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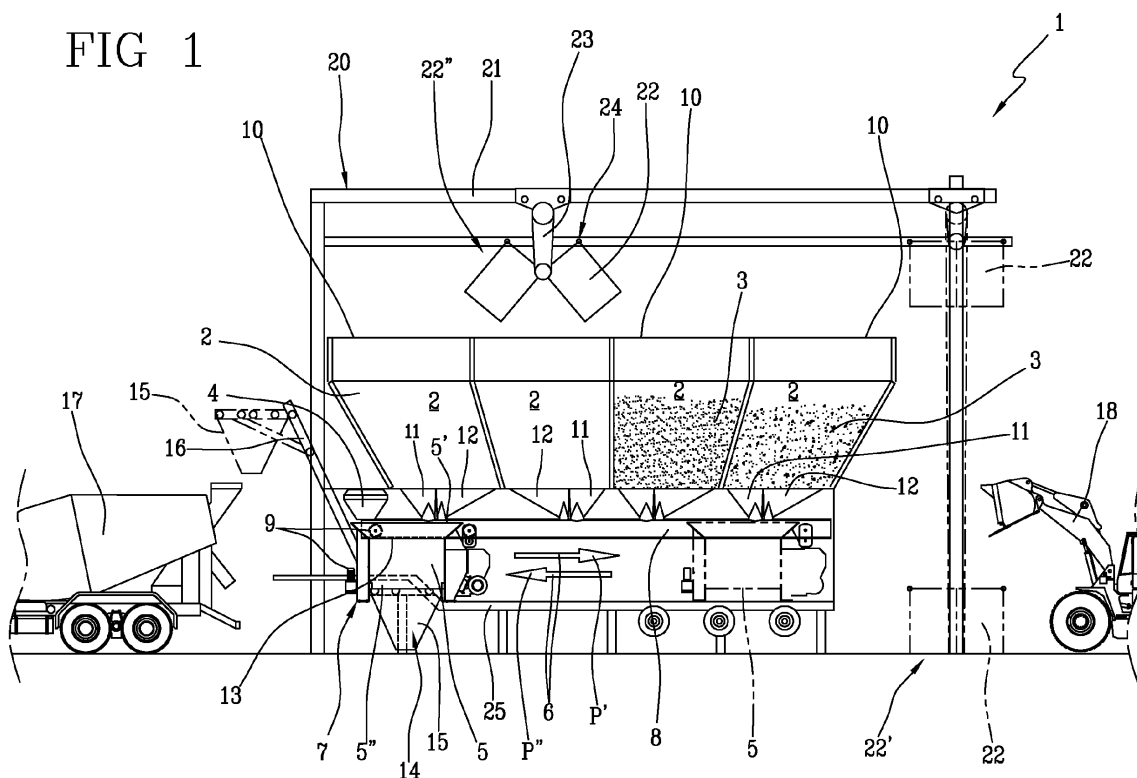
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(54) **A plant for production of a construction material.**

(57) A plant for production of a construction material comprises at least two hoppers (2), each containing a respective component element (3) of the construction material, such as concrete, and a mixing tank (5), inside of which the component elements (3) are mixed together so as to form the construction material. The mixing tank

(5) is slidably mobile below the hoppers (2), so as to receive from each one of them a determined quantity, batched and weighed, of the relative component element (3) stored therein. During its movement, the mixing tank works the elements so as to produce the construction material.

FIG 1



Description

Description

[0001] The present invention relates to a plant for production of a construction material.

[0002] The present invention finds widespread use in construction, for the production of a generic construction material, particularly concrete.

[0003] Plants for the production of construction material, such as for example concrete, to which reference will be made herein below, without any loss of generality, require extensive spatial areas, given the considerable amount of space required by the various structural elements.

[0004] In particular, large silos and containment hoppers are necessary for storing each inert material (sand, gravel, and water) or the various additives required for the production of concrete.

[0005] Generally, a screw pipe departs from the bottom of each silo and conveys a determined amount of the inert material contained therein toward a mixing tower located at a certain distance and at a certain height. The containment hoppers instead release determined amounts of the stored material onto a conveyor belt, which then pours it all inside the mixing tower.

[0006] The mixing tower is generally a very large unit, in a fixed position interposed between the silos and the containment tanks, inside of which a body capable of mixing the material poured into the tower is moving.

[0007] At the bottom of the mixing tower there is a funnel-shaped unloading mouth, through which the finished construction material is loaded inside concrete mixers so as to be transported to the work-sites.

[0008] Stationary plants generally supply construction material to work-sites located in the vicinity or to those work-sites that do not require excessive amounts of concrete.

