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(54) **DEVICE FOR DETECTING A PANTOGRAPH PASSING ALONG AN ELECTRIFIED OVERHEAD LINE AND SLIDING THEREON**

VORRICHTUNG ZUR ERKENNUNG EINES ENTLANG EINER ELEKTRISCHEN FREILEITUNG GEFÜHRTEN UND DARAUF GLEITENDEN PANTOGRAPHEN

DISPOSITIF DE DÉTECTION D'UN PANTOGRAPHE PASSANT LE LONG D'UNE LIGNE AÉRIENNE ÉLECTRIFIÉE ET GLISSANT SUR CELLE-CI

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Description

Field of application of the invention

[0001] The present invention applies in the field of railway and streetcar transport, i.e. in the field to which vehicles circulating along a special roadbed (i.e. dedicated thereto), comprising one or two tracks, belong. Said vehicles are generally defined "rolling stock".

[0002] In particular, the present invention relates to the field of electric rolling stock (i.e. operated by an own engine thereof, of electric type) and namely, the field of rolling stock in which the power is supplied by means of a mechanical member, commonly referred to as a "pantograph", sliding along an electrified overhead line.

[0003] The present invention specifically relates to a device which can be connected to an electrified overhead line and adapted to detect the passage of the pantograph sliding thereon.

Overview of the prior art

[0004] In railway and streetcar transport, the tracks are to be conveniently lubricated in order to minimize the friction between the tracks and the wheels of the rolling stock where sliding, rather than rolling, occurs. Said lubrication is required for example, at a curve, on the innermost edge of the track since said edge is intended to rub against the so-called "guide edge" of the rim of the wheels when the rolling stock element carries out the curve.

[0005] The frequency with which a lubricant is to be applied to a section of track depends on the transit frequency of the rolling stock at said section. To this end, railway and streetcar systems are provided with devices adapted to detect the passage of a rolling stock element at given points of the railway or streetcar network. Said devices comprise one or more proximity sensors (generally of the inductive, capacitive or optical type) capable of detecting the transit of a rolling stock element by perceiving the presence of an object in a portion of space "monitored" by the sensor. The presence of at least one proximity sensor however implies that the devices for detecting the transit of a rolling stock element supplied by means of an electric cable and this makes the installation of these devices difficult.

[0006] The document WO 2011/162605 A2 discloses a system for localizing objects on a track using ultrasound sensors mounted on the overhead line.

Objects of the invention

[0007] Although the above-described problem occurs irrespective of the type of supply of the rolling stock circulating on a railway or streetcar network, for the avoidance of doubt the present invention aims at solving the aforesaid problem for the railway and streetcar networks comprising an electrified overhead line from which an

electric rolling stock element transiting on said network can be supplied by means of at least one pantograph.

[0008] Therefore, it is the object of the present invention to overcome the above drawbacks concerning the railway and streetcar networks comprising an electrified overhead line by providing a device adapted to detect the transit of an electric rolling stock element along a section of a railway or streetcar network which is easier to install with respect to the known devices having the same purpose.

Summary and advantages of the invention

[0009] The subject of the present invention is a device adapted to detect the transit of an electric rolling stock element along a section of a railway or streetcar network,

said railway or streetcar network comprising an electrified overhead line,

said rolling stock element being electrically supplyable by means of a pantograph comprised in said rolling stock element and sliding on said line as said rolling stock element transits along said network, in which, according to the invention, said device comprises:

- an electric machine (such as e.g. a dynamo) adapted to convert a rotating motion into electrical energy for supplying it;
- connection means adapted to integrally connect said electric machine to said electrified overhead line while electrically isolating said electric machine from said electrified overhead line;
- conversion means adapted to convert a translation motion into a rotating motion;
- transmission means connected both to said electric machine and to said conversion means,

said transmission means being suitable for transmitting a rotating motion converted from a translation motion by said conversion means, to said electric machine for supplying electrical energy,

said conversion means being positioned so that, when said electric machine is connected to said electrified overhead line, when a rolling stock element transits along said section of railway or streetcar network, said conversion means come into contact with the pantograph of said rolling stock element so as to convert a translation of said pantograph occurring when it slides along said electrified overhead line into rotating motion,

said transmission means being electrically isolated to by said pantograph when said conversion means are in contact therewith;

- means for emitting radiofrequency electromagnetic waves connected to said electric machine so that they can be activated upon a supply of electrical energy by said electric machine, said emitting means being suitable for emitting, at an activation thereof, radiofrequency electromagnetic waves encoding a signal that a rolling stock element has transited along said section of railway or streetcar network. Incidentally, the radiofrequency electromagnetic waves are electromagnetic waves having a frequency which is lower than 300 GHz. The emitting means emit electromagnetic waves preferably at a frequency of 2405 MHz.

[0010] The device of the invention is suitable for detecting the transit of an electric rolling stock element along a section of railway or streetcar network, not by "monitoring" a portion of space close to the network (such as the devices of the prior art), rather by detecting the passage of a pantograph along the electrified overhead line at the aforesaid section of network.

[0011] Advantageously, in the device of the invention, while transiting along the railway or streetcar network, it is the rolling stock element itself to provide the supply required by the transceiver means to send a signal that a rolling stock element has passed (by means of the pantograph thereof and of the conversion means, transmission means and the electric machine of the device). In light of what is said, by default, the device is inactive and is activated only at the passage of a rolling stock element. Thus, electric feeder cables are not required.

[0012] The signal that a rolling stock element has transited is not sent via cable by the device of the invention, rather it is encoded in radiofrequency electromagnetic waves.

[0013] Feeder cables and transmission cables are not required; the device of the invention is easier to install with respect to the known devices of the same type. The present device advantageously is also highly accurate because it may only be activated by the contact (and the translation) of the pantograph with the conversion means upon a sliding thereof along the electrified overhead line. Incidentally, for the avoidance of doubt, an electric rolling stock element is generally provided with two pantographs, only one of which is in contact with the electrified overhead line. The detection of the passage of a pantograph by means of the device of the invention thus necessarily corresponds to the transit of one electric rolling stock element alone (or of a convoy pushed or pulled by one electric rolling stock element alone).

[0014] Other innovative features of the present invention are disclosed in the following description and are referred to in the dependent claims.

[0015] According to one aspect of the invention, said conversion means comprise a discoidal element which is rotatable about an axis arranged transversely and centrally to said discoidal element,

said discoidal element being positioned so that, when said electric machine is connected to said electrified overhead line, when a rolling stock element transits along said section of railway or streetcar network, said discoidal element:

- is not parallel to the pantograph of said rolling stock element and
- comes into contact with said pantograph at a substantially circular edge of said discoidal element.

