



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**23.06.2021 Bulletin 2021/25**

(51) Int Cl.:  
**B28C 5/08** (2006.01) **B28C 5/42** (2006.01)  
**B01F 7/00** (2006.01) **B01F 7/16** (2006.01)  
**B01F 7/24** (2006.01) **B01F 15/00** (2006.01)

(21) Application number: **19218050.3**

(22) Date of filing: **19.12.2019**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME KH MA MD TN**

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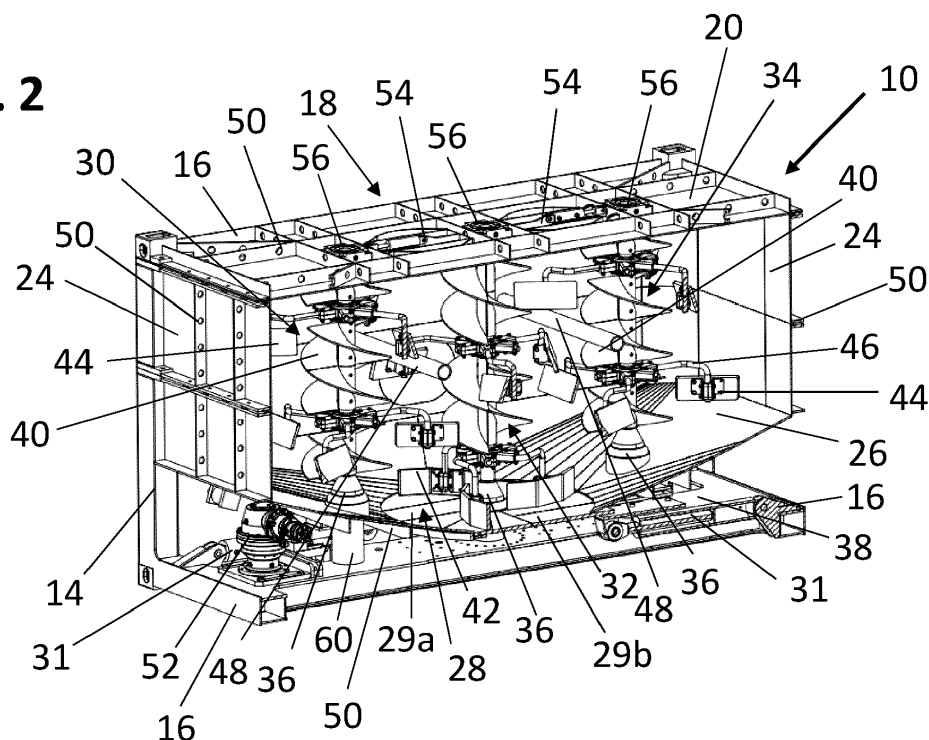
Remarks:  
Amended claims in accordance with Rule 137(2) EPC.

(54) **CONCRETE MIXING DEVICE**

(57) The invention relates to a concrete mixing device (10), comprising a cuboid outer frame (12), within which a mixing container (18) is immovably fixed. The mixing container (18) comprises at least two spaced apart mixing rotors (30, 32, 34), having a first mixing rotor (30) with first mixing elements (40, 44, 46), and a second mixing rotor (32) with second mixing elements (40, 44, 46), whereby the first and second mixing rotors (30, 32,

34) are driven by at least one mixing drive (36) mounted in connection with the mixing container (18), whereby the mixing rotors (30, 32, 34) are pivoted at their upper and lower ends, which mixing container (18) has at least one upper feed opening (54) and at least one lower discharge opening (28). The invention provides a movable concrete mixing device with a large capacity.

**Fig. 2**



## Description

**[0001]** The present invention relates to a concrete mixing device comprising a cuboid outer frame within which a mixing container is located. Such a concrete mixing device is known for example from DE 44 03 793 A1 or from WO 01/34357 A1. These concrete mixing devices have overcome the problem to be able to forward and move a concrete mixing device to locations where a concrete mixer car isn't able to get through. Preferable for such a kind of cuboid frame is a frame in the size of a EURO container according to ISO particularly a 40 feet container which is transportable with ships and vans.

**[0002]** Although this concrete mixing device has solved the problem of being located at different locations which are not accessible by cars, the problem of these known devices is that the cylinder is comparably small so that the capacity of the concrete mixing device is rather small.

**[0003]** It is accordingly object of the invention to provide a movable concrete mixing device which has a larger capacity than known devices.

**[0004]** This object is solved with a concrete mixing device according to claim 1. Preferred embodiments of the invention are subject-matter of the dependent claims. Preferred embodiments of the invention are also described in the specification and the drawings.

**[0005]** According to the invention, the container comprises at least two spaced apart mixing rotors comprising a first mixing rotor with first mixing elements and a second mixing rotor with second mixing elements, whereby the first and second rotors are driven by at least one mixing drive mounted in connection with the mixing container. In contrast to the known concrete mixing devices, the mixing container is fixedly connected to the cuboid frame which reduces the amount of bearing and support structures. On the other hand the mixing container, which is e.g. welded to the cuboid frame can be made much larger. By the provision of several mixing rotors, a good mixing of the concrete is obtained although the container itself is not moving. The mixing rotors are pivoted in the mixing container at their upper and lower ends, whereby the mixing container has at least one upper feed opening and at least one lower discharge opening. The mixing container takes a large portion of the total volume within the cuboid outer frame. This again means that an advantage over the prior art is that the inventive concrete mixing device has not to be refilled as often as the known concrete mixing devices.

