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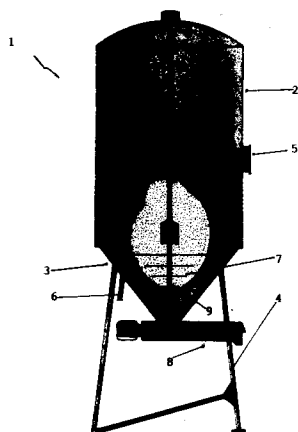
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E-31002 Pamplona(ES)(54) **Portable plant for proportioning and tempering dry concrete in bulk or other granular products.**

(57) Portable plant for proportioning and tempering dry concrete or other granular products, which plant is comprised of: a tank (2) totally or partly divided into compartments (2a-2b) or not being divided at all and provided with emplacement and support means in the operative position (4); a homogenizing, feeding and proportioning chamber (7) provided with forced homogenizing, feeding and proportioning means (9) having a vertical, horizontal or mixed operation; a tempering chamber (8) of the said products with

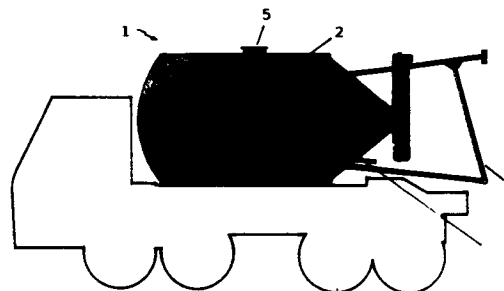
water, to produce the end product; and means for loading and transporting the product on a conventional tractor vehicle. The said tank incorporates factory filler inlets (5) which adopt a lateral position, and in situ filler inlets (6) capable of being coupled to pneumatic loading means. It enables the dry concrete and other granular products, for use in the building and engineering construction, to be supplied, processed and produced in situ.

FIG 1



lower section

FIG 10



The present invention relates to a portable plant for proportioning and tempering mainly dry concrete, permitting the said product or other granular products to be stored, produced and processed on the very site where it is to be used, whilst guaranteeing the quality of its specifications.

According to the prior art, the concrete for use in the building and engineering construction sector is produced either in situ or in industrial installations or plants designed for such purpose, which plants supply, by means of concrete mixing vehicles, the concrete in a fresh state, already tempered and ready for immediate use because the fresh concrete sets within a short period of time (approximately two hours), after which it can no longer be used.

In accordance with the said prior art, the industrial plants designed for producing the concrete are normally fixed installations, for medium- to large-scale productions, operating with the same principles. The most outstanding common feature between all these installations is that they only proportion, and in some instances temper, the fresh concrete which, in order to be supplied to the building site where it has to be used, is indefectibly introduced in a concrete mixing truck which transports the concrete, maintaining it under constant tempering.

The fresh concrete supply system in accordance with the prior art presents the following problems:

1. Since the concrete or any other granular product incorporating a binding material has to be used within a short period of time, approximately two hours, once the tempering process has terminated, it can only be produced and transported at the time of being requested by the final consumer.
2. As already pointed out, the time limit to use the concrete, under optimum conditions, is very short and, therefore, when a loaded truck leaves the factory and reaches the building site where, more often than necessary, the product cannot be unloaded, the concretes and other granular products, which have already been tempered, are used after the established time limit for use has expired, wherefore the results of the final product lack technical guarantees. When the problem is eventually detected (unfitness due to excessive time) the product, which can neither be re-used nor subjected to any conditioning process, is returned and has merely to be thrown away, involving economic and other kinds of losses.
3. Since concrete cannot be produced whilst no particular and specific order exists on the part of the consumer, even the smallest concrete producing plants should be overdimensioned with

respect to production as well as transportation means (concrete mixing truck), since otherwise it would not be possible to satisfy the demands at exact specific times.

4. Since, the wet concrete must be continually tempered as from its production until its use on the building site, the concrete mixing vehicles should operate continuously, both during the operations of loading at the factory and transportation as well as during the operation of pouring the concrete at the building site, this resulting in very high fuel consumptions.

5. The short life-span of the concrete in a fresh state, once produced, logically causes the radial distance in which each plant can act in order to conduct its business activity to be very short, since, we repeat, the maximum period of utilization of the concrete, under ideal conditions, including transportation thereof, is of about two hours from the termination of the tempering process.

6. Concrete in a fresh state is a product whose technical characteristics cannot be altered once it has been produced in accordance with fixed specifications. Therefore, at the time of requesting or placing an order the said characteristics should be exactly specified, since, we repeat, the same cannot be favourably changed, not even in the event such changes were necessary due to technical requirements of the building.

Further, the production of the concrete in situ in accordance with the known art, presents serious disadvantages, since although it obviates those derived from the production at a distance, it presents other peculiar and specific drawbacks:

1. In general terms, the means for producing in situ, does not incorporate suitable control means for guaranteeing an adequate quality of the end product.
2. The raw materials are unloaded and stored in the open air, therefore being subjected to specially harmful atmospheric conditions, such as rain and snow, which alter the degree of moisture of the aggregates and consequently the moisture on the whole of the end product. It is therefore clear, we repeat, that the quality of the concrete mainly depends on the water-cement ratio, apart from the fact that this kind of storage is highly contaminating.