[0009] In the cases in which the construction sites are located in remote locations with respect to stationary plants, or the works under construction require significant amounts of construction material, therefore such as to require a continuous flow of construction material and thus making transport with concrete mixers not very practical or economical, the realisation of mobile plants for the production of the construction material directly on the premises of the work-site is preferred.

[0010] These mobile plants reproduce stationary plants, on a reduced scale. Therefore, a first disadvantage related to these mobile plants, and observable, however, also in stationary plants, consists in the considerable space required at the work-site, where an extensive area to devote exclusively to that aim is not always available.

[0011] Moreover, the connections between the storage silos and the mixing tower or between the mixing tower and the containment hoppers, involve a large number of moving members with resulting higher pro-

duction costs for maintenance and repairs, in addition to reduced levels of safety at the work-site.

[0012] Current mobile plants for production of concrete are characterised by low hourly production and as a result, by a limited capacity for storage of inert material.

[0013] Lastly, the considerable dimensions of mobile plants involve a high demand for electrical power and thus a high consumption thereof.

[0014] In this context, the technical task on which the present invention is based, is to propose a plant for production of a construction material, said plant being able to overcome the drawbacks of the prior art cited hereinabove.

[0015] An aim of the present invention is to propose a new plant for production of a construction material, capable of producing concrete of certified quality in amounts sufficient to satisfy any operative need of a work-site, without the need to have recourse to external suppliers when a large quantity of construction material is required so as to have continuous jets.

[0016] A further aim of the present invention is to realise a plant for production of a construction material, said plant requiring reduced space and being compact and simple in structure, so as to avoid excessive moving parts, increase safety on the job and reduce the costs of maintenance and repairs. Furthermore, the present invention proposes to realise a plant for production of a construction material, making it possible to increase hourly production and the capacity for storage of the inert materials, while concomitantly decreasing the demand for electrical power.

[0017] Lastly, the present invention proposes to realise a plant for production of a construction material, producing an excellent construction material, complying with the proper doses and the correct mixing sequences.

[0018] The defined technical task and the specified aims are substantially achieved by a plant for production of a construction material, comprising the technical characteristics stated in one or more of the appended claims. Further characteristics and advantages of the present invention will become more apparent from the approximate, and hence non-limiting, description of a preferred, but not exclusive embodiment of a plant for production of a construction material, as illustrated in the accompanying drawings, wherein:

- Figure 1 is a schematic front view of a plant for production of a construction material, the subject matter of the present invention, wherein two vehicles present at a work-site and interacting with the plant itself, are visible;
- Figure 2 shows the plant, the subject matter of the present invention, in a second embodiment;
- Figure 3 shows a detail of the plant appearing in Figure 2;
- Figure 4 shows an example of the plant, the subject matter of the present invention, in the transport mode.

[0019] With particular reference to the figures appended herein, a plant for production of a construction material according to the present invention has been generically indicated by 1.

[0020] The plant, which is the subject matter of the present invention, can be utilised as a mobile plant, and is thus assemblable, when required, at a work-site, and as a stationary production plant, realised in suitable dimensions.

[0021] Generically the plant 1, which is the subject matter of the present invention, is designed for the production of any construction material, preferably concrete.

[0022] In the following, for the sake of simplicity, reference will be made only to concrete as the construction material, however, without this intending any loss of generality and without intending to limit the use of the plant solely to the production of concrete.

[0023] A first example of the plant 1 that is the subject matter of the present invention is shown in Figure 1. The plant comprises at least two hoppers 2, each containing a respective component element 3 of the construction material.

[0024] The elements forming the concrete are sand and gravel, differing in particle size, water and additives.

[0025] Advantageously, the plant comprises more than one hopper 2, each containing a respective solid component 3, and at least one tank 4 for containing and batching a respective liquid component, such as water and/or various additives.

[0026] Advantageously, the hoppers 2 are arranged close together, preferably in an aligned position. However, any other compact conformation is possible, such as, for example, an arrangement in a circle or, depending on the number of hoppers, arranged at the vertexes of a polygon, possibly as close to each other as possible.

[0027] The tank 4 is also arranged next to at least one hopper 2, so as to maintain a compact arrangement of the structure.

[0028] The plant 1 further comprises a mixing tank 5, inside of which the various component elements 3 are mixed together so as to form the concrete. Advantageously, inside the mixing tank 5 there is provided a specific mixing member 25 (unillustrated) that stirs and blends the individual component elements inserted in the mixing tank 5.

[0029] The mixing tank 5 has an upper loading opening 5' and a lower unloading base 5". Advantageously, the lower unloading base 5" is generally closed and opens only at the end of a cycle of mixing, loading and working, that is, when the construction material is ready for use and the mixing tank 5 needs to be emptied, in a manner that will be explained below.

