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(54) Modular mixing unit

(57) Modular, containerised mixing unit (1) for mixing concrete, cement or mortar, whereby all components, still separated, are conveyed in one component container (2a,2b). The container may be provided with an independent power source, with support legs, wheels or train wheels and can be used at substantially any location. For coupling a component container (2a,2b) to the container (1) an integrated hoisting device or a hydraulically driven centring device (3a,3b) can be used.

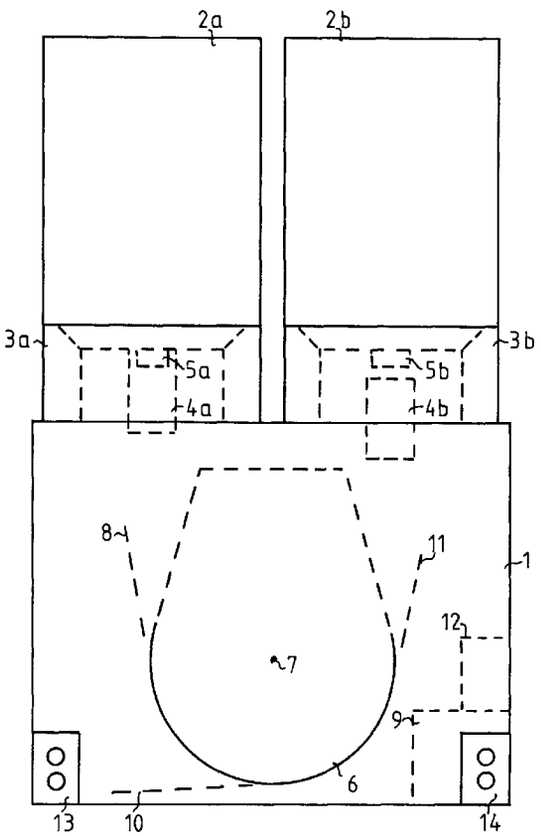

FIG.1

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Description

[0001] The invention relates to a mixing unit for mixing components supplied to a product by at least one component container, where always one component container contains a number of components of the product and where under operational conditions an upper side of the mixing unit is provided with a first coupling part and an under side of the component container with a second coupling part, which coupling parts are arranged such that once the coupling parts are connected, all components are substantially simultaneously poured into the mixing unit, via the connected first and second coupling parts.

[0002] Containers containing more components and provided with a coupling part are known from the European patent EP 0 573 434 for example, which patent is included by reference in the present application. According to the teaching of this patent a very precise mixture can be obtained, resulting in a high-quality product by supplying all components in one container.

[0003] The present invention uses the known component containers but, in doing so, it solves a different problem. It is characterized in that the mixing unit is placed in a container and that a number of component containers can be attached onto the container for use in places that are difficult to access and/or locations with an at least substantially absent infrastructure.

[0004] According to the inventive thought it would then be sufficient to provide the mixing unit with possibly a number of necessary modular extensions and a number of component containers and to transport the mixing unit to a location where a product like concrete is needed. In this context one may think of very exotic examples, but also of very trivial ones. For building multi-storeyed buildings for example the concrete is conveyed by a concrete mixing truck towards the building site and then brought to the required location in a rather cumbersome way. According to the invention, a mixing unit and a number of component containers may be located at the building site and the concrete can be mixed right at the spot. This results in a fresh and an optimally specified product, while the environmental effects are less and the cost of transport can be significantly reduced.

[0005] According to another aspect of the invention, the mixing unit is characterized in that the container is provided with centring means for receiving and centring a component container and that the first coupling part is provided with an actuator for moving the coupling part to a lower position or to an upper position. It is possible then to place a component container on top of the container and to postpone the coupling of the first and the second coupling part until a new fill for the mixing unit is needed. Generally speaking this will be the case as soon as an earlier fill has been mixed and delivered, such that no time is wasted.

[0006] According to another aspect of the invention, the mixing unit is characterized in that the container is provided with at least two centring means for receiving and centring at least two component containers and with at least two first coupling parts, provided with actuators. It is possible then to receive a number of component containers and to place them on top of the container, after which the component containers can be coupled and emptied when needed. For mixtures with components that are difficult to store combined into one container it is now possible to supply these components to more than one container. If, for example, no water is available on the building site, one component container can be filled with the dry components of a mortar and a second component container with exactly the necessary amount of water. In this case the mixing process can still be called semi-continuous, as the component containers can be exchanged during the mixing of the constituents of the previous component containers.

