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(54) **Apparatus for cleaning a concrete mixer drum**

(57) Apparatus for containing and mixing concrete, comprising a drum (11) rotatable around an axis of rotation (Z). The drum (11) is provided at one end with an aperture (17) for loading/unloading the concrete. The apparatus comprises a cleaning device (20) located in a fixed position outside the drum (11) and configured to

clean at least one portion of the external surface of the drum (11) located in proximity to the aperture (17). The cleaning device (20) comprises at least one removal member (22) configured as a blade and provided with at least one removal edge (23) located in contact with said at least one portion of external surface of the drum (11).

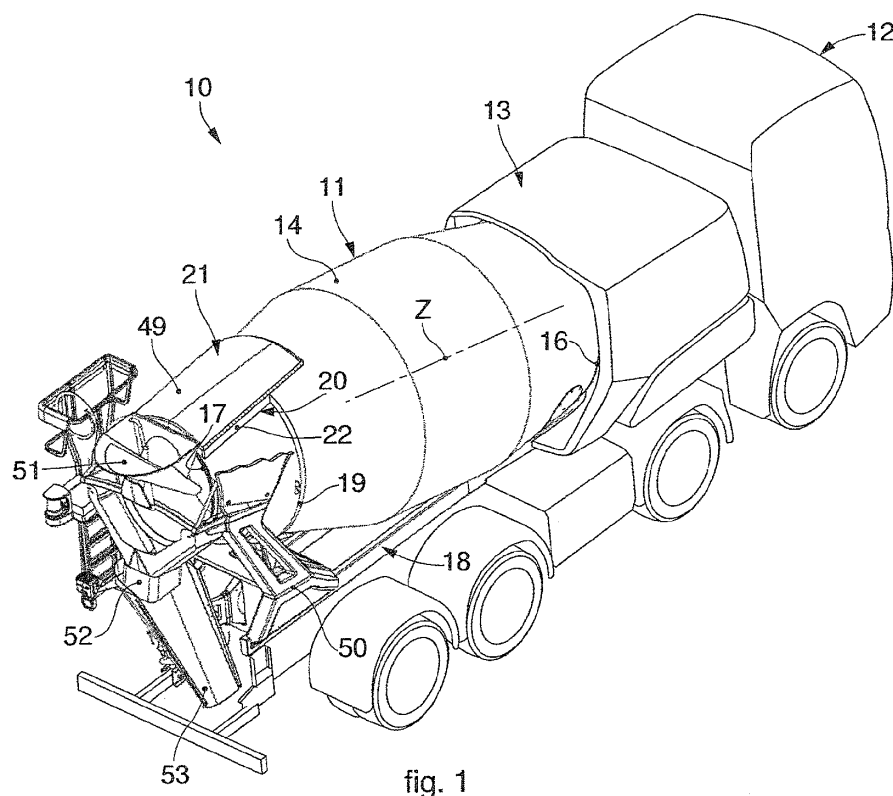


fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns an apparatus for containing and mixing concrete, such as a concrete mixer or a mixer truck.

[0002] In particular the apparatus according to the present invention comprises at least a rotatable drum and a cleaning device to keep at least the external surface of the latter clean.

BACKGROUND OF THE INVENTION

[0003] Apparatuses are known for containing and mixing concrete, such as concrete mixers or mixer trucks, provided with a drum that can be made to rotate and inside which the concrete is put.

[0004] The apparatus allows to load the raw materials that make up the concrete inside the drum, or the already formed concrete, possibly to transport them/it to the place where they/it will be used, keeping them/it mixed, and then to unload the concrete thus formed once it has arrived in the place where it will be used.

[0005] The drum consists of a containing shell, also called casing, which is provided at its ends with a closed bottom and an aperture for the introduction of raw materials or the concrete and for the subsequent unloading thereof. The casing is shaped like a rounded cylinder with a diameter that reduces both toward the bottom and toward the aperture. The drum is made to rotate around an axis of rotation inclined downward on the side of the bottom of the casing.

[0006] In the internal surface of the casing, mixing blades are attached, conformed as a spiral that develop longitudinally to the drum.

