(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 098 601 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.12.2022 Bulletin 2022/49

(21) Application number: **21177230.6**

(22) Date of filing: **01.06.2021**

(51) International Patent Classification (IPC):
B66F 9/12 *(2006.01)* ***B66C 1/22*** *(2006.01)*
B66F 9/14 *(2006.01)* ***B65G 67/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B66F 9/12; B66C 1/226; B66F 9/143

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

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(54) FIBC HANDLING TOOL TO BE MOUNTED ON A PAY LOADER OR A HEAVY DUTY FORKLIFT TRUCK

(57) The present disclosure relates to an FIBC handling tool (10) arranged to be mounted on a pay loader or a heavy duty forklift truck (20) and for picking up three FIBC's (4a, 4b, 4c) which have a total width when placed next to another in a line which is bigger than the inner width (w1) of a trailer (1) with fixed outer walls (2) and a standard inner width, to transport these FIBC's to the trailer and to load these in the trailer. The FIBC handling tool comprises a central arm (12b) and two outer arms (12a, 12c) which are movably mounted towards and away from the central arm, and which each have a first length (l1), enabling the arms to pick-up a respective one of the three neighbouring FIBC's at a pick-up position, and wherein at least one arm has an adjustable length which is smaller or bigger than the first length, enabling to move the respective FIBC to a load position in which the three picked-up FIBC's are positioned in a V-configuration in which the two outer FIBC's are positioned at least partially before or behind the central FIBC, or in a slanted configuration in which the three FIBC's are placed in a row which is placed under a certain angle in view of the back wall of the trailer, in the trailer, and the outer arms are moved towards the central arm such that the three loaded FIBC's in the V-configuration or the slanted configuration have a total width which is smaller than the inner width of the trailer.

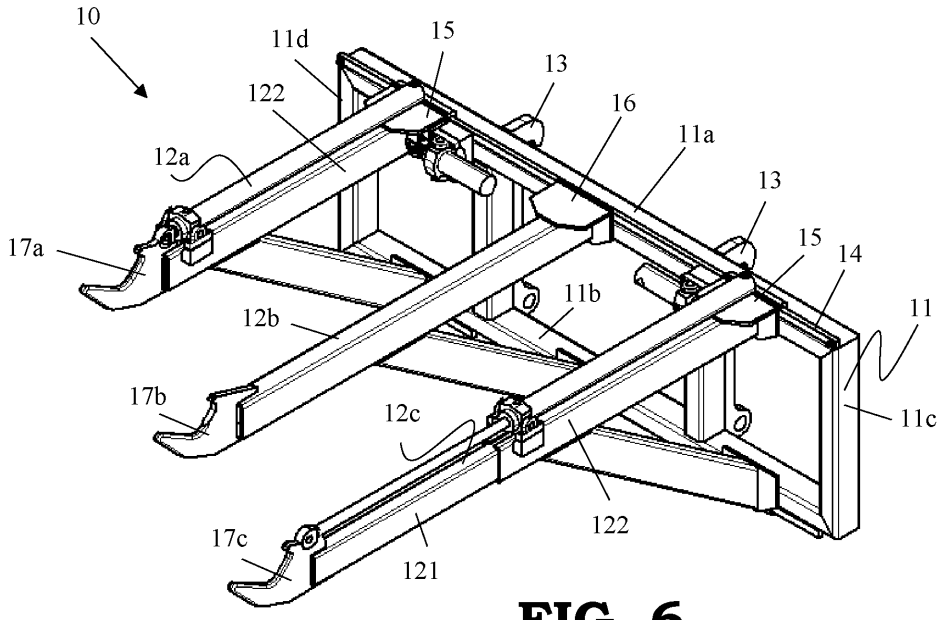

FIG. 6

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Description

Technical field

[0001] The present disclosure relates to a flexible intermediate bulk container (FIBC) handling tool arranged to be mounted on a pay loader or a heavy duty forklift truck and which is arranged for simultaneously picking-up three neighbouring FIBC's which are placed in a row, for simultaneously transporting these three picked-up FIBC's to a trailer with fixed outer walls and an inner width and for simultaneously loading three FIBC's in the trailer, wherein the three FIBC's have a total width when placed in a line next to one another which is bigger than the inner width of the trailer.

Background

[0002] Fertilizers are normally packed in FIBC's, also known as big bags, having a standard weight of 600 kg and having a diameter of 0.80 m. One of the possibilities to transport such FIBC's is by means of a truck with a trailer with fixed outer walls, such as for example a walking floor trailer. A trailer with fixed outer walls normally has an outer diameter of between 2.55 m and 2.65 m and an inner diameter of between 2.45 m and 2.55 m.

[0003] As is shown in figure 1, normally, in a trailer (1) with fixed outer walls having an inner diameter of between 2.45 m and 2.55 m, three FIBC's (3) with a standard diameter (d_1) of 0.80 m can be placed in a row next to one another. The trailer (1) is then filled with successive rows of three such FIBC's (3). This is hereafter called "a straight configuration".

[0004] To load the FIBC's (3) filled with fertilizer via the back (2b) of the trailer (1), different tools are known.

[0005] An example of such a tool is a loading pin which is mounted on the front of a forklift truck. This loading pin is able to pick up from one to up to three FIBC's. In case two or three FIBC's have been picked up by the loading pin, these are simultaneously transported towards the trailer and then loaded in the back of the trailer the one after the other in the length direction of the trailer. As such, the FIBC's can be loaded in the trailer to obtain the straight configuration as shown in figure 1.

[0006] Another example of such a tool consists of a multihook yoke which is provided with three hooks that are directly mounted in a fixed position on a frame which is arranged to mounted on the front of a payloader or a heavy duty forklift truck. This multihook yoke is arranged to simultaneously pick up three FIBC's from a storage pile of FIBC's that are placed next to one another. The picked-up FIBC's are then transported towards the trailer and simultaneously loaded in the back of the trailer with fixed walls to obtain the straight configuration as shown in figure 1.