[0030] The mixing tank 5 is located immediately below the hoppers 2 and it is movable from one hopper 2 to the other so as to receive from each of them a determined amount of the relative component element 3 stored therein. The mixing tank 5 is movable along a slide guide 8, which is set in motion by a specific moving means 9, such

as, for example, an electric motor or a rack system, and it can move on tracks or on tyres.

[0031] The movement of the mixing tank 5 is translatable and defines a pathway 6 that is preferably a rectilinear, outward and return pathway.

[0032] Depending upon the arrangement of the hoppers 2, besides being rectilinear, the pathway may also be circular or polygonal. Preferably, the mixing tank 5 follows the pathway 6 outward and back, that is, taking on the same positions at least twice in each loading and working cycle. As an alternative, if for example the pathway is looped, the mixing tank may follow the pathway just once, along the entire loop.

[0033] In any case, the mixing tank 5, preferably, begins and ends the pathway 6 at a sole position 7.

[0034] While the mixing tank 5 advances along the pathway 6, it completes an entire cycle of loading and working of the component elements 3 and performs the mixing necessary to obtain the final product, that is, the concrete.

[0035] Each hopper 2 comprises a loading mouth 10, located superiorly, and at least one unloading mouth located inferiorly. In the preferred embodiment illustrated in Figures 1 and 2, there are provided at least a first 11 and a second 12 unloading mouth, both located in the lower part of the hopper 2, and aligned in sequence along the pathway 6 of the mixing tank 5. Advantageously, the batching opening of the first 11 and the second 12 unloading mouths of each hopper 2 is positioned perpendicularly with respect to the path followed by the mixing tank 5.

[0036] The two unloading mouths 11 and 12 differ in dimensions, in such a manner that different quantities of the same inert component 3 can be batched.

[0037] The larger unloading mouth, which is identifiable for example as the first mouth 11, is dedicated to delivery of large quantities of the inert component element 3, and thus for fast filling of the mixing tank 5.

[0038] The smaller unloading mouth, which is instead identifiable for example as the second mouth 12, is dedicated to delivery of small quantities of the inert component element 3, and thus for precision batching and control of the correct quantity supplied and the desired weight of the material. Suitable weighing and batching means 13 contributes to the correct determination of the quantity of each component element 3 weighed and poured into the mixing tank 5. Said means is preferably located at the loading opening 5' of the mixing tank 5 or, alternatively, at each one of the unloading mouths 11 and 12 of each hopper 2.

[0039] The weighing and batching means 13 comprises loading cells for weighing and batching a preset quantity of a component element 3.

[0040] In this manner, only the correct quantity of the inert component element required for the production of the concrete is batched, weighed and drawn, as set by means of a control unit (unillustrated), which manages the entire operation of the plant 1.

[0041] Upon the passage of the mixing tank 5 beneath the various hoppers 2, specific sensors (unillustrated) determine the opening of the unloading mouths 11 or 12, and delivery of the batched quantity of the corresponding element 3 to be delivered.

[0042] These sensors cooperate with the cited control unit.

[0043] The component elements 3 forming the concrete are introduced into the mixing tank following the best sequence of introduction, so as to obtain a correct mix of the ingredients.

[0044] The mixing process is also facilitated by the movement of the tank 5. In fact, along the pathway 6, the tank 5 undergoes stages of braking and acceleration, and the longitudinal inertial force created during these stages is a further improvement of the mixing process, above all during the return run.

[0045] When the mixing tank 5 reaches the position 7 again, thus at the end-run position along the pathway 6, and particularly at the end-run of the return tract, the construction material is ready to be extracted from the mixing tank 5 and utilised.

[0046] At this position 7, the plant comprises transfer means 14 for transferring the construction material from the mixing tank 5 to a generic transport device 17, such as to a concrete mixer (illustrated in Figure 1) or to a conveyor belt, or even to special conduits that directly bring the concrete directly to where it is needed.

[0047] Such transfer means 14 comprises a container 15, mobile between a loading position and an unloading position, and a lift 16 for moving the container 15.

[0048] Advantageously, the loading position of the container 15 is situated below the mixing tank 5, whereas the unloading position of the container 15 is located above the transport device 17. In Figure 1, one sees, for example, the funnel-shaped container 15 pouring the content inside the concrete mixer.

[0049] When the mixing tank 5 has completed the cycle of loading and working, it returns to the initial position 7, where it stops so as to permit the emptying thereof and the concurrent filling of the container 15.

[0050] The unloading base 5" of the mixing tank 5 opens, for example with a guillotine opening, and all the construction material produced in that cycle is poured into the container 15.

[0051] Once this exchange has been made, the base closes again and the tank 5 is ready for a new cycle of loading and working.

[0052] While the mixing tank 5 performs a new cycle of loading and working, the container 15 is set in motion by the lift 16 and brought into the unloading position, above the transport device 17.