[0016] According to this aspect of the invention, when the device is connected to the electrified overhead line, when a rolling stock element transits along the railway or streetcar network, the pantograph of said rolling stock element comes into contact with the discoidal element and, by sliding on the electrified overhead line, rotates the latter about the axis thereof. Said rotating motion is transferred from the transmission means to the electric machine, which sufficiently generates electrical energy to activate the emitting means so that the latter send a signal that a rolling stock element has transited.

[0017] According to another aspect of the invention, said discoidal element is positioned so that, when said electric machine is connected to said electrified overhead line, said discoidal element is substantially orthogonal to the pantograph of said rolling stock element when a rolling stock element transits along said section of railway or streetcar network.

[0018] According to another aspect of the invention, said discoidal element is made of an electrically insulating material at least at said substantially circular edge.

According to another aspect of the invention, said discoidal element comprises a brush including a plurality of bristles arranged substantially radially, at least at said substantially circular edge,

said discoidal element being positioned so that, when said electric machine is connected to said electrified overhead line, said discoidal element is at least partially compressed by the pantograph of said rolling stock element at said brush when a rolling stock element transits along said section of railway or streetcar network.

[0019] According to another aspect of the invention, the bristles of said brush are made of an electrically insulating synthetic material, preferably nylon.

[0020] According to another aspect of the invention, said discoidal element has a diameter between 120 mm and 140 mm, preferably of 130 mm, at said substantially circular edge,

said discoidal element being positioned so that, when said electric machine is connected to said electrified overhead line, said rotation axis of said discoidal element:

- lies on the side opposite to said electrified overhead line with respect to a pantograph sliding on the latter

and

- there is a distance from said electrified overhead line between 45 mm and 55 mm, preferably of 50 mm.

[0021] According to this aspect of the invention, when the device is connected to an electrified overhead line, the rotation axis of the discoidal element lies above said line.

[0022] Incidentally, distance between the rotation axis of the discoidal element and the electrified overhead line means the minimum distance between a point on said axis and a point on said line.

[0023] According to another aspect of the invention, said electric machine comprises a dynamo including a rotor and a stator,

said stator being connectable to said electrified overhead line by said connection means,
 said rotor being rotatable with respect to said stator, about an axis thereof,
 a rotation of said rotor, with respect to said stator, about the axis thereof, thus generating electrical energy,
 said transmission means comprising at least one shaft rotationally coupled to said discoidal element and to said rotor so that a rotation of said discoidal element about the axis thereof results in a rotation of said rotor, with respect to said stator, about the axis thereof, thus generating electrical energy.

[0024] According to another aspect of the invention, said connection means comprise:

- a container made of an electrically insulating material, preferably nylon, said container accommodating said electric machine and at least partially said transmission means therein;
- at least one terminal integrally connected to said container externally thereto and which can be tightened on said electrified overhead line, integrally with the latter.

[0025] According to another aspect of the invention, said device further comprises receiver means adapted to receive radiofrequency electromagnetic waves emitted by said emitting means and encode a signal that a rolling stock element has transited along said section of railway or streetcar network.

Brief description of the drawings

[0026] Further objects and advantages of the present invention will become apparent from the detailed description provided below of an exemplary embodiment thereof and from the accompanying drawings merely given by way of a nonlimiting example, in which:

- **figure 1** shows a front flat and diagrammatic view of

a device according to the present invention;

- **figure 2** shows a flat back view of the device in figure 1;
- **figure 3** shows a longitudinal diagrammatic cross section (from the top) of the device in figure 1;
- **figure 4** shows the device in figure 1 connected to an electrified overhead line of a railway or streetcar network.

Detailed description of some preferred embodiments of the invention

[0027] In the continuation of the present description, a figure may also be shown with reference to elements not expressly indicated in that figure but in other figures. The scale and proportions of the different elements depicted do not necessarily correspond to the actual ones.

[0028] **Figures 1 to 3** show a device 1 of the invention adapted to detect the transit of an electric rolling stock element along a section of a railway or streetcar network, comprising an electrified overhead line 30 (shown in figure 4). The rolling stock which transit can be detected by device 1 is the one electrically supplied by line 30 by means of a pantograph included in the rolling stock element and sliding on said line 30 when the latter transits along said network.

[0029] Device 1 comprises a container 2, preferably parallelepiped in shape having rectangular base, integrally connected to two mutually opposed brackets 3. Container 2 is interposed between the brackets 3, and the latter are preferably overhangingly connected to two mutually opposite walls 7 and 8, respectively, (corresponding to the side walls thereof in figures 1 and 2) of container 2. The brackets 3, and preferably also the container 2, are made of an electrically insulating material, preferably nylon. Two terminals 4 are respectively and integrally connected to the brackets 3 at the face of the latter facing downwards in figures 1 and 2. The terminals 4 are sized so as to be tightened on line 30, integrally thereto. Incidentally, given that the brackets 3 are integrally connected to container 2, also the terminals 4 are integrally connected to container 2, externally to the latter, and container 2 can be integrally connected to line 30 by means of the terminals 4.

[0030] Device 1 also comprises an electric machine 5 accommodated in container 2 and adapted to convert a rotating motion into electrical in order to supply the latter. Machine 5 preferably is a dynamo including a stator integrally connected to container 2 and a rotor which is rotatable with respect to the stator, about an axis thereof. A rotation of the rotor, with respect to said stator, about the axis thereof generates electrical energy. Dynamos are substantially known. Therefore, further details will not be provided. Given that the stator of dynamo 5 is integrally connected to container 2 and that the latter is integrally connected to the terminals 4, the stator of dynamo 5 can be integrally connected to line 30, the stator being electrically isolated therefrom. The connector 2 and

the terminals 4 thus act as means for connecting dynamo 5 to line 30.

[0031] Device 1 further comprises a discoidal element 6 which is rotatable about an axis arranged transversely and centrally to said element 6. In other words, by schematizing the discoidal element 6 with a circle, the rotation axis of said element 6 is preferably arranged orthogonal to said circle and preferably passes through the middle thereof. The discoidal element 6 is outside container 2 and is preferably oriented with respect to the latter 2, parallel to two mutually opposite walls 9 and 10 thereof corresponding to the front wall 9 and to the rear wall 10, respectively, of container 2 in figures 1 and 2. Therefore, the rotation axis of the discoidal element 6 is preferably orthogonal to the walls 9 and 10. With respect to container 2, the discoidal element 6 is also preferably positioned so that the rotation axis of said element 6 crosses wall 9. The discoidal element 6 is preferably made of an electrically insulating material at least at a substantially circular edge 11 thereof. Namely, the discoidal element 6 preferably comprises a brush 12 including a plurality of bristles 13 which are arranged substantially radially (at least at edge 11) and are made of an electrically insulating synthetic material, preferably nylon.

[0032] As is shown in figures 1 and 2, the discoidal element 6 has a diameter which is preferably greater than the height of the faces 9 and 10 of container 2. Due to this, the discoidal element 6 protrudes both at the bottom and at the top with respect to container 2 (i.e. with respect to the upper and lower walls thereof in figures 1 and 2). Preferably, the diameter of the discoidal element 6 at edge 11 is between 120 mm and 140 mm, and more preferably is 130 mm.