[0007] The mixing blades have both the function of mixing the concrete when the drum is rotating in a first direction of rotation, and also the function of expelling the concrete through the aperture when the direction of rotation is inverted.

[0008] The mixer truck is provided with an unloading hopper that receives the concrete discharged from the aperture of the drum. A conveyor channel receives the concrete from the unloading hopper and conveys it toward the laying zone, or toward another apparatus.

[0009] Part of the concrete, in particular its liquid component, drips toward the lower part of the drum when it is discharged, dirtying the zone near the aperture. The rotation of the drum in turn draws the liquid component of the concrete onto the remaining external end surface of the drum, dirtying a large part of the external end part of the drum, and also giving an unpleasant esthetic effect.

[0010] After the concrete has been discharged, therefore, a careful cleaning is sometimes required, at least of part of the drum, to prevent the formation of incrustations that could compromise the functioning thereof.

[0011] The drum is usually cleaned manually by an op-

erator, for example using a jet of water.

[0012] The prior art documents JPS61 213105 A, FR 2.930.734 A1, JPS51 76822 A and JP 200 233406 show solutions of cleaning devices applied to rotary drums, but none of them is put in direct cooperation with the end aperture through which the material to be mixed is introduced and discharged, and none of them is integrated and protected by the structures associated with the rotary drum.

[0013] Purpose of the present invention is to obtain an apparatus for containing and mixing concrete that allows to keep the external surface of the drum clean, at least after discharge operations and in particular in the end zone thereof, at least partly limiting the manual intervention of an operator on the external cleaning of the drum.

[0014] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0016] In accordance with the above purpose, an apparatus for containing and mixing concrete comprises a drum rotatable around an axis of rotation for mixing the concrete. The drum has an at least partly axial symmetric configuration with respect to the axis of rotation and is provided, at a back end of the drum, with a loading/unloading aperture. Raw materials can be introduced through the aperture and the concrete can be discharged.

[0017] According to one aspect of the present invention, the apparatus comprises a cleaning device located in a fixed position outside the drum and configured to clean at least one portion of the external surface of the drum located in proximity to the aperture. The cleaning device comprises at least one removal member configured as a blade and provided with at least one removal edge located in contact with the at least one portion of external surface of the drum.

[0018] In this way, when the drum is made to rotate, the removal member, stationary with respect to the drum, removes the remains of concrete left on the external surface of the drum with the removal edge or conveyor, thus keeping it constantly clean.

[0019] According to one form of embodiment, it is provided that the removal member has a terminal end of the removal edge located in direct proximity to the aperture. By the term "in direct proximity" we mean that the terminal end of the removal edge is located substantially flush with, or protruding or recessed by a few millimeters with respect to an end edge that defines said aperture.

[0020] According to another form of embodiment, it is provided that the removal member is mounted on a support element suitable to support and to attach the removal

member to a support structure that is stationary with respect to the drum.

[0021] Further forms of embodiment provide that the cleaning device also comprises a washing member provided to spray a washing liquid onto the external surface of the drum. The combined action of the removal member and the washing liquid allows to increase the cleaning action on the external surface of the drum.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] These and other characteristics of the present invention will become apparent from the following description of some forms of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a perspective view of an apparatus for containing and mixing concrete according to the present invention, mounted on a means of transport;
- fig. 2 is a partly sectioned perspective view of an enlarged detail of fig. 1;
- fig. 3 is a schematic representation seen from above of a part of the apparatus for containing and mixing concrete according to the present invention;
- fig. 4 is a section view of a detail of fig. 3 from IV to IV;
- fig. 5 is a section view from V to V of fig. 4;
- fig. 6 is a schematic representation of another form of embodiment of fig. 5;
- fig. 7 is a schematic representation of another form of embodiment of fig. 5;
- fig. 8 is a schematic representation of another form of embodiment of fig. 5.

[0023] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one form of embodiment can conveniently be incorporated into other forms of embodiment without further clarifications.