[0007] There is however a need, for instance in the fertilizer business, to transport FIBC's (4) with weight bigger than 600 kg, more in particular starting from 750 kg to 1200 to 1250 kg or sometimes even more. Such FIBC's have a diameter which is bigger than 0.80 m. A 750 kg FIBC for instance normally has a diameter of 0.89 m, while FIBC's with a weight of 1000 kg or more usually have a diameter of more than 1 m (the maximum diameter being around 1.15 m). It is clear that it is not possible anymore to place the FIBC's (4) in the straight configuration as shown in figure 1 in the trailer (1) with an inner width of between 2.45 m and 2.55 m. Instead, a different configuration, hereafter called "a shifted configuration" has to be applied. An example of such a shifted configuration is shown in figure 2. To obtain such a configuration when loading three FIBC's simultaneously in the back of the trailer (1), the three FIBC's either need to be loaded in a V-configuration (as can be seen in figures 4a and 4b), in which per three FIBC's (4), two outer FIBC's (4a, 4c) are placed partially before or behind a central FIBC (4b), or in a slanted configuration (as can be seen in figures 5a and 5b), in which three FIBC's (4) are placed in a row which is placed under an angle (α) in view of the back wall (2a) of the trailer (1) (which is vertically extending since a trailer (11) always has a rectangular cross-section).

[0008] It is possible to use the loading pin as described above to obtain such a configuration, but then the FIBC's need to be picked up one by one and loaded one by one in the back of the trailer, which is very time consuming. The V- or slanted configuration cannot be obtained with such a loading pin.

[0009] Also with the known multihook yoke as described above, it is not possible to simultaneously load three picked up FIBC's in the V- or slanted configuration.

[0010] It is thus a goal of the present disclosure to provide an FIBC handling tool which can be placed on a payloader or a heavy duty forklift truck and which can simultaneously pick up three FIBC's with a total width when these are placed in a row next to one another with is more than the inner width of a trailer with fixed walls and a certain inner width, which can subsequently transport these to the trailer and thereafter drop these off in the trailer in a V- configuration or a slanted configuration in which the three FIBC's have a total width which is now smaller than the inner width of the trailer such that they still fit in an optimal way in the trailer.

Summary

[0011] According to a first aspect of the present disclosure, an FIBC handling tool arranged to be mounted on a pay loader or a heavy duty forklift truck and which is arranged for simultaneously picking-up three neighbouring FIBC's, for simultaneously transporting these three picked-up FIBC's to a trailer with fixed outer walls comprising at least a back wall, and comprising an inner width, and for simultaneously loading three FIBC's in the trailer, wherein the three neighbouring FIBC's when placed next to another in a straight line have a total width which is bigger than the inner width of the trailer, the FIBC han-

dling tool comprising

- a mounting system to mount the FIBC handling tool on the pay loader or the heavy duty forklift truck and comprising a cross-bar;
- a central arm which is arranged to pick-up, carry during transport and load a central FIBC, and two outer arms which each are arranged to pick-up, carry during transport and load an outer FIBC, which are movably mounted in view of the cross-bar towards and away from the central arm, and

    - which each have a first length, enabling the arms to pick-up a respective one of the three neighbouring FIBC's at a pick-up position, and
    - wherein at least one arm has an adjustable length which is smaller or larger than the first length, enabling to move the respective FIBC to a load position in which

        ◦ the three loaded FIBC's are rearranged in a V-configuration in which the two outer FIBC's are positioned at least partially before or behind the central FIBC, or in a slanted configuration in which the three FIBC's are placed in a row which is placed under a certain angle in view of the back wall of the trailer, in the trailer, and
        ◦ thereafter, the outer arms are moved towards the central arm thereby reducing the total width of the three FIBC's to a width smaller than the inner width of the trailer.

[0012] This FIBC handling tool allows that the trailer with fixed outer walls and a standard inner width can be loaded in an optimal and time efficient way still allowing the simultaneous loading of three neighbouring FIBC's in the trailer. Furthermore, the fact that the two outer arms are movable towards and away from the central arm allows that the same FIBC handling tool can be used to transport FIBC's with different diameters, which is practically not possible with the known solutions according to the prior art as described above since FIBC's are in principle always placed in contact with one another at all steps in the supply chain.

[0013] In a more particular embodiment of an FIBC handling tool according to the present disclosure, in the pick-up position, each of the arms have the same length such that three FIBC's which are placed in a line next to one another can be simultaneously picked up.

[0014] In an embodiment of an FIBC handling tool according to the disclosure, wherein at least two of the arms have an adjustable length which is bigger or smaller than the first length of the arms.

[0015] More in particular, the two outer arms have an adjustable length and the central arm has a fixed length.

[0016] In a particular embodiment of an FIBC handling tool according to the present disclosure, each of the arms is arranged with a hook at the front end of the arm which is arranged to pick-up, carry and drop-off the respective FIBC.

[0017] In a possible embodiment of an FIBC handling tool according to the present disclosure, the length of the one or more arms is adjustable by composing each of the arms out of at least two pieces that are movable with relation to one another.

[0018] In a more specific embodiment according to the present disclosure, the pieces of the one or more arms are slidably mounted with respect to one another.

[0019] More in particular, the one or more arms are composed out of two pieces, wherein a first one of the two pieces situated at the front end of the respective arm is arranged to slide inside a second one of the two pieces which is situated at the back end of the respective arm.

[0020] In an embodiment of an FIBC handling tool according to the present disclosure, the two outer arms are mounted in a slidable way towards and away from the central arm over a rail arranged on the cross-bar of the mounting system.

[0021] In an optional embodiment of an FIBC handling tool according to the present disclosure, each of the hooks are mounted in a pivotable way in a vertical direction in view of the respective arm.

[0022] In a particular embodiment of an FIBC handling tool according to the present disclosure, the pay loader or the heavy duty forklift truck is arranged with a hydraulic system which is arranged to provide energy for the movements of the one or more arms and/or hooks, and wherein the FIBC handling tool comprises a control unit which is arranged to direct the energy to the one or more arms and/or hooks to perform the necessary movement thereof.

[0023] According to another aspect of the present disclosure, a pay loader or heavy duty truck comprising an FIBC handling tool according to the present disclosure as described above is disclosed.