**[0006]** In a preferred embodiment of the invention, the mixing rotors comprise mixing screws which are per se well-known to improve the mixing action during rotation of the mixing rotors, which mixing screws are coaxial to the rotor axis.

**[0007]** Preferably, the mixing rotors may carry mixing blades, which extend radially further away from the mixing rotors than e.g. the mixing screws. The mixing blades are preferably mounted to the mixing rotors with mount-

ing arms whereby it has to be taken care of that the mixing blades of the different rotors do not interfere with each other. With this measure the mixing effect can be extended radially so as to effect a far better mixing of the concrete. A collision of mixing blades of different rotors overlapping radially can be avoided if the mixing blades of the different rotors are mounted mutually offset. With this measure, a very good mixing area in the volume of the mixing container can be obtained so that the mixing is very effective. As the mixing blades of the different rotors overlap each other in a direction perpendicular to the rotor axis, a very intensive mixing effect is obtained.

**[0008]** The by far best and efficient mixing effect can be obtained, if the mixing screws are combined with the mixing blades, which has the effect that the mixing space is extended over the total volume of the mixing container.

**[0009]** As it has been mentioned above, preferably the cuboid frame is the size of a common container, used for transport on vans and/or vessels or cranes, particularly a EURO container according to ISO, particularly a 40 feet container. This has the advantage that the cuboid frame can be transported with ships or vans or cranes to each location on the building site, even in upper areas or floors, for example of a skyscraper building.

**[0010]** Preferably the corners of the cuboid frame comprise fitting joints which allow an easy gripping of the container, e.g. with crane lift hooks and which allow stacking of the containers.

**[0011]** The cuboid frame could also be manufactured for a special project as to best fit the demands of that project. Thus, containers for building sites in the alps might have to be smaller because of the environmental circumstances which do not allow large containers. The inventive mixing device can thus be transported with a skip loader and/or forklift.

**[0012]** The mixing device in the cuboid frame can be used isolated and it has its own energy source, even without infra-structure. Thus energy source can e.g. be an electric fuel-driven generator, a hydraulic generator or a fuel driven motor.

**[0013]** Preferably a heating and/or cooling device is located in the mixing container and/or in the walls of the mixing container. Thus, the concrete mixture can always be kept at optimal temperature for best mixing and processing.

**[0014]** The mixing container is not sensible against slight tilting. Thus the mixing device with a filled mixing container can e.g. be tilted by 10 degrees from the horizontal without affecting its function. This is important for smaller building sites in the mountains, where horizontal planes are limited

**[0015]** Preferred, the mixing rotors extend parallelly, particularly vertically. This has the advantage that the mixing drive can be mounted at one end of both mixing rotors so that one drive can be used for driving both mixing rotors without complicated gearbox structures.

**[0016]** Preferably, the at least one feed opening is located in the container top and is preferably closable via

a pivoted hatch. Thus, the mixing container can be filled easily from above with the necessary dry concrete mixture. In this connection the feed openings are preferably located between the mixing rotors. By this measure the mixing is already very efficient at the start.

**[0017]** Preferably, the mixing container also has a separate water inlet which is connectable to a water supply system so that it is easy to feed the water according to the amount of dry concrete mixture fed by the feed opening. Of course, several feed openings with pivotable hatches can be located in the container top, preferably between the mixing rotors. This has the advantage that particularly at the beginning, the mixing of the material fed near the mixing rotors is quite effective. Of course the water can simply be fed through the feed opening.

**[0018]** Preferably, the container bottom is funnel shaped. This has the advantage that the container bottom has one lowest point at which the discharge opening or eventually a discharge device can be located as to effectively empty the complete mixing container.

**[0019]** Preferably, on this behalf, a water pressure device with water jets can be mounted in connection with the mixing container so that pressurized water can be fed via the water nozzles located in the sidewalls and/or top of the mixing container. This allows an effective cleaning of the interior of the mixing container which is important as the container itself is not movable as in the known concrete mixing devices.

**[0020]** Preferably a driven discharge device is located in the lowest point of the container bottom. The discharge device is configured to discharge the mixed concrete through the discharge opening. Such a discharge device can for example be a discharge screw or discharge blades which are mounted at the lower end of the mixing rotor located at the deepest point of the funnel shaped container bottom. This has the advantage that aside of the mixing rotors, no separate discharge device has to be provided for emptying the mixing container to a better degree than only by gravity.

**[0021]** Of course the discharge opening can be simply closed by gate valves without the need of a separate discharge device.

**[0022]** In this connection it has to be carried out that aside of the bottom being funnel shaped also other shapes of the bottom are acceptable which lead to a defined deepest area of the concrete mixing container which is then easily to use for discharging the concrete or for discharging the water when cleaning the mixing container. Such shapes can for example be a ramp, a V or a U shape of the container bottom.

**[0023]** In a preferred embodiment of the invention, the mixing container comprises vertically and/or horizontally extending reinforcement bars extending through the interior of the mixing container, preferably between the mixing rotors and preferably between opposite inner walls of the mixing container. As the wet concrete mixture within the mixing container is extremely heavy, these reinforcement bars improve the form-stability of the mixing

container when being filled, preventing the walls of the mixing container from deforming. Of course, the reinforcement bars have to be located as not to collide with the mixing rotors. Preferably, the location of at least one of these bars between the mixing rotors has the advantage that this is normally the point which is the most remote from the sidewalls of the mixing container and thus is best adapted to reinforce the structural rigidity of the mixing container.

