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(71) Applicant(s)  
**ARC Limited**  
(Incorporated in the United Kingdom)  
The Ridge, Chipping Sodbury, BRISTOL, BS17 6AY,  
United Kingdom

(72) Inventor(s)  
**Anthony Kujawa**

(74) Agent and/or Address for Service  
**Haseltine Lake & Co**  
Imperial House, 15-19 Kingsway, LONDON,  
WC2B 6UD, United Kingdom

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(54) Abstract Title  
**Method and apparatus for delivering aggregate.**

(57) A method for delivering aggregate e.g. bituminous road stone comprises the steps of filling a container 8 with aggregate, transporting the container by transport vehicle 2 to a distribution site, demounting the container from the vehicle, loading customer vehicles from the container then remounting it on a transport vehicle and returning it. The remounting and returning is preferably carried out when the container is either empty, the temperature of its contents has fallen below a preset value or a preset time interval has elapsed since the container was last filled. The container is provided with a screw conveyor 22 at its base for conveying its contents out of an outlet 26. It also has a retractable support 29 which, when the vehicle is demounted, is extended to support the outlet above the ground, in particular above the level of a customer's vehicle so that material may be ejected from the container directly into the vehicle. The container may be constructed with a double wall to provide insulation, the gap between the walls being filled with rock wool and/or the container may be heated. A hook lift assembly 6, 30 may be used for demounting and remounting the container. Further features include wheels or rollers 21, 23, a lid 10 preferably lockable and a power supply 24 to drive the screw conveyor.