It is an object of this invention to provide an integral portable plant for proportioning and tempering concrete or other dry granular products in bulk which obviates the said drawbacks and which, essentially, enables concrete based on the dry concrete in bulk, which is disclosed in another patent in the name of the applicant of this application, to be supplied, distributed and produced in situ. In short, and merely for a better understanding

of the plant in question, the said product refers to a dry concrete in bulk, all the components of which have been subjected to specific processings so that on the whole, it presents a degree of residual humidity of lower than 1.5% of its weight, thereby assuring a life-span of the product, before being tempered with water, of more than 3 days and, even under optimum conditions, of more than 30 days from its manufacture to its use, under ideal technical conditions and to which water will be added, we repeat, just before it will be used.

A further object of the invention is to provide a plant of the type mentioned, the elements of which are arranged to obtain an accurate, uniform final quality of the product, by means of a very simple manufacturing process which can be carried out by a single person requiring no specific prior knowledge. This plant, therefore, incorporates the pertinent means and control panels for the automatic control of the manufacturing process.

A still further object of the invention is to adapt one of the said plants so that it can be transported by means of conventional tractor equipments, which plant, inasmuch as its functioning is independent of the transportation elements, enables higher performances to be obtained than those obtained with the conventional tempering and transportation system incorporated in concrete mixing vehicles.

Yet a further object of the invention is to provide a portable plant which, due to its peculiar design, enables the quality or pre-established characteristics of the end product to be modified, by, for example, either altering the cement-water ratio, in particular phases of the production, or by adding, in partial phases, various additives for particular applications, so that it will be possible to obtain, with a single plant, a diversified production, depending on the specific needs at each moment.

A still further object of the invention is to proportion a non-contaminating portable plant for processing dry concrete in bulk or other granular products, since it is designed to store and conserve the said products hermetically, without contacting the outside, whilst the said products are in a powdered form, protected from the wind.

This invention specially enables industrial plants and installations designed for producing concrete to manufacture their products in accordance with preestablished manufacturing plans and not under the specific conditions of an order. It also enables such products to be stored for long periods of time under suitable conditions of use and determines large savings in fuel.

To achieve these end purposes, the plant for proportioning and tempering concrete of this invention is comprised of a storage bin or tank provided with means for emplacing it into the ground where the plant will be positioned, as well as other means

for facilitating the loading and transportation thereof in a tractor to comply with the said portable characteristic.

The said tank could, depending on the case and application, be divided totally or partly into compartments and will be provided with two types of filler inlets: one for factory loading having tightness characteristics, arranged laterally so that when the plant occupies its filling position, in other words resting on its longitudinal axis, the said inlet will be positioned in an upper plane; and another for in situ loading, that is to say at the point at which the plant is installed, so designed to enable pneumatic loading means to be coupled thereto. If the interior of the tank is divided, the number of filler inlets, of one type or the other, will naturally coincide with the number of independent compartments. It has been demonstrated, when the tank is divided into two like compartments, that the centre line of the wall determining the internal division should almost coincide with the axis of the factory filler inlets, to thereby facilitate the filling operations.

The lower part of the tank, which adopts the shape of an inverted truncated cone, is provided with a homogenizing, feeding and proportioning chamber into which the product, stored in the tank is deposited, to be homogenized, fed and proportioned in a forced manner to the tempering chamber, by means of forced homogenizing, feeding and proportioning means formed mainly of endless screws and other vertical, horizontal or mixed, combining one arrangement and the other, positioning and driving systems.

The fact that the forced vertical homogenizing, feeding and proportioning means may act either jointly or independently, only the homogenization and feeding means, has proved specially useful.

Feeding is facilitated by the section given to the outlet of the homogenizing, feeding and proportioning chamber, since by increasing the said section an improved feeding is achieved. In this respect it has been proved that the use of a double circular, almost elliptical section having a dividing wall or not is recommendable since it enhances the results of the mere circular section. Even the wall itself, forming the internal division of the tank, improves the drop of the product, preventing the formation of domes, which results in a more appropriate feeding.

Beneath the said homogenizing, feeding and proportioning chamber there is positioned a tempering chamber in which the dry concrete in bulk or other granular products or additives coming from the former chamber are conveniently tempered with water which will be supplied to the said tempering chamber by conventional means provided with the suitable devices for controlling the flow until the

end product in question is obtained, which end product will be discharged through the pertinent outlets capable of being located at different positions.

A detailed description of the preferred embodiment of the invention will now be made, with reference to the accompanying drawings, wherein:

Figures 1 to 9 are partly cut, elevational views of particular embodiments of the portable plant for proportioning and tempering dry concrete in bulk or other granular products of the invention, arranged in an operative position on the building site, that is, erected on the support and installation means on site, showing details of the lower section adopted by the homogenizing, feeding and proportioning chamber, and

Figure 10 is a view illustrative of the mode of transportation and loading at the factory of any one of the plants of figures 1 to 9.