DETAILED DESCRIPTION OF SOME FORMS OF EMBODIMENT

[0024] With reference to fig. 1 an apparatus for containing and mixing concrete indicated hereinafter as concrete mixer 10, comprises a drum 11 rotatable around an axis of rotation Z to mix the concrete which is located inside it.

[0025] In the case shown in fig. 1, the concrete mixer 10 is mounted on a transport mean 12 in order to provide not only to mix the concrete but also to transport it. It is not excluded that in some forms of embodiment the concrete mixer 10 is not mounted on a transport mean but is stationary.

[0026] The drum 11 has an axial symmetric configuration with respect to the axis of rotation Z and, in this case, a substantially cylindrical shape with ends that narrow

toward the axis of rotation Z.

[0027] In particular the drum 11 has a first base end or bottom 16 which is closed, and a second end provided with an aperture 17 through which the raw materials that make up the concrete or the concrete itself are/is introduced, and the concrete inside it is discharged.

[0028] The drum 11 comprises a containing shell or casing 14, which defines a containing chamber 15 (fig. 2) for the concrete.

[0029] Actuation members 13, provided to make the drum 11 rotate, are associated in proximity to the bottom 16 (fig. 1) of the drum 11.

[0030] The concrete mixer 10 comprises a framework 18 configured to support the drum 11 keeping it inclined upward on the side of the aperture 17.

[0031] The framework 18 is provided, in the known way, with supports, not visible in the drawings, suitable to guide the rotation of the drum 11 around the axis of rotation Z. To this purpose a circular guide 19, which during use cooperates with the supports, is attached on the external surface of the drum 11.

[0032] The concrete mixer 10 also comprises a cleaning device 20 located outside the drum 11 and suitable to constantly keep at least a surface portion of the external surface of the casing 14 constantly clean.

[0033] In particular, the cleaning device 20 is located in a fixed position with respect to the drum 11 and is installed on a support structure 21 connected to the framework 18 of the concrete mixer 10.

[0034] The cleaning device 20 comprises at least one removal member 22 configured as a blade and suitable to exert, on at least one portion of the external surface of the drum 11, a mechanical removal action to remove possible residues present thereon. The removal member 22 has a main development in length and is disposed longitudinally to the axis of rotation Z of the drum 11.

[0035] The removal member 22 is chosen from a group consisting of a wiper blade, a scraper, a spatula, a stick or flexible plate, or possible combinations thereof.

[0036] The removal member 22 is made of a polymer material chosen from a group consisting of polytetrafluoroethylene, styrene resins, polyamide resins or combinations thereof. Merely by way of example, commercially known materials such as Teflon or Akulon can be used.

[0037] Other forms of embodiment can provide that the removal member 22 is made of a metal material, harmonic steel for example, or rubber.

[0038] Some forms of embodiment, for example those shown in figs. 1-3, provide to dispose the cleaning device 20 in the upper part of the drum 11.

[0039] The removal member 22 is disposed so as to exert a pressure that acts in a direction orthogonal to the external surface of the drum 11. In particular, the removal member 22 is provided with a removal edge or scraping edge 23, located in contact with the external surface of the casing 14 and longitudinally with respect to the axis of rotation Z of the drum 11.

[0040] Moreover, it is provided that a terminal end 24

of the scraping edge 23 is located in direct proximity to the aperture 17.

[0041] By the term "in direct proximity" we mean that the terminal end 24 of the scraping edge 23 is located substantially flush with, or protruding or recessed by a few millimeters with respect to an end edge 26 that defines said aperture 17. In this way, during the unloading of the concrete through the aperture 17, possible and substantially liquid residues thereof are cleaned from the external surface of the casing 14.

[0042] Some forms of embodiment of the present invention can provide that the removal member 22 is provided with axial positioning means which allow to adjust the position of the terminal end 24 of the scraping edge 23 with respect to the end edge 26 of the aperture 17.

[0043] In the forms of embodiment shown in figs. 2 and 3 it is provided that the cleaning device 20 comprises two removal members 22 located in two different angular positions on the external surface of the drum 11.

