

(19)



(11)

EP 3 284 882 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

09.12.2020 Bulletin 2020/50

(51) Int Cl.:

E04H 7/22 (2006.01)

B65D 88/30 (2006.01)

B65D 88/26 (2006.01)

E04H 7/24 (2006.01)

B65D 88/00 (2006.01)

B65D 88/32 (2006.01)

(21) Application number: **17382681.9**

(22) Date of filing: **11.10.2017**

(54) **A SILO AND PROCESS FOR TRANSPORTING AND ASSEMBLING SAID SILO**

SILO UND PROZESS ZUM TRANSPORT UND ZUR AUSFSTELLUNG DES SILOS

UN SILO ET PROCEDE DE TRANSPORT ET D'ERECTION D'UN SILO

(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**

(43) Date of publication of application:

21.02.2018 Bulletin 2018/08

(73) Proprietor: **Egavic Serveis d'Enginyeria, S.L.**

08500 Vic, Barcelona (ES)

(72) Inventors:

- **Sala i Prat, Ramón**
08500 Vic, Barcelona (ES)

- **Sala i Prat, Jordi**

08500 Vic, Barcelona (ES)

(74) Representative: **Balder IP Law, S.L.**

Paseo de la Castellana 93

5ª planta

28046 Madrid (ES)

(56) References cited:

DE-A1- 2 621 009

DE-A1- 3 430 039

DE-C1- 3 320 029

US-A- 4 338 752

EP 3 284 882 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of silos for storage of materials. More particularly, the present invention relates to a silo and a process for transporting and assembling such silo that allows saving costs while improving the quality.

STATE OF THE ART

[0002] Silos have been known for a long time since they have been quite necessary for the storage of material. In many cases, silos store granulated material, powdery material, among other. In spite of the somewhat simple construction or assembly of a silo, there have been efforts in the prior art to further improve assembling and/or installing silos.

[0003] Patent document WO-2015134338-A1 discloses a temporary addition or injection system. In such system, a silo can be mounted on a trailer, a transfer pot and/or a control system may be mounted on the trailer, transport the silo to a work-site and self-erect it to stand vertically on the trailer at the work-site or dismount the silo at the work-site.

[0004] Patent document WO-9606753-A1 relates to a transport vehicle that enables receiving and depositing a container such as a silo. The transport vehicle includes a pivoting device with two arms in parallel that are pivoted when receiving and depositing the silo, thereby making possible to erect the silo at an installation site.

[0005] Patent document EP-1871697-B1 discloses containers for storing dry granules and powders, such containers being silos in some examples. A cylindrical silo may be transported and lifted onto a concrete base to be installed at a particular location. The cylindrical silo may have mounted thereon a filter that fits within the space between the silo and the supporting structure.

[0006] In patent document US-2013142601-A1 there is disclosed a transportable self-erecting silo system for oil and natural gas. The patent document describes a trailer including a flipper mechanism coupled with a trailer bed and a rocker arm. The silo is mounted on the truck, and by means of the flipper mechanism and some hydraulic jacks the silo may be raised and rotated for the installation of the same.

[0007] At some installation locations, the construction of silos is expensive due to a lack of facilities or machinery for carrying out such task. Accordingly, there is a need for minimizing the number of tasks that need be carried out at an installation location and reducing the complexity of such tasks. It is preferable that most of the tasks for the construction and/or assembly of silos may be carried out at facilities of a company, even if the facilities are remote from the installation location.

[0008] The inventors have found out that silos may be further improved in what regards the transportation and

assembly of the same in order to save time and costs when new silos need be installed at a particular location.

[0009] DE 33 20 029 C1, US 4 338 752 A and DE3430039A1 disclose collapsible silos.

5 **[0010]** DE 2621009 A1 discloses a silo assembly for storage of granulated or powdery material, comprising a body of silo and a hopper, the hopper being arranged inside the body of silo, the assembly comprising a supporting structure arranged inside the body of silo, said supporting structure being destined to support the body of silo at an installation site.

DESCRIPTION OF THE INVENTION

15 **[0011]** A first aspect of the invention relates to a process for transporting and assembling at least one silo for storage of granulated or powdery material according to claim 1.

20 **[0012]** The process for transporting and assembling at least one silo of the present disclosure makes possible to prepare one or more silos at one location where facilities and machines for the preparation of silos are available, and to transport the prepared one or more silos to a location where they are to be installed for the final assembling of the same. This is particularly advantageous for simplifying installation of new silos at those locations where manpower, machinery and/or facilities for building silos are scarce or expensive. Accordingly, the process of this aspect of the invention reduces the number of operations that need be carried out at the installation location in what regards building the silo. As the body of silo is already built, only the hopper and supporting structure need be assembled.

25 **[0013]** In order to ease the transporting and assembling the at least one silo, the body of silo is adapted to host some or all the components necessary for the installation of the at least one silo at the installation location. In this sense, the hopper or the components for making the same may be arranged inside the body of silo so that the transportation of the body of silo already provides the transportation of the other components. This saves time and simplifies the transportation since only the body of silo has to be attached to a means of transportation (e.g. a ship, a truck, a train, etc.) as the remaining components are already stored inside the body of silo.

30 **[0014]** Upon arriving at the installation location, the components within the body of silo are taken out therefrom so that the hopper may be mechanically coupled with the body of silo. When the components for making the hopper are arranged inside the body of silo, then the hopper is first assembled, and then it is mechanically coupled with the body of silo. Similarly, the supporting structure is also assembled so that the body of silo may be provided on top of it and, thus, the hopper may provide the material at the lower part of the silo through the unload opening thereof.

35 **[0015]** The body of silo is provided in the form of a freight container, thereby reducing the cost of transport-

ing and assembling the silo.

[0016] In some preferred embodiments, the at least one silo is for storage of granulated or powdery edible material.

[0017] In some embodiments, a shape of the body of silo is a parallelepiped.

[0018] In contrast to a body of silo featuring a cylindrical shape or geometry, as the shape of the body of silo comprises six planar faces (e.g. cuboid, cube, etc.), the transportation of the body of silo is simple in what regards attaching the body of silo to a means of transportation. Additionally, the same shape is also advantageous for hosting components inside of the body of silo for the transportation.

[0019] In some of these embodiments, the process further comprises removing, from the body of silo, at least one door from a first end or a second end of the body of silo; wherein a step of removing at least one door from the body of silo takes place after a step of transporting, to an installation location of the at least one silo, the body of silo.

[0020] One of the end walls need not be removed, and can serve as an upper cover. Only it is needed to modify for example with a feeding inlet. Obviously, these modifications will be carried on at the installation site.

[0021] When the body of silo is a freight container, it may be advantageous to maintain the whole structure of the freight container (that is, the six sides of the container) for securing the components stored inside the body of silo. Then, at the installation location of the at least one silo, at least one door may be removed from one end of the container so that the container may function as a silo.

[0022] In some of these embodiments, the process further comprises providing at least one plate on an inner face of each wall of the body of silo, each of the at least one plate preferably comprising food paint on a face thereof.

[0023] Since the walls of a freight container may comprise slots, protrusions and/or recesses, mainly due to the nerves or undulated shape of the wall (for providing rigidity to the walls), in order to store the material within the at least one silo it is convenient that the inner face of the walls of the container are flat. By providing from the inside of the body of the silo at least one plate on each of these walls the surface is made planar. Preferably each of these plates are coated or painted with food paint.

[0024] Another reason for attaching plates to the inner surface of the undulated walls of the silo is to provide more stiffness. In some cases, the lower plates can be thicker than the upper ones, since the pressure is higher in the lower part due to the column pressure.

[0025] The plates, like in the prior art, are preferably provided with through apertures that coincide with the segments of the (undulated) wall that are more interior, such that it is possible to weld the plates to the nerves, which will be placed horizontal when the container is placed vertically.

[0026] In some of these embodiments, the freight con-

tainer is a sea container.

[0027] In some embodiments, the process further comprises painting an inner face of each wall of the body of silo with food paint.