[0053] In Figure 1, the movement carried out by the container 15 is indicated by the dashed line. Initially, the container 15 translates toward the outside of the plant, drawing itself out from under the mixing tank 5, and it is then raised along the lift 16, to a height, in an external position with respect to the plant, so as to enable it to

near the concrete mixer by running backwards, the latter being waiting to be filled.

[0054] Once the container 15 has poured the entire load into the transport device 15, it repositions itself below the mixing tank 5, which in the meantime has performed another cycle of loading and working and has returned to the initial position 7.

[0055] With the transfer means 14 described above, numerous cumbersome structural components are eliminated, such as conveyor belts or screw pipes, components that required continuous and burdensome maintenance and repair work.

[0056] As illustrated in Figures 2 and 3, the hoppers 2 are filled by means of a scraper 18, which climbs an embankment 19 up to the height of the loading mouth 10 of the hopper 2, to pour the load directly into the hopper 2. Alternatively, as illustrated in Figure 1, the plant 1 comprises an automatic system for filling 20 the hoppers 2.

[0057] This filling system 20 comprises a bridge structure 21 overlying the hoppers 2, and at least one loading bucket 22 is mobile along the bridge structure 21.

[0058] The bucket 22 travels along the bridge structure 21 from a lowered position 22' at ground level, in which it is filled with a determined quantity of a component element, for example by means of a scraper 18, to a raised position 22", located above the hoppers 2, into which the loading bucket 22 pours its content into the relative hopper 2.

[0059] The bridge structure 21 comprises a hoist 23, which moves the loading bucket 22.

[0060] A lever and fulcrum mechanism 24 cooperates with the hoist 23 so as to realise the unloading of the material transported by the loading bucket 22 internally of the relative hopper 2, as illustrated in Figure 1. Advantageously, the plant described can be easily disassembled and transported to a work-site. An example of how the plant described is easily transportable is shown in Figure 4.

[0061] The lower part of the plant 1, particularly the unloading mouths 11 and 12 of the hoppers 2, the tank 4, the transfer means 14 and the mixing tank 5 rest on a base 25, which is nothing other than a truck trailer 26.

[0062] When realised in suitable dimensions, the plant described can, however, also be installed as a stationary installation.

[0063] The invention thus achieves its set aims.

[0064] The plant described proves to be simple and compact in structure and has limited dimensions. The moving parts are limited in number and are all confined to areas with limited access to workers, thereby increasing safety levels at the work-site.

[0065] This plant makes it possible to produce a considerable amount of construction material directly at the work-site, and above all, with a continuous flow, avoiding interruptions or supplies from external suppliers resulting in increases in production costs.

[0066] The mixing tank is of limited dimensions and thus has a limited capacity, but, at the same time, it re-

quires less power and is more agile, with lower consumption levels, as it is able to optimize the loading and working cycles and to operate non-stop.

[0067] The mixing of the elements proves to be better, more effective, owing also to the movement of the mixing tank itself.

[0068] The weighing and batching system makes it possible to achieve high precision in the proportions of the inert elements introduced and thus produce high-quality construction material.

[0069] The plant described makes it possible to increase hourly production of the construction material, while concomitantly reducing energy consumption and the space required at the work-site.

Claims

1. A plant for production of a construction material comprising at least two hoppers (2), each containing a respective component element (3) of said construction material, a mixing tank (5) internally of which the component elements (3) are mixed with one another so as to form the construction material, **characterised in that** said mixing tank (5) is mobile below said hoppers (2) so as to receive, from each hopper (2), a determined quantity of the relative component element (3) stored therein.
2. The plant according to claim 1, **characterised in that** said mixing tank (5) translates along a pathway (6) extending below said hoppers (2).
3. The plant according to one of the preceding claims, **characterised in that** each hopper (2) comprises a loading mouth (10), located superiorly, and at least a first (11) and a second (12) unloading mouth, located inferiorly.
4. The plant according to claim 3, **characterised in that** said first (11) and said second (12) unloading mouth have different dimensions, so as to batch different quantities of a same component element (3) contained in the respective hopper (2).
5. The plant according to one of the preceding claims, **characterised in that** it comprises means for weighing and batching (13) the component element (3); said weighing and batching means (13) being located in the mixing tank (5) or in each one of said hoppers (2).
6. The plant according to claim 5, **characterised in that** said weighing and batching means (13) comprises loading cells for weighing and batching a predetermined quantity of component element (3) to be deposited inside the mixing tank (5).
7. The plant according to one of claims 3 to 6, **characterised in that** said first (11) and said second (12) unloading mouth are arranged sequentially along the pathway (6) of the mixing tank (5).
8. The plant according to one of the preceding claims, **characterised in that** it comprises transfer means (14) for transferring the construction material from said mixing tank (5) to a transport device (17) for transferring said construction material.
9. The plant according to claim 8, **characterised in that** it comprises an initial position (7) from which said mixing tank (5) departs in order to translate along said pathway (6), along an outward run (P') and a return run (P''), during which it performs a cycle of loading and working of the component elements (3) contained therein, and to which position (7) said tank (5) returns, once it has reached an end-run of the return run (P''), so as to deliver the construction material inside said transfer means (14).
10. The plant according to claim 9, **characterised in that** said mixing tank (5) comprises an upper loading opening (5') and a lower unloading base (5'') that can be opened at the position (7) so as to deliver the construction material inside said transfer means (14).
11. The plant according to one of claims 8 to 10, **characterised in that** said transfer means (14) for transferring the construction material comprises a container (15), which is mobile between a loading position and an unloading position of the construction material, and a lift (16) for moving said container (15).
12. The plant according to claim 11, **characterised in that** said loading position of said container (15) is situated below said mixing tank (5), and **in that** said unloading position of said container (15) is located above a transport device (17).
13. The plant according to one of the preceding claims, **characterised in that** it comprises a filling system (20) for filling said hoppers (2), said system (20) comprising a bridge structure (21) overlying said hoppers (2) and at least one loading bucket (22); said loading bucket (22) being mobile between a lowered position (22'), in which it is filled with a determined quantity of a component element (3), and a raised position (22'') located above said hoppers (2), wherefrom said loading bucket (22) pours its content inside the relative hopper (2).
14. The plant according to claim 13, **characterised in that** it comprises a hoist (23), which moves said loading bucket (22).