**[0024]** Preferably, the sidewalls of the mixing container extend at least over the upper half, preferably at least over the upper two-third of the cuboid frame. Thus, the volume of the mixing container is very high compared with the total volume within the cuboid frame. Thus, the volume of the mixing container with respect to the volume within the cuboid frame can be kept very high, for example at least a half or at least two third of the volume within the cuboid frame. This has the advantage that large amounts of concrete can be mixed and a refill of the mixing containers is not necessary as often as with the known concrete mixing devices mentioned above.

**[0025]** In a preferred embodiment of the invention, a bottom structure as e.g. a bottom plate and/or grid is fitted to the cuboid frame below the mixing container, which bottom structure supports the mixing device. This has the advantage that the whole mixing drive as well as the mixing container are located within the outer fines of the cuboid frame. Of course it would be possible to mount the mixing drive above the mixing container on a top structure which has technically the same effect but in this case, the mixing drive would not be closed to the upper end of the cuboid frame. Thus, in case of a top location of the mixing drive, a top protecting cover would have to be provided above the mixing drive to protect it. This need of a cover structure is eliminated if the mixing drive is arranged on the bottom structure which does not only support the mixing drive but also protects it from outside.

**[0026]** Preferably, the mixing drive comprises at least one drive motor and optionally at least one gearbox, which are configured to turn the adjacent mixing rotors in identical or in contrary rotation directions. This is simply realized via one drive motor or a gearbox or with separate drive motors for each mixing rotor without the necessity to use a gearbox. Usually, a gearbox is needed anyway to transform the high rotation of a drive motor into the lower rotation speed of the mixing rotors within the mixing container, unless the mixing drive is a hydraulic one.

**[0027]** Preferably, the mixing drive also comprises an energy supply for the mixing drive, particularly the drive motor. In case the drive motor is fuel driven, this energy supply is a fuel container. If the drive motor is driven electrically, this energy supply is a large accumulator or a fuel driven generator or in case of a hydraulic mixing drive it is a hydraulic generator mounted to the concrete mixing device preferably at a bottom structure thereof. The hydraulic drive has the advantage that also the feed hatches and gate valves for the discharge opening can be hydraulically driven, so that there is only one hydraulic

generator necessary for all components of the concrete mixing device.

**[0028]** Preferably, three mixing rotors are provided within the mixing container whereby the middle one of the three mixing rotors is located in the middle of the container where preferably the bottom of the mixing container has its deepest area for discharging the mixed concrete. Thus, a good mixing result is obtained in the longitudinal cuboid frame of a EURO container and via the location of the middle mixing rotor at the place of the lowest point of the container bottom, an effective discharge operation of the mixing container is obtained which can be supported by the middle mixing rotor.

**[0029]** Preferably, the side walls and/or the top walls and/or the bottom of the mixing container is/are reinforced by reinforcing struts, which are preferably arranged in a grate like manner. With this measure, the mixing container receives a sufficient rigidity for taking up a high amount of concrete and further, these reinforcing structures protect the mixing container against damage from outside.

**[0030]** Following terms are used as synonyms: mixing container - container;

**[0031]** It is clear for the skilled person that mentioned embodiments can be combined with each other arbitrarily.

**[0032]** The invention will be described hereinafter schematically by the aid of the following drawings. In these drawings

- Fig. 1 shows a perspective view of the inventive concrete mixing device,
- Fig. 2 shows a perspective view according to Fig. 1 but as a sectional view in the vertical and longitudinal direction,
- Fig. 3 a sectional side view of the mixing container of Fig. 1 and 2,
- Fig. 4 a lateral side view of the mixing container according to one of the preceding figures, and
- Fig. 5 a side view of the mixing container from the longitudinal end.

**[0033]** The inventive concrete mixing device 10 comprises a cuboid frame 12 consisting of vertical frame beams 14 and horizontal frame beams 16. With the term "cuboid frame" it is meant that the outer shape of the frame is cuboid. It is not necessary that the horizontal or vertical frame beams 16, 14 are always located in the outer edge of the frame 12 which can be seen with the horizontal longitudinal beams 14 in the bottom area. Within the cuboid frame 12, a mixing container 18 is fixed, preferably by welding, although other fixing options are possible, e.g. fixing with bolts. The mixing container 18 has a closed container top 20 which is about aligned with

the top side of the cuboid frame 12 and lateral side walls 22 and end walls 24, whereby the side walls 22, 24 extend roughly over two third of the upper length of the vertical frame beams 14. The mixing container 18 has a container bottom 26 which is preferably funnel shaped and comprises in its middle in the lowest bottom area a circular discharge opening 28 secluded by two gate valves 29a, 29b, being movable via a hydraulic drive 31 along horizontal guides 33 as to open and close the discharge opening 28. Preferably the gate valves 29a, 29b are configured to be movable mutually contrary to each other as to open the discharge opening from and to the middle. Within the mixing container 18, three mixing rotors 30, 32, 34 are located which are pivoted between upper pivots 56 connected to the container top 20 and mixing drives 36 mounted via supports 60 to a bottom structure 38 of the cuboid frame 12.