[0028] In some embodiments, a step of assembling the hopper and the body of silo at a first end thereof takes place after a step of providing, at the installation location of the at least one silo, the body of silo on the supporting structure.

[0029] In some embodiments, a step of providing, at the installation location of the at least one silo, the body of silo on the supporting structure comprises lifting the body of silo with a crane and placing with the crane the body of silo vertically on the supporting structure.

[0030] The use of cranes at some locations may be difficult depending on the geometry of the terrain, the presence of buildings blocking the free movement of the cranes, etc. and it also may be expensive (e.g. if there is a reduced number of cranes available). In some cases the use of a crane may be limited to lifting the body of silo so as to form the at least one silo, thereby simplifying the assembly of the at least one silo.

[0031] In some embodiments, the body of silo is a first body of silo, and the process further comprises:

providing second, third and fourth bodies of silo;
for each of the second, third and fourth bodies of silo:

providing inside the body of silo a hopper or components for making the hopper;
transporting, to the installation location of the at least one silo, the body of silo with the hopper or components for making the hopper arranged inside the body of silo;
assembling, at the installation location of the at least one silo, the hopper with the body of silo at a first end thereof; and
providing, at the installation location of the at least one silo, the body of silo on the supporting structure;

providing a combining hopper such that an opening thereof is coupled with an unload opening of each hopper assembled to the first, second, third and fourth bodies of silo.

[0032] In some cases a plurality of silos is to be transported and assembled so as to form an assembly of silos. Each of the silos to be assembled may host the components necessary for the building thereof.

[0033] By mechanically coupling a combining hopper with the unload opening of each hopper of the four silos, an assembly with a single unload opening (that of the combining hopper) may be provided. In the context of the present disclosure, the term 'master' of 'combining hopper' only denotes that it is a hopper used for collecting the material that is unloaded from each silo of the assembly of silos. It is clear that simply the term 'hopper'

can be used instead of 'combining hopper' without departing from the scope of the present disclosure.

[0034] In some embodiments, dimensions of the body of silo are dimensions defined in standard ISO 1496, or any updating thereof.

[0035] A second aspect of the invention refers to a silo according to claim 11 for storage of granulated or powdery material, comprising:

a body of silo, a shape of the body of silo being a parallelepiped; and
a hopper adapted to be included inside the body of silo and to be mechanically coupled with the body of silo at a first end of the body of silo.

[0036] The body of silo is provided in the form of a freight container, thereby reducing the cost of transporting and assembling the silo.

[0037] Prior to the assembly of the silo, the silo is adapted to be transported and installed in a cost-effective manner. In this sense, the body of silo features a geometry of a parallelepiped that simplifies the transportation (it may be easily attached to a means of transportation) of the same and which makes possible to transport the components constituting the body of silo without increasing the volume that needs be transported (because the components are included within the body of silo).

[0038] The silo further comprises a supporting structure adapted to be included inside the body of silo and to support the body of silo when the body of silo and the hopper are mechanically coupled.

[0039] The body of silo may also store inside the same the supporting structure that holds the silo in an upright position.

[0040] In some preferred embodiments, the silo is for storage of granulated or powdery edible material.

[0041] In some of these embodiments, the freight container is a sea container.

[0042] In some embodiments, dimensions of the body of silo are dimensions defined in standard ISO 1496 and all the updatings thereof.

[0043] Similar advantages as those described for the first aspect of the invention may also be applicable to the second aspect of the invention.

[0044] A third aspect of the invention relates to an assembly of silos for storage of granulated or powdery material, comprising:

four silos according to the second aspect of the invention;
a supporting structure for supporting of the four silos; and
a combining hopper;
each of the four silos is in contact with other two of the four silos; and
the combining hopper is provided such that an opening thereof is coupled with an unload opening of each hopper of the four silos.

[0045] In some preferred embodiments, each silo of the four silos is for storage of granulated or powdery edible material.

[0046] Similar advantages as those described for the second aspect of the invention may also be applicable to the third aspect of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] To complete the description and in order to provide for a better understanding of the invention, a set of drawings is provided. Said drawings form an integral part of the description and illustrate an embodiment of the invention, which should not be interpreted as restricting the scope of the invention, but just as examples of how the invention can be carried out. The drawings comprise the following figures:

Figures 1-4 show silos, which may be transported and assembled, in accordance with embodiments of the invention.

Figure 5 shows a mounted supporting structure of a silo.

Figure 6 shows a body of silo mounted on a supporting structure.

Figure 7 shows a body of silo in accordance with an embodiment of the invention.

Figures 8A-8B shows a process of lifting a body of silo.

Figure 9 shows a process for coupling a hopper with a body of silo.

Figure 10-12 partially show assemblies of silos in accordance with embodiments of the invention.

Figure 13 shows an assembly of silos in accordance with an embodiment of the invention.

DESCRIPTION OF WAYS OF CARRYING OUT THE INVENTION

[0048] As shown in the figures, the present invention relates to a process for transporting and assembling at least one silo 10a-10d, 25, 30 for storage of granulated or powdery material. Mainly, the great improvement of the present invention is that a container for transporting the silo will, at the installation site, be the silo body itself. This will allow for moving many assembly stages to the site where the container is built, thus allowing to save much costs at the installation site. Surprisingly, the inventors have checked that without or few modifications, the current containers can fulfill perfectly the silo body function.

[0049] To this end, the inventive method comprises the following steps:

First a step of providing a body of silo 11a-11d; This first step already allows itself to save costs and even improve the quality of the silo body, because instead of leaving the manufacturing stages of the silo body

for the personnel available at the place of installation, these are made at the facilities of the container manufacturer. These manufacturers manufacture a large number of containers and can do so in an industrialized way and satisfying the quality standards. Indeed, as they are manufactured with the current techniques, i.e. assembling the parts that will form the silo in the place of installation, the final result is left to the chance of the manufacturing conditions at the installation place. This is all the more true given that these silos are often installed in developing countries, where skilled labor is scarce and construction tools are expensive and also maybe scarce. The modification of the container to be fully adapted for forming the body silo can be done at the container manufacturer facilities or at the silo manufacturer.

Second, a step of providing inside the body of silo 11a-11d:

a hopper 12a-12d or components for making the hopper 12a-12d; and
a supporting structure 13 of the at least one silo 10a-10d, 25, 30;

[0050] These steps, depicted through figures 1 to 3, are possible since there is room enough in the body to store the hopper and the supporting structure. And there is no need to store therein the plates that made the silo body, as it is currently done.

[0051] Next, the method goes on by transporting, to an installation location of the silo 10a-10d, 25, 30, the body of silo 11a-11d with the supporting structure 13 and the hopper 12a-12d or components for making the hopper 12a-12d arranged inside the body of silo 11a-11d; Since the silo body will be made of a container specially conceived for transportation, this step will be optimally carried out.

[0052] Finally, the method goes on by assembling, at the installation location of the silo 10a-10d, 25, 30, the hopper 12a-12d and the body of silo 11a-11d at a first end thereof; and mounting, at the installation location of the silo 10a-10d, 25, 30, the body of silo 11a-11d on the supporting structure 13.

[0053] As shown in the Figs, the shape of the body of silo 1 is a parallelepiped, and specifically, the body of silo 11a-11d is a freight container, preferably a maritime container, with standard dimensions. For example, the container may be a 20 feet, 40 feet or 40 feet high cube container, which length x width x height maybe approximately respectively:

1 foot (or ft) = 0,3 meter (m)
20 feet: 6 m x 2,4 m x 2,5 m
40 feet: 12,2 m x 2,4 m x 2,6 m
40 feet high cube: 12,2 m x 2,4 m x 2,9 m

[0054] The method can comprise the step of removing,

from the body of silo 11a-11d, the doors from a first end or a second end of the body of silo; the step of removing the door from the body of silo 11a-11d takes place after a step of transporting, to an installation location of the silo 10a-10d, 25, 30, the body of silo 11a-11d. One of the door or end walls must be removed, since this end will form the open end of the silo body, such that the goods stored therein can pass into the hopper.