[0044] As shown in fig. 2, the removal members 22 are disposed inside an angular sector 54 of the drum 11, with an angular amplitude comprised between 45° and 120°.

[0045] In particular (fig. 3), the removal members 22 are located convergent or divergent with respect to each other toward the aperture 17 and angled with respect to the axis of rotation Z by an angle α with an amplitude comprised between 5° and 10°. This disposition of the removal members 22 allows to maintain the concrete present on the external surface of the casing 14 confined between the two removal members 22.

[0046] According to the form of embodiment shown in fig. 4, it is provided that the terminal end 24 of the removal member 22 is provided with a portion 25 protruding with respect to the scraping edge 23. The protruding portion 25 is disposed, during use, in contact with the thickness of the end edge 26 that defines the aperture 17 of the drum 11.

[0047] The removal member 22 is provided, along its longitudinal extension, with a plurality of notches 48 suitable to increase its flexibility.

[0048] The removal member 22 is mounted on a support element 27 suitable to support and to attach the removal member 22 to the support structure 21, keeping it in contact with the casing 14.

[0049] In the form of embodiment shown in figs. 4 and 5, the support element 27 comprises an L-shaped bracket 28 with a first side 29, at the end of which the removal member 22 is attached, and a second side 30, orthogonal to the first side 29, attached by attachment means 31 to the support structure 21.

[0050] The removal member 22 can be connected to the first side 29 of the bracket 28 by a same-shape coupling and/or by mechanical interference, even if a connection by means of mechanical members such as screws, rivets, nails or suchlike is not excluded.

[0051] The attachment means 31 can be the releasable type, threaded members for example, which can allow the removal member 22 to be dismantled/replaced, or

the permanent type, such as welding for example.

[0052] According to other forms of embodiment (figs. 6 and 7) the support element 27 comprises an L-shaped section bar 32 which is attached to the support structure 21 in either a permanent or releasable way, for example with threaded connection means. The support element 27 also comprises a support blade 33 in which, in a way similar to that described heretofore, the removal member 22 is mounted. The support blade 23 is mounted on the section bar 32 and position adjustment members 34 are provided between the two, which allow to adjust the position and pressure exerted by the removal member 22 on the external surface of the drum 11.

[0053] The position adjustment members 34 in this case comprise an eyelet 35 with an elongated shape made on one side of the section bar 32, and a bolt 36 inserted both in the eyelet 35 and in a through hole 37 provided in the support blade 33.

[0054] By adjusting the position of the bolt 36 in the eyelet 35 it is possible to modify the position of the removal member 22, and also the pressure exerted by the latter on the external surface of the casing 14. This solution allows to modify the position of the removal member 22, in order, for example, to take into account the wear to which it is subjected during use.

[0055] In other forms of embodiment (fig. 7) the cleaning device 20 comprises a washing member 38 provided to spray a washing liquid, for example water, on the external surface of the casing 14.

[0056] The washing member 38 comprises one or more nozzles 39 attached to the support structure 21, parallel to the longitudinal extension of the removal member 22, and located so as to direct the jet of water in the contact zone between the latter and the casing 14.

[0057] According to another form of embodiment of the present invention (fig. 8), which can be combined with the forms of embodiment described here, the removal member 22 is associated to one or more pressure adjustment members 40 which are configured to ensure the reciprocal contact and a predefined pressure between the removal member 22 and the external surface of the casing 14.

[0058] The pressure adjustment member 40 comprises a tubular body 41 in which the support element 27 of the removal member 22 is slidingly inserted.

[0059] The tubular body 41 is provided with a through aperture 45, or slit, in which the support element 27 is slidingly disposed.

[0060] The support element 27 in this case comprises a T-shaped section bar 42, that is, having a first segment 43 with a substantially rectangular cross section connected in proximity to the center line by a second segment 44 which also has a rectangular cross section.

[0061] The first segment 43 is disposed through and sliding through the through aperture 45 while the second segment 44 is disposed completely inside the tubular body 41; an elastic element 46, provided to keep the first segment 43 thrust toward the outside of the tubular body

41, presses against it.