**[0034]** The mixing drives 36 can comprise either separately driven motors or one common drive motor which transfers the drive energy to the different drives 36 via gearboxes. If separate drive motors are provided for each mixing rotor 30, 32, 34, the mutual rotation direction can be changed. If the mixing rotors 30, 32, 34 are connected via a gearbox, this requires two switching steps of the gearbox comprising one switching step where the mixing rotors 30, 32, 34 rotate in the same direction and another switching step where the adjacent mixing rotors 30, 32, 34 turn in mutually contrary directions.

**[0035]** Each mixing rotor comprises a mixing screw 40 concentrically located on each mixing rotor whereby the middle mixing rotor 32 comprises at its lower end above the discharge opening 28 discharge blades 42 which are provided to supply the discharge of the mixed concrete via the discharge opening 28. Each of the mixing rotors 30, 32, 34 may further comprise mixing blades 44 mounted to the mixing rotors 30, 32, 34 in radial direction further remote to the rotation axis via mounting arms 46. These mixing blades 44 are radially far apart from the corresponding mixing rotor axis and the mixing blades 44 of the different mixing rotors are mutually offset so as to not interfere with each other. Between the mixing rotors 30, 32, 34, horizontal reinforcing bars 48 are provided which give the mixing container 12 a higher rigidity against the pressure of the heavy concrete mixture on the inner walls of the mixing container 12. On this behalf, the container top 20, the sidewalls 22, 24 as well as the bottom preferably comprise reinforcing struts 50 which provide a higher rigidity to the mixing container walls and to the stability of the whole concrete mixing device 10. On the bottom plate 38 of the cuboid frame 12, a hydraulic generator 52 is provided which forms a hydraulic supply for the separate mixing drives 36 and the hydraulic drives for the hatches of the feed openings 54 and the hydraulic drives 31 of the gate valves 29a, 29b. Also an optional inspection hatch 58 may be operated hydraulically.

**[0036]** Pivoted feed hatches 55 - preferably hydraulically driven - are provided in the feed openings 54 in container top via 20, which can be driven in an opening

and close position. Thus, it is possible to fill the mixing container 12 with dry concrete mixture as well as with water and other components. The Figs. 1 and 2 show the upper pivots 56 for the pivoting of the upper ends of the mixing rotors 30, 32, 34.

**[0037]** Preferably, high pressure water nozzles (not shown) connected to a high pressure water supply (not shown) are located in the top and/or in the sidewalls of the mixing container 18 to allow easy cleaning of the interior of the mixing container after it is empty. With such a high pressure water cleaning device with high pressure cleaning nozzles, a more effective cleaning of the interior can be obtained than it is possible manually via the feed openings 54 in the container top 20.

**[0038]** Preferably, at the upper and optionally also lower four corners of the vertical frame beams 14, lifting and/or fixing lugs 62 are provided which allow the lifting and/or fixing or supporting of the complete concrete mixing device on a van or on a vessel so that it can be transported via ship, via van and via a crane to any location of a building site. The mixing container 12 takes a very large portion of the space within the cuboid frame 12 so that with a limited room of the EURO container, a large amount of concrete mixture can be handled.

**[0039]** An inspection hatch 58 may be located in the side wall to allow the operators to check the interior of the mixing container 18 and to perform maintenance in the mixing container 18.

**[0040]** The invention is not restricted to the above embodiments but may be varied within the scope of the appended patent claims.

Reference numbers:

**[0041]**

10	concrete mixing device
12	cuboid frame
14	vertical frame beams
16	horizontal frame beams
18	mixing container
20	container top
22	container side walls
24	container end walls
26	container bottom
28	circular discharge opening in the lowest area of the container bottom
29a,b	gate valves for the discharge opening
30	first mixing rotor
31	hydraulic drives for the gate valves
32	second mixing rotor
33	horizontal guides for the gate valves
34	third mixing rotor
36	mixing drive(s)
38	bottom structure (bottom plate) fixed to the cuboid frame for supporting the mixing drive(s)
40	mixing screw of each mixing rotor
42	discharge blades fixed to the second mixing ro-

		tor in the lowest area of the container bottom
44		mixing blades
46		mounting arms to fix the mixing blades to the mixing rotor
5	48	horizontal reinforcing bars through the interior of the mixing container
	50	reinforcing struts around the faces of the mixing container
	52	hydraulic generator for mixing drives
10	54	feed opening
	56	upper pivots in the container top for mixing rotors
	58	inspection hatch in the side wall of the mixing container
15	60	supports for the mixing drives on the bottom structure
	62	lugs at the upper corners of the cuboid frame for lifting the mixing device

**Claims**

- Concrete mixing device (10), comprising a cuboid outer frame (12), within which a mixing container (18) is immovably fixed, which container (18) comprises at least two spaced apart mixing rotors (30, 32, 34), comprising a first mixing rotor (30) with first mixing elements (40, 44, 46), and a second mixing rotor (32) with second mixing elements (40, 44, 46), whereby the first and second mixing rotors (30, 32, 34) are driven by at least one mixing drive (36) mounted in connection with the mixing container (18), whereby the mixing rotors (30, 32, 34) are pivoted at their upper and lower ends, which mixing container (18) has at least one upper feed opening (54) and at least one lower discharge opening (28).
- Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing rotors (30, 32, 34) comprise mixing screws (40).
- Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing rotors (30, 32, 34) carry mixing blades (44), which are preferably mounted to the mixing rotors (30, 32, 34) with mounting arms (46).
- Concrete mixing device (10) according to claim 3, **characterized in that** the mixing blades (44) of different rotors (30, 32, 34) are mounted mutually offset.
- Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the cuboid frame (12) is the size of an EURO container according to ISO, particularly a 40 feet container.
- Concrete mixing device (10) according to any of the

preceding claims, **characterized in that** the mixing rotors (30, 32, 34) extend parallel, particularly vertically.

7. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the at least one feed opening (54) is located in the container top (20) and is preferably closable via a pivoted hatch.
8. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the container bottom (26) is funnel shaped.
9. Concrete mixing device (10) according to claim 8, **characterized in that** the discharge opening is in or near the lowest point of the funnel shaped container bottom (26).
10. Concrete mixing device (10) according to claim 8 or 9, **characterized in that** in or near the lowest point of the funnel shaped container bottom (26) a driven discharge device (42) is located which is configured to discharge mixed concrete through the discharge opening (28).
11. Concrete mixing device (10) according to claim 10, **characterized in that** in the discharge device (42) is formed by discharge blades mounted at the lower end of the mixing rotor (32) located at the deepest point of the funnel shaped container bottom (26).
12. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing container (18) comprises vertically and/or horizontally extending reinforcement bars (48) extending between the rotors (30, 32, 34).
13. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the side walls (22, 24) of the mixing container (18) extend at least over the upper half, preferably over the upper two-third of the cuboid frame (12).
14. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** to the cuboid frame (12) a bottom structure (38) is fixed below the mixing container (18), which bottom structure carries the mixing drive (36).
15. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing drive (36) comprises at least one drive motor and optionally at least one gearbox, which mixing drive (36) preferably comprises an energy supply (52) for the mixing drive.
16. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** it comprises

es three mixing rotors (30, 32, 34) whereby the middle one (32) of the three mixing rotors (30, 32, 34) is located in the middle of the container (18).

17. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the side walls (22, 24) and/or top wall (20) of the mixing container (18) is reinforced by reinforcing struts (50), which are preferably arranged in a grate like manner.

Amended claims in accordance with Rule 137(2) EPC.

1. Concrete mixing device (10), comprising a cuboid outer frame (12), within which a mixing container (18) is immovably fixed, which container (18) comprises at least two spaced apart parallel mixing rotors (30, 32, 34), comprising a first mixing rotor (30) with first mixing elements (40, 44, 46), and a second mixing rotor (32) with second mixing elements (40, 44, 46), whereby the first and second mixing rotors (30, 32, 34) are driven by at least one mixing drive (36) mounted in connection with the mixing container (18), which mixing container (18) has at least one upper feed opening (54) and at least one lower discharge opening (28), **characterized in that** the mixing rotors (30, 32, 34) extend vertically, that the mixing rotors (30, 32, 34) are pivoted at their upper and lower ends, that the container bottom (26) is funnel shaped and that the discharge opening is in or near the lowest point of the funnel shaped container bottom (26).
2. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing rotors (30, 32, 34) comprise mixing screws (40).
3. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing rotors (30, 32, 34) carry mixing blades (44), which are preferably mounted to the mixing rotors (30, 32, 34) with mounting arms (46).
4. Concrete mixing device (10) according to claim 3, **characterized in that** the mixing blades (44) of different rotors (30, 32, 34) are mounted mutually offset.
5. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the cuboid frame (12) is the size of an EURO container according to ISO, particularly a 40 feet container.
6. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the at least one feed opening (54) is located in the container top (20) and is preferably closable via a pivoted hatch.
7. Concrete mixing device (10) according to any of the

preceding claims, **characterized in that** in or near the lowest point of the funnel shaped container bottom (26) a driven discharge device (42) is located which is configured to discharge mixed concrete through the discharge opening (28).