[0055] Depending on the goods to be stored inside the silo, the process can further comprise providing plates on the inner face of each wall of the body of silo 11a-11d. These plates can preferably be coated with food paint on a face thereof. By food paint it is meant painting that is compatible with the storage of foods. Again, this is a step that can be done at the silo manufacturer facility, in series.

[0056] Advantageously, the step of assembling the hopper 12a-12d and the body of silo 11a-11d at a first end thereof takes place after a step of providing, at the installation location of the silo 10a-10d, 25, 30, the body of silo 11a-11d on the supporting structure 13.

[0057] The step of providing, at the installation location of the silo 10a-10d, 25, 30, the body of silo 11a-11d on the supporting structure 13 comprises lifting the body of silo 11a-11d with a crane and placing with the crane the body of silo 11a-11d vertically on the supporting structure 13, as shown in figures 8A to 9.

[0058] Now, another embodiment of the invention is disclosed, which comprises a plurality of silos, that are joined to form a matrix or silos. Although the method is specifically disclosed and illustrated for four silos, it is also possible to apply it to only two or three silos, or for more than four silos.

[0059] As shown in figs 10 to 13, the body of silo 11a-11d is a first body of silo 11a-11d, and the process further comprises:

providing second, third and fourth bodies of silo 11a-11d;
for each of the second, third and fourth bodies of silo 11a-11d:

providing inside the body of silo 11a-11d a hopper 12a-12d or components for making the hopper 12a-12d;

transporting, to the installation location of the at least one silo 10a-10d, 25, 30, the body of silo 11a-11d with the hopper 12a-12d or components for making the hopper 12a-12d arranged inside the body of silo 11a-11d;

assembling, at the installation location of the at least one silo 10a-10d, 25, 30, the hopper 12a-12d with the body of silo 11a-11d at a first end thereof; and

providing, at the installation location of the at least one silo 10a-10d, 25, 30, the body of silo 11a-11d on the supporting structure 13;

providing a combining hopper 20 such that an opening thereof is coupled with an unload open-

ing of each hopper 12a-12d assembled to the first, second, third and fourth bodies of silo 11a-11d.

[0060] This embodiment is especially advantageous in the context of the present invention. The core of the invention is using the container as a main part of the silo at the installation site. Therefore, the lateral dimensions of each silo will be limited by the width and the height of the container. Therefore, it is very likely that at the installation point many silos will have to be installed.

[0061] As shown in figures 1 to 3, the invention also relates to a silo assembly 10a-10d, 25, 30 for storage of granulated or powdery material, comprising a body of silo 11a-11d and a hopper 12a-12d or components for forming a hopper, and wherein the hopper 12a-12d or the components for forming a hopper are arranged inside the body of silo 11a-11d, such that the body of silo serves both as a container and as a main part of a silo.

[0062] The silo assembly 10a-10d, 25, 30 further comprises a supporting structure 13 arranged inside the body of silo 11a-11d, said supporting structure being destined to support the body of silo 11a-11d when the body of silo 11a-11d and the hopper 12a-12d are mechanically coupled at an installation site.

[0063] The body of silo 11a-11d has preferably a parallelepiped shape, and is a freight container and more preferably a sea container;

The invention also relates to an assembly 20 according to claim 12 of silos 10a-10d, 25, 30 for storage of granulated or powdery material.

[0064] Finally, both for the assembly and the silo, the dimensions of the body of silo are dimensions defined in standard ISO 1496.

[0065] In the present description silo assembly and assembly of silos are different concepts. The first means a kit for transporting a silo. The second one, assembly of silos means a bigger structure resulting from adjoining two or more silos, that will share a common discharge outlet.

Claims

1. Process for transporting and assembling at least one silo (10a-10d, 25, 30) for storage of granulated or powdery material, comprising:

providing a body of silo (11a-11d), the body of silo (11a-11d) being a freight container;
providing inside the body of silo (11a-11d):

a hopper (12a-12d) or components for making the hopper (12a-12d); and
a supporting structure (13) of the at least one silo (10a-10d, 25, 30);

transporting, to an installation location of the at

least one silo (10a-10d, 25, 30), the body of silo (11a-11d) with the supporting structure (13) and the hopper (12a-12d) or

components for making the hopper (12a-12d) arranged inside the body of silo (11a-11d);
assembling, at the installation location of the at least one silo (10a-10d, 25, 30), the hopper (12a-12d) and the body of silo (11a-11d) at a first end thereof; and

providing, at the installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d) on the supporting structure (13).

2. Process according to claim 1, wherein a shape of the body of silo (11a-11d) is a parallelepiped.
3. Process according to claim 1, further comprising removing, from the body of silo (11a-11d), at least one door from a first end or a second end of the body of silo; wherein a step of removing at least one door from the body of silo (11a-11d) takes place after a step of transporting, to an installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d).
4. Process according to claim 3, further comprising providing at least one plate on an inner face of each wall of the body of silo (11a-11d), each of the at least one plate preferably comprising food paint on a face thereof.
5. Process according to any of claims 1-3, further comprising painting an inner face of each wall of the body of silo (11a-11d) with food paint.
6. Process according to any of the preceding claims, wherein a step of assembling the hopper (12a-12d) and the body of silo (11a-11d) at a first end thereof takes place after a step of providing, at the installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d) on the supporting structure (13).
7. Process according to any of the preceding claims, wherein a step of providing, at the installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d) on the supporting structure (13) comprises lifting the body of silo (11a-11d) with a crane and placing with the crane the body of silo (11a-11d) vertically on the supporting structure (13).
8. Process according to any of the preceding claims, wherein the body of silo (11a-11d) is a first body of silo (11a-11d), and the process further comprises:
providing second, third and fourth bodies of silo (11a-11d);
for each of the second, third and fourth bodies

of silo (11a-11d):

providing inside the body of silo (11a-11d) a hopper (12a-12d) or components for making the hopper (12a-12d);
transporting, to the installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d) with the hopper (12a-12d) or components for making the hopper (12a-12d) arranged inside the body of silo (11a-11d);
assembling, at the installation location of the at least one silo (10a-10d, 25, 30), the hopper (12a-12d) with the body of silo (11a-11d) at a first end thereof; and
providing, at the installation location of the at least one silo (10a-10d, 25, 30), the body of silo (11a-11d) on the supporting structure (13);

providing a combining hopper (22) such that an opening thereof is coupled with an unload opening of each hopper (12a-12d) assembled to the first, second, third and fourth bodies of silo (11a-11d).

9. Process according to any of the preceding claims, wherein the freight container is a sea container.

10. Process according to any of the preceding claims, wherein dimensions of the body of silo are dimensions defined in standard ISO 1496.

11. Silo assembly (10a-10d, 25, 30) for storage of granulated or powdery material, comprising a body of silo (11a-11d) and a hopper (12a-12d) or components for forming a hopper, wherein the body of silo (11a-11d) being a freight container and the hopper (12a-12d) or the components for forming a hopper being arranged inside the body of silo (11a-11d), such that the body of silo serves both as a container and as a main part of a silo, the assembly comprising a supporting structure (13) arranged inside the body of silo (11a-11d), said supporting structure being destined to support the body of silo (11a-11d) when the body of silo (11a-11d) and the hopper (12a-12d) are mechanically coupled at an installation site.

12. Assembly (20) of silos (10a-10d, 25, 30) for storage of granulated or powdery material, comprising:

four silo assemblies (10a-10d, 25, 30) according to claim 11 in their assembled configuration; and
a combining hopper (22);
wherein each of the four silos (10a-10d, 25, 30) is in contact with other two of the four silos (10a-10d, 25, 30); and
wherein the combining hopper (22) is provided

such that an opening thereof is coupled with an unload opening of each hopper (12a-12d) of the four silos (10a-10d, 25, 30).

13. Silo assembly according to claim 11, wherein the freight container is a sea container

14. Silo assembly according to any of claims 11 or 13, wherein the dimensions of the body of silo (11a-11d) are dimensions defined in standard ISO 1496.