15. The plant according to claim 14, **characterised in that** it comprises a lever and fulcrum mechanism (24), which cooperates with said hoist (23) so as to realise the unloading of the loading bucket (22) inside the relative hopper (2). 5
16. The plant according to one of the preceding claims, **characterised in that** it comprises at least one tank (4) for batching liquid additives inside the mixing tank (5). 10
17. The plant according to one of the preceding claims, **characterised in that** it is mobile, transportable and mountable at a work-site according to needs. 15

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FIG 1

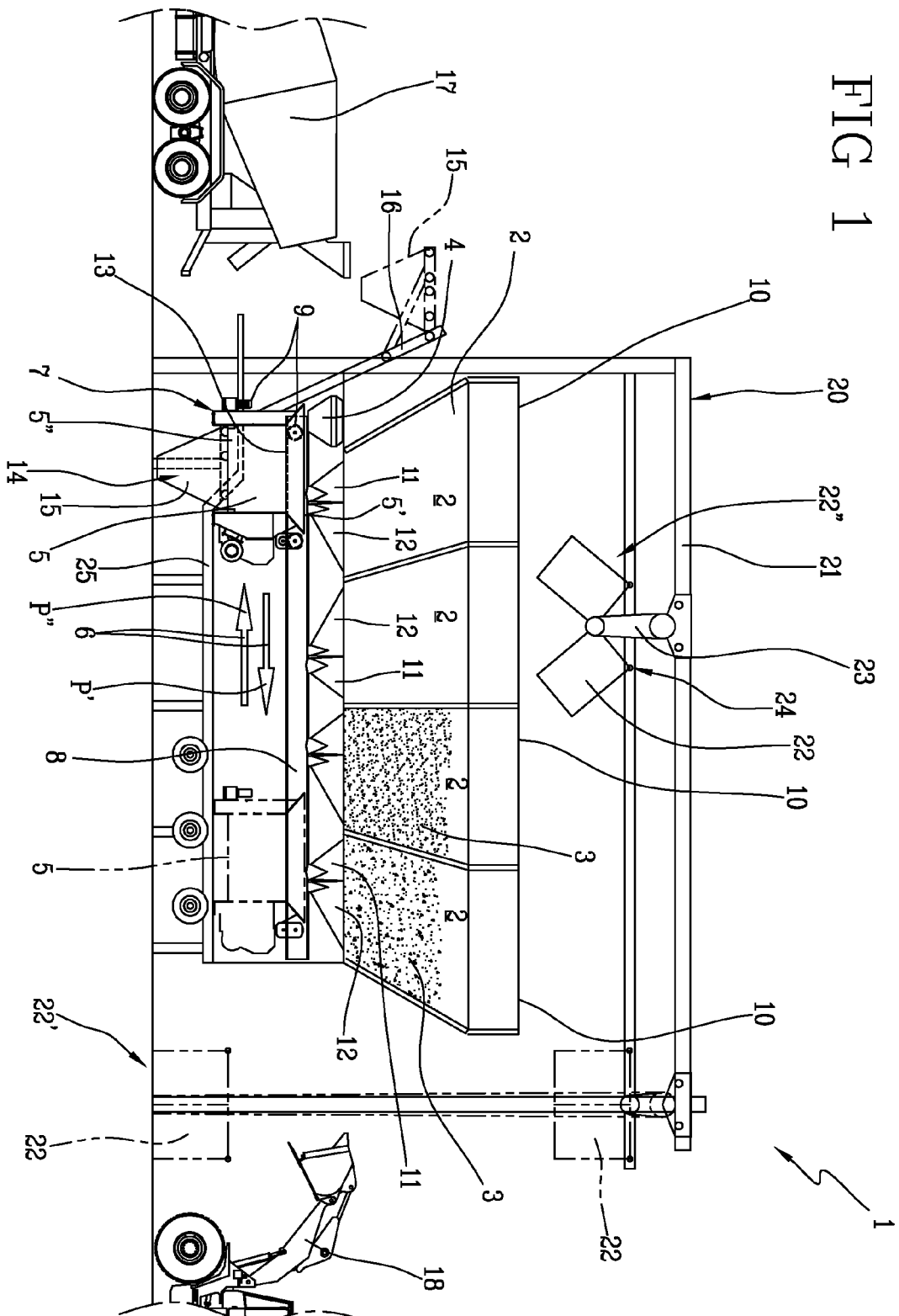
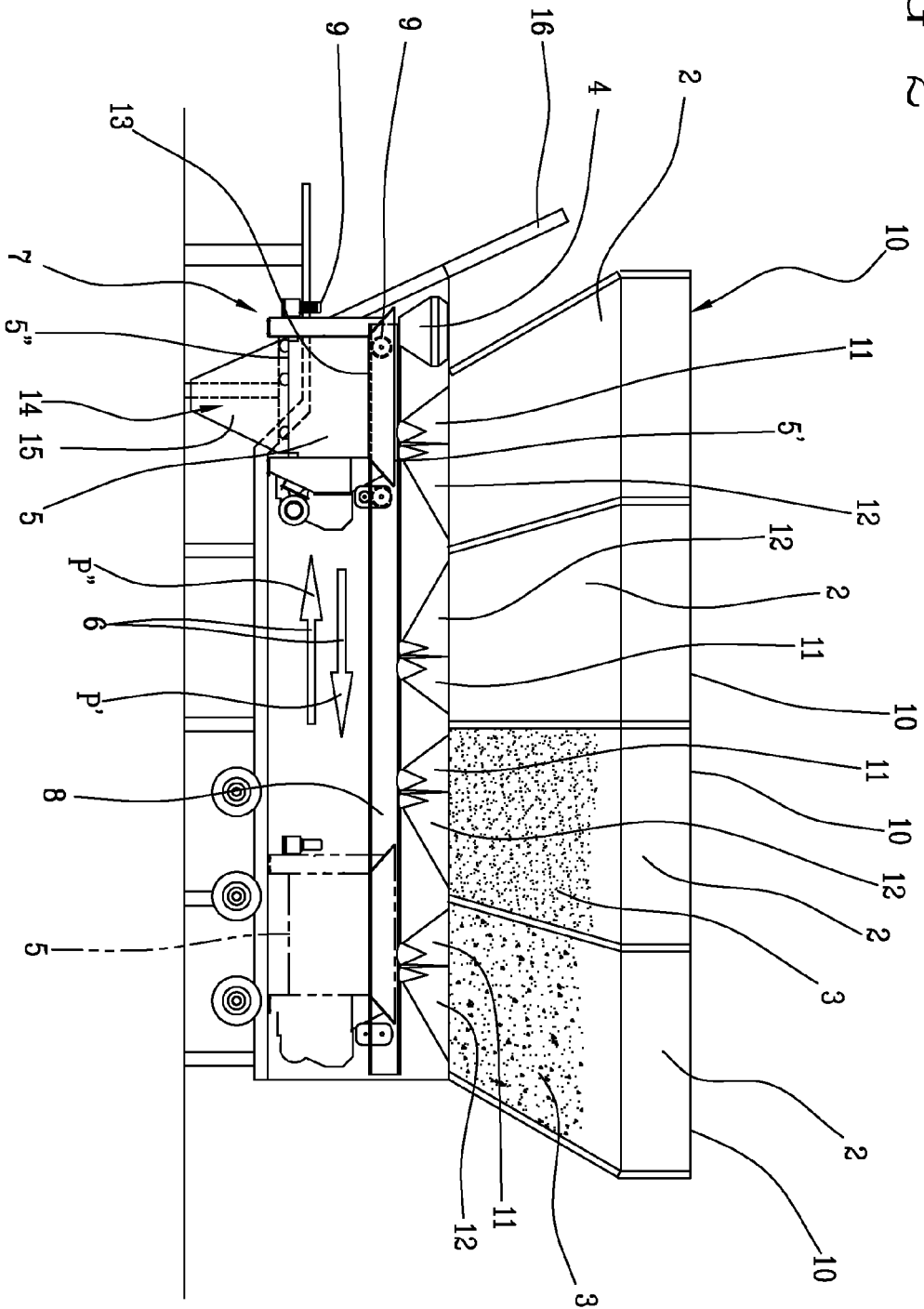