As will be seen from the accompanying drawings, the portable plant of the invention (1) is comprised of a tank (2) adopting a general cylindrical shape, the lower part (3) of which is shaped as an inverted truncated cone.

To install the plant in the work yard, the plant (1) includes emplacement means comprised of support legs (4).

With reference to the basic embodiment of figure 1, it can be seen that the said tank (2) is provided with a laterally positioned factory filler inlet (5), so that in the working position on the site (figures 1 to 9) the inlet is found on one side and therefore inoperative, whilst when the plant rests on its longitudinal axis, that is to say, when the plant occupies its transportation and factory filling position (figure 10), the said inlet is encountered in a higher position, wherefore it can be reached by the pertinent filler means.

Likewise, the tank (2) could be provided with an in situ filler inlet (6), for the instance in which the tank is filled once the plant has been installed, occupying its work position. The said inlet will adopt the shape of a tube capable of being coupled to pneumatic loading means (not shown) which is preferably positioned at the lower zone of the tank.

Naturally, as can be seen in figures 4 to 9, when the interior of the tank (2) is divided into separate compartments, each compartment will be associated to the corresponding filler inlets, of one type or the other, as previously described. When the interior of the said tank is divided into two like compartments, as shown in figures 4 and 5, the centre line of the dividing wall (10) and the axis of the factory filler inlets (5) should almost coincide.

At the lower truncated zone (3) of the tank (2) there is arranged a chamber (7) for homogenizing, feeding and proportioning the product contained

therein.

The lower section of the said chamber (7) may simply be circular, as shown in figure 1. Nonetheless, to improve feeding and proportioning, it has been demonstrated that the said section should be almost elliptical, preferably with a central or double circular dividing wall, as shown in detail in figures 2 to 9.

To the homogenizing, feeding and proportioning chamber will be coupled a tempering chamber (8) which will incorporate the pertinent water inlet means (not shown) to carry out the final tempering of the product which will be discharged through the corresponding discharge openings as a finished and ready-for-use product. In certain cases (embodiments of figures 2 to 9) the orientation of the said chamber could be changed between two 180 degree-opposed positions, to thereby position the discharge opening at one side of the plant or at the other side thereof, as may be necessary. Actually, referring to the specific assumption shown in figure 1, it can be seen that the said chamber should be rotary, so that its discharge opening could be positioned at 360 degrees. As will easily be understood by those skilled in the art, the said water inlet means for tempering will be provided with means for shutting-off and regulating the inlet flow, thus enabling the ratio between the water and the dry concrete or other granular products which are being tempered to be adjusted at all times.

In specific assumptions, as shown in figures 2, 3, 4, 6 and 8, that is to say, in those in which horizontally positioned homogenizing, feeding and proportioning means is used, the chamber (7) is not arranged forming a part of the tank (2), but it is positioned along with the tempering chamber (8) in alignment, ahead of it and in the same plane.

The homogenizing, feeding and proportioning of the dry concrete in bulk and any other granular products present in the tank (2) will be forced, through forced homogenizing, feeding and proportioning means (9) mainly comprised of endless screws and other systems. Only through forced driving mechanisms is it possible to obtain an adequate homogenization of the product and that the quantity penetrating therefrom into the tempering chamber is the desired quantity. As will be clearly understood by those skilled in the art, the perfect adaptation of the end product (concrete) to the required specifications mainly depends upon the cement-aggregates-water ratio, so that a disproportion in the said ratio will render the end product unfit for its specific purpose.

The said forced homogenizing and proportioning means could adopt a vertical arrangement and operation, as shown in figures 1, 5, 7 and 9, or a horizontal, as shown in figures 2, 3, 4, 6 and 8, in which they are positioned in the same plane as the

tempering means and are activated by the same driving devices. In these cases, as previously mentioned, the homogenizing and proportioning chamber (7) is positioned in alignment with the tempering chamber (8) in the said same plane.

As previously indicated, the vertical homogenizing, feeding and proportioning means can act jointly or the homogenizing and feeding means can act independently, the proportioning means being formed separately.

In those cases in which the tank (2) is divided into compartments having different sizes, it has been proved that the use of two proportioning devices could be useful, at least one of which (9a) will be provided with means for regulating the variable flow, as shown in figures 8 and 9.

As indicated, the tank (2) could be undivided as shown in figures 1 and 2, or it could be divided. This division may be partial, that is the entire tank is not to be divided, as shown in the embodiment of figure 3, in which the compartments only affect the end section of the tank. To this end, the internal dividing wall (10) is used, which divides the said lower section of the tank into two sections or compartments 2a and 2b which intercommunicates at the top. Further, the said dividing wall improves the drop of the product, preventing the formation of domes.

