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(54) **METHOD FOR TRANSPORTING ASPHALT AND ASPHALT CONTAINER**

(57) The invention relates to a method for transporting asphalt from an asphalt plant for producing asphalt to an asphalt paver for applying asphalt to a road surface, and an asphalt container. The asphalt container is elongate and insulated. One of the longitudinal ends of the asphalt container is provided with a filling/discharge port. During filling in the asphalt plant, the asphalt container is at an angle or vertical to the longitudinal end, which is provided with the filling/discharge port on the high side. During discharging of asphalt in the asphalt paver, the asphalt container is at an angle to the longitudinal end, which is provided with the filling/discharge port on the low side.

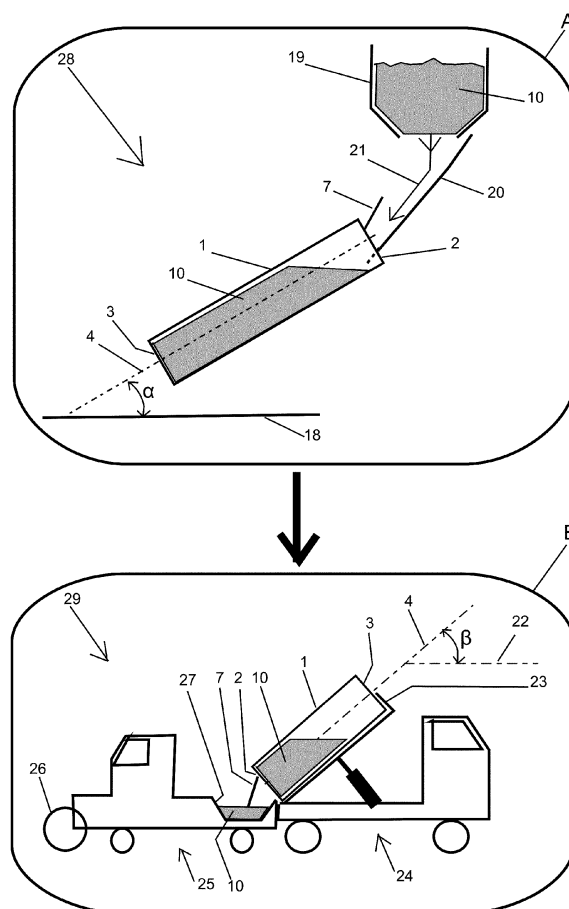


Fig. 2

Description

[0001] The present invention relates to the transportation of asphalt from an asphalt plant to an asphalt paver.

[0002] According to the invention, the term asphalt is to be understood as referring to a mixture comprising:

- mineral aggregate, and
- bitumen as a binding agent

which mixture is used in road construction for producing a road surface. According to the invention, this mixture may comprise still further constituents, such as recycled asphalt granules, fillers and additives.

[0003] According to the invention, an asphalt plant is to be understood as referring to an installation in which the asphalt is produced by mixing mineral aggregates and optionally recycled asphalt granules with heated bitumen.

[0004] According to the invention, an asphalt paver is to be understood as referring to a device by means of which the asphalt, optionally after a treatment in this device, is laid when producing a road surface.

[0005] Where this application uses the terms 'insulated' or 'insulation', these are understood to refer to 'thermally insulated' and 'heat insulation', respectively, in order to prevent cooling down of the asphalt.

Prior art

[0006] In general, asphalt is collected from the asphalt plant by means of lorries with an insulated tipper body and driven to the road construction site. The tipper body is elongate and is in a horizontal position when the asphalt is being collected from the asphalt plant. At the top, the tipper body is provided with two hatches, each of which extend along the entire length of the tipper body and are hingedly attached to one of the longitudinal walls of the tipper body. In order to load asphalt at the asphalt plant, the hatches are opened, the tipper body is driven to a position below a storage silo and hot asphalt is poured from the storage silo into the horizontal tipper body. Subsequently, the hatches are closed and the lorry drives to the road construction site. When it arrives at the road construction site, the tipping lorry is situated near the asphalt paver. In this case, the rear side of the tipping lorry is turned towards the supply side of the asphalt paver. At its rear end, the tipper body is provided with a discharge hatch. The tipper body is tilted at an angle in the tipping position in order to discharge the asphalt into the asphalt paver via the discharge hatch at the rear end of the tipper body. After the tipper body has been emptied, the lorry drives back to the asphalt plant to pick up a new load of asphalt and a subsequent lorry with a full tipper body is positioned on the supply side of the asphalt paver. This lorry empties its tipper body into the asphalt paver, drives back to the asphalt plant for a next load and yet another lorry with a full tipper body is positioned on the supply side of the asphalt paver, etc.

[0007] With this known method of supplying asphalt from the asphalt plant to the asphalt paver, there is a constant coming and going of lorries to supply asphalt while the asphalt paver is in use. The coming and going of the lorries takes place on the public road. In order to prevent the asphalt from cooling down between leaving the asphalt plant and being processed by the asphalt paver, on the one hand, the tipper bodies are insulated and, on the other hand, the tipper bodies are emptied as quickly as possible into the asphalt paver. During rush hour, this coming and going is seriously hampered by the other traffic. Furthermore, the coming and going of the lorries seriously hampers the other traffic, both during rush hour and outside rush hour. For these reasons, asphaltting work generally takes place at night.

[0008] In order to prevent asphalt from cooling down during transportation from the asphalt plant to the asphalt paver, it is furthermore known to provide heating means in or on the asphalt container, by means of which the asphalt is heated up in the meantime. However, this requires a large amount of energy and heating the asphalt may furthermore adversely affect the quality of the asphalt.

[0009] It is furthermore known to prevent asphalt from cooling down during transportation from the asphalt plant to the asphalt paver and to reduce the nuisance to the other traffic by providing the asphalt plants close to the road construction site. This is the reason why the Netherlands currently has more than 50 asphalt plants which represent a significant amount of capital investment.

[0010] NL-C-1008690 discloses a method for transporting asphalt from the asphalt plant to the asphalt paver, in which several asphalt containers are filled horizontally at an asphalt plant, are transported to the asphalt paver horizontally and are emptied there at an angle. By transporting several containers simultaneously, nuisance is reduced. In order to ensure a more efficient return journey of empty asphalt containers, NL-C-1008690 proposes to place relatively small asphalt containers inside relatively large asphalt containers, which means that the asphalt containers are of a conventional type and have hatches or a cover on the upper side.

The invention

[0011] It is an object of the present invention to provide an alternative method for transporting asphalt from an asphalt

plant to an asphalt paver and an asphalt container. It is a further object of the invention for the method and/or asphalt container according to the invention to make it possible to at least partly overcome one or more of the abovementioned drawbacks of the prior art.

[0012] One or more of the aforementioned objects are achieved according to the invention by providing a method for transporting asphalt from an asphalt plant for producing asphalt to an asphalt paver for applying asphalt on a road surface; wherein use is made of at least one elongate, insulated asphalt container; wherein the elongate shape of the asphalt container defines a first longitudinal end and a second longitudinal end and a longitudinal centre axis extends between the first longitudinal end and the second longitudinal end; wherein the asphalt container comprises a filling/discharge port which is configured for filling the asphalt container with asphalt, on the one hand, and for discharging asphalt from the asphalt container, on the other hand, which filling/discharge port is provided in the first longitudinal end of the asphalt container; and wherein the method comprises the following steps:

Step A: In an asphalt plant, filling the at least one asphalt container with asphalt via its filling/discharge port, while the longitudinal centre axis of the asphalt container is at a filling angle with respect to the horizontal during filling in such a way that, viewed in a vertical direction, the first longitudinal end (comprising the filling/discharge port) is higher than the second longitudinal end;

Step E: Discharging asphalt from the asphalt container into an asphalt paver via the filling/discharge port, while the longitudinal centre axis of the asphalt container is at a discharging angle with respect to the horizontal during discharging in such a way that, viewed in vertical direction, the first longitudinal end (comprising the filling/discharge port) is lower than the second longitudinal end.