[0033] Device 1 comprises a mechanical transmission system 14 connected both to the rotor of dynamo 5 and to the discoidal element 6 and adapted to transmit a rotating motion of the latter (about the axis thereof) to the rotor of dynamo 5 in order to convert the aforesaid rotating motion into electrical energy for supplying it. System 14 preferably comprises a first shaft 15 onto which the discoidal element 6 is keyed, at one end, and a second shaft 16 integrally connected, at one end, to the rotor of dynamo 5. Shaft 15 crosses the wall 9 of container 2 and is rotatable with respect to the latter about a longitudinal axis thereof coinciding with the rotation axis of the discoidal element 6. Shaft 15 is thus centrally connected to the discoidal element 6 and is preferably arranged orthogonal both to the latter and to wall 9. Shaft 16 is accommodated in container 2 and is preferably arranged parallel to shaft 15. Shaft 16 is rotatable with respect to container 2 about a longitudinal axis thereof coinciding with the rotation axis of the rotor of dynamo 5. In addition to being rotationally coupled to the discoidal element 6 and to the rotor of dynamo 5, shafts 15 and 16 are rotationally coupled to each other by a belt 17 wound about a pair of pulleys 18 and 19 keyed onto the shafts 15 and 16, respectively, at the ends of the latter opposite to the discoidal element 6 and dynamo 5, respectively. There-

fore, system 14 preferably, but not necessarily, is a belt-type transmission system. Pulley 18, which is integral with shaft 15, preferably has a greater diameter than the one of pulley 19, which is integral to shaft 16, so that the rotor of dynamo 5 rotates faster than the discoidal element 6. The belt transmission of a rotating motion is substantially known. Therefore, further details will not be provided. Incidentally, as shown in figure 3, system 14 is only partially accommodated in container 2.

[0034] Device 1 comprises a first transceiver system 20 adapted to emit radiofrequency electromagnetic waves, preferably at a frequency of 2405 MHz. System 20 comprises at least one antenna (not shown in the drawings) and is connected to dynamo 5 so as to be suppliable by the latter. Namely, by default, system 20 is inactive and is connected to dynamo 5 so that it can be activated upon a supply of electrical energy by the dynamo itself. System 20 is configured to emit, at an actuation thereof, radiofrequency electromagnetic waves encoding a signal that a rolling stock element has transited (along the section of railway or streetcar network where device 1 is installed). Said signal can be received by a second transceiver system, the latter also preferably being part of device 1, although it can also be placed at a great distance from container 2. The first 20 and the second transceiver system are preferably unequivocally coupled to each other: the signal emitted by system 20 that a rolling stock element has transited can be preferably received and decoded by a second transceiver system alone, coupled thereto. The first 20 and the second transceiver system preferably use the known protocol "ZigBee" to "communicate with each other".

[0035] Figure 4 shows device 1 integrally connected to the electrified overhead line 30. As indicated above, the connection between device 1 and line 30 preferably occurs by means of one or more terminals 4. The discoidal element 6 is positioned so that, when device 1 is connected to line 30, when a rolling stock element transits along the section of railway or streetcar network comprising line 30, a pantograph of said rolling stock element comes into contact with the discoidal element 6, so that a translation of said pantograph occurring when it slides along line 30 causes a rotation of the discoidal element 6 about the axis thereof. The discoidal element 6 thus acts as a means for converting the translation motion of the pantograph into a rotating motion. Incidentally, brush 12 ensures the transmission system 14 is electrically isolated from the pantograph when the latter is in contact with the discoidal element 6.

[0036] When device 1 is connected to line 30, as shown in figure 4, shaft 15 (and with it, the rotation axis of the discoidal element 6) preferably lies above line 30, i.e. on the opposite side of the latter with respect to a pantograph sliding thereon. Namely, when device 1 is connected to line 30, the distance 31 between the latter and the rotation axis of the discoidal element 6 preferably is between 45 mm and 55 mm, and more preferably is 50 mm.

[0037] When device 1 is connected to line 30, the dis-

coidal element 6 is preferably positioned so that, when a rolling stock element transits along the section of railway or streetcar network comprising line 30, said element 6 is not parallel to the pantograph of said rolling stock element and comes into contact with said pantograph at edge 11. Namely, when device 1 is connected to line 30, the discoidal element 6 is preferably arranged substantially vertical, i.e. substantially orthogonal to a pantograph sliding on line 30. The discoidal element 6 is also preferably positioned so that, when a rolling stock element transits along the section of railway or streetcar network comprising line 30, said element 6 is partially compressed by the pantograph of said rolling stock element at brush 12.

[0038] With regard to the operation of device 1, when the latter is connected to line 30, system 20 is inactive so long as no rolling stock element transits along the section of railway or streetcar network comprising line 30. When a rolling stock element transits along said section of railway or streetcar network, the pantograph of said rolling stock element comes into contact with the discoidal element 6 and, by sliding on the electrified overhead line 30, rotates the latter about the axis thereof. Said rotating motion is transferred from system 14 to dynamo 5, which sufficiently generates electrical energy to activate system 20 so that the latter sends a signal that a rolling stock element has transited, to the second transceiver system (which can be placed at a certain distance from container 2).

[0039] In addition to the advantages mentioned above, device 1 is reliable because system 14 is preferably oversized with respect to the mechanical effort required for the operation thereof.

[0040] On the basis of the description provided for a preferred exemplary embodiment, it is obvious that certain changes can be made by those skilled in the art without departing from the scope of the invention as defined by the following claims.

Claims

1. A device (1) adapted to detect the transit of an electric rolling stock element along a section of a railway or streetcar network, comprising an electrified overhead line (30),

said rolling stock element being electrically supplyable by means of a pantograph comprised in said rolling stock element and sliding on said electrified overhead line (30) as said rolling stock element transits along said network, said device (1) being **characterized in that** it comprises:

- an electric machine (5) adapted to convert a rotating motion into electrical energy in order to supply it;

- connection means (2, 3, 4) adapted to integrally connect said electric machine (5) to said electrified overhead line (30) while electrically isolating said electric machine (5) from said electrified overhead line (30);
- conversion means (6) adapted to convert a translation motion into a rotating motion;
- transmission means (14) connected both to said electric machine (5) and to said conversion means (6),

said transmission means (14) being suitable for transmitting a rotating motion converted from a translation motion by said conversion means (6), to said electric machine (5) for supplying electrical energy,

said conversion means (6) being positioned so that, when said electric machine (5) is connected to said electrified overhead line (30), when a rolling stock element transits along said section of railway or streetcar network, said conversion means (6) come into contact with the pantograph of said rolling stock element so as to convert a translation of said pantograph occurring when it slides along said electrified overhead line (30) into rotating motion, said transmission means (14) being electrically isolated to said pantograph when said conversion means (6) are in contact therewith;

- means (20) for emitting radiofrequency electromagnetic waves connected to said electric machine (5) so that they can be activated upon a supply of electrical energy by said electric machine (5), said emitting means (20) being suitable for emitting, at an activation thereof, radiofrequency electromagnetic waves encoding a signal that a rolling stock element has transited along said section of railway or streetcar network.