[0062] The tubular body 41 is attached to the support structure 21 with releasable or permanent type attachment means, such as threaded connections, rivets, pins, nails, welding or suchlike.

[0063] The through aperture 45 of the tubular body is defined by edges 47 of the tubular body 41 which also have an end-of-travel or abutment function for the second segment 44 of the section bar 42.

[0064] The support structure 21 (fig. 1) comprises a protection body 49 disposed above the drum 11, in proximity to the aperture 17, and having an arched configuration mating with the diameter of the drum 11.

[0065] The protection body 49 is supported by a support frame 50 which is attached to the framework 18.

[0066] A loading hopper 51 is associated to the protection body 49 in order to allow the raw materials to be introduced inside the drum 11.

[0067] An unloading hopper 52 is attached to the support frame 50 and allows to collect the concrete unloaded from the aperture 17 and to introduce it into a conveyor 53.

[0068] It is clear that modifications and/or additions of parts may be made to the apparatus for containing and mixing concrete as described heretofore, without departing from the field and scope of the present invention.

[0069] For example it can be provided that the removal member 22 comprises a plurality of removal sectors with an oblong development and each of which is located in continuation with the other, so as to define a determinate removal length. This solution confers greater flexibility of use on the removal member 22, so that it is possible to replace only one or some removal sector/s depending on different conditions of wear.

[0070] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of apparatus for containing and mixing concrete, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Apparatus for containing and mixing concrete, comprising a drum (11) rotatable around an axis of rotation (Z), said drum (11) being provided at one end with a loading/unloading aperture (17), the apparatus also comprising a framework (18) configured to support said drum (11) keeping it inclined upward on the side of the aperture (17), and also comprising a cleaning device (20) located in a fixed position outside said drum (11) and configured to clean at least one portion of the external surface of said drum (11), **characterized in that** said cleaning device (20) is installed on a support structure (21), connected to said framework (18), comprising a protection body

(49) disposed above said drum (11), in proximity to said aperture (17), and having an arched configuration mating with the diameter of said drum (11), and comprises at least a removal member (22) configured as a blade and provided with at least one removal edge (23) located in contact with said at least one portion of external surface of said drum (11) and with a terminal end (24) located substantially flush with, or protruding or recessed by a few millimeters with respect to an end edge (26) that defines said aperture (17).

2. Apparatus as in claim 1, **characterized in that** said at least one removal member (22) is chosen from a group consisting of a wiper blade, a scraper, a spatula, a stick or flexible plate, or possible combinations thereof.

3. Apparatus as in claim 1 or 2, **characterized in that** said at least one removal member (22) has a main development in length and is disposed longitudinally with respect to said axis of rotation (Z) of said drum (11).

4. Apparatus as in any claim hereinbefore, **characterized in that** said terminal end (24) of the removal member (22) is provided with a portion (25) protruding from said removal edge (23), and **in that** said protruding portion (25) is disposed during use in contact with an end edge (26) that defines said aperture (17).

5. Apparatus as in any claim hereinbefore, **characterized in that** said at least one removal member (22) is mounted on a support element (27) suitable to support and to attach said removal member (22) to a fixed support structure (21).

6. Apparatus as in claim 5, **characterized in that** said support element (27) is attached to said support structure (21) by means of attachment means (31) of the releasable type.

7. Apparatus as in claim 5 or 6, **characterized in that** said support element (27) comprises a section bar (32) attached to said support structure (21) and a support blade (33) of said at least one removal member (22), said support blade (33) being associated to said section bar (32) and there being provided, between these two, position adjustment members (34) configured to adjust the position and pressure exerted by the removal member (22) on the external surface of said drum (11).

8. Apparatus as in any claim hereinbefore, **characterized in that** said cleaning device (20) comprises a washing member (38) provided to wash the external surface of said drum (11) with a washing liquid.