Patentansprüche

1. Verfahren zum Transportieren und Zusammenbauen von mindestens einem Silo (10a-10d, 25, 30) für die Lagerung von granuliertem oder pulverförmigem Material, umfassend:

Bereitstellen eines Silokörpers (11a-11d), wobei der Silokörper (11a-11d) ein Frachtcontainer ist,
Bereitstellen im Inneren des Silokörpers (11a-11d):

einen Trichter (12a-12d) oder Komponenten zum Ausbilden eines Trichters (12a-12d), und
eine Stützstruktur (13) des mindestens einen Silos (10a-10d, 25, 30),

Transportieren des Silokörpers (11a-11d) mit der Stützstruktur (13) und dem Trichter (12a-12d) oder Komponenten zur Ausbildung des Trichters (12a-12d), die im Inneren des Silokörpers (11a-11d) angebracht sind, zu einem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), Zusammenbauen des Trichters (12a-12d) und des Silokörpers (11a-11d) an einem ersten Ende von diesem, an dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), und
Bereitstellen des Silokörpers (11a-11d) auf der Stützstruktur (13) an dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30).

2. Verfahren gemäß Anspruch 1, wobei eine Form des Silokörpers (11a-11d) ein Parallelepiped ist.

3. Verfahren gemäß Anspruch 1, wobei das Verfahren ferner das Entfernen mindestens einer Tür von einem ersten Ende oder einem zweiten Ende des Silokörpers von dem Silokörper (11a-11d) umfasst, wobei ein Schritt des Entferns mindestens einer Tür von dem Silokörper (11a-11d) nach einem Transportschritt des Silokörpers (11a-11d), zu einem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), stattfindet.

4. Verfahren gemäß Anspruch 3, wobei das Verfahren ferner das Bereitstellen von mindestens einer Platte an einer inneren Fläche jeder Wand des Silokörpers (11a-11d) umfasst, wobei jede der mindestens einen Platte bevorzugt Lebensmittelfarbe auf einer ihrer Flächen aufweist. 5
5. Verfahren gemäß einem der Ansprüche 1 - 3, wobei das Verfahren ferner das Anstreichen einer inneren Fläche jeder Wand des Silokörpers (11a-11d) mit Lebensmittelfarbe umfasst. 10
6. Verfahren gemäß einem der vorherigen Ansprüche, wobei ein Schritt des Zusammenbauens des Trichters (12a-12d) und des Silokörpers (11a-11d) an einem ersten seiner Enden nach einem Bereitstellungsschritt des Silokörpers (11a-11d) auf der Stützstruktur (13), an dem Aufstellungsort des mindestens einem Silos (10a-10d, 25, 30), stattfindet. 15
7. Verfahren gemäß einem der vorherigen Ansprüche, wobei der Bereitstellungsschritt des Silokörpers (11a-11d) auf der Stützstruktur (13) an dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30) das Anheben des Silokörpers (11a-11d) mit einem Kran und das Platzieren des Silokörpers (11a-11d) mit dem Kran, vertikal auf der Stützstruktur (13) umfasst. 20
8. Verfahren gemäß einem der vorherigen Ansprüche, wobei der Silokörper (11a-11d) ein erster Silokörper (11a-11d) ist und das Verfahren ferner umfasst: 25
- Bereitstellen eines zweiten, dritten und vierten Silokörpers (11a-11d), 30
- für jeden der zweiten, dritten und vierten Silokörper (11a-11d): 35
- Bereitstellen eines Trichters (12a-12d) oder Komponenten für die Ausbildung des Trichters (12a-12d) im Inneren des Silokörpers (11a-11d), 40
- Transportieren des Silokörpers (11a-11d) mit dem Trichter (12a-12d) oder den Komponenten zur Ausbildung des Trichters (12a-12d), die im Inneren des Silokörpers (11a-11d) angebracht sind, zu dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), 45
- Zusammenbauen des Trichters (12a-12d) mit dem Silokörper (11a-11d) an einem seiner Enden an dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), und Bereitstellen des Silokörpers (11a-11d) auf der Stützstruktur (13), an dem Aufstellungsort des mindestens einen Silos (10a-10d, 25, 30), 50
- Bereitstellen eines Sammeltrichters (22), 55
- so dass eine Öffnung von diesem mit einer Entladeöffnung von jedem der Trichter (12a-12d), die an dem ersten, zweiten, dritten und vierten Silokörper (11a-11d) angebracht sind, verbunden ist.
9. Verfahren gemäß einem der vorherigen Ansprüche, wobei der Frachtcontainer ein Seecontainer ist.
10. Verfahren gemäß einem der vorherigen Ansprüche, wobei die Abmessungen des Silokörpers die in der Norm ISO 1496 definiert Abmessungen sind.
11. Silo-Einheit (10a-10d, 25, 30) für die Lagerung von granuliertem oder pulverförmigem Material, die einen Silokörper (11a-11d) und einen Trichter (12a-12d) oder Komponenten für die Ausbildung eines Trichters enthält, wobei der Silokörper (11a-11d) ein Frachtcontainer ist und der Trichter (12a-12d) oder die Komponenten zur Ausbildung eines Trichters im Inneren des Silokörpers (11a-11d) angeordnet sind, so dass der Silokörper sowohl als ein Container und als auch als Hauptbestandteil eines Silos dient, wobei die Einheit eine Stützstruktur (13), die im Inneren des Silokörpers (11a-11d) angeordnet ist, enthält, wobei diese Stützstruktur für das Stützen des Silokörpers (11a-11d) bestimmt ist, wenn der Silokörper (11a-11d) und der Trichter (12a-12d) an einem Aufstellungsstandort mechanisch verbunden werden.
12. Einheit (20) von Silos (11a-11d, 25, 30) für die Lagerung von granuliertem oder pulverförmigem Material, enthaltend:
- vier Siloeinheiten (10a-10d, 25,30) gemäß Anspruch 11 in ihrer aufgebauten Konfiguration, und
- ein Sammeltrichter (22),
- wobei jeder der vier Silos (10a-10d, 25, 30) in Kontakt mit zwei anderen der vier Silos (10a-10d, 25, 30) ist, und
- wobei der Sammeltrichter (22) so bereitgestellt ist, dass eine Öffnung von diesem mit den Entladeöffnungen von jedem der Trichter (12a-12d) der vier Silos (10a-10d, 25, 30) verbunden ist.
13. Silo-Einheit gemäß Anspruch 11, wobei der Frachtcontainer ein Seecontainer ist.
14. Silo-Einheit gemäß einem der Ansprüche 11 oder 13, wobei die Abmessungen des Silokörpers die in der Norm ISO 1496 definierten Abmessungen sind.
- Revendications**
1. Procédé de transport et d'assemblage d'au moins un silo (10a-10d, 25, 30) pour le stockage de maté-