[0024] According to still another aspect of the present disclosure, a method is disclosed for simultaneously loading three flexible intermediate bulk containers (FIBC's) onto a trailer, which three FIBC's when placed next to another in a straight line, have a total width which is bigger than the inner width of the trailer, comprising the steps of:

- picking up the three neighbouring FIBC's with a pay loader or a heavy duty forklift truck;
- transporting the three FIBC's to the trailer, and;
- loading the three FIBC's onto the trailer;

wherein the method further comprises, after picking up and prior to loading the three FIBC's onto the trailer, the step of rearranging the position of the three FIBC's from a straight line next to one another to a V-configuration in which the two outer FIBC's are positioned at least partially before or behind the central FIBC, or in a slanted configuration in which the three FIBC's are placed in a row

which is placed under a certain angle, thereby reducing the total width of the three FIBC's to a width smaller than the inner width of the trailer.

[0025] In a particular method according to the present disclosure, an FIBC handling tool according to the present disclosure and as described above is used.

Description of the figures

[0026]

FIG. 1 shows a principle drawing of a cross section of a truck and a trailer with fixed outer walls and having a standard inner width, which is loaded with FIBC's with a standard width of 0.80 m in a straight configuration according to the prior art;

FIG. 2 shows a principle drawing of a cross section of a truck and a trailer with fixed outer walls having a standard width and being loaded with FIBC's having a total width when placed in a row being bigger than the inner width of the trailer and which are placed in a shifted configuration in the trailer;

FIG. 3 shows a principle drawing of an FIBC handling tool which is mounted on a payloader or a heavy duty forklift truck at the pick-up position in which all three arms have the same first length;

FIG. 4a shows a principle drawing of the FIBC handling tool as shown in FIG. 3 in which the two outer arms have a reduced length in view of the central arm and in which the three picked up FIBC's have been brought to a V-configuration having a total width which is smaller than the inner width of the trailer.

FIG. 4b shows a principle drawing of the FIBC handling tool as shown in FIG. 3 in which the two outer arms have a bigger length in view of the central arm and in which the three picked up FIBC's have been brought to another V-configuration in view of the V-configuration as shown in FIG. 4a, which other V-configuration has a total width which is smaller than the inner width of the trailer;

FIG. 5a shows a principle drawing of an FIBC handling tool as shown in FIG.3 in which the first outer arm has a bigger length and the second outer arm has a reduced length in view of the length of the central arm and in which the three picked up FIBC's have been brought to a slanted configuration having a total width which is smaller than the inner width of the trailer;

FIG. 5b shows a principle drawing of an FIBC handling tool as shown in FIG. 6 in which the first outer arm has a reduced length and the second outer arm has an extended length in view of the length of the central arm and in which the three picked up FIBC's have been brought to another slanted configuration in view of the slanted configuration as shown in FIG. 5b, this other slanted configuration having a total width which is smaller than the inner width of the trailer;

FIG. 6 shows a perspective top view of an FIBC handling tool according to the present disclosure.

FIG. 7 shows a top view of an FIBC handling tool as shown in FIG. 6.

Detailed description

[0027] The present disclosure relates to a flexible intermediate bulk container (FIBC) handling tool (10), as shown in FIGs 6 and 7, which is arranged to be mounted on (the front of) a pay loader or a heavy duty forklift truck (20) (see 3, 4a, 4b, 5a and 5b). In order to mount the FIBC handling tool (10) on the front of a pay loader or a heavy duty forklift truck (20) (as can be seen in figure 3), the FIBC handling tool (10) at least comprises a cross-bar (11b) which is provided with two mounting pins (13), as can be seen in figures 6 and 7. In the FIBC handling tool (10) according to the present disclosure, the cross-bar is an upper cross-bar (11b) forming part of a cross-frame (11). This cross-frame (11) more in particular has a rectangular shape and is further built up out of a lower cross-bar (11b) and a left and right side bar (11c, 11d).

[0028] As can be seen in figures 6 and 7, onto the upper cross-bar (11a), three arms, i.e. a central arm (12b) and two outer arms (12b, 12c), are mounted. The two outer arms (12b, 12c) are more in particular mounted in a movable way towards and away from the central arm (12b). In this embodiment of an FIBC handling tool (10) according to the present disclosure, the central arm (12b) is fixedly mounted on the upper cross-bar (11a). It could however also be possible to mount it in a movable way on the upper cross-bar (11a) (not shown in the figures). More in particular, as can be seen in figures 6 and 7, the upper cross-bar (11a) comprises a rail (14) onto which the two outer arms (12a, 12c) are slidably mounted towards and away from the central arm (12b), more in particular via a slidable mounting element (15) which can slide over the rail (14). In this embodiment of an FIBC handling tool (10) according to the present disclosure, the central arm (12b) is mounted on the upper cross-bar (11a) via a mounting element (16) which is fixedly connected to the upper cross-bar (11a). It would however also be possible to mount the central arm (12b) via a slidable mounting element which can slide over the rail (14) (not shown on the figures).

[0029] As can be seen in figures 6 and 7, each of the arms (12a, 12b, 12c) at the front end thereof is provided with a hook (17a, 17b, 17c) which has such a shape that it can pick-up an FIBC (4) out of a storage pile in the pick-up position, carry it during transportation towards the trailer (1) and then drop it off at the load position in the trailer (1). More in particular, the hooks (17a, 17b, 17c) are mounted in a pivotable way in a vertical direction in view of the respective arm (12a, 12b, 12c) onto which it is mounted.

[0030] One or more of the three arms (12a, 12b, 12c) have a length (l_2, l_3, l_4) which is adjustable and which is

smaller or bigger than a first length (l_1) of the respective arm (12a, 12b, 12c) in the pick-up position, such that the arms (12a, 12c) and consequently also the FIBC's (4) which these arms (12a, 12c) are carrying can be brought from the pick-up position to a load position in which the FIBC's (4) are arranged in a V-configuration as shown in figures 4a and 4b or in a slanted configuration as shown in figures 5a and 5b. In the FIBC handling tool (10) according to the present disclosure, two arms, i.e. the outer two arms (12a, 12c) have an adjustable length and the central arm (12b) has a fixed length. This however does not take away the possibility to provide for other configurations in which for instance one of the outer arms (12a, 12c) and the central arm (12b) has an adjustable length and the other one of the outer arms (12c, 12a) has a fixed length (not shown on the figures).