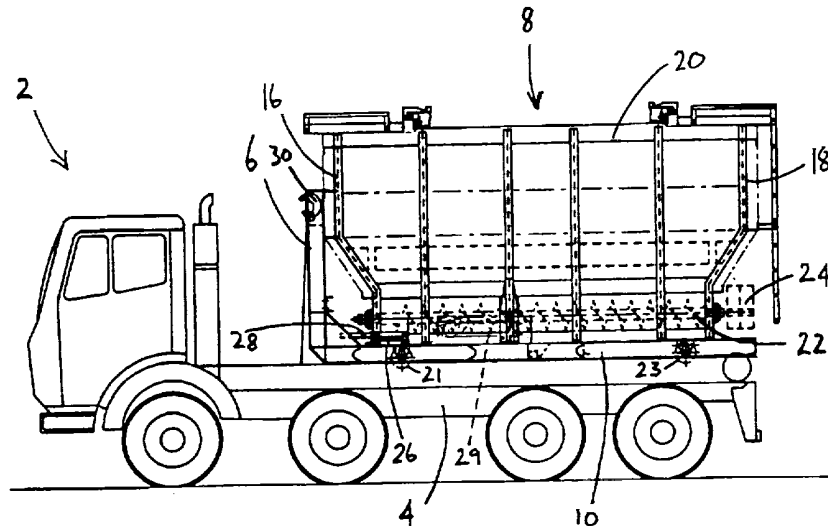


FIGURE 2

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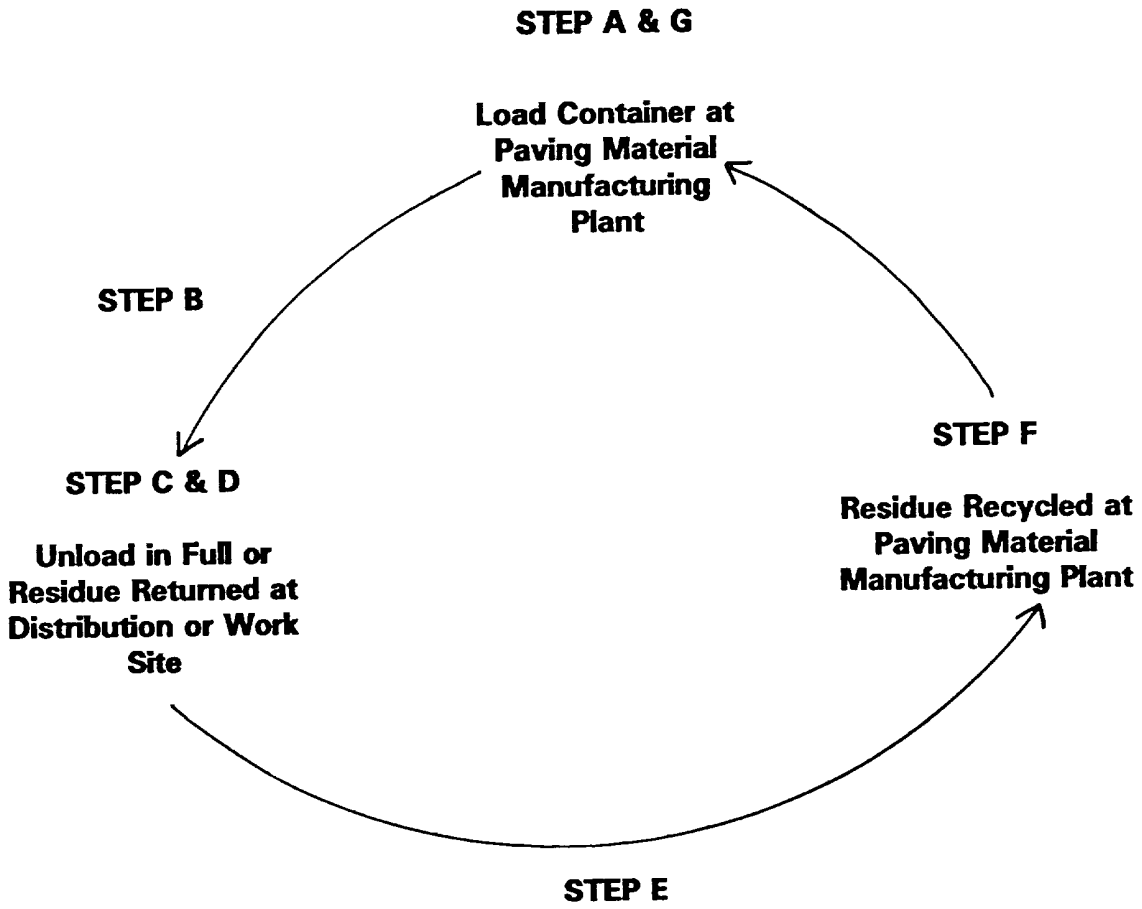


FIGURE 1



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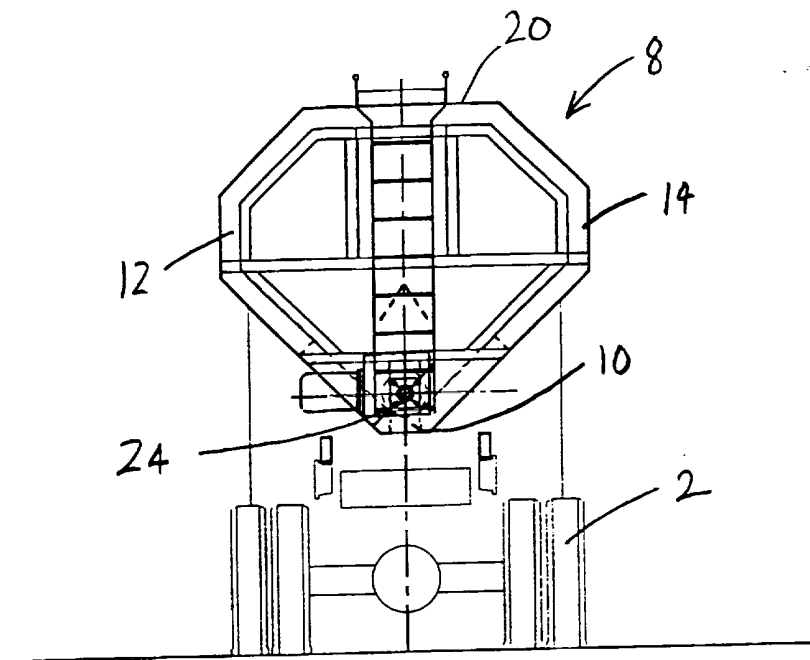


FIGURE 3



METHOD AND APPARATUS FOR DELIVERING AGGREGATE

This invention relates to a method and apparatus for delivering aggregate such as bituminous coated roadstone for the construction and repair of roads and pavements.

5 Bituminous coated roadstone is traditionally produced at either quarry sites or depots, which are often some distance from the market. The coated roadstone material is then delivered to the customer by heavy goods vehicle (HGV). These vehicles have insulated bodies and normally deliver a standard load to the customer of 16, 20, or 24 tonnes. The product has to be delivered to the customer within a given time due to heat loss during transit and the minimum temperature required for laying the material. If the lorry is delayed on site the customer may be charged an additional cost of the waiting time for the vehicle. If excess material has been ordered this will often be wasted.

10 Different solutions have been developed to try to overcome these problems through the use of satellite storage facilities for coated materials at strategic sites.