[0013] By filling the elongate asphalt container, which is used to transport asphalt horizontally, in the asphalt plant via one of the longitudinal ends while the longitudinal centre axis of the asphalt container is at an angle or vertical, it becomes possible to significantly reduce the heat losses of the asphalt during transportation. The hatches which are conventionally provided on the long upper side of an asphalt container and which usually extend along the entire length of the asphalt container, are no longer required and may be omitted or may be permanently closed. It then becomes possible to insulate this upper side of the asphalt container seamlessly and completely without any interruption, as there are no hatches which have to be opened.

[0014] By means of the method according to the invention, it is possible to further reduce heat losses since only one port suffices for the asphalt container with the method according to the invention, in this application referred to as 'filling/discharge port', which is used both for filling the asphalt container and emptying the asphalt container. Conventional asphalt containers for horizontal transportation have 2 ports, namely a filling port in the form of filling hatches on the upper side and a discharge port in the form of a discharge hatch at a longitudinal end.

[0015] With the method according to the invention, it is thus possible to significantly reduce heat leaks, optionally using insulation. The insulation to be used with an asphalt container according to the invention may be of various types. Thus, it is conceivable to use insulating materials or insulation systems such as those which are already known with conventional asphalt containers, such as those known from other techniques or such as are still to be developed. What is important is the fact that whichever insulation is used with an asphalt container according to the invention, this insulation can be much more efficient as a result of the method according to the invention because heat losses can be significantly reduced due to the fact that, on the one hand, the filling hatches provided on the elongate upper side of conventional asphalt containers are no longer required and, on the other hand, the number of ports required for filling and emptying can be reduced to just one.

[0016] Filling the elongate asphalt container in an angled or vertical position furthermore means that much less air is trapped in the asphalt container. Air trapped in the asphalt container results in a deterioration in the quality of the asphalt during transportation and also means that effectively less asphalt can be carried along in each asphalt container.

[0017] In accordance with a further embodiment of the method according to the invention, during filling in step A, the filling angle is in the range from 25° to 90°, more particularly in the range from 25° to 45° or in the range from 60° to 90°. At these filling angles, an asphalt container can be filled in a satisfactory and efficient manner.

[0018] In accordance with a further embodiment of the method according to the invention, during filling in step A, the filling angle is in the range from 25° to 30° or in the range from 35° to 45°. At these filling angles, asphalt containers having a length of circa 6 m can be filled in a satisfactory and efficient manner from and below a conventional dispensing silo in an asphalt plant.

[0019] In accordance with a further embodiment of the method according to the invention, the longitudinal centre axis may be substantially vertical during filling in step A.

[0020] In accordance with a further embodiment of the method according to the invention, during filling in step A, the asphalt may be poured into the asphalt container on account of gravity in such a way from, for example, a storage silo at the asphalt plant. According to the invention, the term pouring is to be understood as meaning that, due to its weight, the asphalt will automatically drop from, for example, the storage silo into the asphalt container.

[0021] In accordance with a further embodiment of the method according to the invention, prior to step A, the asphalt container is brought from a horizontal position, in which the longitudinal centre axis runs substantially horizontally, to an angled or vertical position, in which the longitudinal centre axis is at said filling angle with respect to the horizontal. Prior to filling, the asphalt container will usually be stored in a horizontal position on the site of the asphalt plant or be situated on a vehicle in a horizontal position.

[0022] In accordance with a further embodiment of the method according to the invention, the filled asphalt container is sealed in an airtight manner at the asphalt plant after filling. By sealing the asphalt in an airtight manner, it will be subjected to processes requiring oxygen, nitrogen or other constituents of air to a lesser degree, or even not at all, during the time it is inside the asphalt container. This greatly benefits the quality of the asphalt in the asphalt container. With conventional asphalt containers which have hatches in the upper side of the asphalt container, no airtight sealing is carried out.

[0023] Due to the fact that, with the method according to the invention, the insulation of the asphalt container is much more efficient, it is possible, in accordance with a further embodiment of the invention, to keep a number of the asphalt containers filled in step A in store near or at the asphalt plant after filling for a time period of at least 2 hours, such as at least 4 hours. Before the filled asphalt container leaves the asphalt plant, it may thus have been kept in store on the site of the asphalt plant for 2 hours or more. The reduced heat losses which the method according to the invention allows, makes it possible to store a filled asphalt container for up to 48 hours. In accordance with yet another further embodiment of the method according to the invention, a number of the asphalt containers filled in step A may be kept in store near or at the asphalt plant after filling for a time period of 2 to 24 hours or longer, such as at least 4 to 24 hours or longer.

[0024] In accordance with a further embodiment of the method according to the invention, the asphalt may be poured from the asphalt container into the asphalt paver during discharging in step E on account of the gravity. In this case, pouring is understood to mean that the asphalt, due to its weight, comes out of the asphalt container which is at a discharging angle and drops into the asphalt paver when the filling/discharge port is open.

In accordance with a further embodiment of the method according to the invention, the discharging angle during discharging in step E may be in the range of 20° to 90°, more particularly of 30° to 70°.

[0025] Due to the fact that the method according to the invention makes it possible to produce an asphalt container with improved insulation, the asphalt contained therein will cool down less rapidly, making it possible for the asphalt plant to be situated at a relatively great distance from the road construction site. In accordance with a further embodiment of the method according to the invention, the method according to the invention may furthermore comprise a step B, which is performed after step A and before step E, wherein step B comprises transporting the at least one filled asphalt container obtained in step A from the asphalt plant to a road construction site by means of a transport means while the longitudinal centre axis is in a horizontal position. During transporting, the asphalt container will be transported in particular horizontally. The longitudinal centre axis of the asphalt container is then substantially parallel to the direction of transportation which - assuming the road is level - is substantially horizontal.

[0026] According to a more detailed embodiment of the method according to the invention with a step B, the asphalt container will, between step A and step B, be brought from an angled or vertical position, in which the longitudinal centre axis is below said filling angle with respect to the horizontal, into a horizontal position, in which the longitudinal centre axis runs substantially horizontally. Bringing the asphalt container to a horizontal position could also still take place partly or partially during filling, for example during the last stage of filling, but then filling is less efficient. According to a more detailed embodiment, bringing the asphalt container to a horizontal transport position thus takes place after step A and before step B.

[0027] In accordance with a further embodiment of the method according to the invention with a step B, the asphalt container may, before or during step B, be placed on a wheeled transport means, such as a lorry, semitrailer, trailer or train wagon.

[0028] In accordance with a further embodiment of the method according to the invention with step B, the transportation in step B may take place via roads and/or railways and/or waterways. It is thus possible to allow transport to take place only via the roads, only via the railways, only via the waterways, a combination of roads and railways, a combination of roads and waterways, a combination of waterways and railways, or a combination - in arbitrary order - of roads, waterways and railways.

