

Construction material silo

- 5 The invention relates to a construction material silo, especially for storing and supplying mixtures of different dry construction materials.

10 Conventional construction material silos usually comprise a storage container, a material intake line which can be closed and opened by means of a valve and a material outlet line which can be opened and closed by means of another valve. If construction material is required at a location of the construction site which is remote from the silo, usually a pipe
15 system is connected to the material outlet and the material is pumped through the pipe system.

If the location where construction material requires changes, either the pipe system is modified or the pipe system is
20 disconnected from the material outlet line of the silo and a further pipe system is connected to the material outlet line conveying the construction material to the new location. This requires a great deal of work.

25 Further, if substantial quantities of construction material are required at numerous locations the silo has to have a very large capacity. Usually the height of a silo is restricted due to pump power, safety regulations and installation equipment. Therefore, a sufficient capacity can only be provided by silos
30 having a very large width or diameter. However, if material mixtures of different dry materials having different particle sizes and/or different density, e.g. sand and cement, are moved downward in a container which has a large cross section the problem of segregation can arise. For example, cement moves

usually faster than sand. The segregation effect can result in a disadvantageous variation of the quality of the mixture, e.g. of dry mortar.

- 5 It is an alternative conventional practice to provide a plurality of construction material silos, one for each location where construction material is required. Thereby the amount of work required for disconnecting and connecting the pipe systems or modifying the pipe system is reduced. However, a larger
10 amount of work is required for transporting and establishing the plurality of silos. A further disadvantage in having a plurality of silos is that, when charging the silos, e.g. by using trucks, it has to be known in advance at which location on the construction site which quantity of construction
15 material is required in order to decide which quantity of material has to be charged to which of the silos, or which of the silos has to be charged next. It is a further disadvantage of this alternative that more space is required to install a plurality of silos. This is especially so since around a silo a
20 certain free space has to be provided for the truck traffic.

- It is an object of the invention to create a silo which is appropriate to supply construction material stored in the silo to various locations at the same construction site, according
25 to the actual needs of the construction work, without requiring a great deal of work and without the result that a particle segregation occurs when the silo is used for a mixture of different dry construction materials.

- 30 According to the invention, the object is achieved by a construction material silo for storing construction material mixtures according to claim 1.

The construction material silo according to the invention comprises an upper silo portion, a lower silo portion and a material intake device.

- 5 All terms such as upper, lower, bottom, top etc. relate to the silo in the state, when it has been set up on the construction site and is in normal use. However, it is also possible that the silo according to the invention is arranged in another orientation when it is not in use, e.g. when it is transported
10 from one construction site to the next.

According to the invention, further the upper silo portion comprises a main chamber. The main chamber has a main chamber at the bottom end. The lower silo portion comprises a plurality
15 of distribution chambers. Each of the distribution chambers has a top end and a bottom end opposite to the top end, wherein the top end of the distribution chamber is connected to the main chamber bottom end, and the bottom end of the main chamber is connected to a discharge passage which can be opened and closed
20 by means of a discharge valve arranged at the discharge passage. Construction material can be supplied to the main chamber through the material intake device.

By providing a lower silo portion comprising a plurality of
25 distribution chambers, it is achieved that the chambers through which the construction material flows before being discharged from the silo have a small cross-sectional area. Therefore, the effect of segregation in a material mixture is substantially reduced. At the same time, the overall cross sectional area of
30 all the distribution chambers is large, so that a large quantity of material can be stored in the silo and, therefore, the material can be supplied to various locations.

By providing the upper silo portion comprising the main chamber which is connected to all the distribution chambers on the one hand, and to the material intake on the other hand, it is achieved that all the distribution chambers can be charged
5 through one material intake and that the material is distributed equally to all the distribution chambers.

According to the invention it is possible that one common discharge passage and one common discharge valve arranged at
10 the discharge passage are provided for two or more or for all distribution chambers. For instance, a further chamber can be provided below the distribution chambers, which further chamber is connected to the distribution chambers and to the discharge passage. Preferably, however, a discharge passage and a
15 discharge valve for the discharge passage are provided separately for each of the distribution chambers.

Thereby it is achieved that as many pipe systems can be connected to the silo as distribution chambers exist.
20 Consequently, once the necessary pipe systems have been provided, no disconnection and subsequent reconnection work has to be carried out when the construction location to which construction material is to be supplied changes. It is even possible that a plurality of construction locations can be
25 supplied at the same time.

Due to the main chamber which is connected to all the distribution chambers on the one hand, and to the material intake on the other hand, construction material loaded into the
30 silo is automatically introduced to that distribution chamber or those distribution chambers where actually construction material is discharged and, therefore, needed. Therefore, when filling the silo with construction material it is not necessary

to consider the individual material requirements at the particular construction sites.