FIG 2



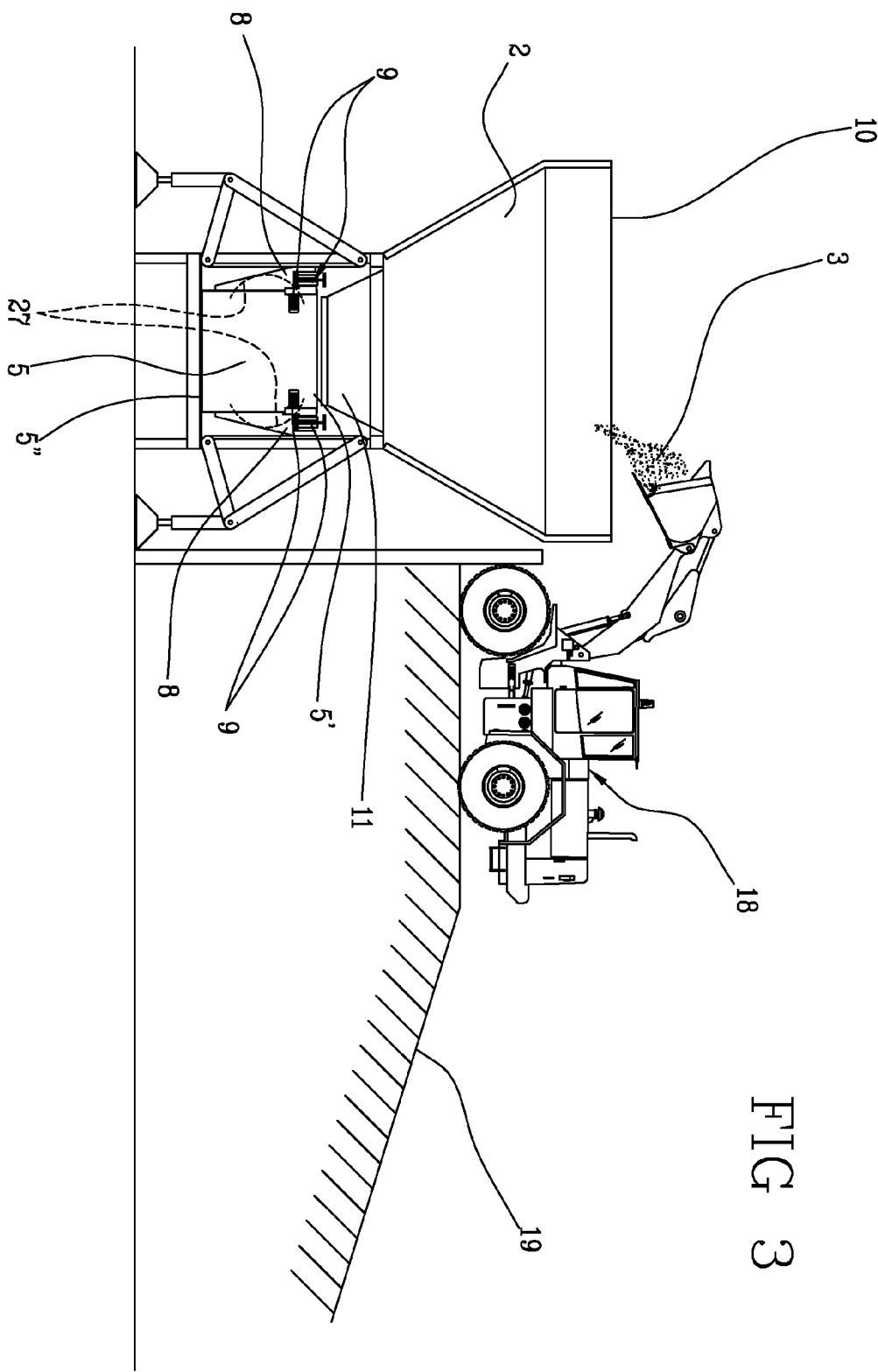
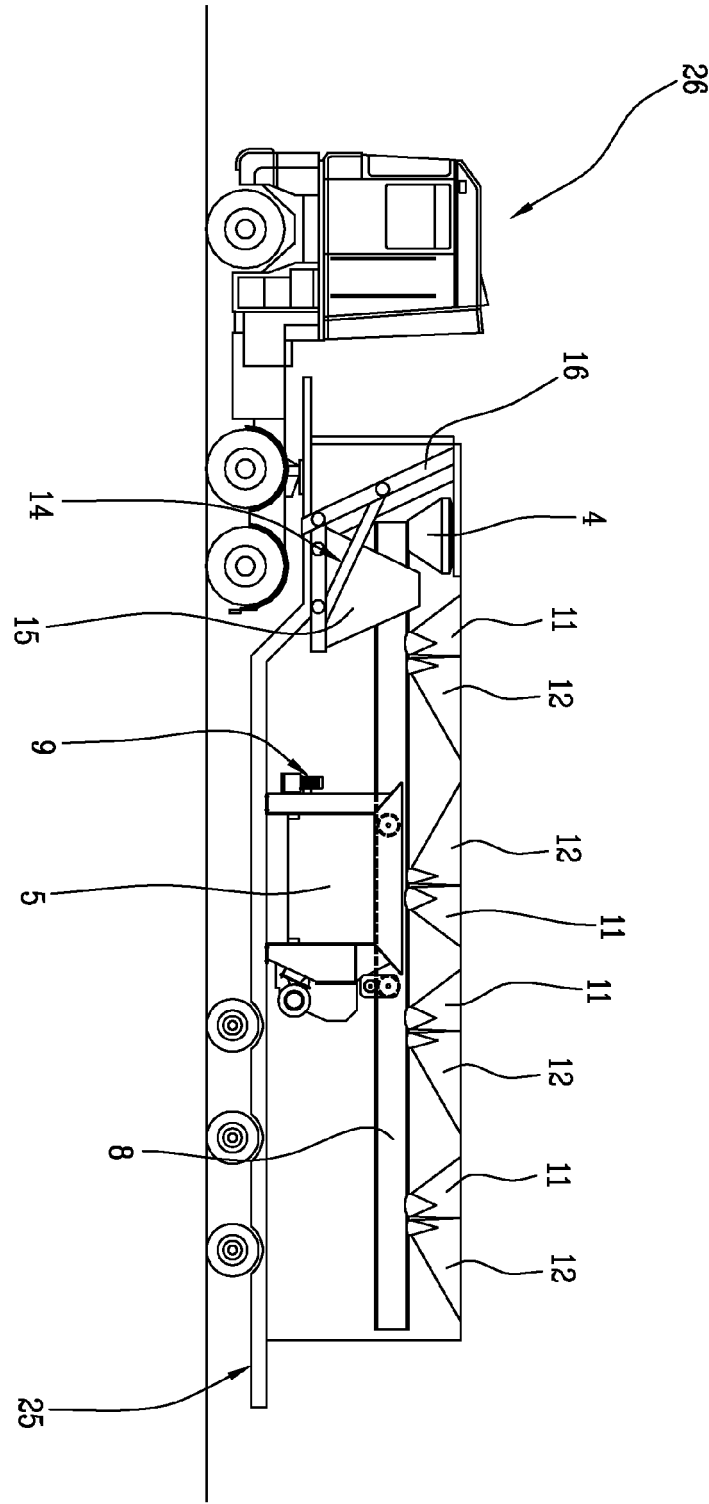