[0029] Due to the fact that, with the method according to the invention, the asphalt in the asphalt container remains sufficiently hot for a significantly longer period of time as a result of the reduced heat losses, it becomes possible insert a buffer period between the moment of filling in the asphalt plant and the moment of emptying into the asphalt paver, during which buffer period the asphalt container filled with asphalt may, as it were, be stored without the asphalt in the asphalt container cooling excessively. In this way, the method according to the invention, in accordance with a further embodiment thereof, may furthermore comprise a step C and a step D, which are performed after step B and before step E; wherein step C comprises storing the at least one filled asphalt container in a buffer location near the road construction site; and wherein step D comprises transferring a said filled asphalt container from the buffer location to an asphalt paver. Storage at the buffer location thus takes place after step C. As has been explained above, storage is

also possible after the asphalt container has been filled, before step B, which may be effected at or near the asphalt plant.

[0030] In accordance with a further embodiment of the method according to the invention, step B may thus take place entirely outside the rush hour - that is to say the period during the day in which traffic is busiest - while step E may take place at any stage during the day or may take place, at least partly, during busy periods, such as at least partly during the rush hour and/or at least partly during the daytime. More particularly, step B may be performed entirely between 19:00 hours and 06:00 hours, such as between 20:00 hours and 05:00 hours, while step E can at least partly take place between 06:00 hours and 19:00 hours, such as at least partly between 09:00 hours and 16:00 hours.

[0031] The buffer period also makes it possible to consider the transfer according to step D and the transporting according to step B entirely separately from one another. In accordance with a further embodiment of the method according to the invention, the transfer according to step D may thus be carried out by means of a vehicle which is different from the transport means used in step B. By way of illustrative example, the transport means used in step B may be an ordinary lorry for container transportation, whereas in step D a vehicle is used which is provided with a tipping frame, by means of which the longitudinal centre axis of the asphalt container can be brought to the desired discharge angle. This does not alter the fact that the invention also provides that it is possible to use the same vehicle for the transfer according to step D as is used in step B (that is to say the vehicle used in step B as the transport means is also used as the vehicle in step D).

[0032] Since, due to the buffer period, step B can be viewed entirely separately from the subsequent steps C, D and E, the removal of asphalt containers which have been emptied into the asphalt paver can be viewed entirely separately from the supply of asphalt containers filled with asphalt. This is not the case with the conventional method. With the conventional method, a single lorry takes the filled asphalt container from the asphalt plant to the asphalt paver, the same lorry discharges the asphalt into the asphalt paver and still the same lorry subsequently takes the emptied asphalt container back to the asphalt plant. In accordance with a further embodiment of the method according to the invention, a step G may take place after step E, wherein, in step G, at least a number of the emptied asphalt containers are placed, stacked on top of one another in one or more pairs of two and with the longitudinal centre axes being horizontal, onto a further transport means, such as a vehicle, vessel or a train, and the asphalt containers stacked on top of one another in one or more pairs of two are returned to the asphalt plant by means of this further transport means. This further transport means may incidentally be a transport means which was used previously for supplying asphalt containers filled with asphalt or another transport means which may, optionally, have been designed specifically for discharging the asphalt containers emptied in step E. By returning two emptied asphalt containers, stacked on top of one another, to the asphalt plant, it is possible to significantly reduce the number of transport movements.

[0033] In accordance with a further embodiment of the method according to the invention, the method uses one or more vehicles and the method comprises a cycle which repeats several times with successive cycle steps, i.e.:

Cycle step I: In step D, a filled asphalt container is transferred from the buffer location to a said vehicle;

Cycle step II: In step D, the asphalt container placed on the vehicle in cycle step I is taken to the asphalt paver by that vehicle;

Cycle step III: In step E, the asphalt is discharged from the asphalt container into the asphalt paver;

Cycle step IV: After the asphalt has been discharged from the asphalt container, the emptied asphalt container is taken away from the asphalt paver to a drop-off location near the road construction site and placed in the drop-off location.

[0034] In accordance with a further embodiment of the method comprising these cycle steps, the vehicle in cycle step I and the vehicle in cycle step IV may be the same vehicle and cycle step IV is followed by a subsequent cycle step V, in which the vehicle is driven to a subsequent filled asphalt container at the buffer location, after which the cycle starts again from the beginning.

[0035] In accordance with a further embodiment of the method according to the invention, the longitudinal centre axis is in a horizontal position during step C.

[0036] According to another further embodiment of the method according to the invention, step C comprises transferring the asphalt container from the transport means to the buffer location.

[0037] According to another further embodiment of the method according to the invention, a number of the filled asphalt containers stored in step C may be kept in store for a time period of at least 2 hours, such as at least 4 hours, at the buffer location. The reduced heat losses which are made possible by the method according to the invention, make storage of a filled asphalt container for up to 48 hours possible. According to yet a further embodiment of the method according to the invention, a number of the filled asphalt containers stored in step C may be kept in store at the buffer location for a time period of 2 to 24 hours or longer, such as at least 4 to 24 hours or longer.

[0038] According to another further embodiment of the method according to the invention, the transfer in step D is performed by means of a vehicle provided with a tipping frame on which the asphalt container is placed; the asphalt container is transferred from the buffer location to the tipping frame between step C and step D; and the tipping frame

is placed at an angle in step E in such a way that the filling/discharge port, viewed in vertical direction, is situated on the low side of the asphalt container.

[0039] According to a further aspect, the invention relates to an asphalt container which may, in particular, be configured for use with the method according to the invention. The asphalt container according to the invention is insulated; has an elongate shape which defines a first and second longitudinal end, and a longitudinal centre axis which extends between the first and second longitudinal end; and comprises a filling/discharge port which is configured in order to fill the asphalt container with asphalt, on the one hand, and to discharge the asphalt from the asphalt container, on the other hand, which filling/discharge port is provided in the first longitudinal end of the asphalt container. In accordance with a further embodiment of the asphalt container according to the invention, the asphalt container is filled with asphalt.

[0040] It should be noted that publication SU-A-1599464 describes an asphalt dumper, consisting of an asphalt container suspended from a hoisting crane. In order to fill this asphalt dumper, it may be placed at an angle, so that a tipping lorry can pour its asphalt load therein. As soon as the asphalt dumper has been filled with asphalt, the hoisting crane lifts the asphalt dumper up and the hoisting crane lowers the asphalt dumper into a trench excavated in the ground in order to pour the asphalt into the bottom of this trench.

[0041] According to yet a further embodiment of the asphalt container according to the invention, the asphalt container has a container wall which internally defines a container space for the asphalt; the longitudinal sides of the container wall form a substantially closed wall; the container wall is externally provided with an insulation which covers substantially the entire container wall; and the filling/discharge port is insulated. The expression substantially closed is understood to mean that a port for loading or unloading is present. The longitudinal sides of the container wall may, for example, be provided with a passage for a measuring probe for measuring the temperature or another value of the asphalt or for sampling.

Brief description of the drawings

[0042] The present invention will be explained below in more detail with reference to the drawings by means of some embodiments, in which:

- Fig. 1 very diagrammatically shows an asphalt container according to the invention, wherein Fig. 1A shows the asphalt container in perspective view, Fig. 1B shows a vertical longitudinal section of the asphalt container according to Fig. 1A, and Fig. 1C shows a vertical cross section of the asphalt container according to Fig. 1A.
- Fig. 2 shows very, very diagrammatically the steps A and E of the method according to the invention.
- Fig. 3 shows very, very diagrammatically a further embodiment of the method according to the invention

Detailed description of embodiments illustrated in the drawings

[0043] Fig. 1 very diagrammatically shows an asphalt container 1 according to the invention which is filled with asphalt 10 - see Figs. 1B and 1C. The asphalt container 1 has an elongate shape which defines a first longitudinal end 2 and a second longitudinal end 3, and a longitudinal centre axis 4 extending from the first longitudinal end 2 to the second longitudinal end 3. The elongate asphalt container shown in Fig. 1 has a block-shaped shape, but, according to the invention, the elongate asphalt container may also have another shape, such as a cylindrical shape. In the following, the asphalt container in each case has an elongate block-shaped shape, but in every instance, another shape, for example a cylindrical shape may be substituted therefor.