In the event this type of division were employed, a single type of product could be introduced into the tank (2). Nevertheless, any one of the sections 2a or 2b may constitute a reserve tank, wherefore each of the said sections will have independent outlets which will include separate shut-off means, so that once the contents of one of these sections has been spent, the contents of the other section will still remain intact.

In other cases, the division will be total, two completely separated and isolated compartments or sections 2a and 2b being formed inside the tank, thereby enabling products having a diverse nature to be stored. The said products could subsequently be subjected to intertempering or they could be tempered separately to obtain two differentiated end products.

The said separate sections can have like dimensions, as shown in figures 4 and 5, or they can have different sizes, as shown in figures 6 to 9, in which the compartment having a smaller capacity 2b is placed laterally and at a lower position with respect to compartment 2a.

As previously mentioned, each of the said compartments will include filler inlets (5-6) as well as independent adjustable outlets.

This arrangement of two isolated compartments enables products having a diverse nature to be stored. Thus, for example, the characteristics of one of them as well as the contents of the larger

section could be enriched or modified, by adding the product contained in the smaller section in accordance with a dose which could also be adjusted.

In the event small-sized compartments are used, it is highly recommendable to incorporate two proportioning means, so that at least one of them will include variable flow regulators.

Having described the object of the invention in sufficient detail, there only remains to be said that the embodiments resulting from variations in shape, sizes, materials and the like, should be deemed as included within the scope of the following claims.

Claims

1. Portable plant for proportioning and tempering dry concrete in bulk or other granular products, characterised in that the plant (1) is comprised of:
 - A generally cylindrical-shaped tank (2), the end section (3) of which adopts the shape of an inverted truncated cone, which tank is maintained in an operative position by emplacement means determined by support legs (4).
 - A homogenizing, feeding and proportioning chamber (7) provided at the lower section of the said tank (2) in which forced homogenizing, feeding and proportioning means (9) is arranged.
 - A tempering chamber (8) arranged adjacent the said homogenizing, feeding and proportioning chamber (7), in which the product coming from the said chamber (7) will be tempered with water to be converted into the end product, and
 - Means for loading and transporting the product in a tractor vehicle.
2. Plant according to the preceding claim, characterised in that the tank (2) could be undivided or or it could be divided into two compartments (2a - 2b) by means of an internal dividing wall (10).
3. Plant according to claim 2, characterised in that the division into compartments by means of the said internal wall (10) could affect the entire interior of the tank or only its lower section (3), in which case two compartments (2a - 2b) intercommunicated at the top are formed.
4. Plant according to claim 3, characterised in that the separate compartments (2a - 2b) could be equal in size or one compartment could be

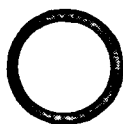
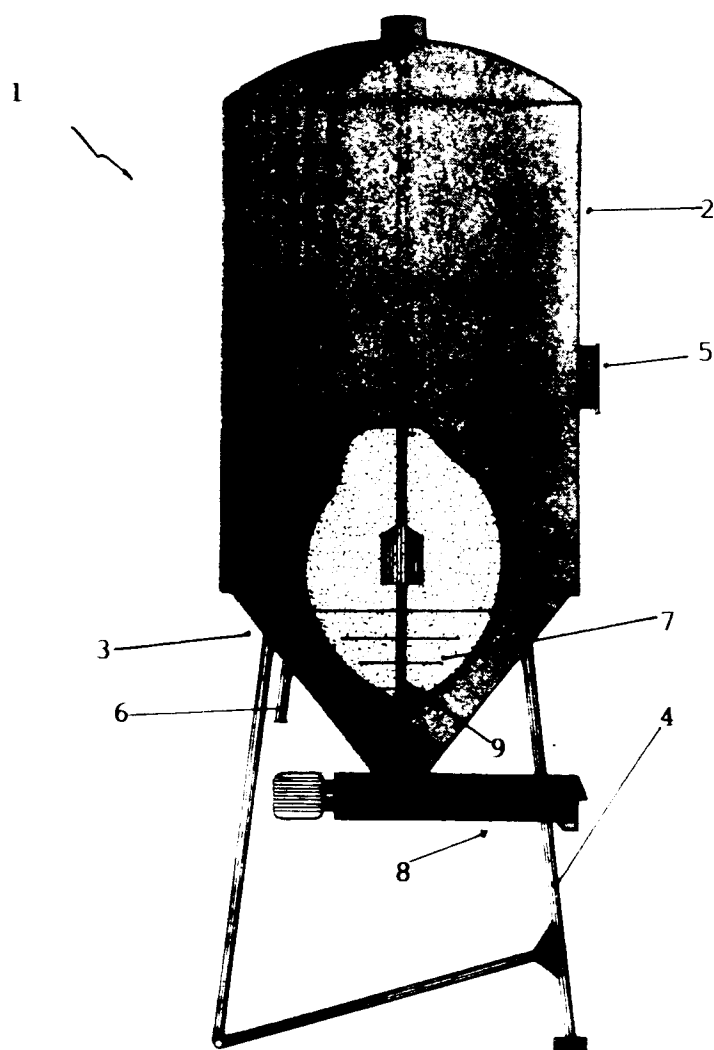
smaller than the other, the smaller (2b) occupying a lateral and lower position than the larger (2a).