FIG 4





EUROPEAN SEARCH REPORT

Application Number
EP 12 16 8481

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 99/10148 A1 (GRACE W R & CO [US]; KREINHEDER MARK [US]; SHEA THOMAS [US]; WESTGATE) 4 March 1999 (1999-03-04) * mixer is not mobile, see numeral 50 /claims 1-4; figure 1 *	1	INV. B28C7/04 B28C9/04
A	BE 898 325 A1 (DEMBLON FERNAND) 16 March 1984 (1984-03-16) * feeder h movable on 2 rails /figure 1; examples 1-6 *	1	
A	US 3 994 404 A (KISOVEC JEAN-FRANCIS) 30 November 1976 (1976-11-30) * pair of chutes, see numerals 20 and 21 in fig 1 /claims 1-4; figures 1,3 *	3,4	
A	EP 0 442 593 A1 (SCANROAD INC [US]) 21 August 1991 (1991-08-21) * mixer not movable /claims 1,2; figure 1 *	1	
A	DE 28 49 624 A1 (HUDELMAIER GERHARD DR) 22 May 1980 (1980-05-22) * claim 1; figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) B28C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 June 2012	Examiner Boone, John
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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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 99/10148 A1 (GRACE W R & CO [US]; KREINHEDER MARK [US]; SHEA THOMAS [US]; WESTGATE) 4 March 1999 (1999-03-04) * mixer is not mobile, see numeral 50 /claims 1-4; figure 1 *	1	INV. B28C7/04 B28C9/04
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A	DE 28 49 624 A1 (HUDELMAIER GERHARD DR) 22 May 1980 (1980-05-22) * claim 1; figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) B28C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 June 2012	Examiner Boone, John
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 16 8481

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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