[0044] The first longitudinal end 2 of the asphalt container 1 is provided with a filling/discharge port 5, which is configured in this case by way of example as a flap 7 which can open along a hinge 6 - see the open position indicated in Fig. 1B by a dashed line - in order to discharge asphalt from the asphalt container and to fill the asphalt container with asphalt.

[0045] The asphalt container 1 has a container wall 17, the inside 8 of which encloses a container space 9 for the asphalt. The longitudinal sides 11, 12, 13, 14 of the container wall 17 form a substantially closed wall, that is to say without ports for loading or unloading asphalt. The longitudinal sides 11, 12, 13, 14 may optionally have a small passage, for example for a measuring probe or for sampling the asphalt. Like the longitudinal sides 11, 12, 13 and 14, the second longitudinal end also forms a substantially closed wall, that is to say a wall that does not have a port for loading or unloading asphalt, but does optionally have a said small passage.

[0046] Due to the fact that the longitudinal sides 11, 12, 13 and 14 and the second longitudinal end 3 form substantially closed walls, it is possible to provide these with a substantially uninterrupted insulation, such as indicated in the longitudinal section of Fig. 1B and the cross section of Fig. 1C in grey and the reference numeral 10. In other words, the insulation 10 on the longitudinal sides 11, 12, 13 and 14 and the second longitudinal end 3 is substantially without a thermal bridge.

[0047] According to the invention, the expression 'thermal bridge', also referred to as cold bridge or heat bridge, is understood to be a part of the outer skin (outside wall, roof or floor) of the asphalt container, where the thermal resistance is lower than the thermal resistance of the rest of the asphalt container, which locally results in a thermal leak in that

part. The expression 'without a thermal bridge' is in this case understood to mean that a thermal bridge is substantially absent.

[0048] As can be seen in Fig. 1, such a thermal bridge is substantially only present in an asphalt container according to the invention at the first longitudinal end 2, where the filling/discharge port 5 is provided. As can be seen in Fig. 1C, this filling/discharge port 5 is insulated with an insulation 16. Here, the thermal bridge will occur at the peripheral edges of the load/discharge hatch 7. It will be clear that, according to the invention, further insulation measures may and will be taken at the locations of these thermal bridges, but as the discharge/filling port has one or more parts which will be movable for the sake of unloading and loading, this means there will be an inherent potential weakness in the operation of the insulation which may be seen as a thermal bridge.

[0049] Fig. 2 very diagrammatically shows the steps A and E of the method according to the invention. In the top half of Fig. 2, step A is illustrated inside a frame and in the bottom half of Fig. 2, step E is illustrated inside a frame.

[0050] According to step E, at least one asphalt container 1 is filled with asphalt 10 in an asphalt plant 28. In this case, the asphalt container 1 is arranged at an angle, so that the longitudinal centre axis 4 of the asphalt container 1 is at a filling angle α with respect to the horizontal ground level 18. This filling angle α may be, for example, in the range of 25° to 50°. The filling angle α may thus be 25° to 30° or 35° to 50°. However, the filling angle α may also be 90°, if there is sufficient space available.

[0051] During filling, the asphalt container 1 is arranged at an angle, with the first longitudinal end 2 being situated higher than the second longitudinal end 3. The filling/unloading flap 7 is open and the asphalt 10 is poured from a silo 19 into the asphalt container 1 via a loading chute 20, as is indicated by means of the bent arrow 21.

[0052] According to step E, the asphalt 10 in the asphalt container is unloaded into an asphalt paver 25. This asphalt paver 25 is shown very, very diagrammatically in Fig. 2. A cab for the operator, a store 27 for asphalt and a finishing unit 26, indicated schematically with a circle, which applies the asphalt to the road surface, smoothes and finishes it off, depending on whether the particular circumstances require this, can be made out. Such asphalt pavers are known in many types and sizes.

[0053] According to step E of the method according to the invention, the asphalt 10 is discharged from the asphalt container 1 into an asphalt paver 25 at a road construction site 29. In this case, the asphalt container 1 is arranged at an angle, so that the longitudinal centre axis 4 of the asphalt container 1 is at a discharging angle β with respect to the horizontal 22. This discharging angle β may be, for example, in the range from 30° to 70°. The discharging angle β may thus be 30° to 55° or 45° to 60°.

[0054] During discharge, the asphalt container is situated at an angle, with the first longitudinal end 2 being situated lower than the second longitudinal end 3. The filling/unloading-flap 7 is open and the asphalt 10 is poured from the asphalt container 1 into the store 27 of the asphalt paver 25.

[0055] In the example from Fig. 2, a tipping lorry 24 with a tipping frame 23 is used during discharging. By means of, for example, a hydraulic cylinder/piston system, the tipping frame 23 and the asphalt container 1 situated on top thereof can be placed at the desired discharging angle β with respect to the horizontal.

[0056] Fig. 3 very, very diagrammatically shows a further method according to the invention. The aforementioned steps A and E form part thereof. Step A in Fig. 3 has been expanded to include a few sub-steps. As is indicated by the oval provided with arrow signs in the centre of Fig. 3, Fig. 3 shows a chain of steps A to G, in which step G may be followed again by step A.

[0057] From left to right, step A comprises the following sub-steps, separated by arrows 32, 33 and 34, which can all be carried out at the asphalt plant:

- the asphalt containers 1 are located in a store - see the far left in step A;
- an asphalt container 1 is taken from the store, see arrow 32, prepared for use and taken to a filling station, see arrow 33;
- at the filling station, which is also shown in the top half of Fig. 2 and has already been discussed in this context, the asphalt container is placed at an angle (if this has not been done yet) and asphalt is poured into the asphalt container;
- the asphalt container is transferred, see arrow 34, to a storage location - see the far right in step A - and kept in store there.

[0058] Filled asphalt containers may be kept in store for a few hours at the end of step A. In this way, it is possible to perform the filling of the asphalt containers during rush hour and to take the asphalt containers from the asphalt plant to the road construction site outside the rush hour. Taking the asphalt containers to the road construction site takes place in step B by means of one or more transport means 30. The transport means 30 may be:

- lorries 30 on which a filled asphalt container has been placed; and/or
- lorries with one or more trailers, wherein in each case one filled asphalt container has been placed on the lorry and each trailer; and/or
- one or more trains with wagons on which filled asphalt containers have been placed; and/or

- one or more vessels on which filled asphalt containers have been placed; and/or
- other types of transport means with asphalt containers.

[0059] Upon arrival at the road construction site, step B is followed by step C. In step C, one or more filled asphalt containers are stored at a buffer location near the road construction site. This buffer location may be a plot next to the road which has to be provided with a layer of asphalt. The asphalt containers may be kept in store at the buffer location for several hours. In this way, it is possible to take the asphalt containers from the asphalt plant to the buffer location outside rush hour and without busy traffic, for example at night, and to carry out the work, the asphaltting, during the rush hour or otherwise busy traffic without hampering this traffic unnecessarily.

[0060] From the buffer location, the asphalt containers are transferred to the asphalt paver 29 in a step D. This transfer according to step D is indicated by arrow 35. This transfer may be carried out by means of a tipping lorry 24 with a tipping frame 23 (see Fig. 2). During this transfer process, the asphalt containers will usually be transferred one by one, but it is also conceivable for several asphalt containers to be transferred at the same time. However, the transfer process may also be performed differently. If the asphalt paver itself has a tipping frame or angled carrier for the asphalt container, then it is, for example, also possible to transfer the asphalt container from the buffer location to the asphalt paver by means of a crane. The crane then carries the asphalt container, for example in a way which is common for unloading freight containers from a ship.