5. Plant according to claim 1, characterised in that the lower section of the said homogenizing, feeding and proportioning chamber (7) could, depending on the case, have a double circular, almost elliptical section, including a central dividing wall or not, or it could have a simply circular section if the vertical homogenizing and feeding or proportioning is forced. 5
10
6. Plant according to claim 1, characterised in that the said tank (2) will be provided with factory filler inlets (5) arranged laterally and having tightness characteristics, and in situ filler inlets (6) comprised of tubes capable of being coupled to pneumatic loading means, preferably arranged at the lower section thereof. 15
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7. Plant according to claims 4 and 6, characterised in that the centre line of the internal wall (10) should almost coincide with the axis of the factory filler inlets (5) in the event the tank (2) were to have two compartments (2a - 2b). 25
8. Plant according to claim 1, characterised in that the product will be homogenized, fed and proportioned in a forced manner, for which purpose the corresponding chamber (7) will include forced homogenizing, feeding and proportioning means (9) based on endless screws and other complementary systems, which means will have a vertical, horizontal or even mixed, combining one arrangement and the other, positioning and functioning; and in that if horizontal homogenizing, feeding and proportioning means is employed, the said means will preferably be positioned in the same plane as the tempering means, being activated by the same driving devices, in which case the homogenizing and proportioning chamber (7) will be positioned in alignment with the tempering chamber (8) in the same plane. 30
35
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9. Plant according to the preceding claim, characterised in that the vertically operative forced homogenizing, feeding and proportioning means could act jointly or only the homogenizing and feeding means could act independently. 50
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10. Plant according to claims 3 and 4, characterised in that the smaller compartment (2b) could incorporate two proportioning systems,

at least one of the said systems (9a) being provided with a variable flow regulator.

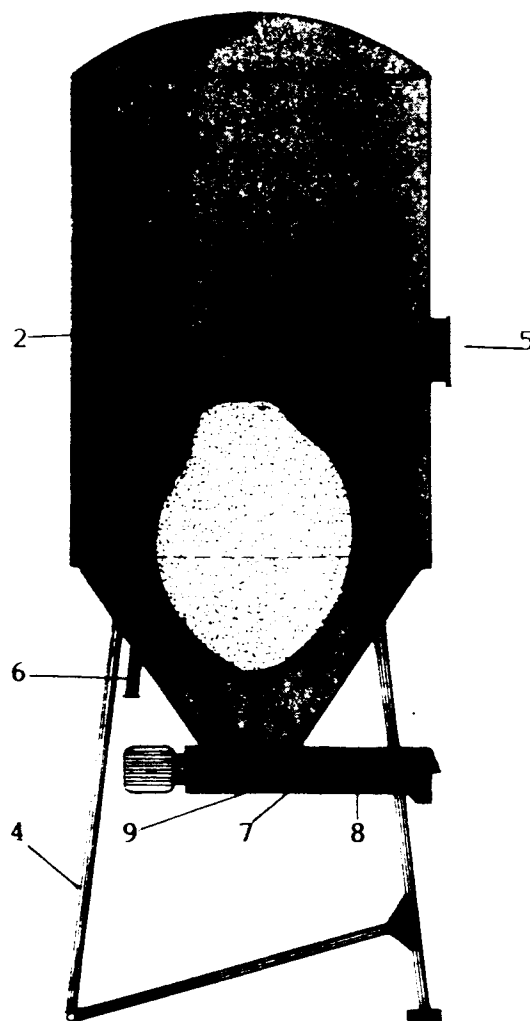
11. Plant according to claim 1, characterised in that the tempering chamber (8) could, in some cases, make a turn of 360 degrees and, in other cases, it will be capable of being oriented, at will, in two 180-degree opposed positions.