Preferably the height of the lower silo portion comprising the
5 distribution chambers amounts to 50 % to 100 % of the height of
the upper silo portion. Thereby it is provided that the
distribution chambers are sufficiently high to significantly
reduce the segregation in material mixtures on the one hand,
and that, on the other hand the main chamber is sufficiently
10 high to provide for a good distribution of the material to the
distribution chambers.

Further preferably, the cross-sectional area of each of the
discharge passages amounts to at least 10 % of the cross-
15 sectional area of the corresponding distribution chamber or
chambers, respectively.

According to the invention, it is e.g. possible that each of
the distribution chambers is formed such that the cross-
20 sectional area is the same at each position between the top end
and the bottom end. It is e.g. also possible that the whole
distribution chamber has a tapered shape from the top end to
the bottom end. Preferably, however, each of the distribution
chambers is formed such that, in a section close to the bottom
25 end of the distribution chamber, the distribution chamber has a
shape which is tapered towards the bottom end. Thereby it is
achieved that a further segregation at the bottom end is
minimized without significantly reducing the overall storage
space of the silo.

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According to the invention it is possible that the material
intake device is provided at any appropriate position of the
silo and that it is constructed in any appropriate design to
ensure that material can be loaded into the main chamber. It is

e.g. possible that a material intake line connected to the main chamber is provided at the top or at the side wall of the upper silo portion. Preferably, however, the material intake device comprises a material intake chamber arranged in the lower silo
5 portion and having an intake top end and an intake bottom end opposite to the intake top end. The intake top end of the material intake chamber is connected to the main chamber bottom end. A material intake passage is provided, to which the intake top end of the material intake chamber is connected. An intake
10 valve is provided at the material intake passage, by means of which the material intake passage can be opened and closed.

By providing the material intake chamber whose intake top end is connected to the main chamber bottom end and which extends
15 downwards through the lower silo portion, it is achieved that the material charged, e.g. from a truck, through the material intake device is directly conveyed to the main chamber bottom end where it is distributed to the distribution chambers. This results in a low travel distance of the material, and,
20 therefore segregation is further reduced. Further, the energy for pumping the material into the silo is minimized.

According to the invention it is possible that the material intake device is laterally arranged in the lower silo portion.
25 However, it is preferred, that the material intake chamber is arranged in the center of the lower part of the silo and is laterally surrounded by the distribution chambers.

Thereby it is achieved that the material which is loaded into
30 the container through the material intake device and arrives at the main chamber bottom end is directly and equally distributed into the surrounding distribution chambers.

According to the invention the distribution chambers can have a circular cross section, a hexagonal cross section or any other appropriate cross section.

- 5 A preferred embodiment of the invention is described with reference to the drawing. In the drawing:

Figure 1 shows a front view of an embodiment of the construction material silo according to the invention, wherein
10 a front wall is cut away.

Figure 2 is a sectional drawing of the embodiment of the silo of figure 1 showing a horizontal section along the line marked Z-Z in figure 1.

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From figure 1 a front view of one embodiment of the construction material silo according to the invention can be gathered. The main body of the silo has a cylindrical shape and is formed by a circumferential wall 41 and a top wall 42. The
20 front portion of the circumferential wall 41 is omitted in figure 1. Support bars 6 are anchored in the ground. The main body is supported by the support bars 6 at the circumferential wall 41. The lower end of the circumferential wall 41 is arranged at a distance from the ground.

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As can be seen from figure 1, the main body comprises an upper silo portion 1 and a lower silo portion 2. The limit between the upper silo portion 1 and a lower silo portion 2 is defined by a separation wall 43 in which a plurality of circular
30 apertures 44 are provided.

The upper silo portion 1 comprises a main chamber 10 formed by the upper portion of the circumferential wall 41, the top wall

42 and the separation wall 43. The main chamber 10 has a main chamber bottom end 101 adjacent to the separation wall 43.

The lower silo portion 2 comprises a plurality of distribution chambers 20 formed by distribution chamber walls 46. In figure 1 only the distribution chamber walls 46 are directly shown by which the distribution chambers 20 are enclosed. Each of the distribution chambers 20 has the shape of a cylinder with a cone-shaped lower end. The upper end of the cylinder portion forms a top end 201 of the distribution chamber 20. The lower end of the cone portion forms a bottom end 202 of the distribution chamber 20. The top end 201 of each of the distribution chambers 20 is connected to the main chamber bottom end 101 of the main chamber 10.

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As can be seen from figure 1, at the lower end of each of the distribution chamber walls 46 a flange is provided at which a valve part is fixed. The valve part is formed with a discharge passage 21 on the inside and a discharge valve 22, by means of which the discharge passage 21 can be opened and closed. The bottom end 202 of the distribution chamber 20 is connected to the corresponding discharge passage 21. For each of the distribution chambers 20 a separate discharge passage 21 is provided and a separate discharge valve 22 is arranged at the discharge passage 21.