[0061] When it has arrived at the asphalt paver 25, the asphalt container is tilted at a discharging angle β and the asphalt is unloaded from the asphalt container into the asphalt paver, such as into a store 27 thereof (see Fig. 2).

[0062] After an asphalt container has been emptied into the asphalt paver, the former will usually be returned to the asphalt plant in order to be filled with asphalt again. The returning process of one or more asphalt containers is illustrated as step G.

[0063] However, prior to the return of empty asphalt containers according to step G, be one or more empty asphalt containers may first be stored near the road construction site. According to a step F, the empty asphalt containers are then taken away from the asphalt paver to a drop-off location near the road construction site and dropped at the drop-off location.

[0064] Prior to their return to the asphalt plant, the empty asphalt containers are then picked up at the drop-off location. Because the empty asphalt containers are very much lighter than the filled asphalt containers, the empty asphalt containers may, according to step G, be transported stacked in pairs of 2 onto lorries 31 or train wagons. In case of transportation by means of a vessel, the empty asphalt containers may be transported stacked in higher stacks.

[0065] After arrival at the asphalt plant, the asphalt containers will be kept in store, see the left side of step A.

[0066] Further embodiments of the invention are given in the the following clauses:

1) Method for transporting asphalt 10 from an asphalt plant 28 for producing asphalt 10 to an asphalt paver 25 for applying asphalt 10 to a road surface;

wherein use is made of at least one elongate, insulated asphalt container 1; wherein the elongate shape of the asphalt container 1 defines a first longitudinal end 2 and a second longitudinal end 3 and a longitudinal centre axis 4 extends between the first longitudinal end 2 and the second longitudinal end 3;

wherein the asphalt container 1 comprises a filling/discharge port 5 which is configured for filling the asphalt container 1 with asphalt 10, on the one hand, and for discharging asphalt 10 from the asphalt container 1, on the other hand, which filling/discharge port 5 is provided in the first longitudinal end 2 of the asphalt container 1; and wherein the method comprises the following steps:

Step A: In an asphalt plant 28, filling the at least one asphalt container 1 with asphalt 10 via its filling/discharge port 5,

Step E: Discharging asphalt 10 from the asphalt container 1 into an asphalt paver 25 via the filling/discharge port 5, while the longitudinal centre axis 4 of the asphalt container 1 is at a discharging angle β with respect to the horizontal 22 during discharging in such a way that, viewed in vertical direction, the first longitudinal end 2 is lower than the second longitudinal end 3.

characterized in that during filling such as according to step A, the longitudinal centre axis 4 of the asphalt container 1 is at a filling angle α with respect to the horizontal 18 which is such that, viewed in vertical direction, the first longitudinal end 2 is higher than the second longitudinal end 3.

2) Method according to one of the preceding clauses, wherein, during filling in step A, the filling angle α is in the range of 25° to 90°, more particularly in the range of 25° to 45° or in the range of 60° to 90°.

3) Method according to one of the preceding clauses, wherein, during filling in step A, the filling angle α is in the range of 25° tot 30° or in the range of 35° tot 45°.

4) Method according to one of the preceding clauses, wherein, during filling in step A, the longitudinal centre axis

4 is substantially vertical.

5) Method according to one of the preceding clauses, wherein, during filling in step A, the asphalt 10 is poured into the asphalt container 1.

6) Method according to one of the preceding clauses, wherein, prior to step A, the asphalt container 1 is brought from a horizontal position, in which the longitudinal centre axis 4 runs substantially horizontal, to an angled or vertical position, in which the longitudinal centre axis 4 is at said filling angle α with respect to the horizontal 18.

7) Method according to one of the preceding clauses, wherein the filled asphalt container 1 is sealed in an airtight manner after filling.

8) Method according to one of the preceding clauses, wherein a number of the asphalt containers 1 filled in step A are kept in store at the asphalt plant 28 after filling for a time period of at least 2 hours, such as at least 4 hours.

9) Method according to one of the preceding clauses, wherein the asphalt 10 is poured into the asphalt paver 25 during discharging in step E.

10) Method according to one of the preceding clauses, wherein the discharging angle β during discharging in step E is in the range of 20° to 90°, more particularly of 30° to 70°.

11) Method according to one of the preceding clauses, wherein the method furthermore comprises a step B, which is performed after step A and before step E, wherein step B comprises transporting the at least one filled asphalt container 1 obtained in step A from the asphalt plant 28 to a road construction site 29 by means of a transport means 30 while the longitudinal centre axis 4 is in a horizontal position.

12) Method according to clause 11, wherein the asphalt container, between step A and step B, is brought from an angled or vertical position, in which the longitudinal centre axis 4 is below said filling angle α with respect to the horizontal, into a horizontal position, in which the longitudinal centre axis 4 runs substantially horizontal.

13) Method according to one of the preceding clauses, wherein the asphalt container 1 is, before or during step B, placed on a wheeled transport means 30, such as a lorry, semitrailer, trailer or train wagon.

14) Method according to one of the preceding clauses, wherein the transportation in step B takes place via roads and/or railways and/or waterways.

15) Method according to one of clauses 11-14, wherein the method furthermore comprises a step C and a step D which are performed after step B and before step E; wherein step C comprises storing the at least one filled asphalt container 1 in a buffer location near the road construction site 29; and

wherein step D comprises transferring a said filled asphalt container 1 from the buffer location to an asphalt paver 25.

16) Method according to clause 15, wherein the transfer according to step D is carried out by means of a vehicle which is different from the transport means 30 used in in step B.

17) Method according to one of clauses 15-16, wherein a step G takes place after step E, wherein, in step G, at least a number of the emptied asphalt containers 1 are placed, stacked on top of one another in one or more pairs of two and with the longitudinal centre axes 4 being horizontal, onto a further transport means 31, such as a vehicle, vessel or a train, and the asphalt containers 1 stacked on top of one another in one or more pairs of two are returned to the asphalt plant 28 by means of this further transport means 31.

18) Method according to one of clauses 15-17, wherein the method uses one or more vehicles; wherein the method comprises a cycle which repeats several times with successive cycle steps, i.e.:

Cycle step I: In step D, a filled asphalt container is transferred from the buffer location to a said vehicle;

Cycle step II: In step D, the asphalt container placed on the vehicle in cycle step I is taken to the asphalt paver by that vehicle;

Cycle step III: In step E, the asphalt is discharged from the asphalt container into the asphalt paver;

Cycle step IV: After the asphalt has been discharged from the asphalt container, the emptied asphalt container is taken away from the asphalt paver to a drop-off location by a said vehicle near the road construction site and placed in the drop-off location.

19) Method according to clause 18, wherein the vehicle in cycle step I and the vehicle in cycle step IV may be the same vehicle; and wherein cycle step IV is followed by a subsequent cycle step V, in which the vehicle is driven to a subsequent filled asphalt container at the buffer location.

20) Method according to one of clauses 15-19, wherein the longitudinal centre axis 4 is in a horizontal position during step C.

21) Method according to one of clauses 15-20, wherein step C comprises transferring the asphalt container 1 from the transport means 30 to the buffer location.

22) Method according to one of clauses 15-21, wherein a number of the filled asphalt containers 1 stored in step C are kept in store for a time period of at least 2 hours, such as at least 4 hours, at the buffer location.