2. A device (1) according to claim 1, **characterized in that** said conversion means (6) comprise a discoidal element (6) which is rotatable about an axis arranged transversely and centrally to said discoidal element (6), said discoidal element (6) being positioned so that, when said electric machine (5) is connected to said electrified overhead line (30), when a rolling stock element transits along said section of railway or streetcar network, said discoidal element (6):

- is not parallel to the pantograph of said rolling

stock element
and

● comes into contact with said pantograph at a substantially circular edge (11) of said discoidal element (6).

3. A device (1) according to claim 2, **characterized in that** said discoidal element (6) is positioned so that, when said electric machine (5) is connected to said electrified overhead line (30), said discoidal element (6) is substantially orthogonal to the pantograph of said rolling stock when a rolling stock element transits along said section of railway or streetcar network.

4. A device (1) according to claim 2 or 3, **characterized in that** said discoidal element (6) is made of an electrically insulating material at least at said substantially circular edge (11).

5. A device (1) according to one of claims 2 to 4, **characterized in that**

said discoidal element (6) comprises a brush (12) including a plurality of bristles (13) which are arranged substantially radially, at least at said substantially circular edge (11), said discoidal element (6) being positioned so that, when said electric machine (5) is connected to said electrified overhead line (30), said discoidal element (6) is at least partially compressed by the pantograph of said rolling stock element at said brush (12) when a rolling stock element transits along said section of railway or streetcar network.

6. A device (1) according to claim 5 when dependent on claim 4, **characterized in that** the bristles (13) of said brush (12) are made of an electrically insulating synthetic material.

7. A device (1) according to claim 5 or 6, **characterized in that** said discoidal element (6) has a diameter between 120 mm and 140 mm at said substantially circular edge (11), said discoidal element (6) being positioned so that, when said electric machine (5) is connected to said electrified overhead line (30), said rotation axis of said discoidal element (6):

● lies on the side opposite to said electrified overhead line (30) with respect to a pantograph sliding on the latter
and

● there is a distance from said electrified overhead line (30) between 45 mm and 55 mm.

8. A device (1) according to one of claims 2 to 7, **char-**

acterized in that

said electric machine (5) comprises a dynamo (5) including a rotor and a stator, said stator being connectable to said electrified overhead line (30) by said connection means (2, 3, 4), said rotor being rotatable with respect to said stator, about an axis thereof, a rotation of said rotor, with respect to said stator, about the axis thereof, thus generating electrical energy, said transmission means (14) comprising at least one shaft (15, 16) rotationally coupled to said discoidal element (6) and to said rotor so that a rotation of said discoidal element (6) about the axis thereof results in a rotation of said rotor, with respect to said stator, about the axis thereof, thus generating electrical energy.

9. A device (1) according to one of the preceding claims, **characterized in that** said connection means (2, 3, 4) comprise:

- a container (2) made of an electrically insulating material, said container (2) accommodating said electric machine (5) and at least partially said transmission means (14) therein;
- at least one terminal (4) integrally connected to said container (2) externally thereto and which can be tightened on said electrified overhead line (30), integrally with the latter.

10. A device (1) according to one of the preceding claims, **characterized in that** it comprises receiver means which can be placed at a certain distance from said container (2) and adapted to receive radiofrequency electromagnetic waves emitted by said emitting means (20) and encoding a signal that a rolling stock element has transited along said section of railway or streetcar network.

Patentansprüche

1. Vorrichtung (1) zum Erfassen des Durchgangs eines elektrisch rollenden Stockelements entlang eines Abschnitts eines Eisenbahn- oder Straßennetzes, umfassend eine elektrifizierte Oberleitung (30),

wobei das rollende Stockelement elektrisch mittels eines Stromabnehmers angetrieben wird, der in dem rollenden Stockelement enthalten ist und auf der elektrifizierten Oberleitung (30) gleitet, wenn das rollende Stockelement entlang des Netzes fährt, wobei die Vorrichtung (1) ist **dadurch gekenn-**

zeichnet, dass sie Folgendes umfasst:

- einen Elektromotor (5), der geeignet ist, eine Drehbewegung in elektrische Energie umzuwandeln, um sie anzutreiben;
- Verbindungsmittel (2, 3, 4), die in der Lage sind, den Elektromotor (5) integral mit der elektrifizierten Oberleitung (30) zu verbinden und gleichzeitig den Elektromotor (5) elektrisch von der elektrifizierten Oberleitung (30) zu trennen;
- Umwandlungsmittel (6), die geeignet sind, eine Translationsbewegung in eine Rotationsbewegung umzuwandeln;
- Übertragungsmittel (14), die sowohl mit dem Elektromotor (5) als auch mit den Umwandlungsmitteln (6) verbunden sind,

- wobei das Übertragungsmittel (14) angepasst ist, um eine Rotationsbewegung, die von einer Translationsbewegung durch ein solches Umwandlungsmittel (6) umgewandelt wird, auf den Elektromotor (5) zu übertragen, um elektrische Energie zuzuführen,
- wobei die Umwandlungsmittel (6) so positioniert sind, dass, wenn der Elektromotor (5) mit der elektrifizierten Oberleitung (30) verbunden ist, zum Zeitpunkt des Transports eines Stockelements, das entlang der Strecke des Eisenbahnnetzes rollt, oder entlang der Straße, wo die Umwandlungsmittel (6) mit dem Stromabnehmer des rollenden Stockelements in Kontakt kommen, um eine Verschiebung des Stromabnehmers, die auftritt, wenn er entlang der elektrifizierten Oberleitung (30) läuft, in eine Drehbewegung umzuwandeln,

wobei die Übertragungsmittel (14) bezüglich des Stromabnehmers elektrisch isoliert sind, wenn die Umwandlungsmittel (6) mit diesem in Kontakt sind;

- mit dem Elektromotor (5) verbundene Mittel (20) zum Aussenden hochfrequenter elektromagnetischer Wellen, wobei diese mit einer elektrischen Energieversorgung über den Elektromotor (5) betreibbar sind,

wobei die Sendemittel (20) in der Lage sind, nach ihrer Aktivierung hochfrequente elektromagnetische Wellen auszusenden, die ein Signal codieren, auf dessen Grundlage ein rollendes Stockelement die Strecke des Eisenbahn- oder Straßennetzes durchlaufen hat.

2. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Umwandlungsmittel (6) ein scheibenförmiges Element (6) umfassen, das sich um eine Achse drehen kann, die quer und mittig in Bezug auf das scheibenförmige Element (6) angeordnet ist, wobei das scheibenförmige Element (6) so positioniert ist, dass, wenn der Elektromotor (5) mit der elektrifizierten Oberleitung (30) verbunden ist, wenn ein rollendes Stockelement den Abschnitt des Eisenbahn- oder Straßennetzes passiert, ist das scheibenförmige Element (6) :

- * nicht parallel zum Stromabnehmer des rollenden Stockelementes und
- * an einer im wesentlichen kreisförmigen Kante (11) des scheibenförmigen Elements (6) mit dem Stromabnehmer in Kontakt kommt.

3. Vorrichtung (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** das scheibenförmige Element (6) so positioniert ist, dass bei Verbindung des Elektromotors (9) an die elektrifizierte Oberleitung (30) das scheibenförmige Element (6) im Wesentlichen orthogonal zum Stromabnehmer des rollenden Stockelements ist, wenn ein rollendes Stockelement die Strecke des Eisenbahn- oder Straßennetzes passiert.

4. Vorrichtung (1) nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** das scheibenförmige Element (6) zumindest an dem im Wesentlichen kreisförmigen Rand (11) aus einem elektrisch isolierenden Material besteht.

5. Vorrichtung (1) nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** das scheibenförmige Element (6) eine Bürste (12) mit mehreren im Wesentlichen in radialer Richtung angeordneten Borsten (13) aufweist, die zumindest radial auf dem im Wesentlichen kreisförmigen Rand (11) angeordnet sind, wobei das scheibenförmige Element (6) so positioniert ist, dass, wenn der Elektromotor (5) mit der elektrifizierten Oberleitung (30) verbunden ist, das scheibenförmige Element (6) dadurch vom Stromabnehmer des rollenden Stockelements auf der Bürste (12) zumindest teilweise zusammengedrückt wird, wenn ein rollendes Stockelement entlang der Strecke des Eisenbahn- oder Straßennetzes fährt.

6. Vorrichtung (1) nach Anspruch 5, sofern von Anspruch 4 abhängig, **dadurch gekennzeichnet, dass** die Borsten (13) der Bürste (12) aus einem elektrisch isolierenden Kunststoffmaterial gebildet sind.

7. Vorrichtung (1) nach Anspruch 5 oder 6, **dadurch**

gekennzeichnet, dass das scheibenförmige Element (6) am im Wesentlichen kreisförmigen Rand (11) einen Durchmesser zwischen 120 mm und 140 mm aufweist,

wobei das scheibenförmige Element (6) so positioniert ist, dass, wenn der Elektromotor (5) mit der elektrifizierten Oberleitung (30) verbunden ist, die Rotationsachse des scheibenförmigen Elements (6):

- in Bezug auf einen entlanglaufenden Stromabnehmer auf der gegenüberliegenden Seite der elektrifizierten Oberleitung (30) angeordnet ist und
- ein Abstand zwischen 45 mm und 55 mm von der elektrifizierten Oberleitung (30) besteht.

8. Vorrichtung (1) nach einem der Ansprüche 2 bis 7, **dadurch gekennzeichnet, dass** der Elektromotor (5) einen Dynamo (5) mit einem Rotor und einem Stator umfasst, wobei der Stator mit der elektrifizierten Oberleitung (30) durch solche Verbindungsmittel (2, 3, 4) verbindbar ist,

wobei sich der Rotor in Bezug auf den Stator um eine Achse desselben drehen kann, wobei eine Drehung des Rotors in Bezug auf den Stator um seine Achse somit elektrische Energie erzeugt, wobei das Übertragungsmittel (14) mindestens eine Welle (15, 16) umfasst, die durch Drehung mit dem scheibenförmigen Element (6) und mit dem Rotor gekoppelt ist, wodurch eine Drehung des scheibenförmigen Elements (6) um seine Achse zur Folge eine Drehung des Rotors gegenüber dem Stator um seine Achse hat, wodurch elektrische Energie erzeugt wird.

9. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verbindungsmittel (2, 3, 4) umfassen:

- * einen Behälter (2) aus einem elektrisch isolierenden Material, wobei der Behälter (2) den Elektromotor (5) und zumindest teilweise das Übertragungsmittel (14) in seinem Inneren aufnimmt,
- * mindestens eine Klemme (4), die einstückig mit dem Behälter (2) und extern von diesem verbunden ist, und die auf die elektrifizierte Oberleitung (30) einstückig mit diesem klemmbar ist.

10. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Empfangsmittel umfasst, die in einem bestimmten Abstand von dem Behälter (2) platziert werden können und geeignet sind, von Sendemitteln (20) emittierte hochfrequente elektromagnetische Wellen zu empfangen und mit der Codierung eines Signals, auf des-

sen Grundlage ein rollendes Stockelements entlang der Strecke des Eisenbahn- oder Straßennetzes passiert hat.

Revendications

1. Dispositif (1) adapté à détecter le transit d'un élément de matériel roulant électriquement le long d'un tronçon d'un réseau ferroviaire ou routier, comprenant une ligne aérienne électrifiée (30),

ledit élément de matériel roulant pouvant être alimenté électriquement au moyen d'un pantographe inclus dans l'élément de matériel roulant et coulissant sur la ligne aérienne électrifiée (30), lorsque l'élément de matériel roulant transite le long dudit réseau, ledit dispositif (1) étant **caractérisé en ce qu'il** comprend :

- un moteur électrique (5) apte à transformer un mouvement de rotation en énergie électrique afin de l'alimenter;
- des moyens de connexion (2, 3, 4) aptes à connecter intégralement le moteur électrique (5) à la ligne aérienne électrifiée (30), tout en isolant électriquement le moteur électrique (5) de la ligne aérienne électrifiée (30);
- des moyens de conversion (6) aptes à convertir un mouvement de translation en un mouvement de rotation;
- des moyens de transmission (14) reliés à la fois au moteur électrique (5) et aux moyens de conversion (6),

- lesdits moyens de transmission (14) étant adaptés pour transmettre un mouvement de rotation converti à partir d'un mouvement de translation par l'intermédiaire de tels moyens de conversion (6) au moteur électrique (5) pour fournir de l'énergie électrique,

- lesdits moyens de conversion (6) étant positionnés de telle sorte que lorsque le moteur électrique (5) est connecté à la ligne aérienne électrifiée (30), lors du transit d'un élément de matériel roulant sur le tronçon de réseau ferroviaire ou routier, lesdits moyens de conversion (6) viennent en contact avec le pantographe de l'élément de matériel roulant, de manière à convertir une translation dudit pantographe qui se produit lorsqu'il glisse le long de la ligne aérienne électrifiée (30), en un mouvement de rotation, lesdits moyens

de transmission (14) étant isolés électriquement par rapport audit pantographe, lorsque lesdits moyens de conversion (6) sont en contact avec celui-ci;

- des moyens (20) pour émettre des ondes électromagnétiques à radiofréquence reliés au moteur électrique (5), ces derniers pouvant être actionnés avec une alimentation en énergie électrique par le moteur électrique (5),

lesdits moyens d'émission (20) étant aptes à émettre, suite à leur activation, des ondes électromagnétiques à radiofréquence qui codent un signal à partir duquel un élément de matériel roulant a transité le long du tronçon de réseau ferroviaire ou routier.