[0031] The FIBC handling tool (10) according to the present disclosure is arranged to pick-up, carry during transport and drop-off three FIBC's (4) which have a diameter (d_2) which is such that, when these three FIBC's (4) are placed in a straight line (row) next to one another, the total width (w_2) of these three neighbouring FIBC's (4) is more than the inner width (w_1) of the trailer (1). As already mentioned above, the standard inner width (w_1) of a trailer with fixed outer walls is between 2.45 m and 2.55 m. When three FIBC's (4) which are placed in a row adjacent to one another have a total width (w_2) which is bigger than the inner width (w_1) of the trailer, they cannot loaded anymore in the trailer (1) in the straight configuration of the prior art, as is as shown in figure 1, but need to be placed in a different "shifted" configuration, of which an example is shown in figure 2. If such FIBC's (4) with a bigger diameter (d_2) then the diameter (d_1) of FIBC's (3) according to the prior art as described above would be forced to be placed in the straight configuration according to the prior art in the trailer (1), the FIBC's could get damaged since they would then be subject to friction between the FIBC's (4) and also between the FIBC's and the inner wall(s) (2) of the trailer (1).

[0032] As can be seen in figures 4a and 4b and figure 2, the shifted configuration as shown in figure 2 can be obtained by loading consecutive rows of three picked-up FIBC's (4a, 4b, 4c) in the trailer (1) in a V-configuration (options I and II as indicated in figure 2).

[0033] The V-configuration can be obtained in two ways. A first possibility is to place the central FIBC (4b) partially behind the two outer FIBC's (4a, 4c) (see figure 4a and option II as indicated in figure 2). A second possibility is to place the central FIBC (4b) partially in front of the two outer FIBC's (4a, 4c) (see figure 4b and option I as indicated in figure 2). When the V-configuration as shown in option I as indicated in figure 2 is chosen to fill up the trailer (1), then two additional FIBC's (4d, 4e) are loaded partially before the central FIBC (4b) of the last V of three FIBC's (4a, 4b, 4c) which was loaded in the trailer (1). When the V-configuration as shown in option II as indicated in figure 2 is chosen to fill up the trailer (1), then first two additional FIBC's (4f, 4g) are loaded partially behind the central FIBC (4b) of the first V of three FIBC's (4a, 4b, 4c) which will be loaded thereafter. The additional FIBC's (4d, 4e) are more in particular loaded one by one using the FIBC handling tool according to the present disclosure.

[0034] As can be seen in figure 4a, to obtain the V-configuration as shown in option II as indicated in figure 2, the two outer arms (12a, 12c) need to have a second length (l_2) which is smaller than the first length (l_1) of the central arm (4b). The second length (l_2) more in particular is the same for both outer arms (4a, 4c). In the V-configuration as shown in figure 4b or option I as indicated in figure 2, the two outer FIBC's (4a, 4c) are placed partially behind the central FIBC (4b). To obtain this configuration, the two outer arms (12a, 12c) need to have a second length (l_2) which is more than the first length (l_1) of the central arm (12b). Also here, the second length (l_2) is the same for both outer arms (4a, 4c).

[0035] As can be seen in figures 5a and 5b and figure 2, the shifted configuration as shown in figure 2 can also be obtained by loading consecutive rows of three picked up FIBC's (4a, 4b, 4c) in a slanted configuration in the trailer (1). To obtain this slanted configuration, the three picked up FIBC's (4) are placed in a row which is oriented under a certain angle (α) in view of the (vertically extending) back wall (2a) of the trailer (1). The angle (α) is for instance 30°.

[0036] In the slanted configuration as shown in figure 5a and option III as indicated in figure 2, the row of three FIBC's (4a, 4b, 4c) is oriented under an angle (α) away from the back wall (2a) of the trailer (1). In other words, the first outer FIBC (4a) is situated closest to the back wall (2a) of the trailer (1), then the central FIBC (4b), and then the second outer FIBC (4c) which is situated furthest from the back wall (2a) of the trailer (1). As can be seen in figure 2 and figure 5a, the first outer FIBC (4a) is located partially behind the central FIBC (4b) which in its turn is situated partially behind the second outer FIBC (4c). To obtain this slanted configuration, the first outer arm (12a) has a third length (l_3) which is more than the first length (l_1) of the central arm (12b) which in its turn is more than the fourth length (l_4) of the second outer arm (12c).

[0037] In the slanted configuration as shown in figure 5b and option IV as indicated in figure 2, the row of three FIBC's (4a, 4b, 4c) is oriented under an angle (α)towards the back wall (2a) of the trailer (1). In other words, the first outer FIBC (4a) is situated furthest from the back wall (2) of the trailer (1), then the central FIBC (4b) and then the second outer FIBC (4c) which is situated closest to the back wall (2a) of the trailer (1). To obtain this slanted configuration, the first outer arm (12a) has a third length (l_3) which is less than the first length (l_1) of the central arm (12b) which in its turn is less than the fourth length (l_4) of the second outer arm (12c).

[0038] When the slanted configuration as shown in option III as indicated in figure 2 is chosen to fill up the trailer (1), then a first additional FIBC (4g) is loaded partially behind the central FIBC (4b) of the first row of three

FIBC's (4a, 4b, 4c) which will be loaded thereafter in the trailer (1), and a second additional FIBC (4d) is loaded partially in front of the central FIBC (4b) of the last row of three FIBC's (4a, 4b, 4c) which was loaded in the trailer (1). When the slanted configuration as shown in option IV as indicated in figure 2 is chosen to fill up the trailer (1), then a first additional FIBC's (4f) is loaded partially behind the central FIBC (4b) of the first row of three FIBC's (4a, 4b, 4c) which will thereafter be loaded in the trailer (1), and a second additional FIBC (4e) is loaded partially in front of the central FIBC (4b) of the last row of three FIBC's (4a, 4b, 4c) which was loaded in the trailer (1). The additional FIBC's (4d, 4e) are more in particular loaded one by one using the FIBC handling tool according to the present disclosure.