23) Method according to one of clauses 15-22,

wherein the transfer in step D is performed by means of a vehicle 24 provided with a tipping frame 23 on which the asphalt container 1 is placed;

wherein the asphalt container 1 is transferred from the buffer location to the tipping frame 23 between step C and step D; and

wherein the tipping frame 23 is placed at an angle in step E in such a way that the filling/discharge port 5, viewed in vertical direction, is situated on the low side of the asphalt container 1.

24) Asphalt container 1 which is configured to be transported in a horizontal position and for use with the method according to one of clauses 1-23,

wherein the asphalt container 1:

- is insulated 15, 16;
- has an elongate shape which defines a first 2 and second 3 longitudinal end, and a longitudinal centre axis 4 which extends between the first 2 and second 3 longitudinal end; and
- comprises a filling/discharge port 5 which is configured in order to fill the asphalt container 1 with asphalt 10, on the one hand, and to discharge asphalt 10 from the asphalt container 1, on the other hand, which filling/discharge port 5 is provided in the first longitudinal end 2 of the asphalt container 1.

25) Asphalt container 1 according to clause 28, wherein the asphalt container 1 is filled with asphalt 10.

26) Asphalt container 1 according to one of clauses 24-25,

wherein the asphalt container 1 has a container wall 11, 12, 13, 14, 2, 3, the inside of which encloses a container space 9 for the asphalt 10;

wherein the longitudinal sides 11, 12, 13, 14 of the container wall form a substantially closed wall;

wherein the container wall is provided on the outside with an insulation 15, 16 which substantially covers the entire container wall; and

wherein the filling/discharge port 5 is insulated.

List of reference numerals and symbols for the figures.

1	Asphalt container	25	Asphalt paver
2	First longitudinal end	26	Finishing unit
3	Second longitudinal end	27	Store for asphalt
4	Longitudinal centre axis	28	Asphalt plant
5	Filling/discharge port	29	Road construction site
6	Hinge	30	Vehicle
7	Flap	31	Vehicle
8	Inside of container wall	32	Transfer
9	Container space	33	Transfer
10	Asphalt	34	Transfer
11	Upper longitudinal side of container wall	35	Transfer
12	Right-hand longitudinal side of container wall	36	Transfer
13	Bottom longitudinal side of container wall		
14	Left-hand longitudinal side of container wall	α	Filling angle
15	Insulation of container wall	β	Discharging angle
16	Insulation of filling/discharge port	A	Step A
17	Container wall	B	Step B
18	Level ground	C	Step C

(continued)

19	Silo		D	Step D
20	Loading chute		E	Step E
21	Arrow indicating the pouring of asphalt		F	Step F
22	The horizontal		G	Step G
23	Tipping frame			
24	Tipping lorry			

Claims

1. Method for transporting asphalt (10) from an asphalt plant (28) for producing asphalt (10) to an asphalt paver (25) for applying asphalt (10) to a road surface;
 wherein use is made of at least one elongate, insulated asphalt container (1); wherein the elongate shape of the asphalt container (1) defines a first longitudinal end (2) and a second longitudinal end (3) and a longitudinal centre axis (4) extends between the first longitudinal end (2) and the second longitudinal end (3);
 wherein the asphalt container (1) comprises a filling/discharge port (5) which is configured for filling the asphalt container (1) with asphalt (10), on the one hand, and for discharging asphalt (10) from the asphalt container (1), on the other hand, which filling/discharge port (5) is provided in the first longitudinal end (2) of the asphalt container (1); and
 wherein the method comprises the following steps:

Step A: In an asphalt plant (28), filling the at least one asphalt container (1) with asphalt (10) via its filling/discharge port (5),

Step E: Discharging asphalt (10) from the asphalt container (1) into an asphalt paver (25) via the filling/discharge port (5), while the longitudinal centre axis (4) of the asphalt container (1) is at a discharging angle (β) with respect to the horizontal (22) during discharging in such a way that, viewed in vertical direction, the first longitudinal end (2) is lower than the second longitudinal end (3).

characterized in that during filling such as according to step A, the longitudinal centre axis (4) of the asphalt container (1) is at a filling angle (α) with respect to the horizontal (18) which is such that, viewed in vertical direction, the first longitudinal end (2) is higher than the second longitudinal end (3).

2. Method according to one of the preceding claims,
 wherein:

- during filling in step A, the filling angle (α) is in the range of 25° to 90°, more particularly in the range of 25° to 45° or in the range of 60° to 90°;
 and/or
- during filling in step A, the filling angle (α) is in the range of 25° tot 30° or in the range of 35° tot 45°.

3. Method according to one of the preceding claims,
 wherein:

- during filling in step A, the longitudinal centre axis (4) is substantially vertical;
 and/or
- during filling in step A, the asphalt (10) is poured into the asphalt container (1).

4. Method according to one of the preceding claims,
 wherein:

- prior to step A, the asphalt container (1) is brought from a horizontal position, in which the longitudinal centre axis (4) runs substantially horizontal, to an angled or vertical position, in which the longitudinal centre axis (4) is at said filling angle (α) with respect to the horizontal (18);

and/or

- the filled asphalt container (1) is sealed in an airtight manner after filling;

and/or

- a number of the asphalt containers (1) filled in step A are kept in store at the asphalt plant (28) after filling for a time period of at least 2 hours, such as at least 4 hours;

and/or

- the asphalt (10) is poured into the asphalt paver (25) during discharging in step E;

and/or

- the discharging angle (β) during discharging in step E is in the range of 20° to 90°, more particularly of 30° to 70°.

5. Method according to one of the preceding claims, wherein the method furthermore comprises a step B, which is performed after step A and before step E, wherein step B comprises transporting the at least one filled asphalt container (1) obtained in step A from the asphalt plant (28) to a road construction site (29) by means of a transport means (30) while the longitudinal centre axis (4) is in a horizontal position.

6. Method according to claim 5, wherein the asphalt container, between step A and step B, is brought from an angled or vertical position, in which the longitudinal centre axis (4) is below said filling angle (α) with respect to the horizontal, into a horizontal position, in which the longitudinal centre axis (4) runs substantially horizontal.

7. Method according to one of the preceding claims, wherein:

- the asphalt container (1) is, before or during step B, placed on a wheeled transport means (30), such as a lorry, semitrailer, trailer or train wagon;

and/or

- the transportation in step B takes place via roads and/or railways and/or waterways.

8. Method according to one of claims 5-7, wherein the method furthermore comprises a step C and a step D which are performed after step B and before step E; wherein step C comprises storing the at least one filled asphalt container (1) in a buffer location near the road construction site (29); and wherein step D comprises transferring a said filled asphalt container (1) from the buffer location to an asphalt paver (25).

9. Method according to claim 8, wherein the transfer according to step D is carried out by means of a vehicle which is different from the transport means (30) used in in step B.

10. Method according to one of claims 8-9, wherein a step G takes place after step E, wherein, in step G, at least a number of the emptied asphalt containers (1) are placed, stacked on top of one another in one or more pairs of two and with the longitudinal centre axes (4) being horizontal, onto a further transport means (31), such as a vehicle, vessel or a train, and the asphalt containers (1) stacked on top of one another in one or more pairs of two are returned to the asphalt plant (28) by means of this further transport means (31).

11. Method according to one of claims 8-10, wherein the method uses one or more vehicles; wherein the method comprises a cycle which repeats several times with successive cycle steps, i.e.:

Cycle step I: In step D, a filled asphalt container is transferred from the buffer location to a said vehicle;

Cycle step II: In step D, the asphalt container placed on the vehicle in cycle step I is taken to the asphalt paver by that vehicle;

Cycle step III: In step E, the asphalt is discharged from the asphalt container into the asphalt paver;

Cycle step IV: After the asphalt has been discharged from the asphalt container, the emptied asphalt container is taken away from the asphalt paver to a drop-off location by a said vehicle near the road construction site and placed in the drop-off location.