9. Apparatus as in claim 8, **characterized in that** said washing member (38) comprises one or more nozzles (39) located so as to direct a jet of washing liquid in the zone of contact between said at least one removal member (22) and the external surface of said drum (11). 5
10. Apparatus as in any claim hereinbefore, **characterized in that** said cleaning device (20) comprises two removal members (22) located in two different angular positions on the external surface of said drum (11). 10
11. Apparatus as in claim 10, **characterized in that** said two removal members (22) are disposed inside an angular sector (54) of said drum (11) having an angular amplitude comprised between 45° and 120°. 15
12. Apparatus as in claim 10 or 11, **characterized in that** said two removal members (22) are located convergent or divergent with respect to each other toward said aperture (17) and angled with respect to said axis of rotation (Z) by an angle with an amplitude comprised between 5° and 10°. 20
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13. Apparatus as in any claim hereinbefore, **characterized in that** said at least one removal member (22) is associated with one or more pressure adjustment members (40) configured to ensure the reciprocal contact and a predefined pressure between said removal member (22) and said external surface of said drum (11). 30
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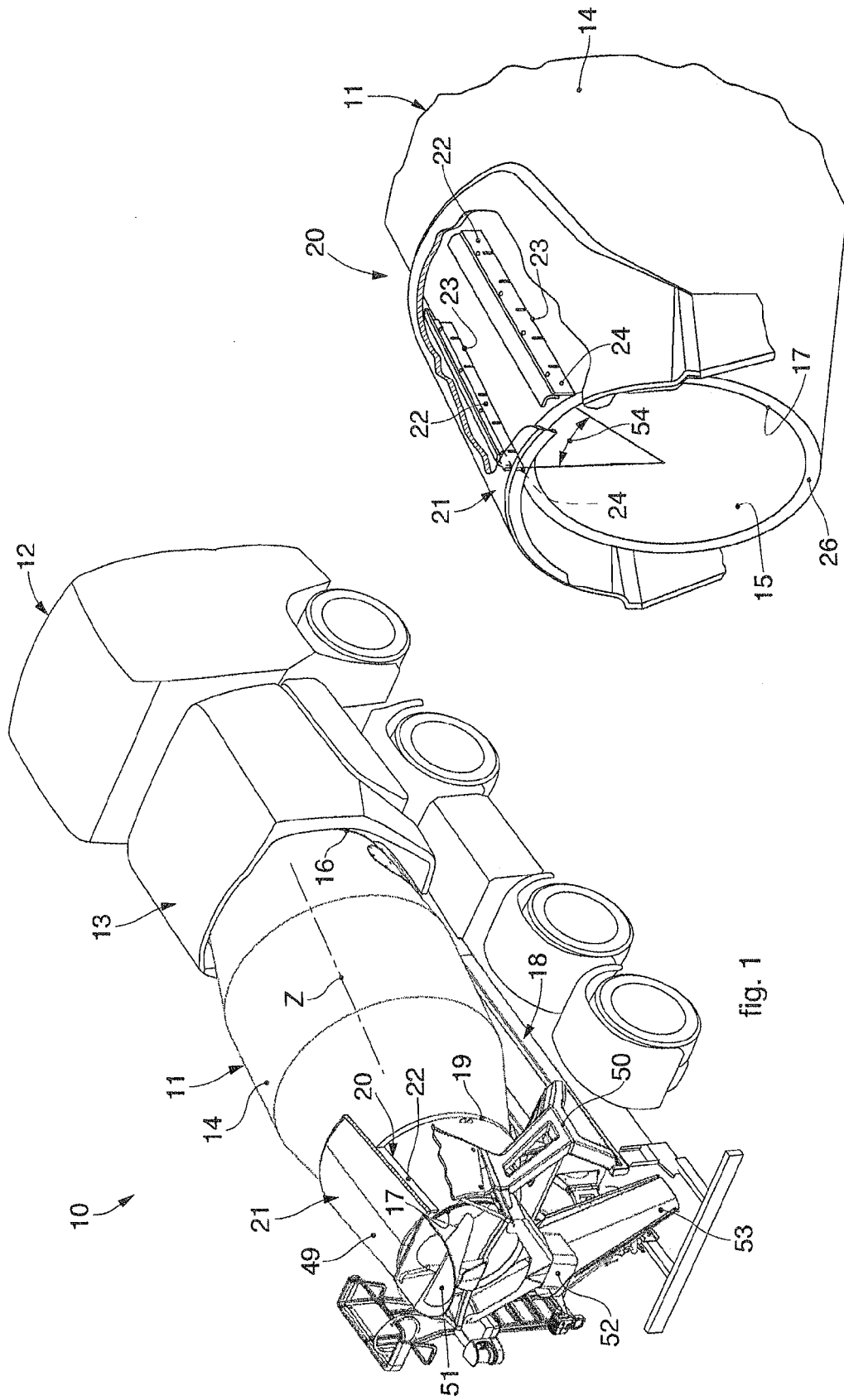