[0039] To have an adjustable length, the respective arms, in this embodiment as shown in figures 6 and 7 the two outer arms (12a, 12c), are composed of two or more pieces (121, 122) which are movably arranged with respect to one another (as can be seen in figures 4 and 5). More in particular, the respective arms (12a, 12c) are composed of two pieces (121, 122) which are movably arranged with respect to one another in a slidable way. More in particular, a first one of the two pieces (121) situated at the front end of each of the arms (12a, 12c) is arranged to slide in and out the inside of the second piece (122) situated at the back end of each of the arms (12a, 12c). Another embodiment would be that the first one of the two pieces (121) slides over the other one of the two pieces (122) towards and away from the cross-frame (11) (not shown in the figures).

[0040] The movement of the two pieces (121, 122) of the arms (12a, 12c) with an adjustable length in view of each other and the movement of the two outer arms (12a, 12c) towards and away from each other is more in particular controlled by a control unit (not shown in the figures) which is part of the FIBC handling tool (10) and which receives its energy to perform the movements from a hydraulic system of the pay loader or heavy duty forklift truck (20). Normally, for each of the movements, a hydraulic connection is necessary. This means that, if one would like to perform all necessary movements of the FIBC handling tool (10) in a hydraulic way, at a minimum three hydraulic loops are necessary, i.e. one to move the two pieces (121, 122) of the arms (12a, 12c) out of one another, one to move the two pieces (121, 122) of the arms (12a, 12c) in one another and one to move the two outer arms (12a, 12c) towards the central arm (12b), or 6 hydraulic connections would be necessary. A payloader or heave duty forklift truck (20) however does not have that many hydraulic connections. Therefore, the FIBC handling tool (10) according to the present disclosure is provided with a control unit (not shown on the figures), which more in particular is arranged with an electrical control, which divides the present energy from the hydraulic system of the payloader or the heavy duty forklift truck (20) in a correct way towards the hydraulic cylinders that are responsible for the different movements.

[0041] The total width of the FIBC handling tool (10) is approximately 2 meter and the maximum length of the arms (11a, 11c) with an adjustable length is also 2 meter.

[0042] A method for simultaneously loading three FIBC's (4a, 4b, 4c) onto a trailer (1), which three FIBC's (4a, 4b, 4c) when placed next to another in a straight line, have a total width (w_2) which is bigger than the inner width (w_1) of the trailer (1), comprises the steps of:

- picking up the three neighbouring FIBC's (4a, 4b, 4c) with a pay loader or a heavy duty forklift truck (20);
- transporting the three picked-up FIBC's (4a, 4b, 4c) to the trailer (1), and;
- loading the three FIBC's (4a, 4b, 4c) onto the trailer (1).

The method further comprises, after picking up and prior to loading the three FIBC's (4a, 4b, 4c) onto the trailer (1), the step of rearranging the position of the three FIBC's (4a, 4b, 4c) from a straight line next to one another to a V-configuration in which the two outer FIBC's (4a, 4c) are positioned at least partially before or behind the central FIBC (4b), or in a slanted configuration in which the three FIBC's are placed in a row which is placed under a certain angle (α), thereby reducing the total width of the three FIBC's to a width smaller than the inner width (w_1) of the trailer (1).

[0043] Normally, FIBC's (4) are stored in a warehouse in a storage pile consisting of successive rows, each row of FIBC's (4) consisting of FIBC's (4) placed the one next to the other in a line, and optionally consisting of up to 5 layers of FIBC's (4) stacked upon each other. To pick up three neighboring FIBC's (4) out of a storage pile, the three arms (12a, 12b, 12c) need to have the same first length (l_1). In the embodiment of an FIBC handling tool (1) according to the present disclosure, the two outer arms (12a, 12c) need to have the same length (l_1) as the fixed length (l_1) of the central arm (12b) (see figure 3).

[0044] When the picked up FIBC's now need to be brought to a V-configuration (as shown in figures 4a and 4b) to load them in the trailer (1), then the length of two outer arms (12a, 12c), which now carry the picked up FIBC's, is reduced to the same second length (l_2) which is smaller than the first length (l_1) of the central arm (12b), as can be seen in figure 4a, or is enlarged to the same second length (l_2) which is bigger than the first length (l_1) of the central arm (12b), as can be seen in figure 4b. Once the two outer arms (12a, 12c) have the appropriate second length (l_2), the two outer arms (12a, 12c) are subsequently moved towards the central arm (12b), such that the total width (w_2) of the three FIBC's is smaller than the inner width (w_1) of the trailer (1). The three FIBC's (4) can then be loaded in the trailer (1).

[0045] When the picked up FIBC's need to be brought to a slanted configuration (as shown in figures 5a and 5b), then the length of one of the two outer arms (12a, 12c) is enlarged, while the length of the other outer arm (12a, 12c) is reduced. In the slanted configuration as

shown in figure 5a, the length of the first outer arm (12a) is enlarged to a third length (l_3) which is bigger than the first length (l_1) of the central arm (12b), while the length of the other outer arm (12c) is reduced to a fourth length (l_4) which is smaller than the first length (l_1) of the central arm (12c). The three FIBC's (4a, 4b, 4c) are now placed in a row again but which is under an angle (α) in view of the (vertically extending) back wall (2a) of the trailer (1) (see figure 2). The row of three FIBC's (4) is here inclined towards the back wall (2a) of the trailer (1). In the slanted configuration as shown in figure 5b, the length of the first outer arm (12a) is enlarged to a third length (l_3) which is smaller than the first length (l_1) of the central arm (12b), while the length of the other outer arm (12c) is reduced to a fourth length (14) which is smaller than the first length (l_1) of the central arm (12b). The row of three FIBC's (4) is then inclined under an angle (α) away from the back wall (2) of the trailer (1). Also here, the outer two arms (12a, 12c) are subsequently moved towards the central arm (12b) such that the total width (w_2) of the three FIBC's (4) is smaller than the inner width (w_1) of the trailer (1). The three picked-up FIBC's (4) can then be dropped off in the load position in the trailer (1).