12. Method according to claim 11, wherein the vehicle in cycle step I and the vehicle in cycle step IV may be the same vehicle; and wherein cycle step IV is followed by a subsequent cycle step V, in which the vehicle is driven to a subsequent filled asphalt container at the buffer location.

13. Method according to one of claims 8-12, wherein:

- the longitudinal centre axis (4) is in a horizontal position during step C; and/or
- step C comprises transferring the asphalt container (1) from the transport means (30) to the buffer location; and/or
- a number of the filled asphalt containers (1) stored in step C are kept in store for a time period of at least 2 hours, such as at least 4 hours, at the buffer location; and/or
- the transfer in step D is performed by means of a vehicle (24) provided with a tipping frame (23) on which the asphalt container (1) is placed,

wherein the asphalt container (1) is transferred from the buffer location to the tipping frame (23) between step C and step D, and

wherein the tipping frame (23) is placed at an angle in step E in such a way that the filling/discharge port (5), viewed in vertical direction, is situated on the low side of the asphalt container (1).

14. Asphalt container (1) which is configured to be transported in a horizontal position and for use with the method according to one of claims 1-13,

wherein the asphalt container (1):

- is insulated (15, 16);
- has an elongate shape which defines a first (2) and second (3) longitudinal end, and a longitudinal centre axis (4) which extends between the first (2) and second (3) longitudinal end; and
- comprises a filling/discharge port (5) which is configured in order to fill the asphalt container (1) with asphalt (10), on the one hand, and to discharge asphalt (10) from the asphalt container (1), on the other hand, which filling/discharge port (5) is provided in the first longitudinal end (2) of the asphalt container (1).

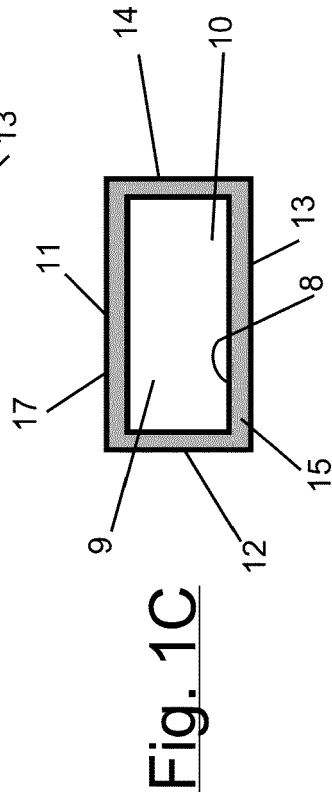
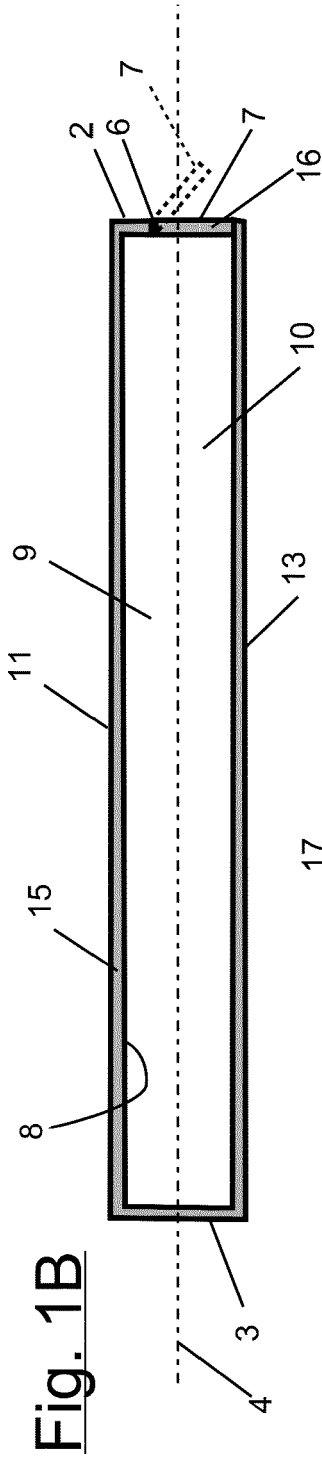
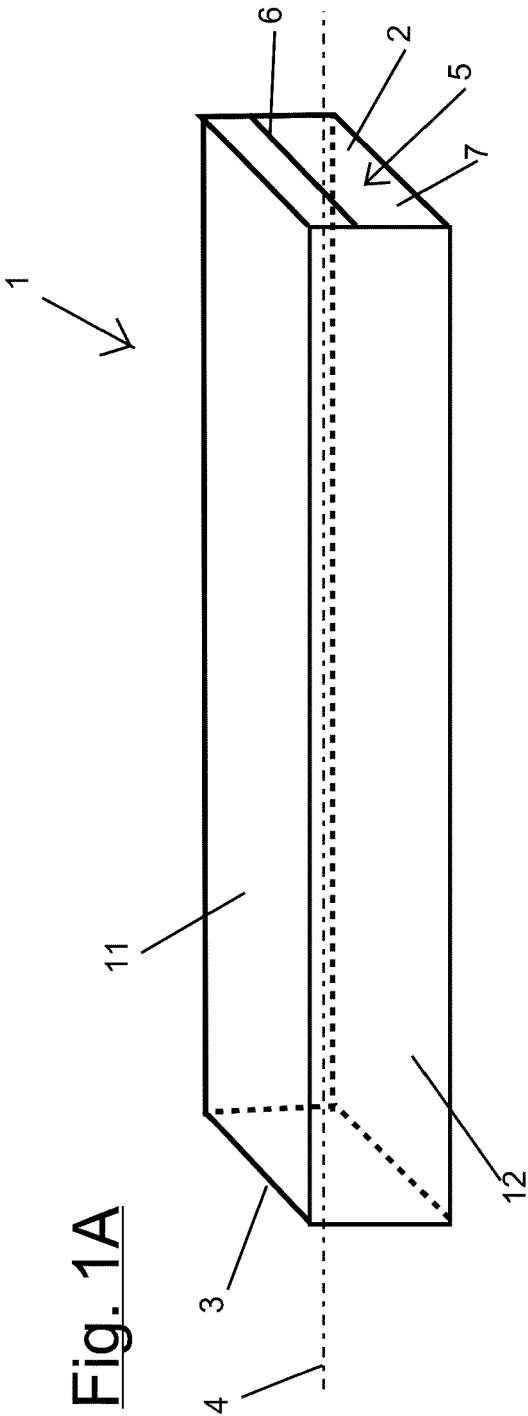
15. Asphalt container (1) according to claim 14, wherein:

- the asphalt container (1) is filled with asphalt (10); and/or
- the asphalt container (1) has a container wall (11, 12, 13, 14, 2, 3), the inside of which encloses a container space (9) for the asphalt (10),

wherein the longitudinal sides (11, 12, 13, 14) of the container wall form a substantially closed wall,

wherein the container wall is provided on the outside with an insulation (15, 16) which substantially covers the entire container wall, and

wherein the filling/discharge port (5) is insulated.