2. Dispositif (1) selon la revendication 1, **caractérisé en ce que** lesdits moyens de conversion (6) comprennent un élément en forme de disque (6), qui peut tourner autour d'un axe disposé transversalement et centralement par rapport à l'élément en forme de disque (6),
ledit élément en forme de disque (6) étant positionné de telle sorte que lorsque le moteur électrique (5) est connecté à la ligne aérienne électrifiée (30), si un élément de matériel roulant passe le long du tronçon du réseau ferroviaire ou routier, l'élément en forme de disque (6):

- n'est pas parallèle au pantographe dudit élément de matériel roulant et
- vient en contact avec le pantographe sur un bord sensiblement circulaire (11) dudit élément en forme de disque (6).

3. Dispositif (1) selon la revendication 2, **caractérisé en ce que** l'élément en forme de disque (6) est positionné de telle sorte que lorsque le moteur électrique (5) est connecté à la ligne aérienne électrifiée (30), l'élément en forme de disque (6) est sensiblement orthogonal au pantographe dudit élément roulant, lorsqu'un élément de matériel roulant transite le long du tronçon de réseau ferroviaire ou routier.

4. Dispositif (1) selon la revendication 2 ou 3, **caractérisé en ce que** l'élément en forme de disque (6) est réalisé en un matériau électriquement isolant au moins sur le bord (11) sensiblement circulaire.

5. Dispositif (1) selon l'une des revendications 2 à 4, **caractérisé en ce que** l'élément en forme de disque (6) comprend une brosse (12) à plusieurs poils (13) disposés sensiblement selon une direction radiale, au moins sur le bord (11) sensiblement circulaire, ledit élément en forme de disque (6) étant positionné

de telle sorte que, lorsque le moteur électrique (5) est connecté à la ligne aérienne électrifiée (30), ledit élément en forme de disque (6) est au moins partiellement comprimé par le pantographe de l'élément dudit matériel roulant sur ladite brosse (12), lorsqu'un élément de matériel roulant transite le long du tronçon de réseau ferroviaire ou routier.

6. Dispositif (1) selon la revendication 5 si dépendante de la revendication 4, **caractérisé en ce que** les poils (13) de la brosse (12) sont formés d'un matériau synthétique électriquement isolant.

7. Dispositif (1) selon la revendication 5 ou 6, **caractérisé en ce que** l'élément en forme de disque (6) a un diamètre compris entre 120 mm et 140 mm sur le bord sensiblement circulaire (11), ledit élément en forme de disque (6) étant positionné de telle sorte que, lorsque le moteur électrique (5) est connecté à la ligne aérienne électrifiée (30), l'axe de rotation dudit élément en forme de disque (6):

- est situé du côté opposé de la ligne aérienne électrifiée (30) par rapport à un pantographe qui glisse sur celle-ci, et
- existe une distance entre 45 mm et 55 mm de la ligne aérienne électrifiée (30).

8. Dispositif (1) selon l'une des revendications 2 à 7, **caractérisé en ce que** le moteur électrique (5) comprend une dynamo (5) avec un rotor et un stator, le stator étant connectable à la ligne aérienne électrifiée (30) par des moyens de connexion (2, 3, 4)

ledit rotor pouvant tourner par rapport au stator autour d'un axe de celui-ci,
une rotation dudit rotor par rapport audit stator autour de son axe génère ainsi de l'énergie électrique,
lesdits moyens de transmission (14) comprenant au moins un arbre (15, 16) couplé par rotation à l'élément en forme de disque (6) et au rotor, une rotation de l'élément en forme de disque (6) autour de son axe entraînant une rotation du rotor par rapport au stator autour de son axe, générant ainsi de l'énergie électrique.

9. Dispositif (1) selon l'une des revendications précédentes, **caractérisé en ce que** les moyens de connexion (2, 3, 4) comprennent:

- * un conteneur (2) en un matériau électriquement isolant, dans lequel le conteneur (2) abrite le moteur électrique (5) et au moins en partie lesdits moyens de transmission (14) à son intérieur;
- * au moins une borne (4) solidaire du conteneur (2) et extérieurement à celui-ci, pouvant être bri-

dée sur la ligne aérienne électrifiée (30) solidai-
rement avec celui-ci.

10. Dispositif (1) selon l'une des revendications précé-
dentes, **caractérisé en ce qu'il** comprend des 5
moyens de réception pouvant être placés à une cer-
taine distance du conteneur (2) et aptes à recevoir
des ondes électromagnétiques à radiofréquence
émises par des moyens d'émission (20) et pour co- 10
der un signal à partir duquel un élément de matériel
roulant a parcouru le tronçon de réseau ferroviaire
ou routier.