FIG 1



lower section

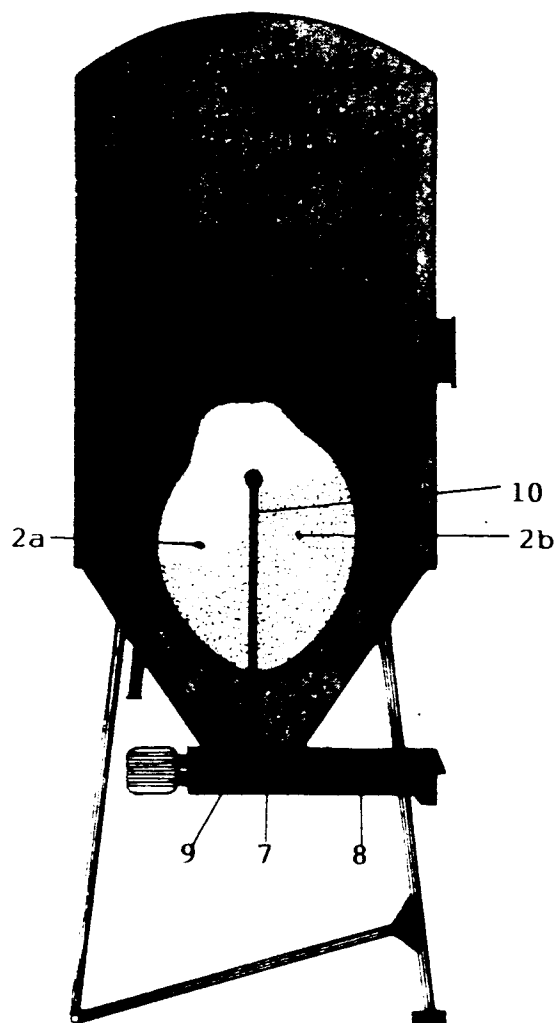
FIG 2



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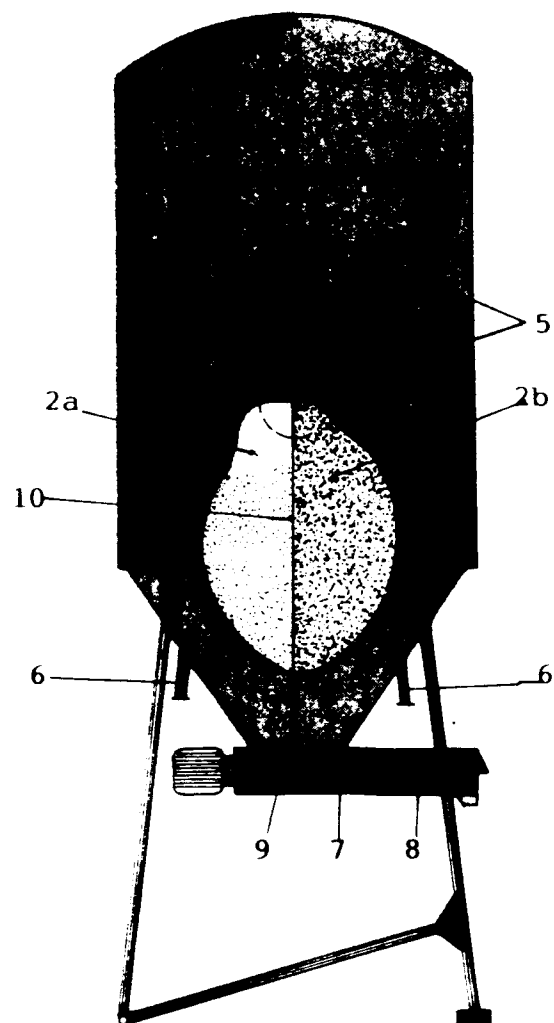
FIG 3



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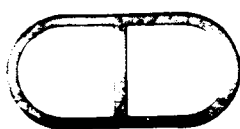
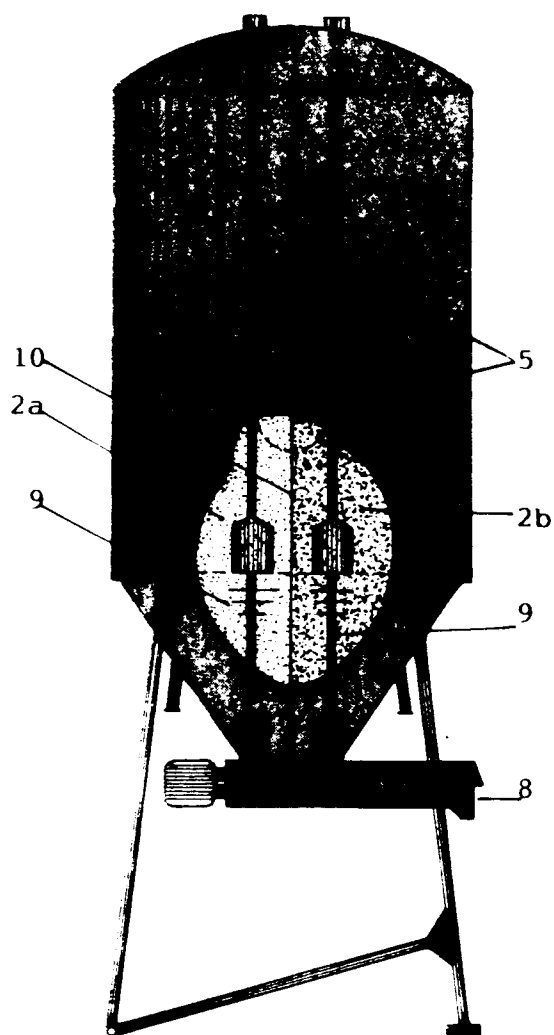
FIG 4