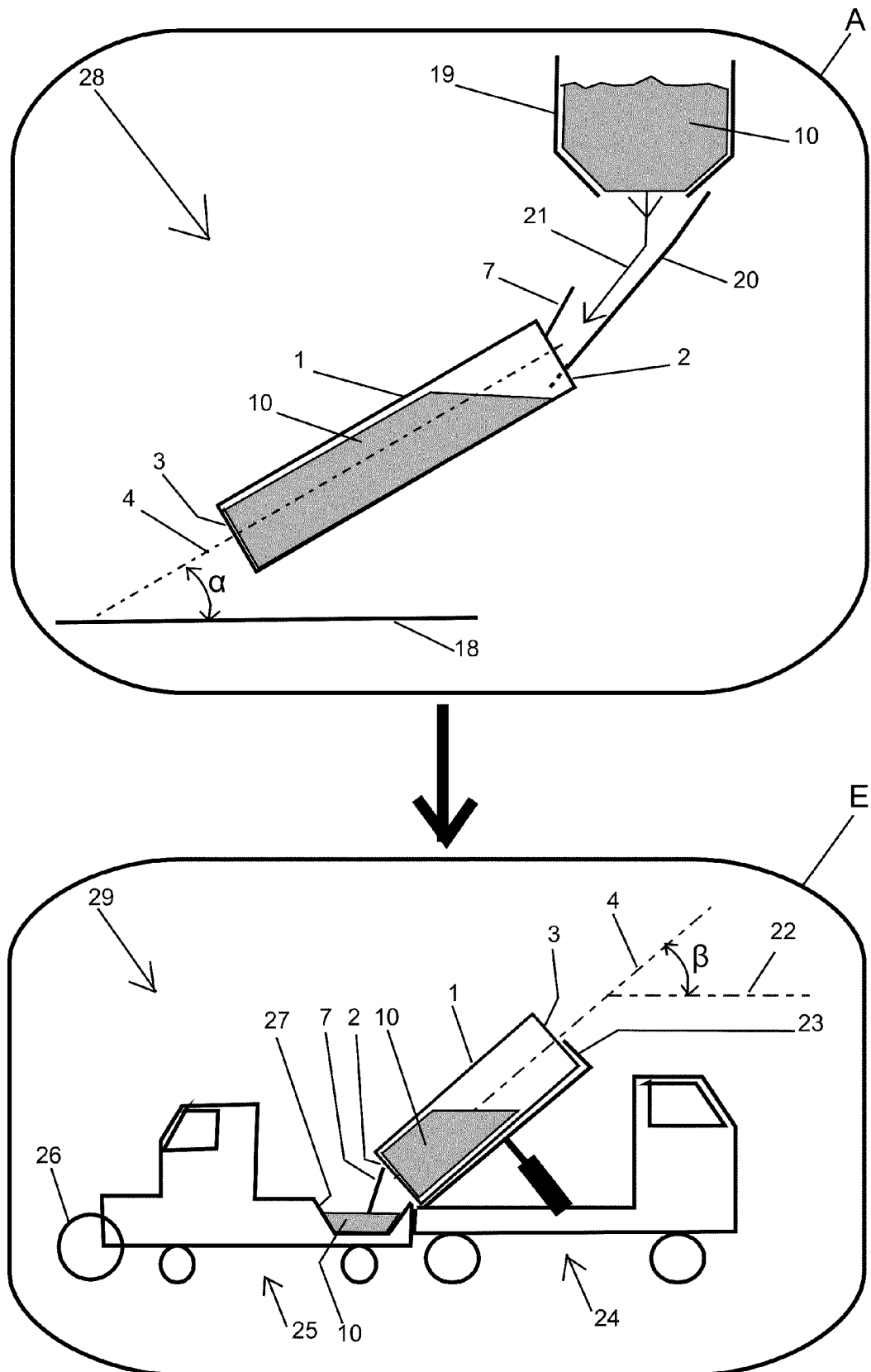
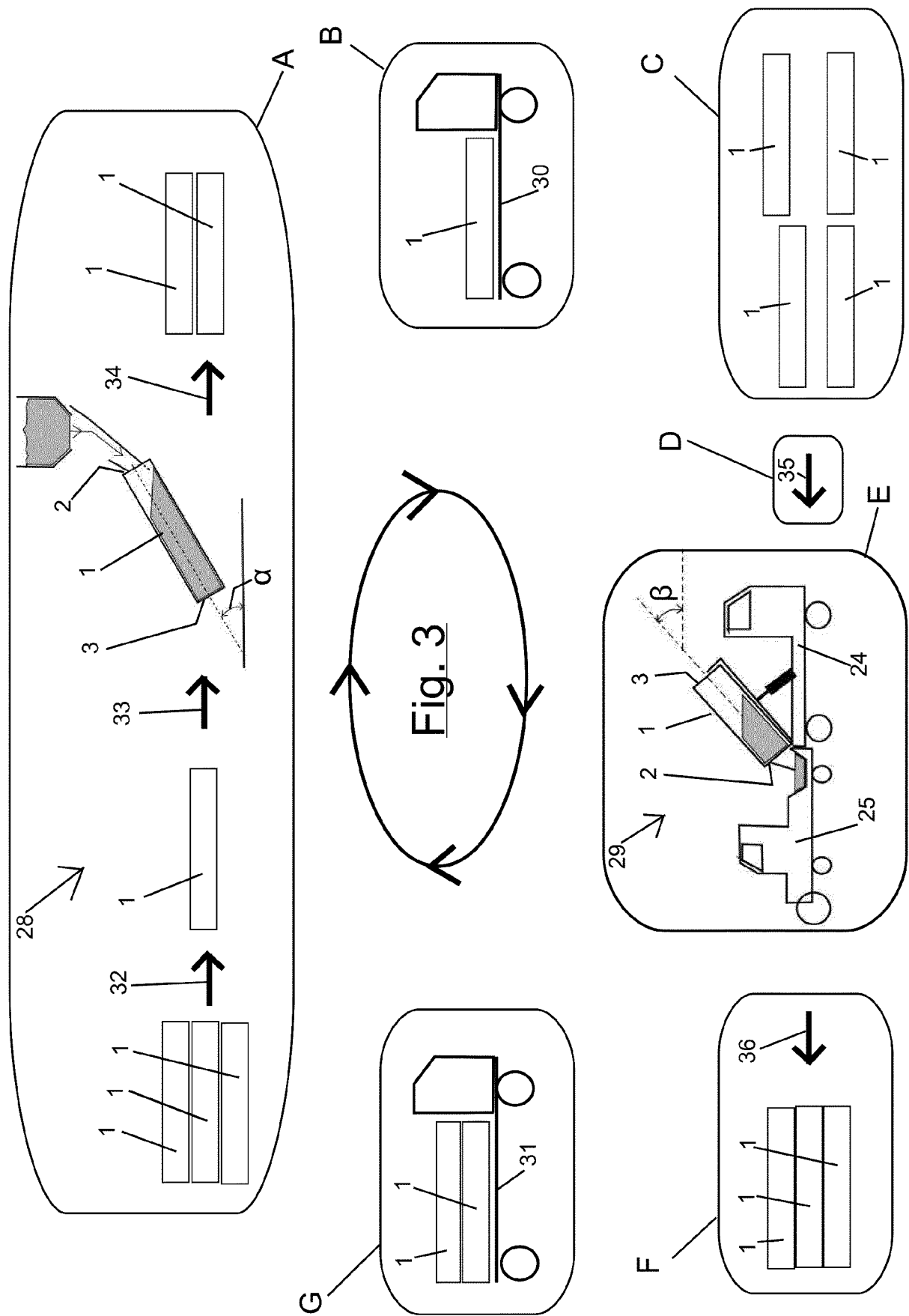


Fig. 2





EUROPEAN SEARCH REPORT

 Application Number
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			E01C B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 March 2019	Examiner Movadat, Robin
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