- riaux granulés ou pulvérulents, consistant à :
- fournir un corps de silo (11a-11d), le corps de silo (11a-11d) étant un conteneur de fret ;
préparer à l'intérieur du corps de silo (11a-11d) :
- une trémie (12a-12d) ou des composants pour fabriquer la trémie (12a-12d) ; et
une structure de support (13) d'au moins un silo (10a-10d, 25, 30) ;
- transporter, vers un lieu d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) avec la structure de support (13) et la trémie (12a-12d) ou les composants pour fabriquer la trémie (12a-12d) disposés à l'intérieur du corps de silo (11a-11d) ;
assembler, sur le lieu d'installation dudit au moins un silo (10a-10d, 25, 30), la trémie (12a-12d) et le corps de silo (11a-11d) à une première extrémité de celui-ci ; et
placer, sur le lieu d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) sur la structure de support (13).
2. Procédé selon la revendication 1, dans lequel une forme du corps de silo (11a-11d) est un parallépipède.
3. Procédé selon la revendication 1, consistant en outre à enlever du corps de silo (11a-11d) au moins une porte d'une première extrémité ou d'une seconde extrémité du corps de silo ; une étape consistant à enlever au moins une porte du corps de silo (11a-11d) ayant lieu après une étape de transport du corps de silo (11a-11d) vers un emplacement d'installation dudit au moins un silo (10a-10d, 25, 30).
4. Procédé selon la revendication 3, consistant en outre à placer au moins une plaque sur une face intérieure de chaque paroi du corps de silo (11a-11d), chacune desdites au moins une plaque comprenant de préférence de la peinture alimentaire sur une de ses faces.
5. Procédé selon l'une quelconque des revendications 1 à 3, consistant en outre à peindre une face intérieure de chaque paroi du corps du silo (11a-11d) avec de la peinture alimentaire.
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel une étape consistant à assembler la trémie (12a-12d) et le corps de silo (11a-11d) à une première extrémité de celui-ci a lieu après une étape consistant à placer, à l'emplacement d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) sur la structure de support (13).
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel une étape consistant à placer, à l'emplacement d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) sur la structure de support (13) consiste à lever le corps de silo (11a-11d) avec une grue et à mettre en place avec la grue le corps de silo (11a-11d) verticalement sur la structure de support (13).
8. Procédé selon l'une quelconque des revendications précédentes, dans lequel le corps de silo (11a-11d) est un premier corps de silo (11a-11d), et le procédé consiste en outre à :
- fournir un deuxième, un troisième et un quatrième corps de silo (11a-11d) ;
pour chacun des deuxième, troisième et quatrième corps de silo (11a-11d) :
- préparer à l'intérieur du corps de silo (11a-11d) une trémie (12a-12d) ou des composants pour fabriquer la trémie (12a-12d) ;
transporter, vers le lieu d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) avec la trémie (12a-12d) ou les composants pour fabriquer la trémie (12a-12d) disposés à l'intérieur du corps de silo (11a-11d) ;
assembler, sur le lieu d'installation dudit au moins un silo (10a-10d, 25, 30), la trémie (12a-12d) avec le corps du silo (11a-11d) à une première extrémité de celui-ci ; et
placer, sur le lieu d'installation dudit au moins un silo (10a-10d, 25, 30), le corps de silo (11a-11d) sur la structure de support (13) ;
- fournir une trémie de mélange (22) de telle sorte qu'une ouverture de celle-ci soit couplée à une ouverture de déchargement de chaque trémie (12a-12d) assemblée aux premier, deuxième, troisième et quatrième corps de silo (11a-11d).
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel le conteneur de fret est un conteneur maritime.
10. Procédé selon l'une quelconque des revendications précédentes, dans lequel les dimensions du corps de silo sont des dimensions définies dans la norme ISO 1496.
11. Ensemble de silo (10a-10d, 25, 30) pour le stockage de matériaux granulés ou pulvérulents, comprenant un corps de silo (11a-11d) et une trémie (12a-12d) ou des composants pour former une trémie, le corps de silo (11a-11d) étant un conteneur de fret et la trémie (12a-12d) ou les composants pour former une

trémie étant disposés à l'intérieur du corps de silo (11a-11d), de sorte que le corps de silo sert à la fois de conteneur et de partie principale d'un silo, l'ensemble comprenant une structure de support (13) disposée à l'intérieur du corps de silo (11a-11d), la-dite structure de support étant destinée à supporter le corps de silo (11a-11d) lorsque le corps de silo (11a-11d) et la trémie (12a-12d) sont couplés mécaniquement sur un site d'installation.

10

12. Ensemble (20) de silos (10a-10d, 25, 30) pour le stockage de matériaux granulés ou pulvérulents, comprenant :

quatre ensembles de silo (10a-10d, 25, 30) selon la revendication 11 dans leur configuration assemblée ; et
 une trémie de mélange (22) ;
 chacun des quatre silos (10a-10d, 25, 30) étant en contact avec deux autres des quatre silos (10a-10d, 25, 30) ; et
 la trémie de mélange (22) étant prévue de telle sorte qu'une ouverture de celle-ci soit couplée à une ouverture de déchargement de chaque trémie (12a-12d) des quatre silos (10a-10d, 25, 30).

15

20

25

13. Assemblage de silos selon la revendication 11, dans lequel le conteneur de fret est un conteneur maritime.

30

14. Assemblage de silo selon l'une des revendications 11 ou 13, dans lequel les dimensions du corps du silo sont des dimensions définies dans la norme ISO 1496.