[0046] When the FIBC handling tool (10) now needs to pick up the next three FIBC's (4) out the row of FIBC's (4) in the warehouse, the two outer arms (12a, 12c) are moved away again from the central arm (12b) to their original pick up position and the length of the outer arms (12a, 12c) is adjusted again to the first length (l_1) thereof.

Claims

1. A flexible intermediate bulk container (FIBC) handling tool arranged to be mounted on a pay loader or a heavy duty forklift truck and which is arranged for simultaneously picking-up three neighbouring FIBC's, for simultaneously transporting these three picked-up FIBC's to a trailer with fixed outer walls comprising at least a back wall, and comprising an inner width, and for simultaneously loading three FIBC's in the trailer, wherein the three neighbouring FIBC's when placed next to another in a straight line have a total width which is bigger than the inner width of the trailer, the FIBC handling tool comprising

- a mounting system to mount the FIBC handling tool on the pay loader or the heavy duty forklift truck and comprising a cross-bar;
- a central arm which is arranged to pick-up, carry during transport and load a central FIBC, and two outer arms which each are arranged to pick-up, carry during transport and load an outer FIBC, which are movably mounted in view of the cross-bar towards and away from the central arm, and

  • which each have a first length, enabling the arms to pick-up a respective one of the three neighbouring FIBC's at a pick-up position, and

  • wherein at least one arm has an adjustable length which is smaller or larger than the first length, enabling to move the respective FIBC to a load position in which

    ◦ the three loaded FIBC's are rearranged in a V-configuration in which the two outer FIBC's are positioned at least partially before or behind the central FIBC, or in a slanted configuration in which the three FIBC's are placed in a row which is placed under a certain angle in view of the back wall of the trailer, in the trailer, and

    ◦ thereafter, the outer arms are moved towards the central arm thereby reducing the total width of the three FIBC's to a width smaller than the inner width of the trailer.

2. An FIBC handling tool according to claim 1, wherein in the pick-up position, each of the arms have the same length such that three FIBC's which are placed in a line next to one another can be simultaneously picked up.

3. An FIBC handling tool according to claim 1 or 2, wherein at least two of the arms have an adjustable length which is larger or smaller than the first length of the arms.

4. An FIBC handling tool according to claim 3, wherein the two outer arms have an adjustable length and the central arm has a fixed length.

5. An FIBC handling tool according to any one of claims 1 to 4, wherein each of the arms is arranged with a hook at the front end of the arm which is arranged to pick-up, carry and drop-off the respective FIBC.

6. An FIBC handling tool according to any one of claims 1 to 5, wherein the length of the one or more arms is adjustable by composing each of the arms out of at least two pieces that are movable with relation to one another.

7. An FIBC handling tool according to claim 6, wherein the pieces of the one or more arms are slidably mounted with respect to one another.

8. An FIBC handling tool according to claim 7, wherein the one or more arms are composed out of two pieces, wherein a first one of the two pieces situated at the front end of the respective arm is arranged to slide inside a second one of the two pieces which is

situated at the back end of the respective arm.

9. An FIBC handling tool according to any one of claims 1 to 8, wherein the two outer arms are mounted in a slidable way towards and away from the central arm over a rail arranged on the cross-bar of the mounting system.

10. An FIBC handling tool according to any one of claims 1 to 9, wherein each of the hooks are mounted in a pivotable way in a vertical direction in view of the respective arm.

11. An FIBC handling tool according to any one of claims 1 to 10, wherein the pay loader or the heavy duty forklift truck is arranged with a hydraulic system which is arranged to provide energy for the movements of the one or more arms and/or hooks, and wherein the FIBC handling tool comprises a control unit which is arranged to direct the energy to the one or more arms and/or hooks to perform the necessary movement thereof.

12. A pay loader or a heavy duty truck comprising an FIBC handling tool according to any one of the preceding claims.

13. Method for simultaneously loading three flexible intermediate bulk containers (FIBC's) onto a trailer, which three FIBC's when placed next to another in a straight line, have a total width which is bigger than the inner width of the trailer, comprising the steps of:

- picking up the three neighbouring FIBC's with a pay loader or a heavy duty forklift truck;
- transporting the three FIBC's to the trailer, and;
- loading the three FIBC's onto the trailer;

wherein the method further comprises, after picking up and prior to loading the three FIBC's onto the trailer, the step of rearranging the position of the three FIBC's from a straight line next to one another to a V-configuration in which the two outer FIBC's are positioned at least partially before or behind the central FIBC, or in a slanted configuration in which the three FIBC's are placed in a row which is placed under a certain angle, thereby reducing the total width of the three FIBC's to a width smaller than the inner width of the trailer.