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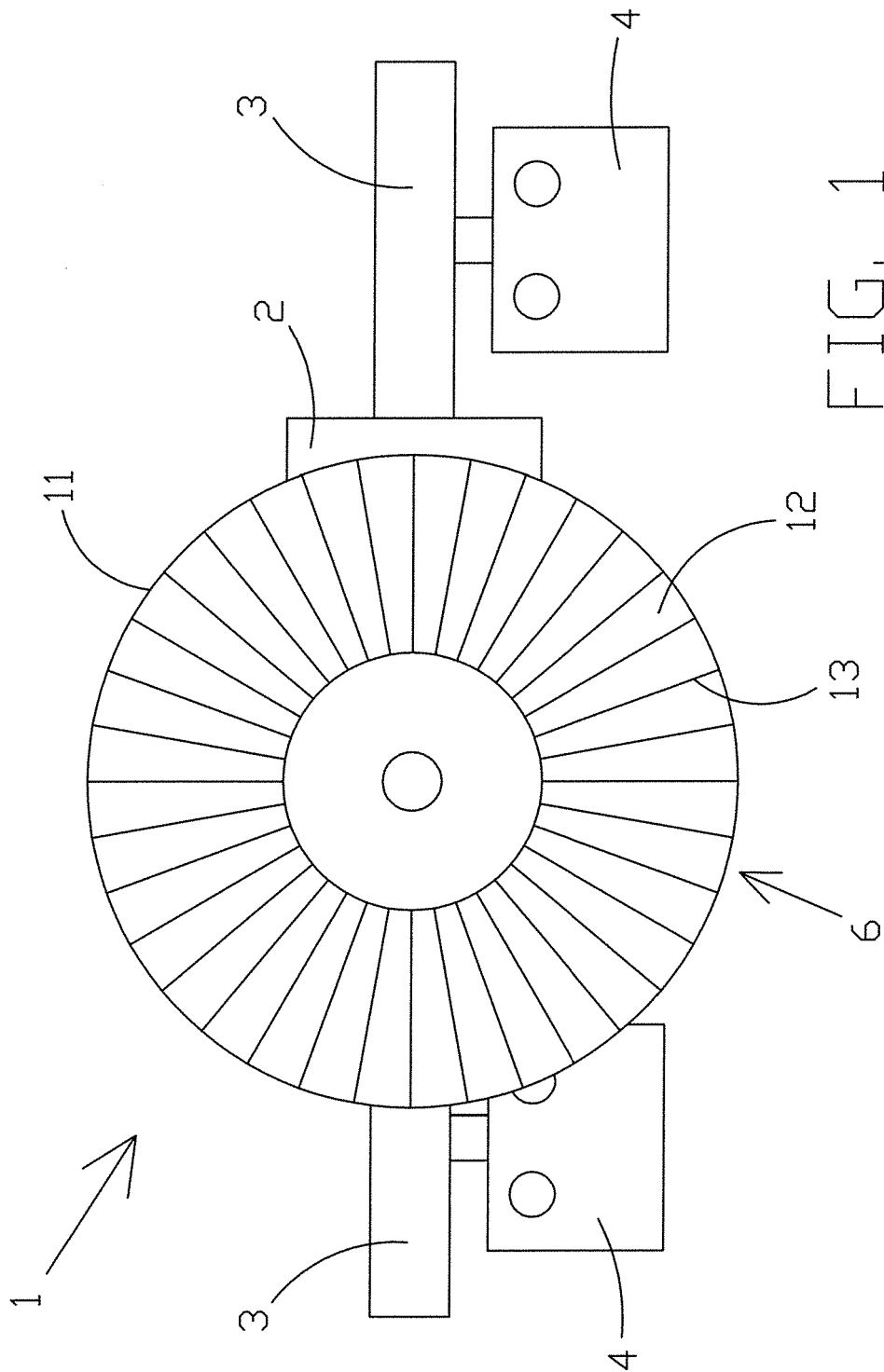
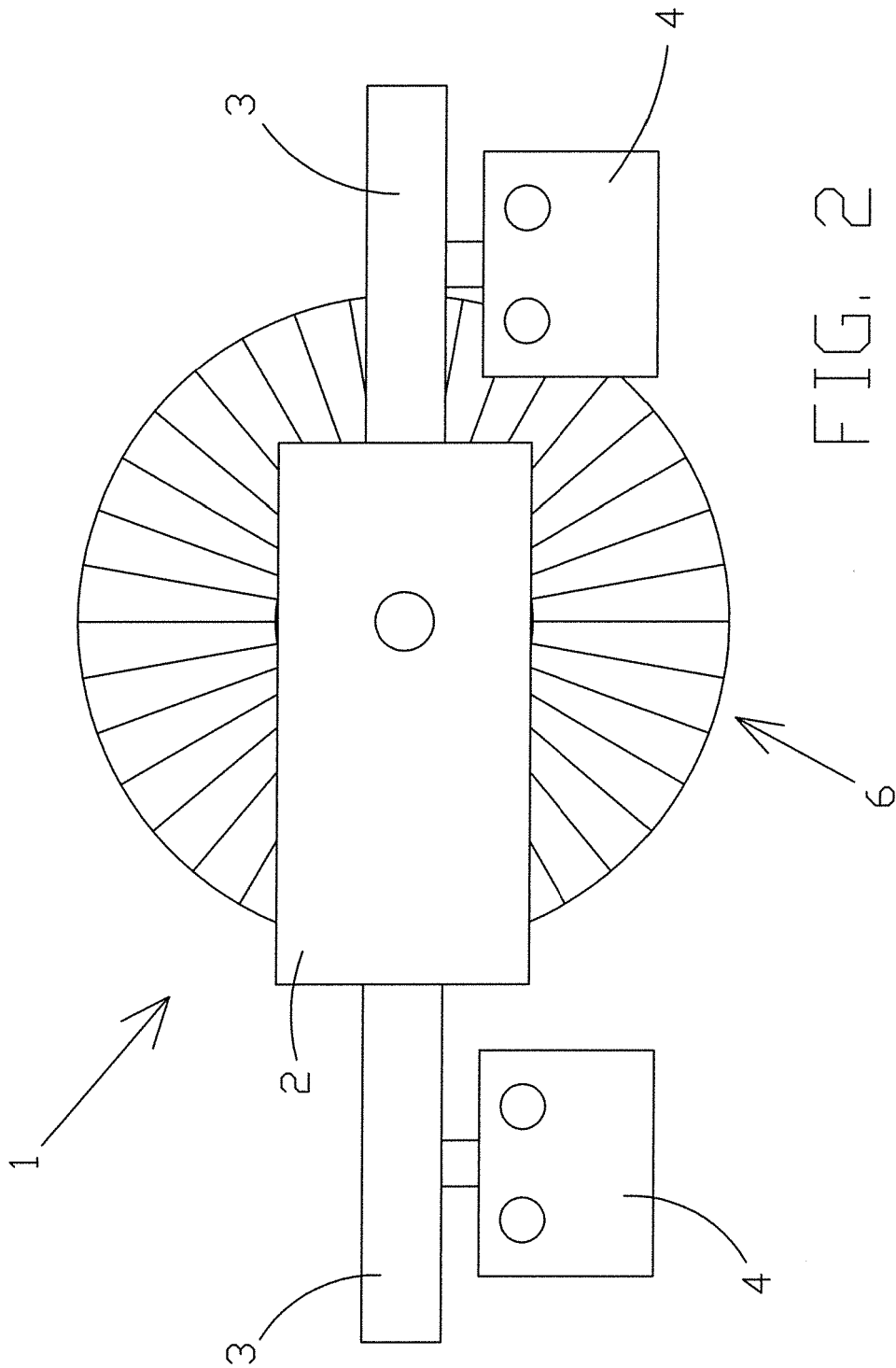
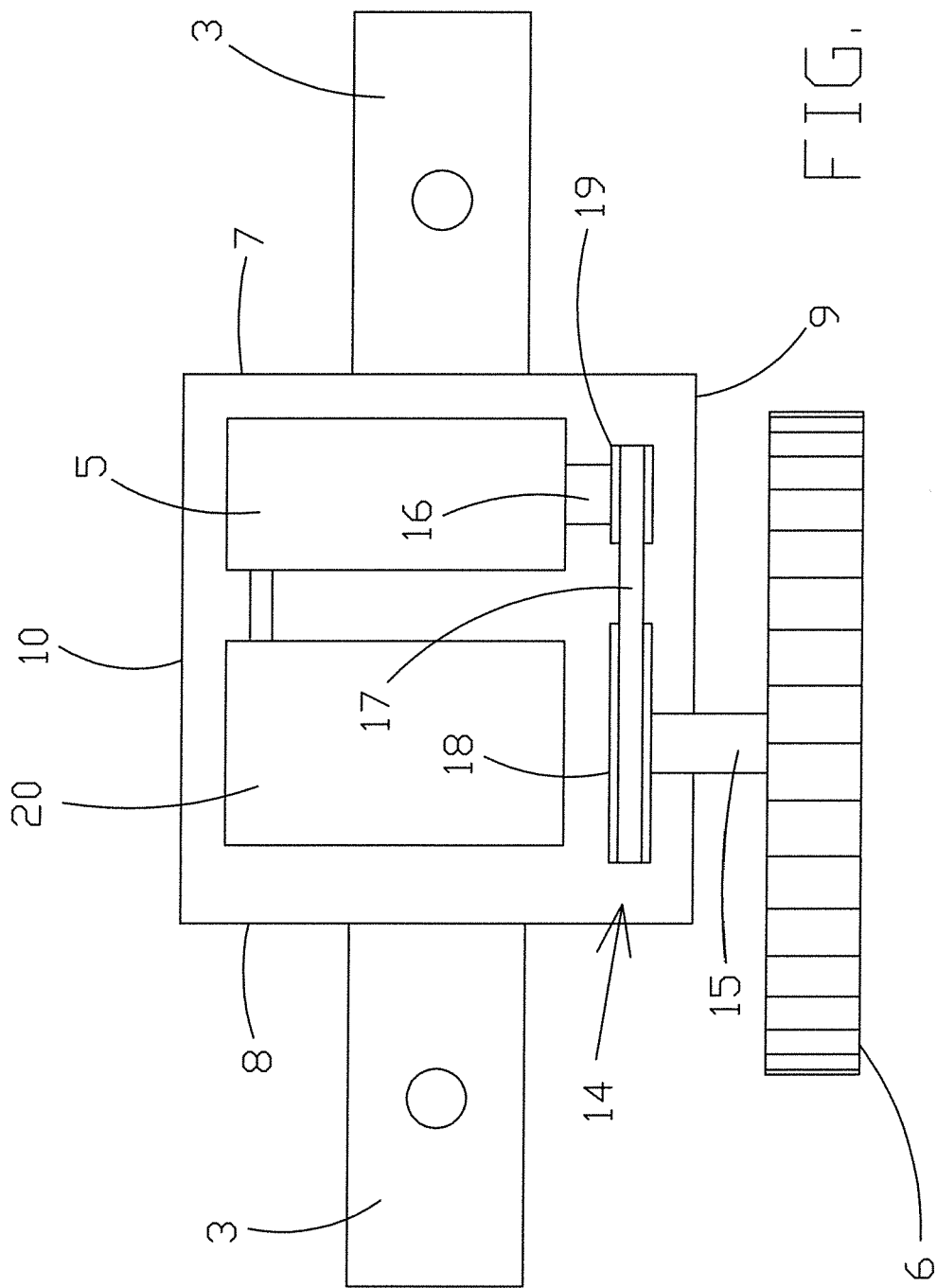