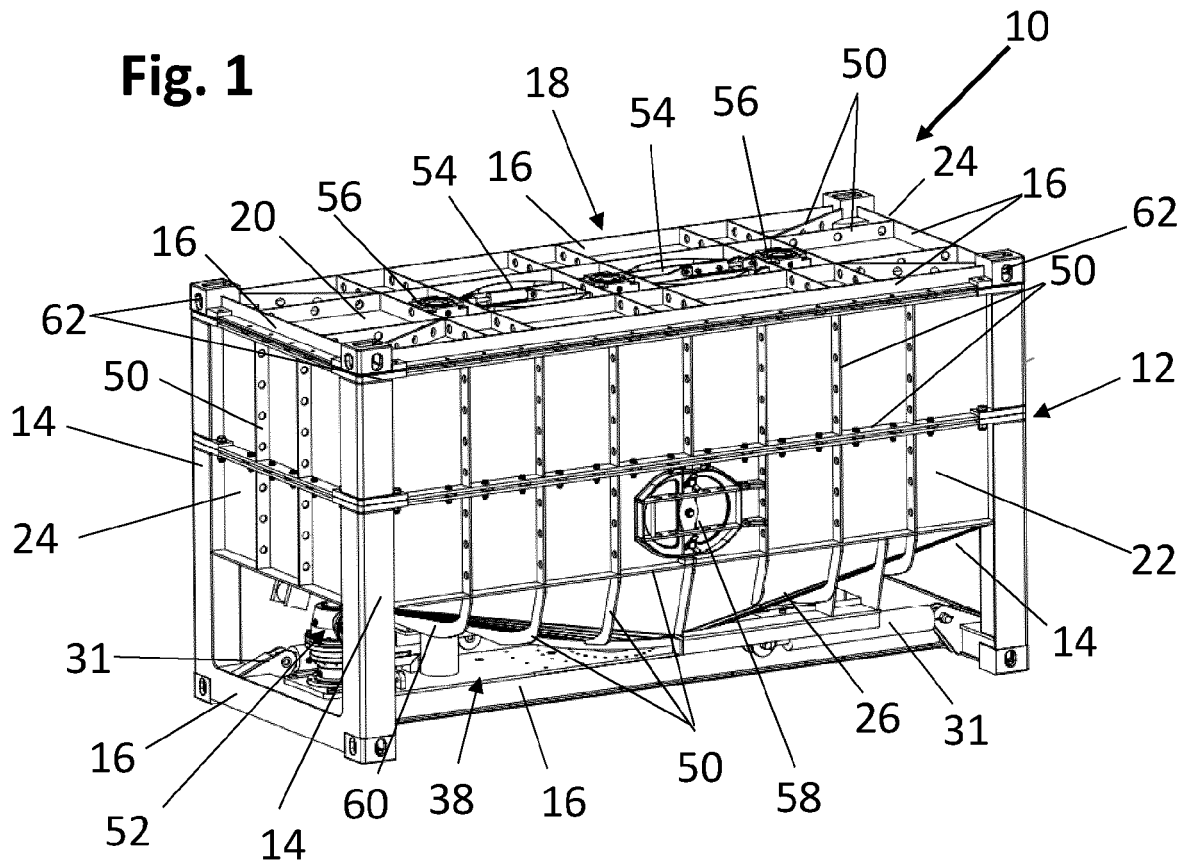
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8. Concrete mixing device (10) according to claim 7, **characterized in that** in the discharge device (42) is formed by discharge blades mounted at the lower end of the mixing rotor (32) located at the deepest point of the funnel shaped container bottom (26). 10
9. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing container (18) comprises vertically and/or horizontally extending reinforcement bars (48) extending between the rotors (30, 32, 34). 15
10. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the side walls (22, 24) of the mixing container (18) extend at least over the upper half, preferably over the upper two-third of the cuboid frame (12). 20
11. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** to the cuboid frame (12) a bottom structure (38) is fixed below the mixing container (18), which bottom structure carries the mixing drive (36). 25  
30
12. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the mixing drive (36) comprises at least one drive motor and optionally at least one gearbox, which mixing drive (36) preferably comprises an energy supply (52) for the mixing drive. 35
13. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** it comprises three mixing rotors (30, 32, 34) whereby the middle one (32) of the three mixing rotors (30, 32, 34) is located in the middle of the container (18). 40
14. Concrete mixing device (10) according to any of the preceding claims, **characterized in that** the side walls (22, 24) and/or top wall (20) of the mixing container (18) is reinforced by reinforcing struts (50), which are preferably arranged in a grate like manner. 45

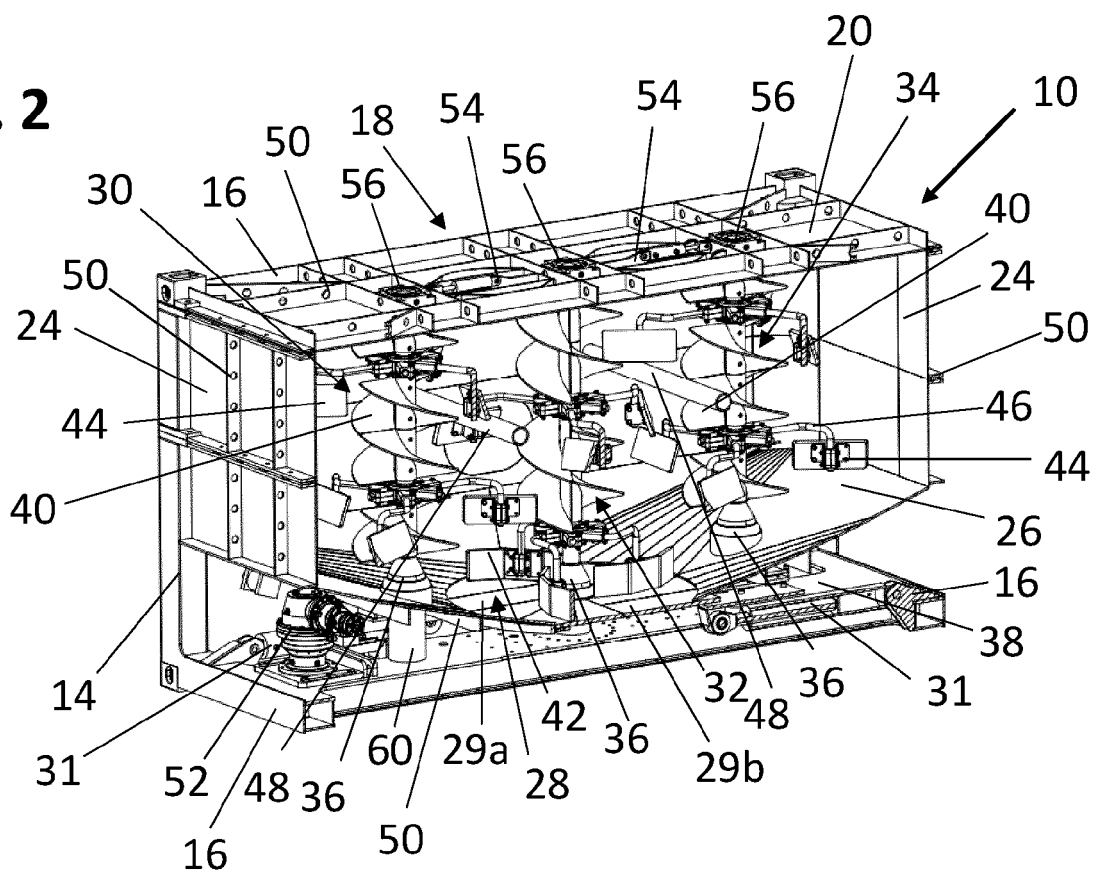
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**Fig. 1**