[0007] According to another aspect of the invention, it must be possible to operate the mixing unit independent of an external energy supply. It is thereto characterized in that the container can be provided with a combustion engine for driving the mixing unit and a generator and/or an hydraulic pump unit.

[0008] According to another aspect of the invention, it must be possible to operate the mixing unit on uneven terrain. It is thereto characterized in that the container can be provided with adjustable support legs. A favourable realization in which the availability of the electricity generator or the hydraulic pump unit is utilized is characterized in that the adjustable support legs are provided with electric or hydraulic drive means.

[0009] According to an another aspect of the invention, it must be relatively simple to relocate the mixing unit on a building site. It is thereto characterized in that the container can be provided with wheels. A favourable realization in which the availability of the electricity generator or the hydraulic pump unit is utilized is characterized in that the wheels are provided with electric or hydraulic drive means.

[0010] According to a further aspect of the invention, the container can be provided with an electrically or hydraulically driven hoisting apparatus, such that no external provisions are necessary for lifting a component container on top of the container.

[0011] With the combination of driven wheels and a hoisting apparatus the mixing unit can independently approach a next component container and place it onto the container. At the same time the mixing of the contents supplied by a previous container can continue, such that a substantially continuous process is obtained.

[0012] According to another aspect of the invention the mixing unit is provided with hydraulically driven upwards moving centring means for contacting and emptying a component container. In this embodiment it is assumed that a supply of component containers is stored on a rack, such that the mixing unit can pass un-

derneath the rack. In order to empty a component container it is then sufficient to move the centring means upwards.

[0013] The invention will be further explained with reference to the following figures, in which:

Fig. 1 schematically represents in side view a mixing unit with two component containers;
Fig. 2 schematically represents in cross section an embodiment of the first and the second coupling part;
Fig. 3 schematically represents in top view a mixing unit with support legs and with two component containers;
Fig. 4 schematically represents in top view a mixing unit with wheels and with two component containers;
Fig. 5 schematically represents a mixing unit with a hoisting device for use on rails;
Fig. 6 schematically represents a mixing unit with hydraulically driven upward moving centring means.

[0014] Fig. 1 schematically represents in side view a mixing unit 1 according to the invention and two component containers 2a,2b, as such well known in the art. Component containers 2a,2b are divided into a number of compartments, each of which comprises a component for making a product, like concrete, cement mortar or any other viscous substance. The upper surface of mixing unit 1 is provided with centring means 3a,3b in which component containers 2a,2b can be placed in a stable but detachable manner, and with first coupling parts 4a,4b for coupling with second coupling parts 5a, 5b which close the bottom part of component containers 2a,2b. In Fig. 1 a first coupling part 4a is coupled to a second coupling part 5a, while the coupling parts 4b and 5b are uncoupled. According to the state of the art the first coupling parts 4a,4b each contain a lance and the second coupling parts 5a,5b each contain a foil, such that when coupled the lance cuts open the foil and the components fall into mixing unit 1. According to an aspect of the invention this takes place exclusively if the first coupling part in question is in its upper position.

[0015] Mixing unit 1 may now be used as follows. First the component containers 2a,2b are brought into place and a mixer 6 is rotated round an axis 7 to assume a position 8. Next, the first coupling part 4a is moved upward until the components of component container 2a fall into mixer 6. Then, mixer 6 is rotated under the application of a motor 9 in a manner well-known in the art until an adequate mixing is obtained. The product obtained is delivered with mixer 6 in a position 10, after which mixer 6 is brought into a position 11 for accepting and processing the contents of component container 2b in a comparable sequence. Meanwhile component container 2a can be replaced, thus making the process substantially continuous.

[0016] Coupling parts 4a,4b are made movable with the aid of hydraulic cylinders, which are in turn driven by an hydraulic pump unit 12, which is in turn driven by motor 9. Motor 9 can be an electromotor if a connection to an electricity supply is available but will generally be a Diesel engine or a petrol engine.