35

40

45

50

55

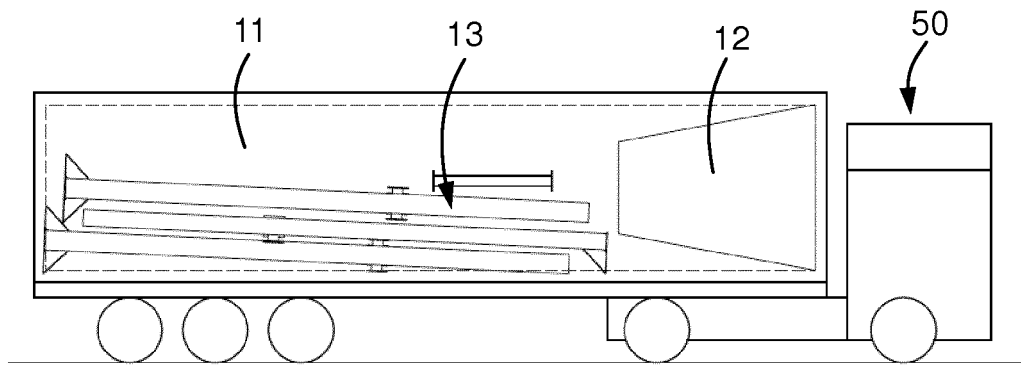


FIG. 1

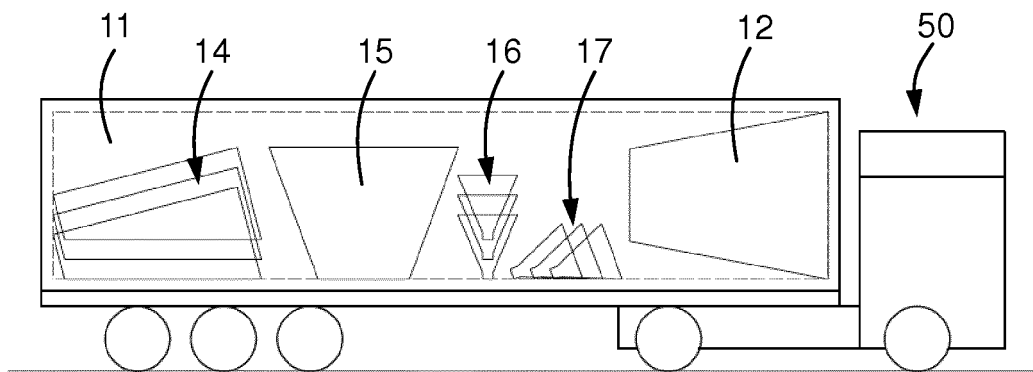


FIG. 2

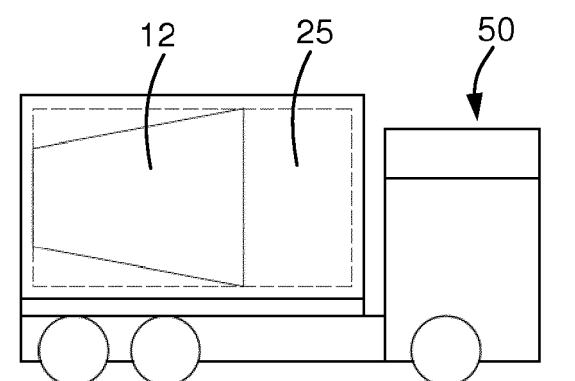


FIG. 3

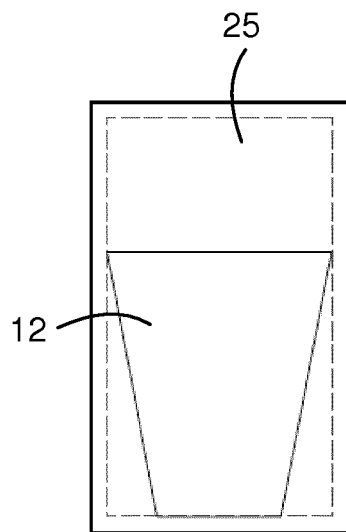


FIG. 4

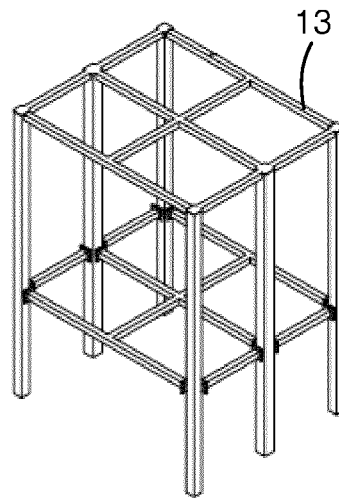


FIG. 5

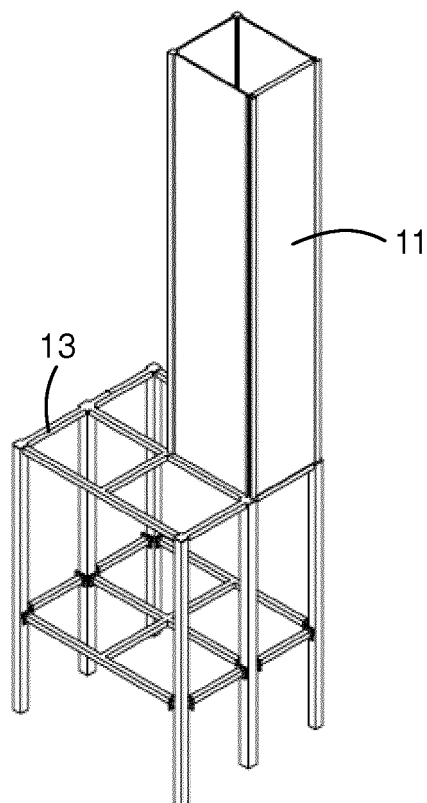


FIG. 6