FIG. 1





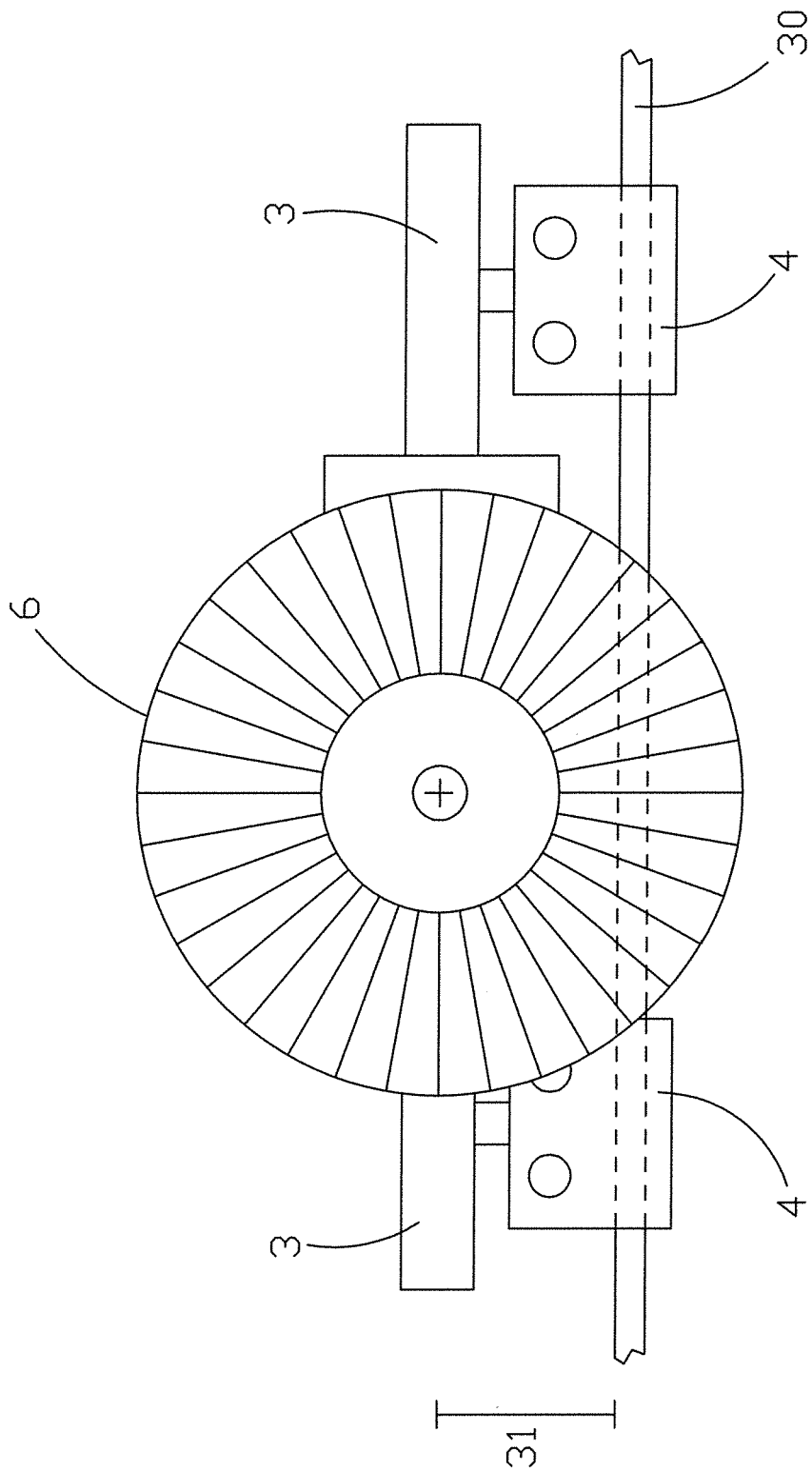


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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