[0017] Fig. 1 further shows on the visible side of mixing unit 1 two interface plates 13,14, arranged for accepting a wheel or a support leg, as the case may be, dependent on the type of mission. The side not visible in Fig. 1 is completely analogously provided with interface plates 15,16.

[0018] Mixing unit 1 further comprises the usual measuring, control and guarding equipment necessary for making a high quality product. Moreover, mixing unit 1 can be provided with a supply store for water, because water will normally be available at a site and can be taken in periodically.

[0019] Fig. 2 represents in cross section an embodiment of the first coupling part 4 and the second coupling part 5. First coupling part 4 is cylindrically shaped and is inserted into a tubular bearing 17, welded into an opening in the roof 18 of mixing unit 1. Second coupling part 5 is also cylindrically shaped and is an integral part of component container 2. Second coupling part 5 is closed by a foil 19, preventing the components from leaving component container 2. First coupling part 4 is provided with a lance 20, designed for cutting open foil 19 and for in fact substantially removing it. To accomplish this, a hydraulic cylinder 21 is provided, on one side connected to roof 18 and on the other side to a projection 22 of first coupling part 4. If hydraulic cylinder 21 is powered, then first coupling part 4 moves upward and encloses second coupling part 5, in which process foil 19 is removed and the components of mixing unit 1 plunge out.

[0020] Fig. 3 schematically shows the two component containers 2a,2b and the mixing unit 1 in top view. Interface plates 13,14,15,16 are now provided with adjustable support legs 23,24,25,26, with which mixing unit 1 may also be used on sloping or uneven terrain. Support legs 23,24,25,26 may be manually adjustable but are preferably adjusted by hydraulic actuators, not shown but well-known in the art, possibly with an automatic level steering, also well-known in the art. Moreover, an interface plate 27 is visible on which a hydraulically driven hoisting device may be placed for exchanging the component containers, which hoisting device can be energised by pump unit 12.

[0021] Fig. 4 schematically shows two component containers 2a,2b and mixing unit 1 in top view. Interface plates 13,14,15,16 are now provided with wheels 28,29,30,31, some of which may be provided with a hydraulic motor, such that mixing unit 1 can move independently on the site. Moreover interface plate 27 is visible again, on which a hydraulically driven hoisting device may be placed for exchanging the component containers. When exchanging the containers the wheels

can be used such as to minimize the distance to be bridged by the hoisting device.

[0022] Fig. 5 schematically shows a mixing unit 1 with a hoisting device 32 to be used on rails. For that purpose mixing unit 1 is also provided with interface plates on the bottom surface not shown to which train wheels 33,34,35,36 are connected. Hoisting device 32 obviously can pick up component containers located alongside the rails and place them on centring means 3.

[0023] Fig. 6 schematically shows a mixing unit with hydraulically driven upward moving centring means, which can be used on a railed version. Centring means 3 are mounted on two hydraulic cylinders 35,36, mounted for pushing centring means 3 upward, such that a lance, further not shown, can cut open the foil and the components can plunge out of component container 2 into mixing unit 1. In this application a supply of component containers 2a,2b,2c,.. is placed on a rack 37, after which mixing unit 1 may independently, without using a hoisting device or other facilities can empty these component containers. It is advisable then to provide the component containers with a projection on their outer surface, for example a rib 38, such that they can be placed in openings in rack 37 and still have some freedom of movement.

[0024] De mixing unit can be very advantageously placed on a vessel, together with a number of component containers and can be employed on locations that are difficult to reach overland.

[0025] The mixing unit can also be used advantageously in the food industry, for making a clean product in a rather polluted environment.

Claims

1. Mixing unit for mixing components supplied to a product by at least one component container, where always one component container contains a number of components of the product and where under operational conditions an upper side of the mixing unit is provided with a first coupling part and an under side of the component container with a second coupling part, which coupling parts are arranged such that once the coupling parts are connected, all components are substantially simultaneously poured into the mixing unit, via the connected first and second coupling parts, characterized in that the mixing unit is placed in a container and that a number of component containers can be attached onto the container for use in places that are difficult to access and/or locations with an at least substantially missing infrastructure.

2. Mixing unit according to claim 1, characterized in that the container is provided with centring means for receiving and centring a component container and that the first coupling part is provided with an actuator for moving the coupling part to a lower position or to an upper position.