fig. 2

fig. 1

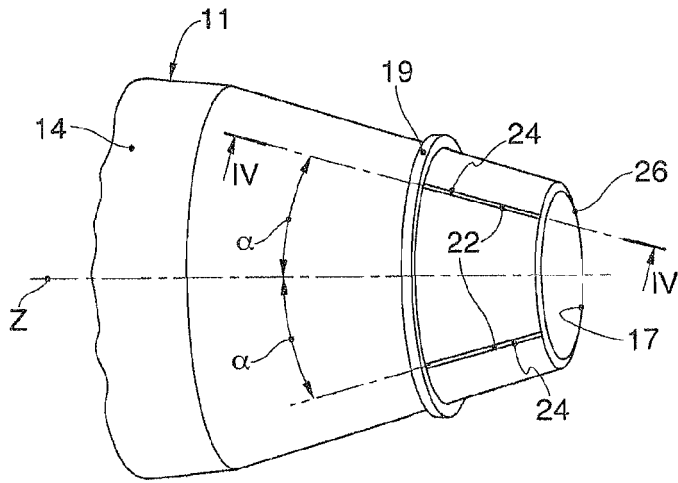


fig. 3

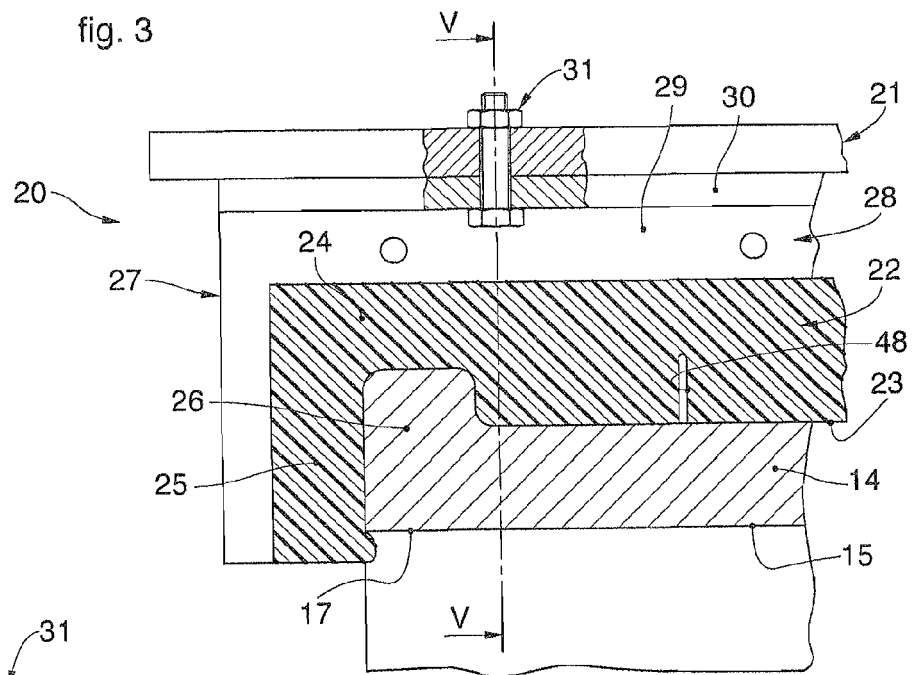


fig. 4

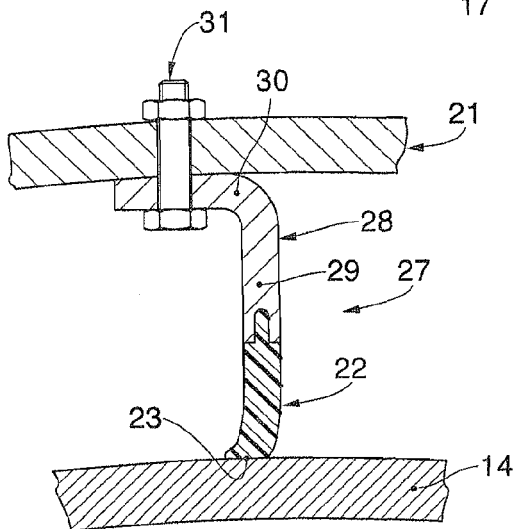


fig. 5

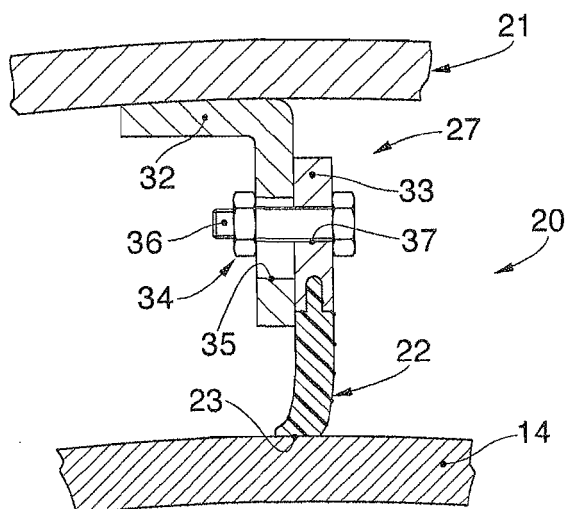


fig. 6

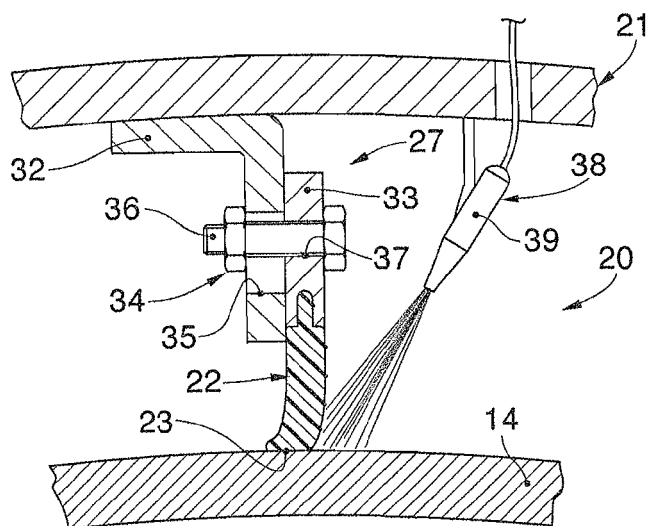


fig. 7

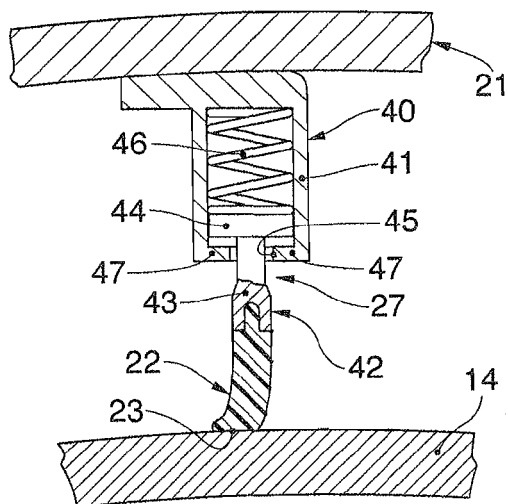


fig. 8



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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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EUROPEAN SEARCH REPORT

Application Number
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Place of search The Hague			Date of completion of the search 4 July 2014
Examiner van der Zee, Willem			
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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