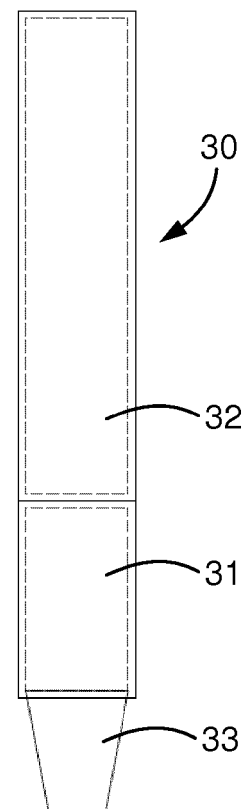


FIG. 7

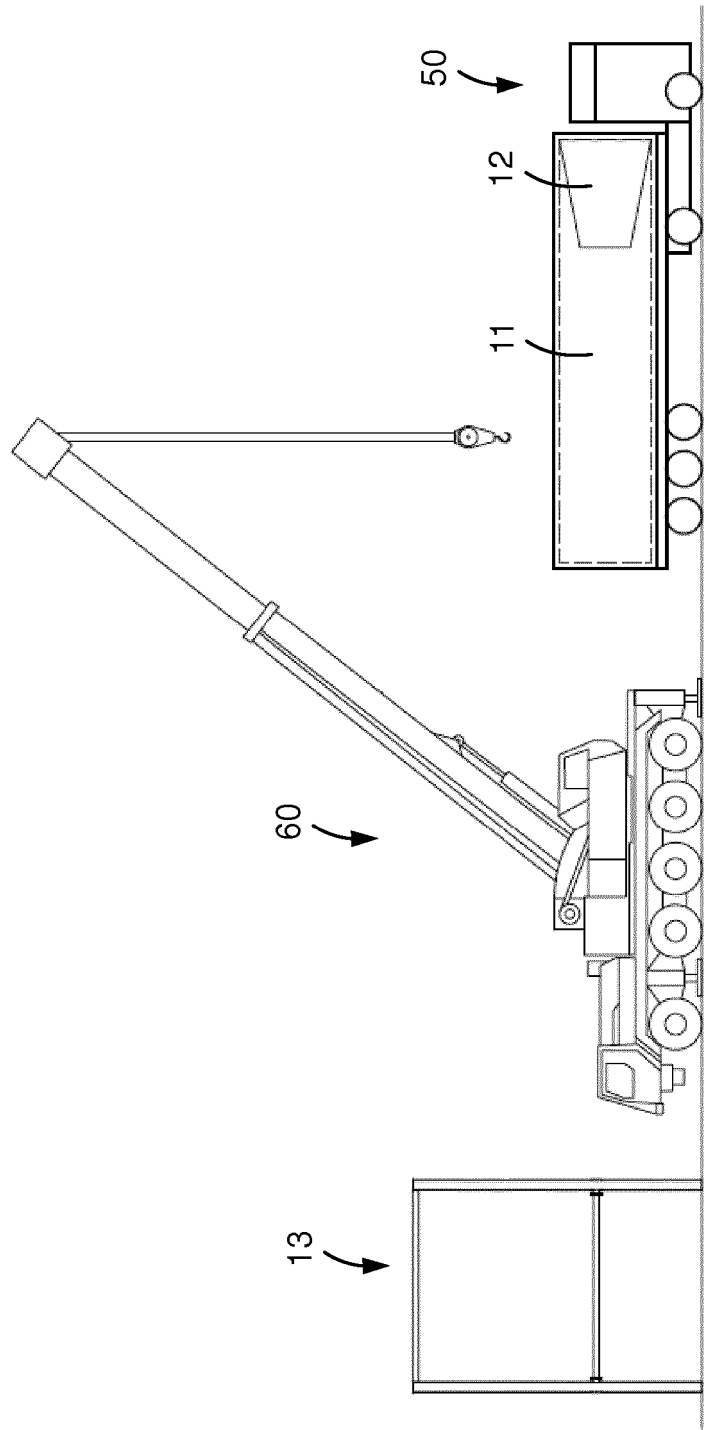


FIG. 8A

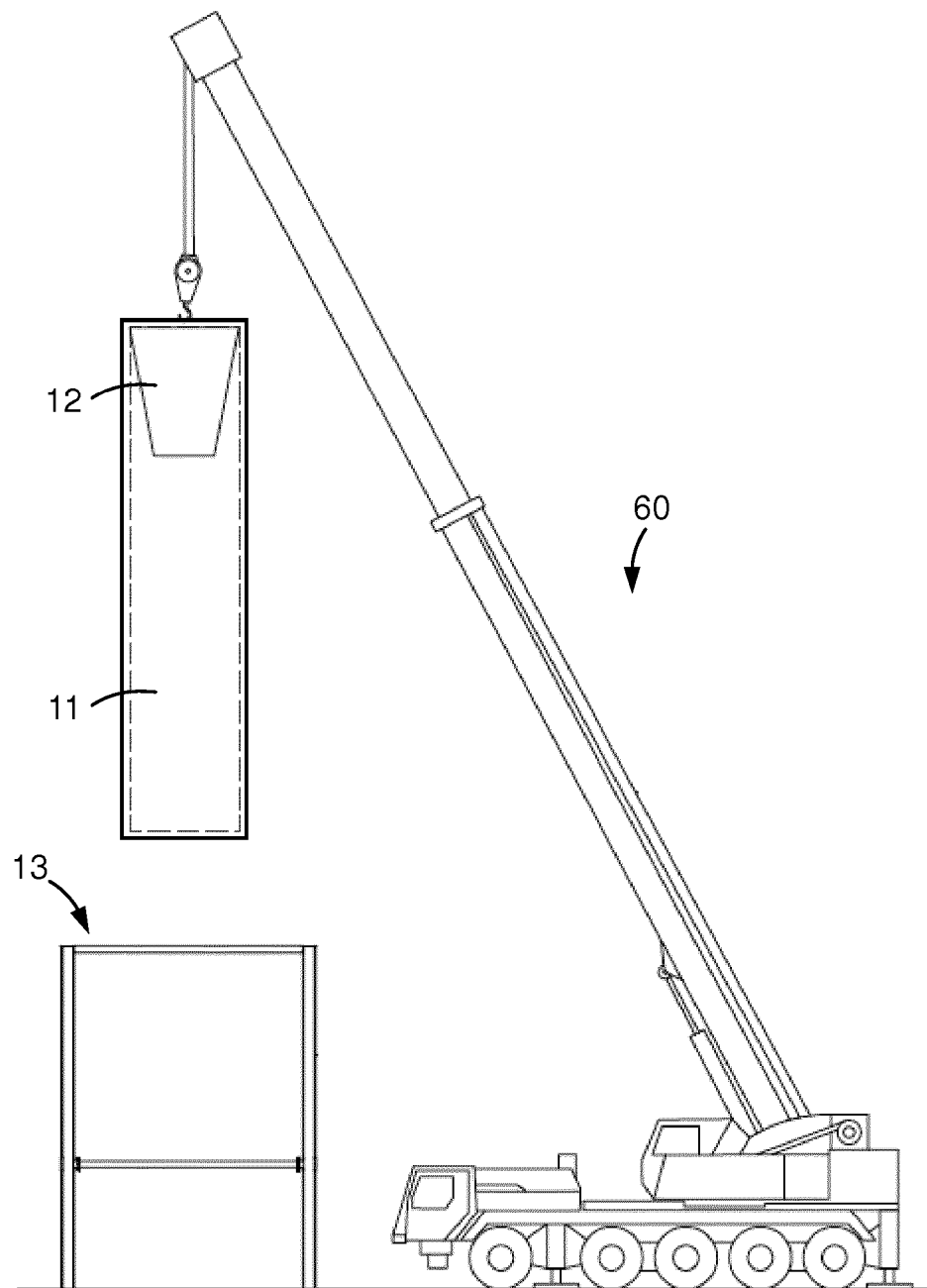


FIG. 8B

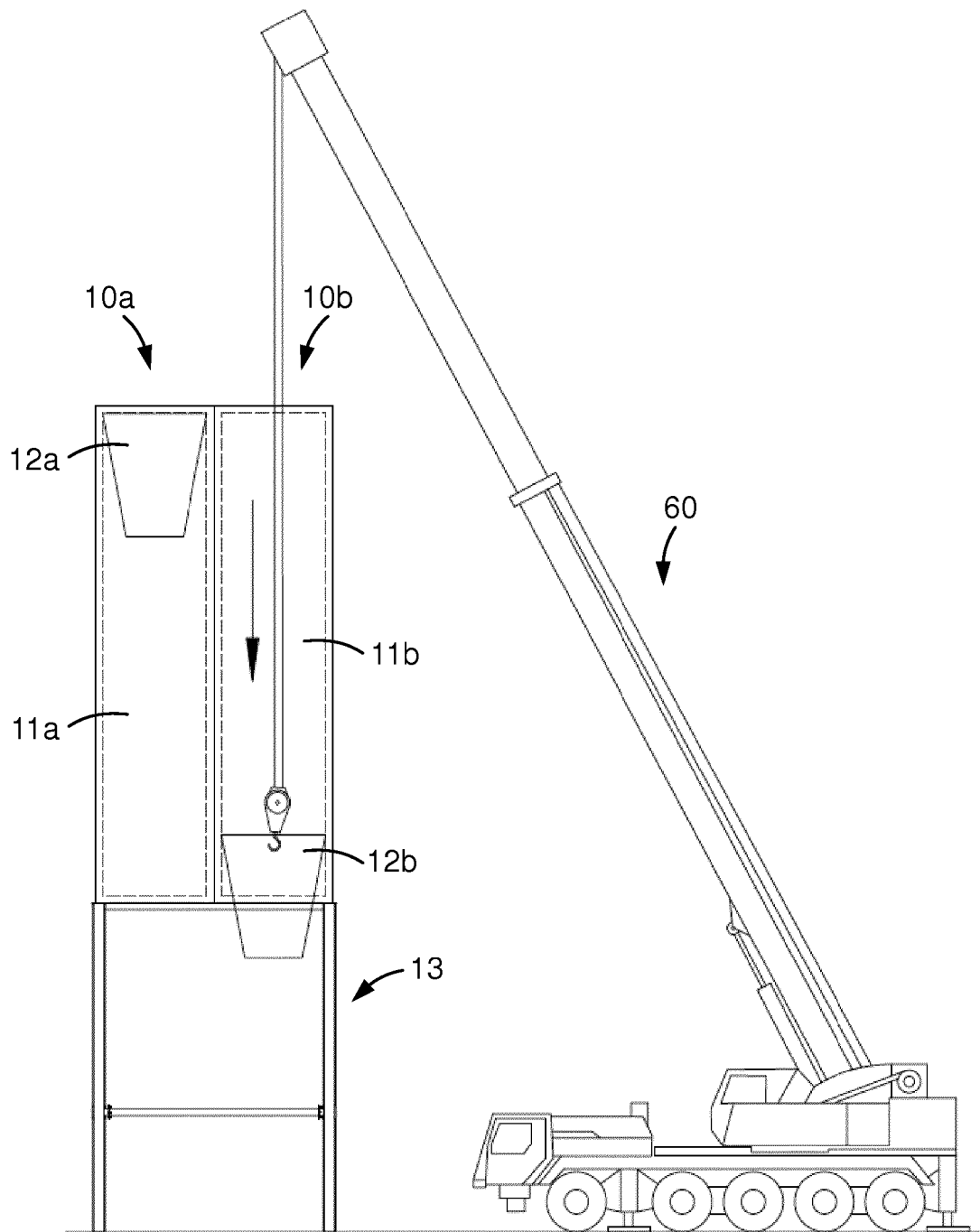


FIG. 9

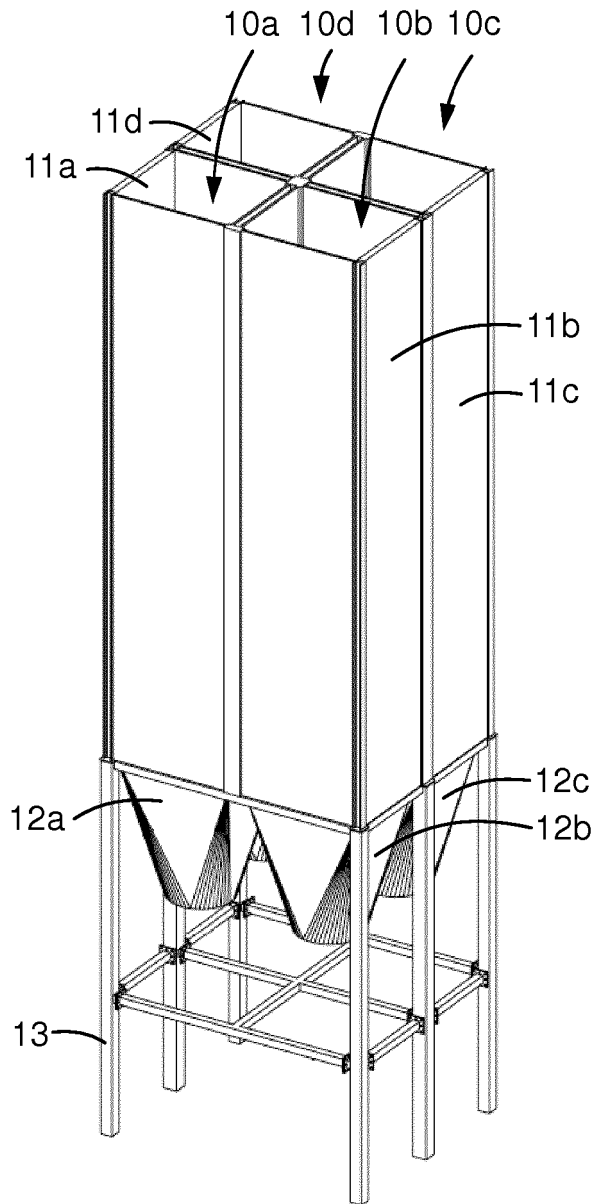


FIG. 10

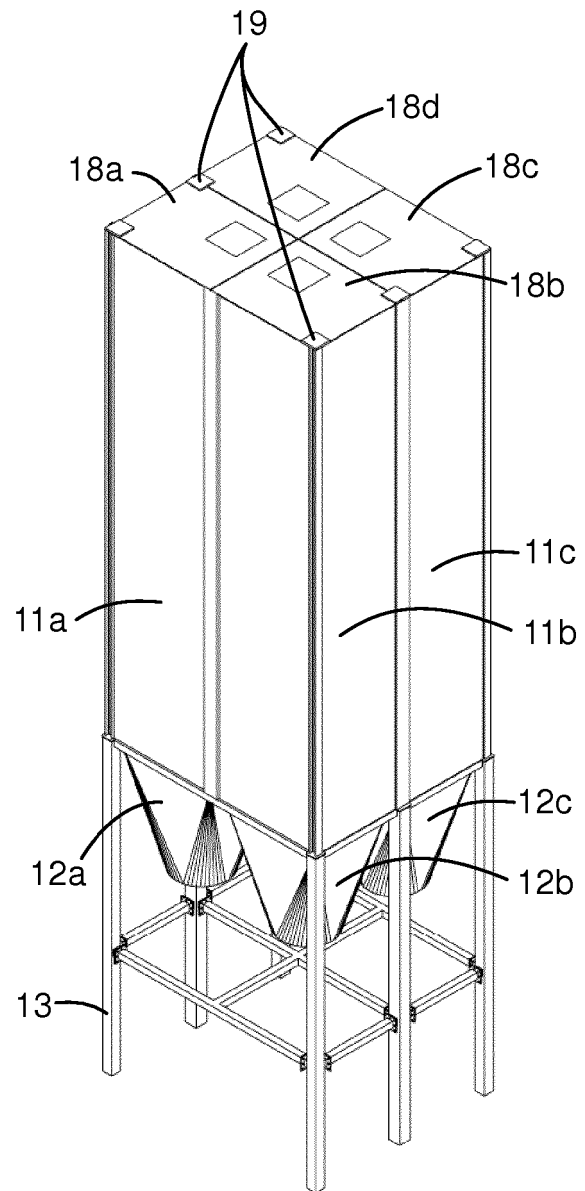


FIG. 11