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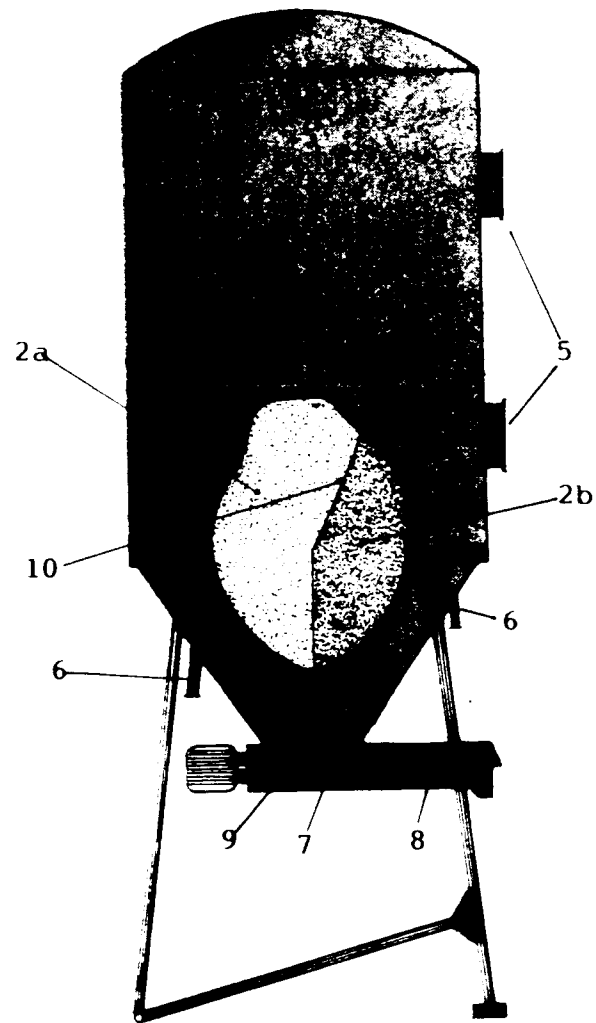
FIG 5



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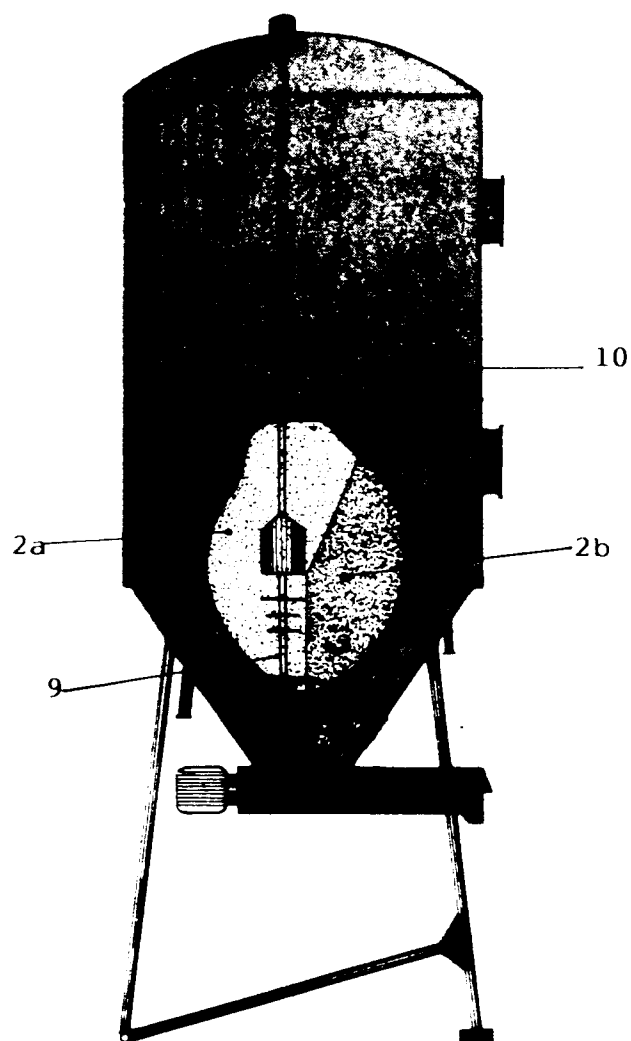
FIG 6



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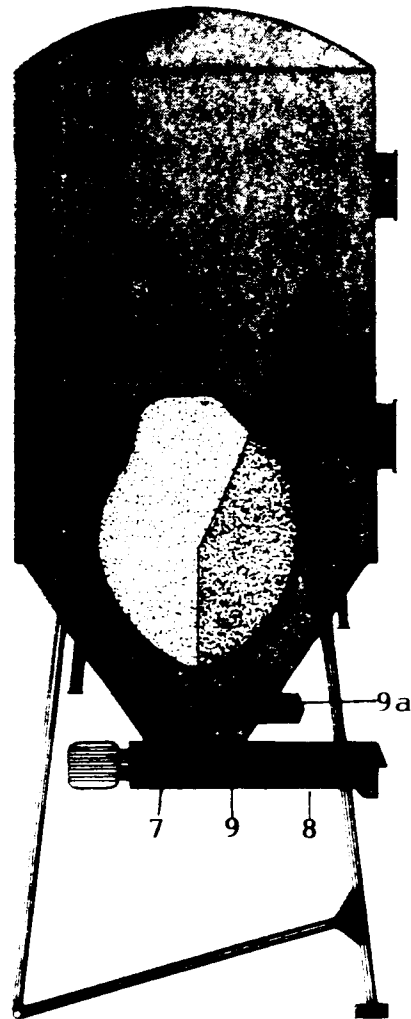
FIG 7