14. Method according to claim 13, wherein an FIBC handling tool according to any one of claims 1 to 11 is used.

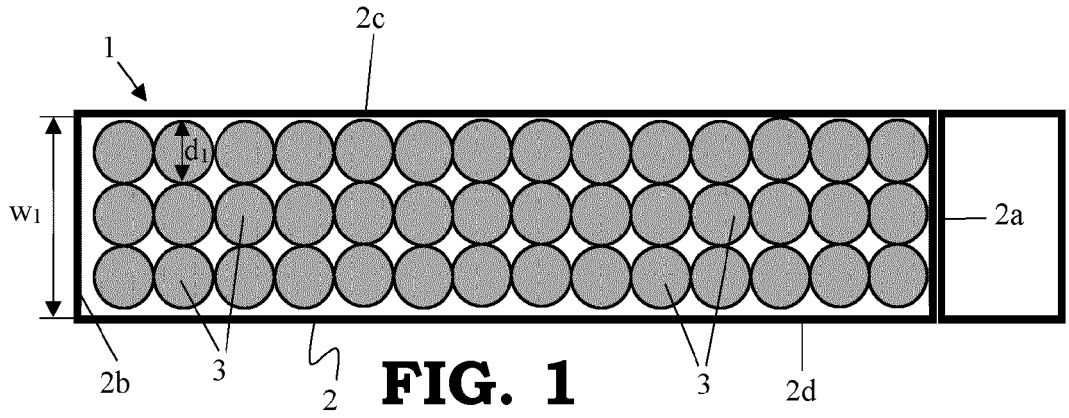

FIG. 1

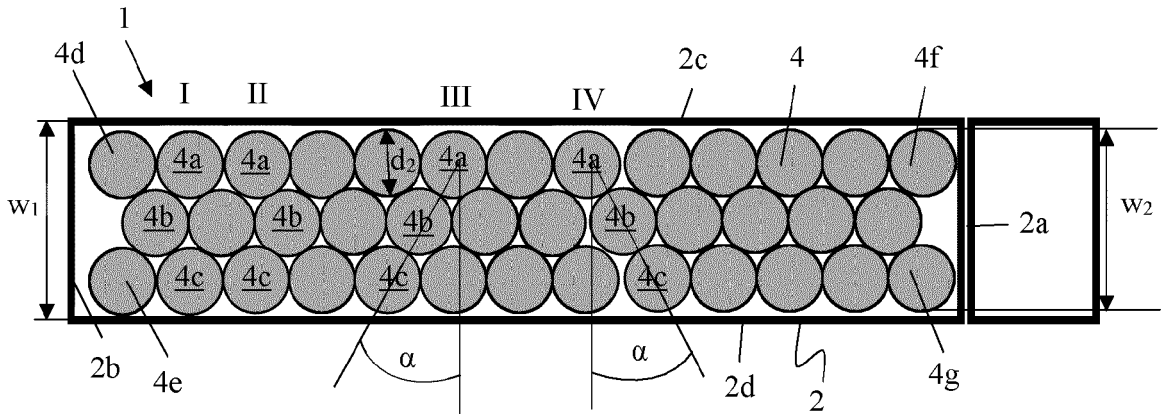

FIG. 2

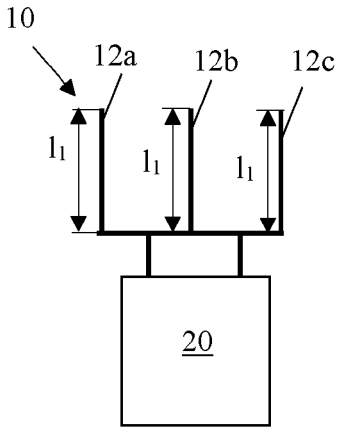

FIG. 3

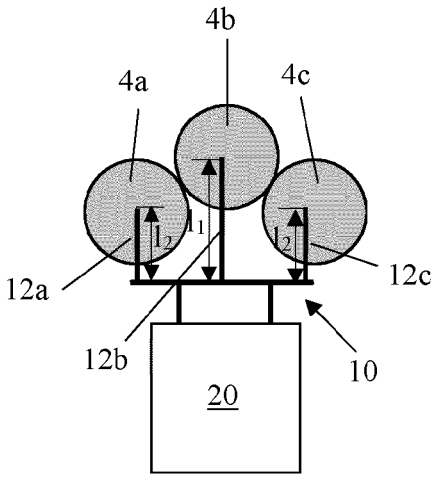

FIG. 4a

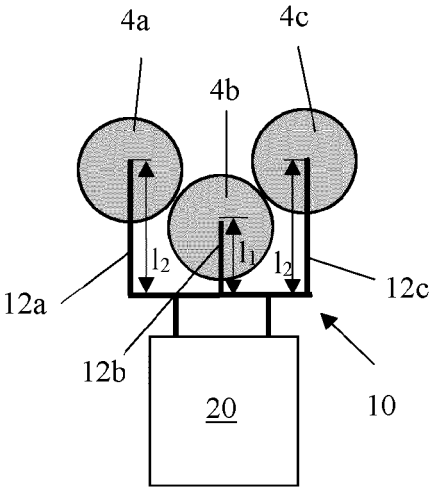

FIG. 4b

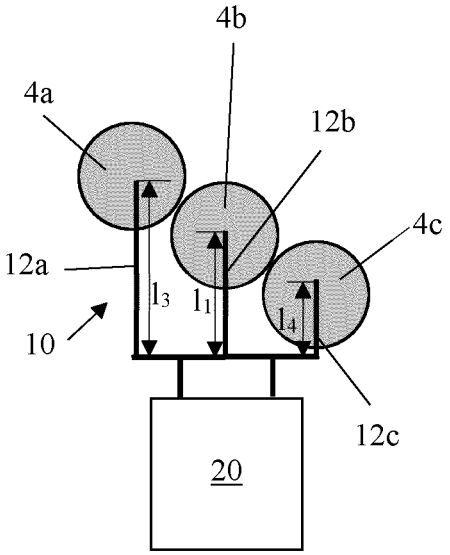

FIG. 5a

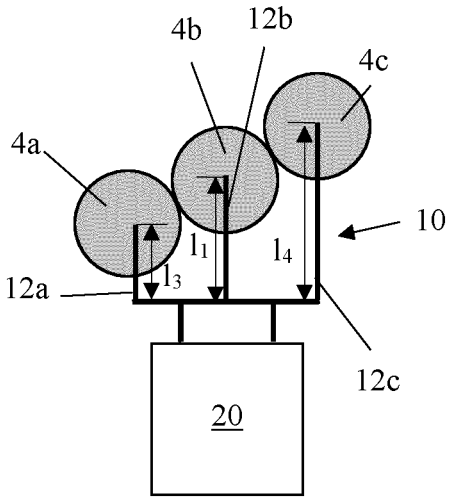

FIG. 5b

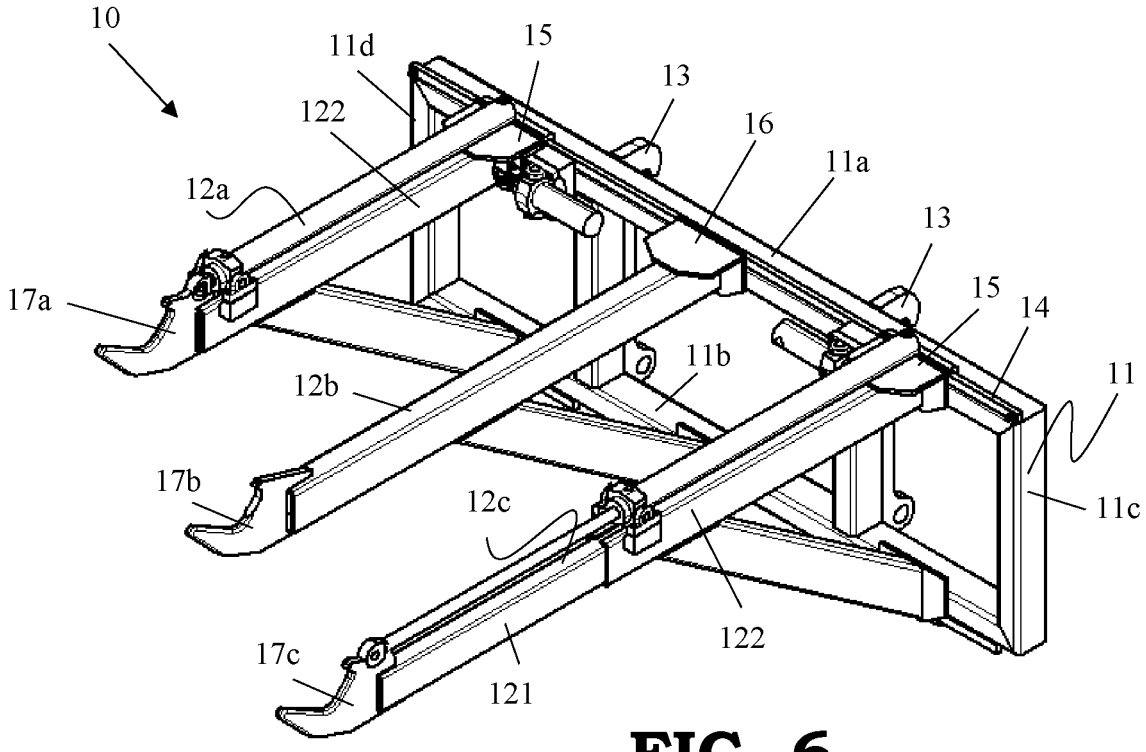

FIG. 6

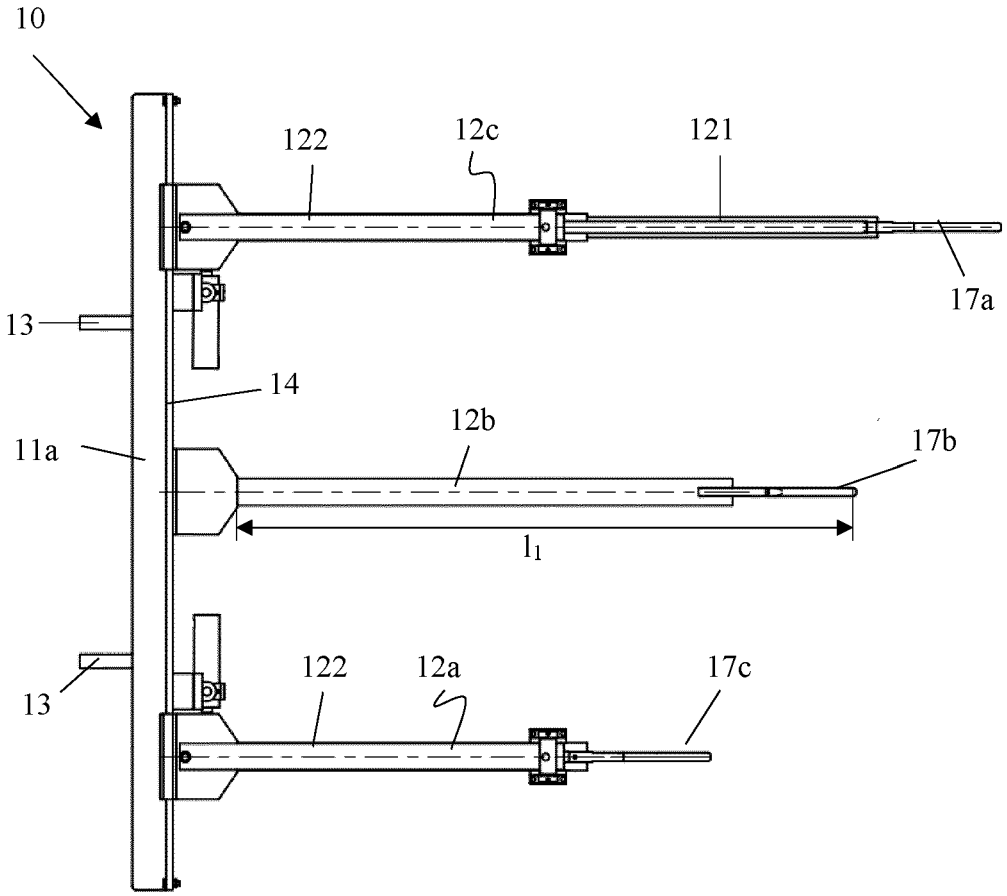

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 7230

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 2009 274775 A (SHINTO UNYU KK) 26 November 2009 (2009-11-26) * abstract * * figures *	1,13	INV. B66F9/12 B66C1/22 B66F9/14 B65G67/02
A	REITEMEYER D: "FLEXIBLE SCHUETTGUT-CONTAINER: TRANSPORTMITTEL ZWISCHEN SILO UND SACK", F+H FORDERN UND HEBEN,, vol. 42, no. 7, 1 July 1992 (1992-07-01), pages 554-558, XP000296881, ISSN: 0341-2636 * page 2, last paragraph * * figure 2 *	1,13	
A	JP S57 135599 U (SEKISUI KASEI KK) 24 August 1982 (1982-08-24) * abstract * * figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B66F
B66C
B65D
B65G
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 November 2021	Sheppard, Bruce

CATEGORY OF CITED DOCUMENTS

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19-11-2021

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JP S57135599 U	24-08-1982	NONE	

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