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As can be seen from figure 1, a material intake device 3 having a material intake chamber 30 is provided in the lower silo portion. The material intake chamber 30 has a very similar design to that of each of the distribution chambers and it is formed by an intake chamber wall 47. The material intake chamber 30 has a cylindrical intake top end 301 and a cone-shaped intake bottom end 302. The intake top end 301 of the material intake chamber 30 is connected to the main chamber

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bottom end 101 of the main chamber 10. At the cone-shaped lower end of the intake chamber wall 47 a flange is provided at which a valve part is fixed. The valve part is formed with a material intake passage 33 on the inside and an intake valve 34 by means of which the material intake passage 33 can be opened and closed. The cone-shaped intake bottom end 302 of the intake chamber 20 is connected to the material intake passage 21 (not shown).

- 10 From figure 2 a horizontal section through the distribution chambers 20 can be gathered. It is obvious that five distribution chambers 20, each having a circular cross section are arranged such that their centre points define a circular line. In the center of the horizontal section of the silo the
15 material intake chamber 30 is arranged. The hatched zones in figure represent the material of the separation wall 43.

Claims

1. Construction material silo for storing construction material mixtures, comprising

5 a) an upper silo portion (1) comprising a main chamber (10) having a main chamber bottom end (101),

b) a lower silo portion (2) comprising a plurality of distribution chambers (20) each of which having

10 b1) a top end (201) connected to the main chamber bottom end (101) of the main chamber (10), and

b2) a bottom end (202), which is opposite to the top end (201) and is connected to a discharge passage (21), which can be opened and closed by means of a discharge valve (22) arranged at the discharge passage (21),

15 and

c) a material intake device (3) through which construction material can be supplied to the main chamber (10).

2. Construction material silo according to claim 1, wherein the
20 discharge passage (21) and the discharge valve (22) arranged at the discharge passage (21) are provided separately for each of the distribution chambers (20).

3. Construction material silo according to claim 1 or 2,
25 wherein each of the distribution chambers (20) is formed such that, in a section (203) close to the bottom end (202) of the distribution chamber (20), the distribution chamber (20) has a shape tapered towards the bottom end (202).

30 4. Construction material silo according to any one of claims 1 to 3, wherein

a) the material intake device (3) comprises a material intake chamber (30) arranged in the lower silo portion (2) and

having an intake top end (301) and an intake bottom end (302) opposite to the intake top end (301),

b) the intake top end (301) of the material intake chamber (30) is connected to the main chamber bottom end (101) of the
5 main chamber (10),

c) a material intake passage (33) is provided, to which the intake bottom end (302) of the material intake chamber (30) is connected, and

d) an intake valve (34) is provided at the material intake
10 passage (33), by means of which the material intake passage (33) can be opened and closed.

5. Construction material silo according to claim 4, wherein the material intake chamber (30) is arranged in the center of the
15 lower part of the silo and is laterally surrounded by the distribution chambers (20).

Abstract**Construction material silo**

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A silo for storing construction material mixtures comprises an upper silo portion (1), a lower silo portion (2) and a material intake device (3). The upper silo portion (1) comprises a main chamber (10) having a main chamber bottom end (101). The lower silo portion (2) comprises a plurality of distribution chambers (20). Each of the distribution chambers (20) has a top end (201) and a bottom end (202) opposite to the top end (201). Further, each of the distribution chambers (20) is connected, with the top end (201), to the main chamber bottom end (101) of the main chamber (10), and is connected, with the bottom end (202), to a discharge passage (21), which can be opened and closed by means of a discharge valve (22) arranged at the discharge passage (21). Through the material intake device (3) construction material can be supplied to the main chamber (10).

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Figure 1

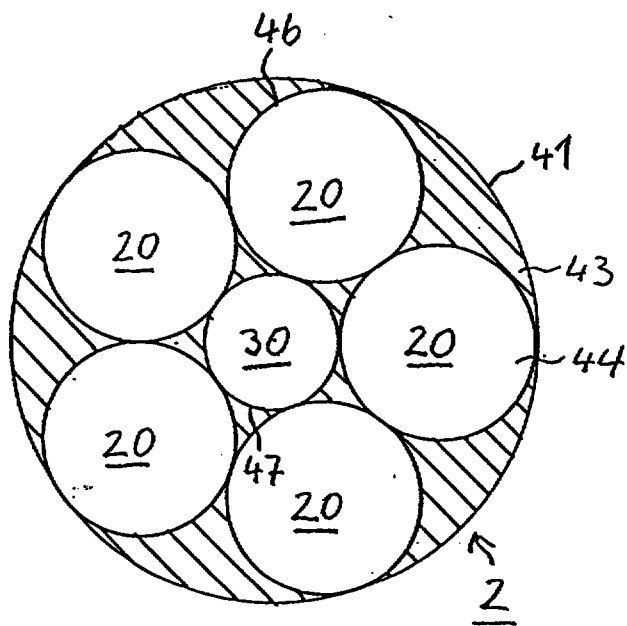


FIG. 2