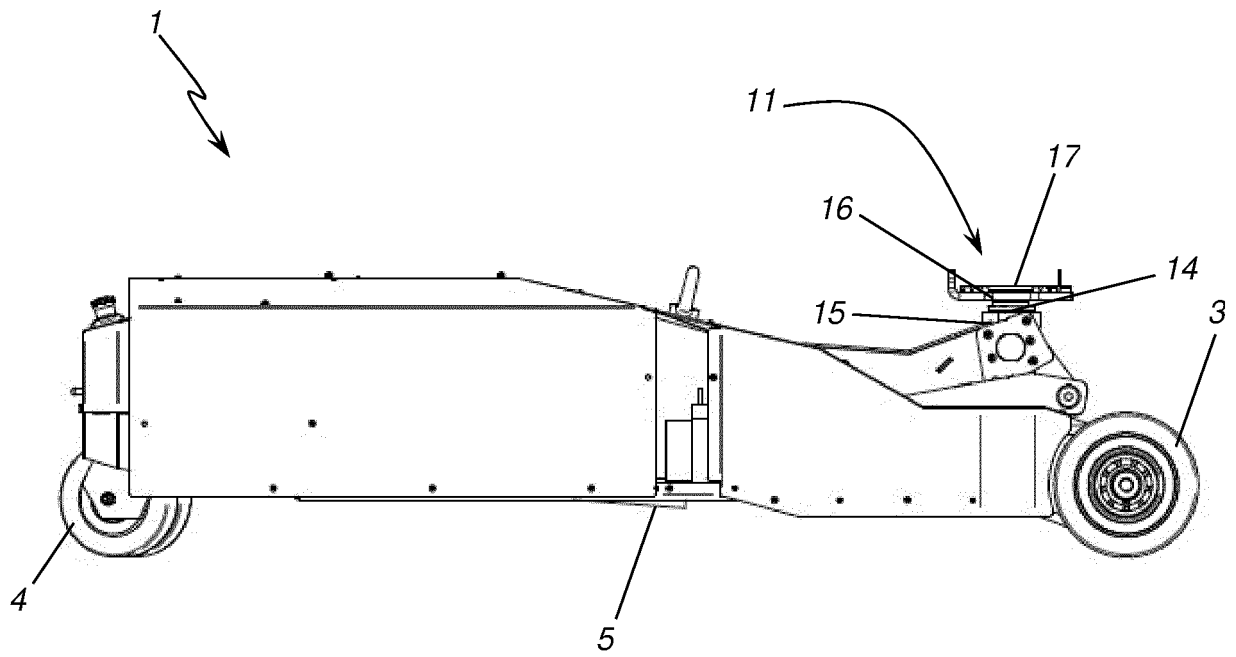


FIG. 2

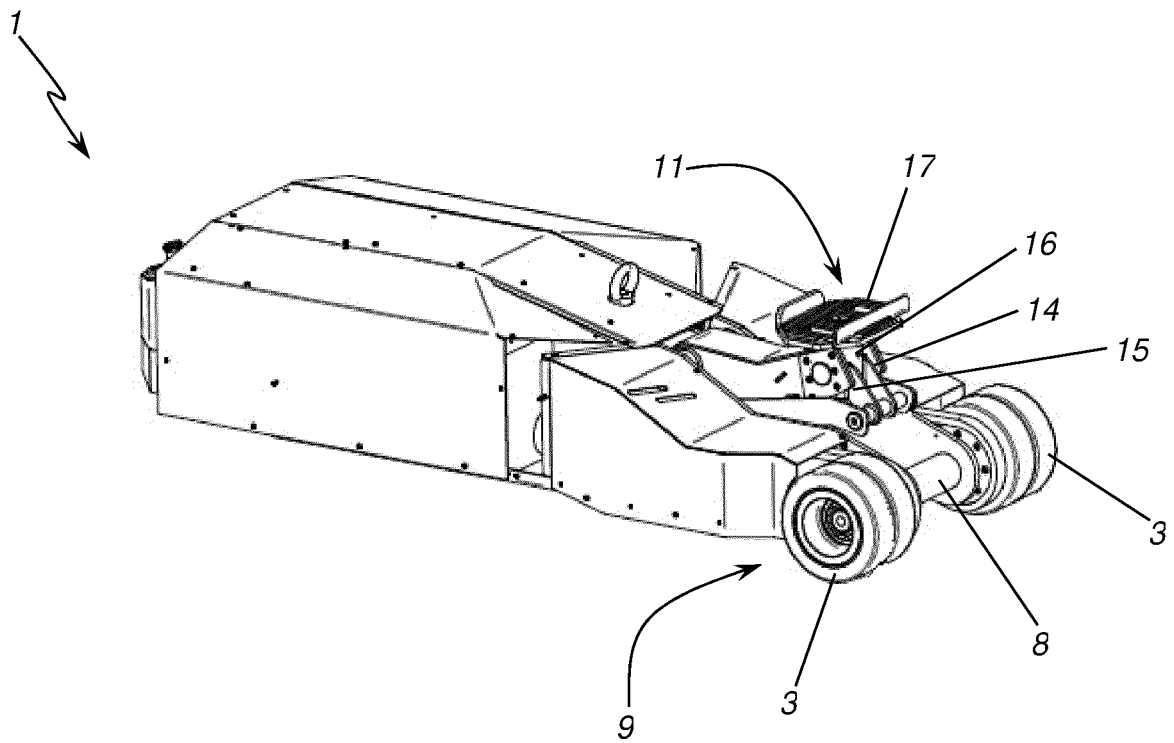


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
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Place of search The Hague		Date of completion of the search 15 July 2021	Examiner Popescu, Alexandru
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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