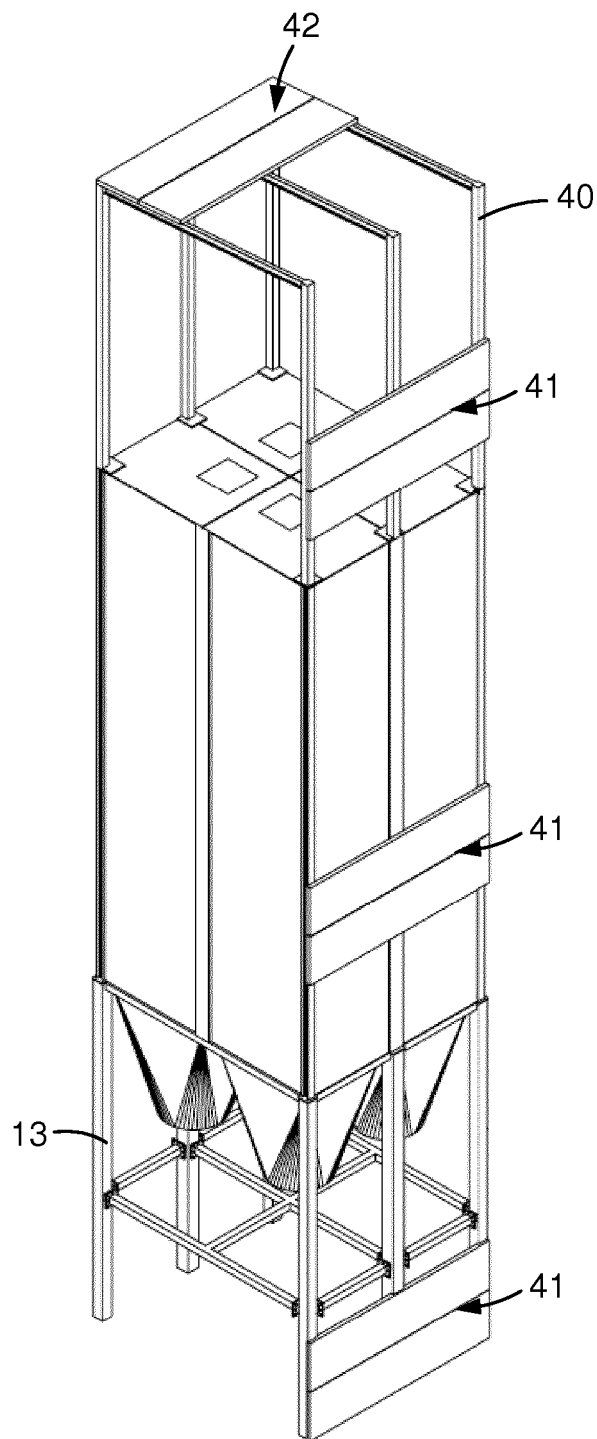


FIG. 12

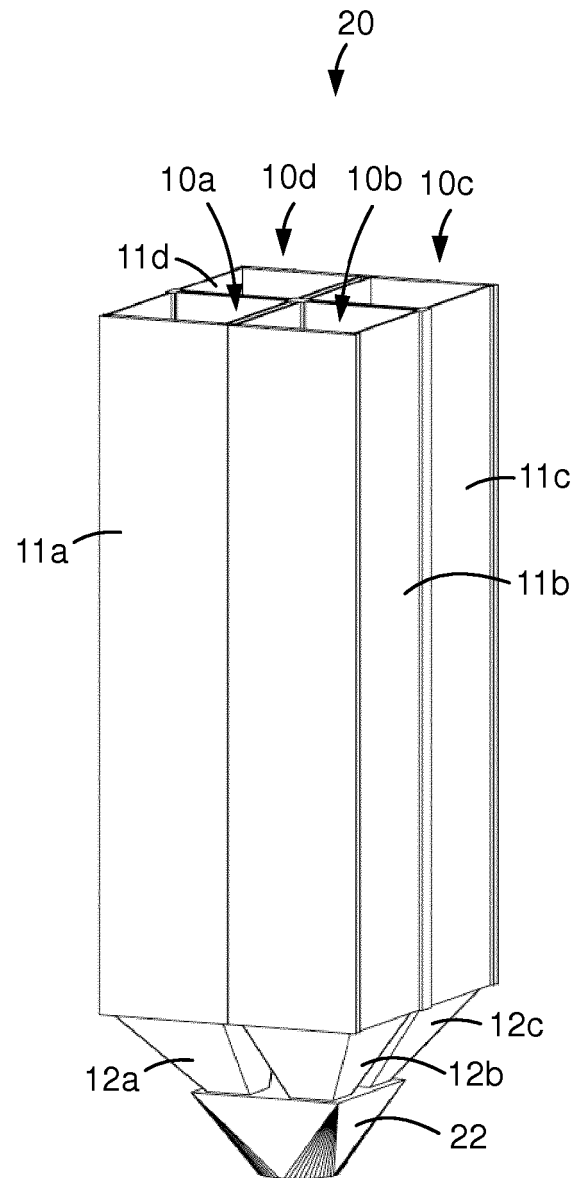


FIG. 13

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2015134338 A1 [0003]
- WO 9606753 A1 [0004]
- EP 1871697 B1 [0005]
- US 2013142601 A1 [0006]
- DE 3320029 C1 [0009]
- US 4338752 A [0009]
- DE 3430039 A1 [0009]
- DE 2621009 A1 [0010]