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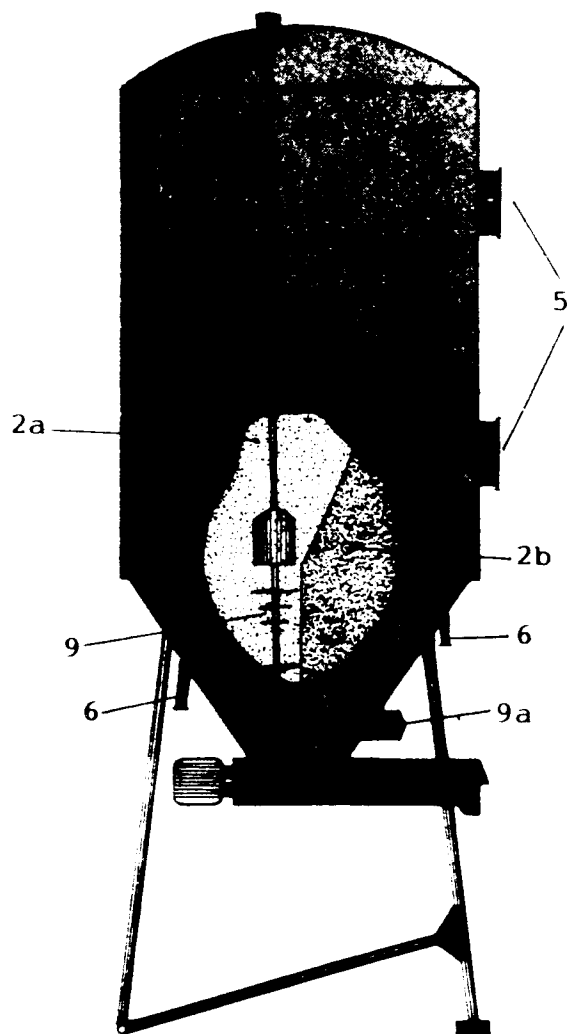
FIG 8



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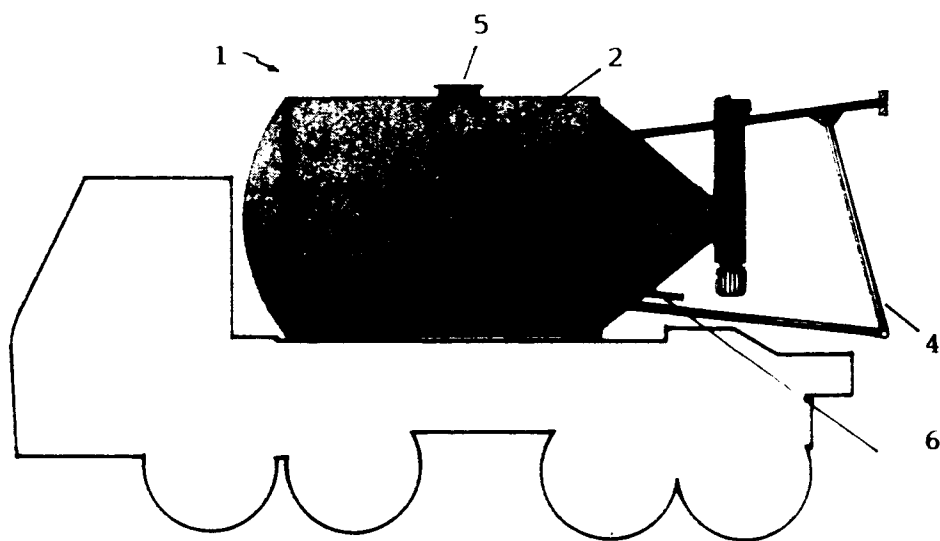
FIG 9



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FIG 10





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EUROPEAN SEARCH REPORT

Application Number

EP 90 50 0114

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-2 323 196 (LONZA) -- --	1,2,5,6,8, 9,11	B 28 C 7/00 B 28 C 9/00
A	EP-A-0 318 874 (SILO ESTRICH) * abstract; figures ** -- --	2-4,10	
A	DE-A-2 259 881 (DIETTERLE) -- --	6	
A	EP-A-0 093 473 (JANSSEN) -- --		
A	EP-A-0 268 991 (TEPE) -- --		
A	EP-A-0 374 418 (TEPE) -- --		
A	DE-A-3 421 916 (HASLBERGER) -- --		
A	GB-A-2 183 613 (STEGMULLER) -- --		
A	CH-A-463 391 (SUTEAU) -- -- -- --		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 28 C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 20 January 92	Examiner PEETERS S.
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