3. Mixing unit according to claim 2, characterized in that the container is provided with at least two centring means for receiving and centring at least two component containers and with at least two first coupling parts, provided with actuators.

4. Mixing unit according to claim 1, characterized in that the container can be provided with a combustion engine for driving the mixing unit and a generator and/or a hydraulic pump unit.

5. Mixing unit according to claim 1, characterized in that the container can be provided with adjustable support legs.

6. Mixing unit according to claim 5, characterized in that the adjustable support legs are provided with electric or hydraulic drive means.

7. Mixing unit according to claim 1, characterized in that the container can be provided with wheels.

8. Mixing unit according to claim 7, characterized in that the wheels are provided with electric or hydraulic drive means.

9. Mixing unit according to claim 1, characterized in that the container can be provided with an electrically or a hydraulically driven hoisting apparatus.

10. Mixing unit according to claim 1, characterized in that the container can be provided with hydraulically driven upward moving centring means for contacting and emptying a component container.

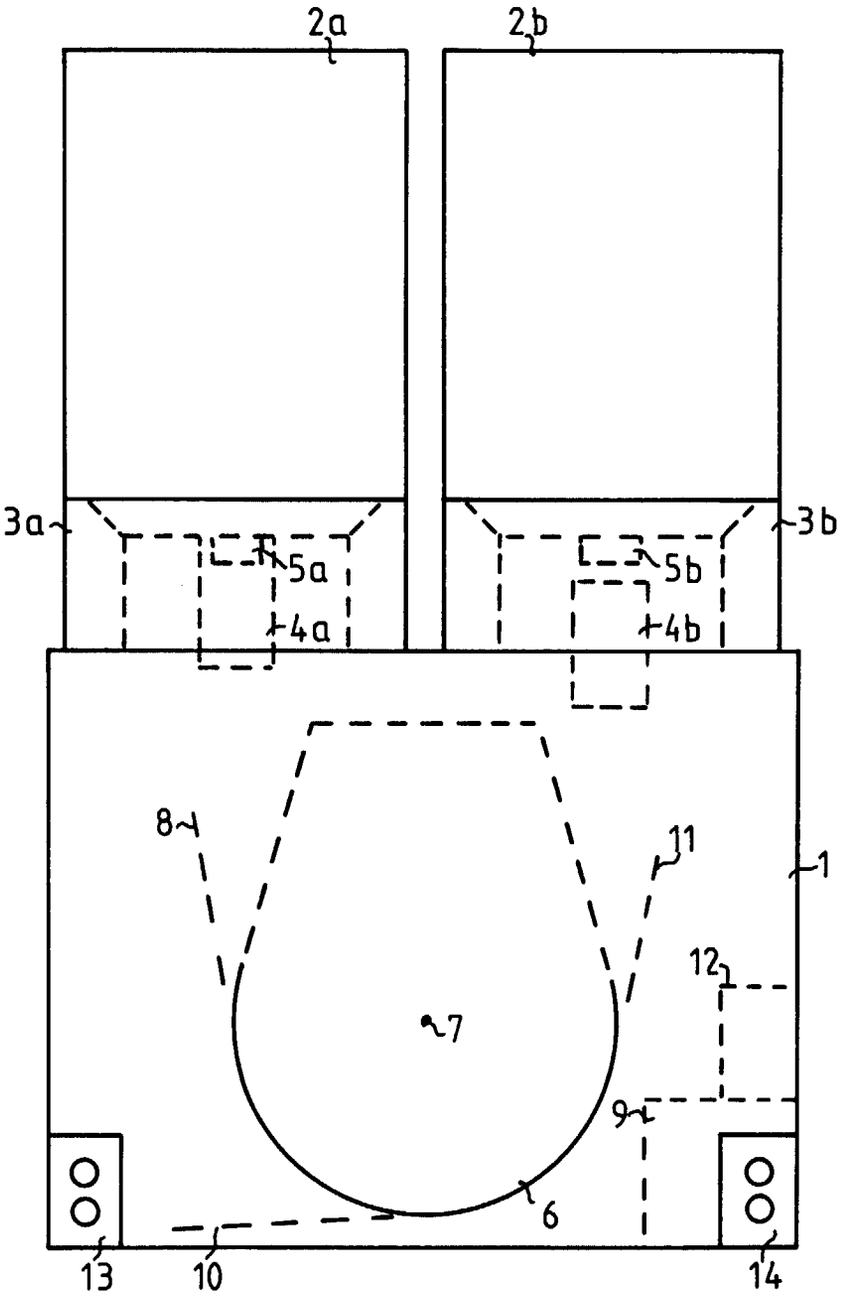

FIG.1

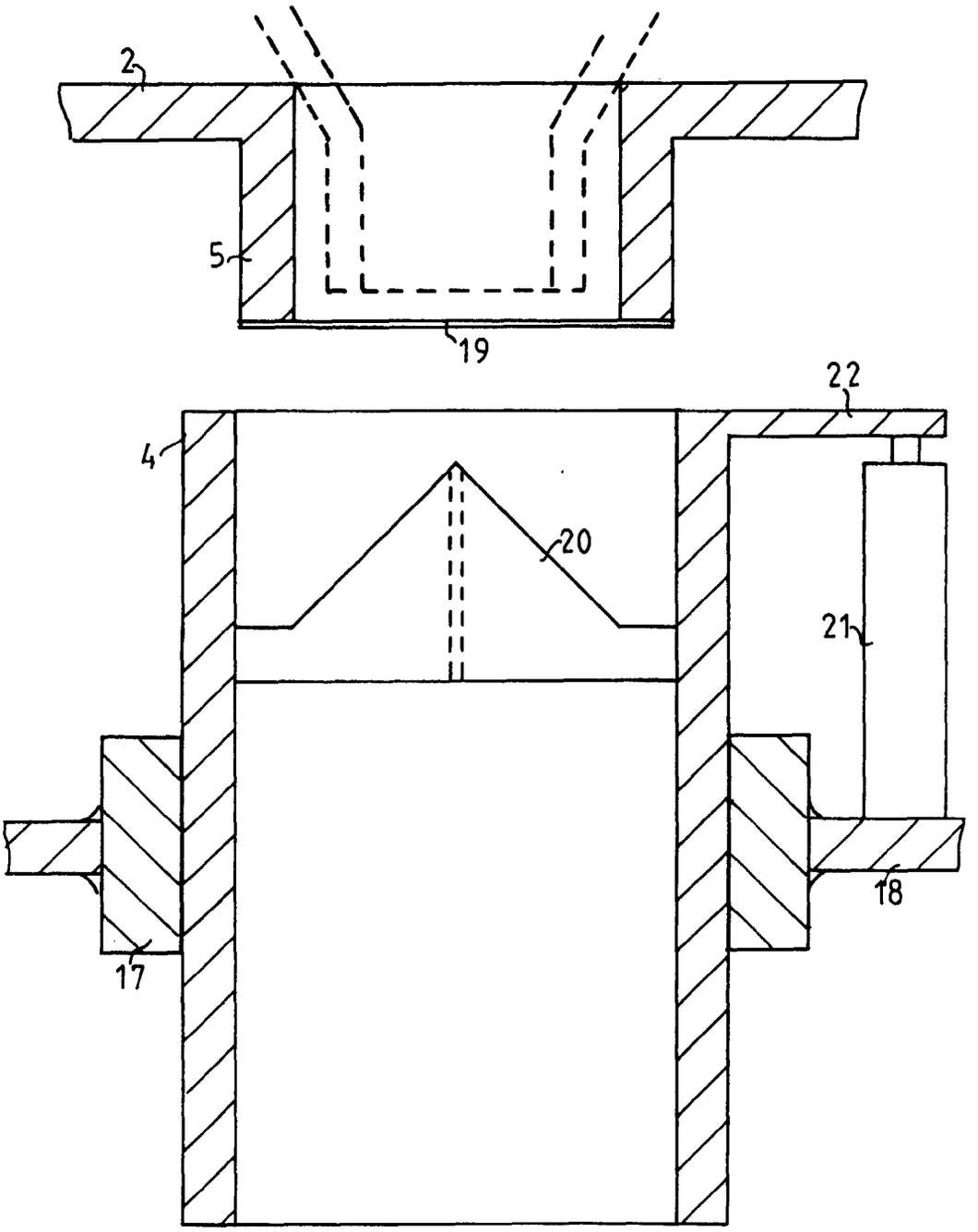

FIG. 2

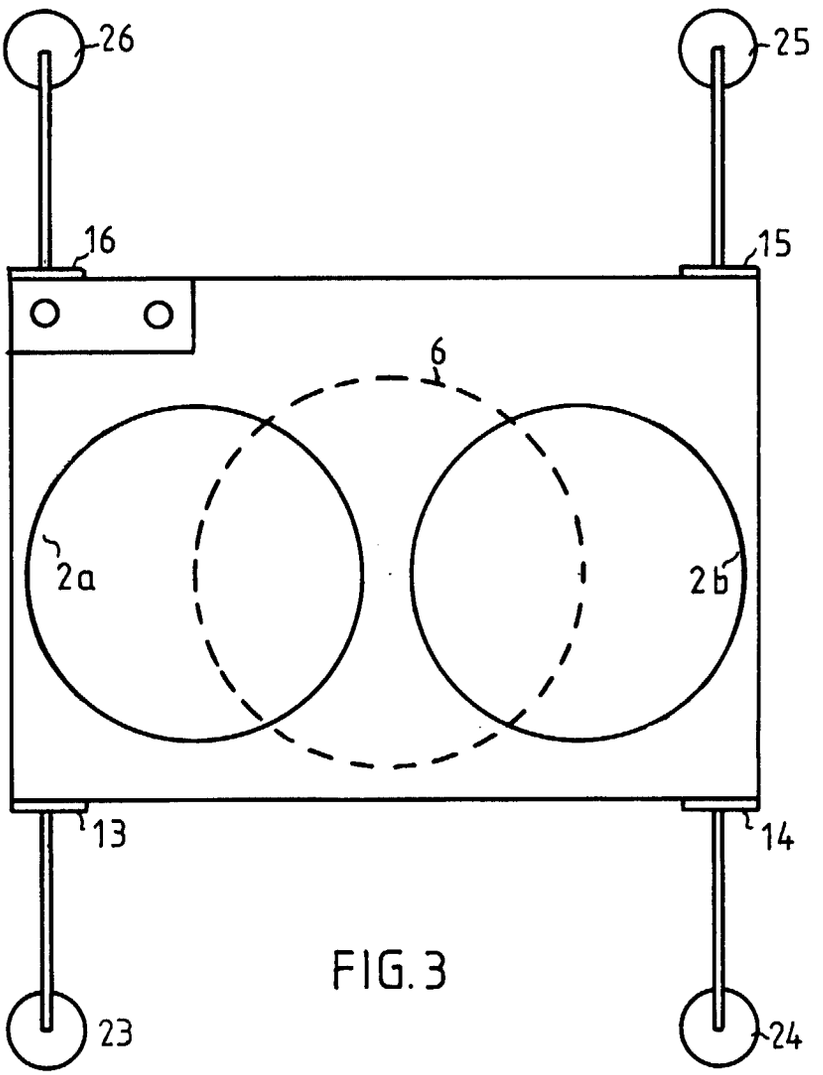

FIG. 3

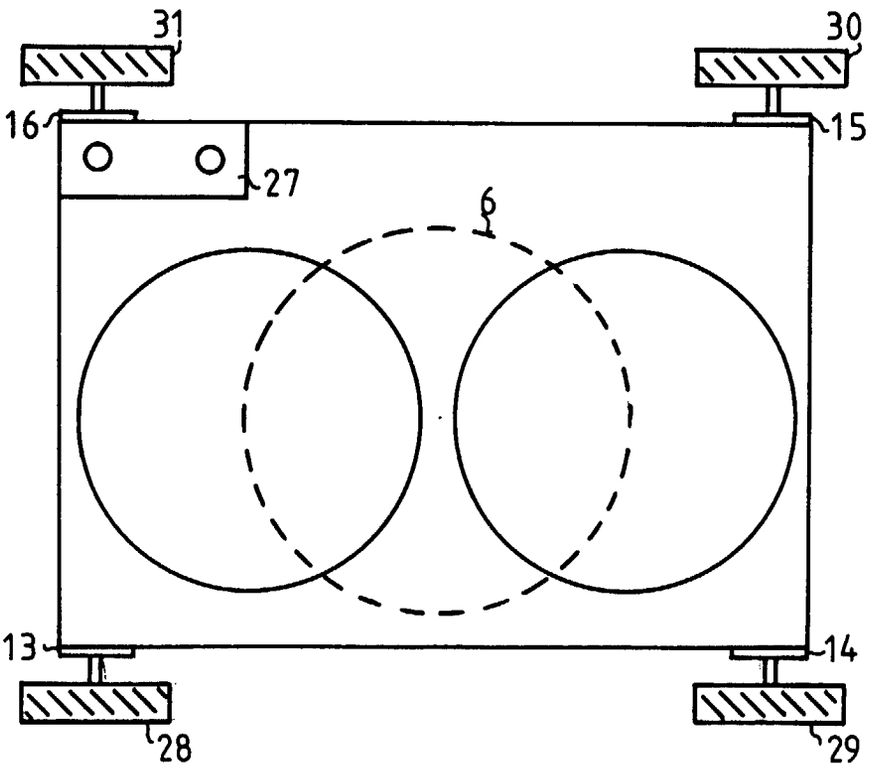

FIG.4

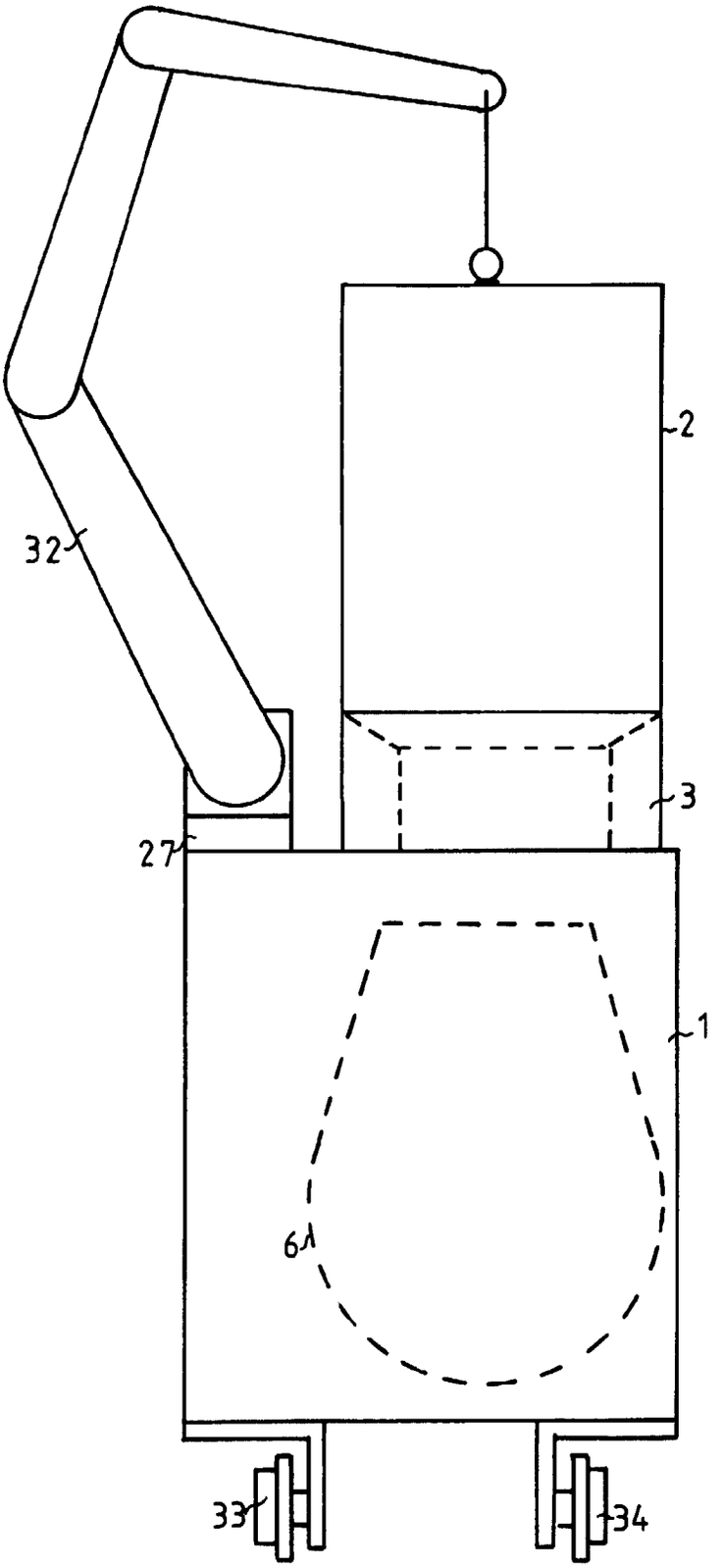

FIG.5

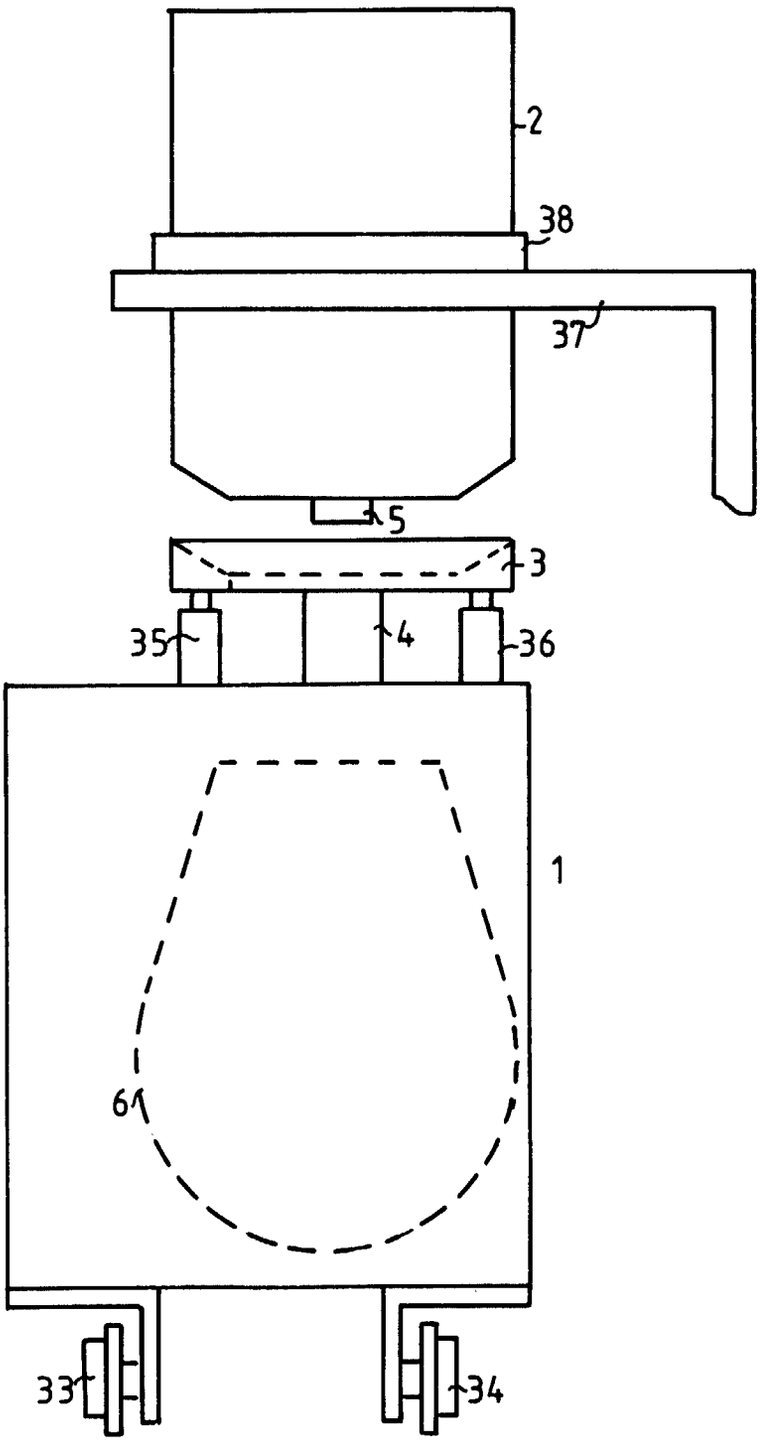

FIG.6