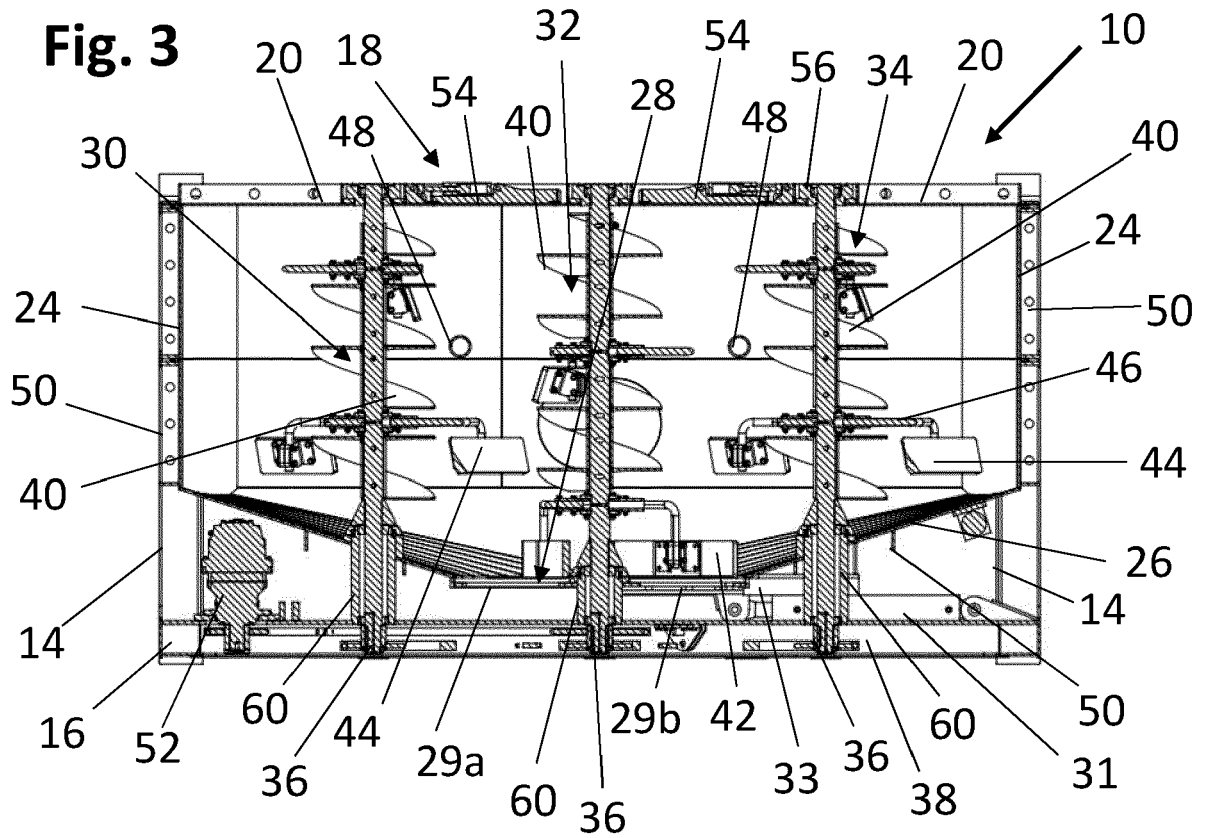


**Fig. 2**

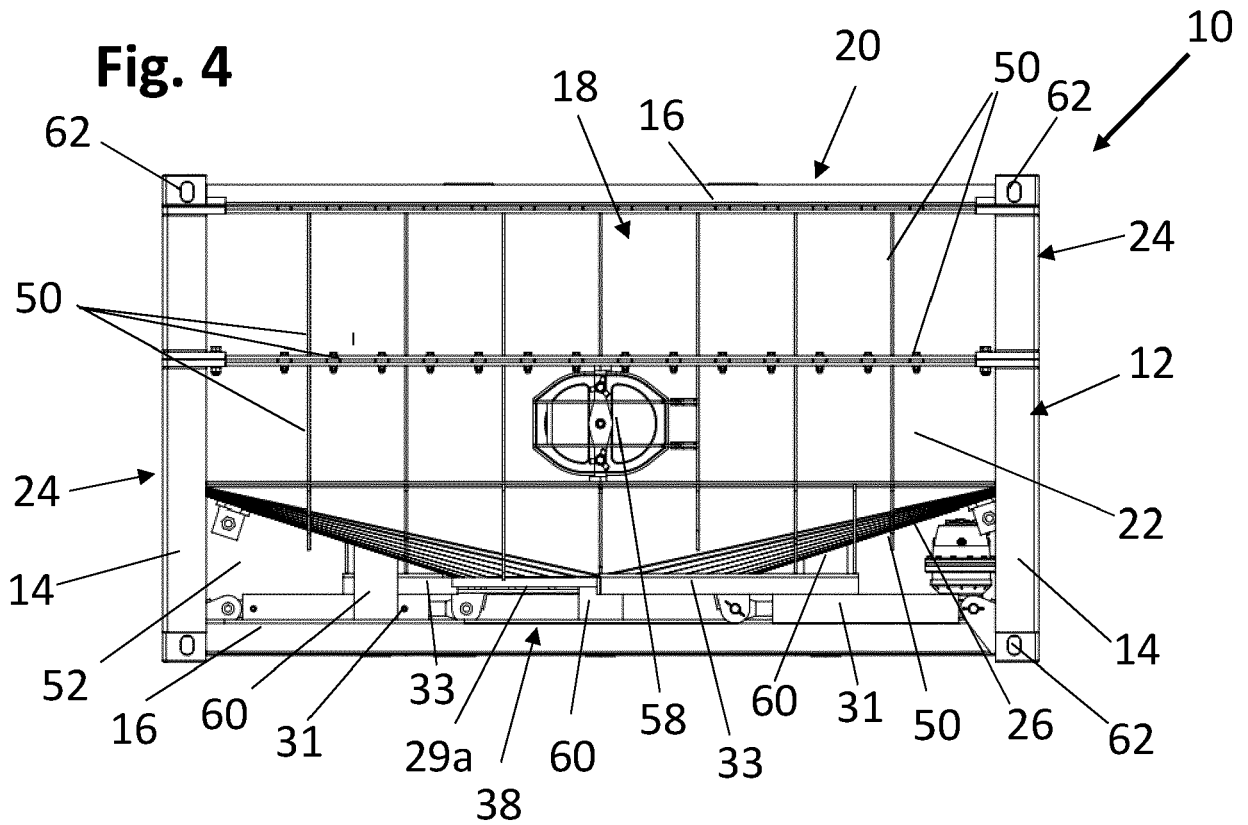




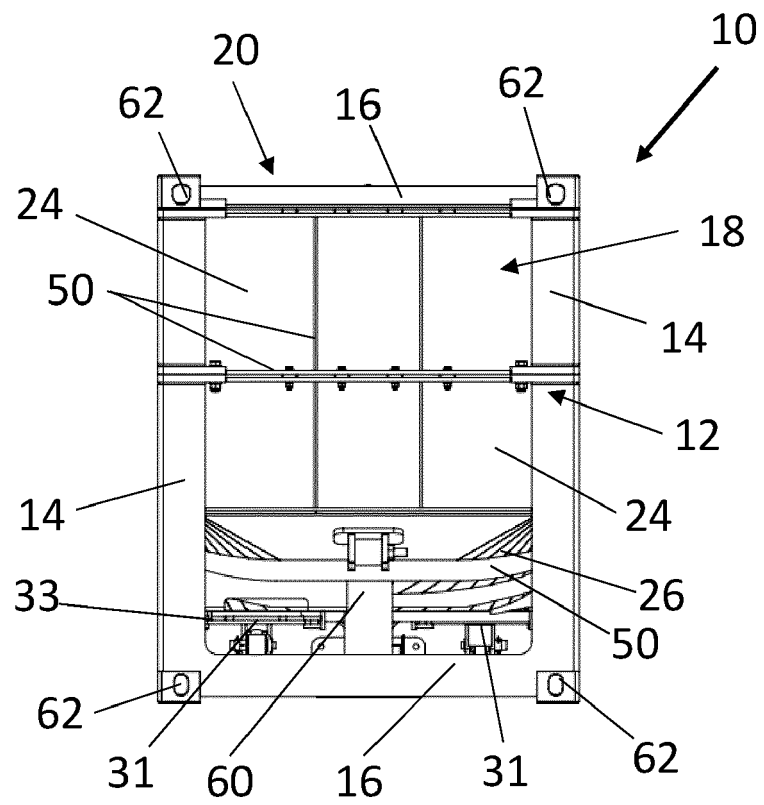
**Fig. 3**



**Fig. 4**



**Fig. 5**





## EUROPEAN SEARCH REPORT

Application Number  
EP 19 21 8050

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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)
X	GB 941 926 A (ALAN DAVID KENNEY) 20 November 1963 (1963-11-20)  * figures 1-7 * * page 2, lines 33-100 * -----	1,2, 5-10, 12-15,17	INV. B28C5/08 B28C5/42 B01F7/00 B01F7/16 B01F7/24 B01F15/00
X	CN 102 441 940 B (XIAN DETONG TRAFFIC TECHNOLOGY CO LTD) 12 March 2014 (2014-03-12) * figures 1-6 * * claim 1 * -----	1,3,4,6, 7,12-15, 17	
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X	CN 108 339 459 A (JIANGSU RUIWO CONSTRUCTION GROUP CO LTD) 31 July 2018 (2018-07-31) * figures 1,2 * * claim 1 * -----	1,3,4, 6-15,17	TECHNICAL FIELDS SEARCHED (IPC)  B28C B01F
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>16 June 2020</b>	Examiner <b>Voltz, Eric</b>
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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