15 Some companies employ "hot boxes" that store coated roadstone materials. The box comprises a simple heated and insulated structure with doors that open at the front and lids that raise up, permitting coated materials to be delivered by lorry and reloaded by shovel. The main disadvantage with this design is the heat loss when the doors are opening and the need to use materials on a "last in first out" basis, which often results in wastage. A loading shovel is required for re-loading vehicles.

20 Another design is raised hot storage bins. This is a larger structure which requires a hopper for the delivery lorry to discharge into and an elevator to

raise the materials into the bins. Lorries collect the stored materials from under the heated and insulated bins. The major problems with this system are the high capital costs and the overall height of the structure.

5           According to a first aspect of the present invention there is provided a method of delivering aggregate, the method comprising filling a container of a transport vehicle with aggregate at an aggregate manufacturing or bulk distribution plant, driving the  
10           container to a distribution site, demounting the container, loading a customer's vehicle with aggregate from the container, mounting the container on to the transport vehicle and returning it to the aggregate manufacturing or bulk distribution plant for  
15           reprocessing and/or refilling.

          According to a second aspect of the present invention, there is provided a transport vehicle container for transporting aggregate, the container comprising a rigid body having a base and a side wall,  
20           a screw conveyor being provided above the base of the container for selectively conveying the aggregate out of an outlet in the base or side wall of the container.

          Preferably the screw conveyor or container is adapted to supply a metered amount of aggregate from  
25           the outlet.

          Preferably the container is demounted on to a support which supports at least a portion of the container above the level of the customer's vehicle, such that the aggregate may be ejected from the  
30           container directly into the customer's vehicle.

          According to a third aspect of the present invention there is provided a demountable transport vehicle container for transporting aggregate, the container being provided with an outlet for unloading  
35           aggregate from the container, the container further comprising a retractable support which, when the

container is demounted, is extended to support the outlet above the ground.

5 Preferably the retractable support props up the container such that the outlet from the screw conveyor is supported at a predetermined height above the ground when the container is demounted from the vehicle.

10 Although the aggregate may comprise construction material or agricultural aggregate such as lime, preferably it comprises paving material and more preferably comprises bituminous coated roadstone for the construction and repair of roads and pavements.

15 Preferably, the container is filled whilst it is mounted on the transport vehicle. Alternatively, the container body is filled whilst it is demounted and is then mounted on the transport vehicle for transport to the distribution site.

20 Preferably a plurality of containers are provided, so that whilst one container is being filled or is in transit, another is supplying aggregate at the distribution site.

25 Preferably the container is returned to the aggregate manufacturing or bulk distribution site when it is empty, when the temperature of the remaining aggregate has dropped below a preset value or when a preset time interval has elapsed since the container body was last filled.

30 A distribution site may comprise a retail sale outlet at which private individuals or small operators obtain small to medium size quantities of aggregate or may alternatively comprise a building site or work site at which the aggregate is to be used.

35 Preferably the container is insulated. This insulation may be in the form of double skinned panels which comprise the base and/or side walls. The insulation may comprise Rockwool (registered trade mark) and may be situated between the inner and outer



skins of the container. The container may also be heated, for example by means of gas burners. Alternatively solar panels may be fixed to the lid or side walls of the container.

5 Preferably the method further comprises the step of weighing the customer's vehicle before and after it has been loaded with aggregate from the container.

10 For a better understanding of the present invention and to show how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a schematic diagram illustrating a method of delivering aggregate comprising a paving material;

15 Figure 2 shows a lorry and container adapted for delivering the paving material;

Figure 3 is a cross-section through the lorry and container of Figure 2; and

20 Figure 4 shows the container demounted from the lorry.

Referring to the drawings, Figure 1 shows a schematic diagram illustrating a method of delivering heated paving material such as bituminous coated roadstone (i.e. asphalt or tarmacadam). The main method steps are repeated in a continuous loop and are as follows:

A) loading a container at a paving material manufacturing plant;

30 B) driving the loaded container by lorry to a distribution or work site;

C) demounting the container from the lorry at the distribution or work site;

35 D) loading customers' vehicles with paving material from the container at the distribution or work site;

E) when the container is empty, a predetermined

time interval has expired since the container was filled or the temperature of the remaining paving material has dropped below a threshold value, mounting the container on a lorry and driving it back to the paving material manufacturing plant;

5

- F) recycling of unused material; and
- G) refilling of the container as in step A

above.

Figure 2 shows a lorry with a demountable container for the delivery of paving material. The lorry 2 is of conventional form and comprises a chassis 4 to which is fitted a hydraulically powered hook lift assembly 6.

10

The container 8 comprises a base 10, two side walls 12, 14 and two end walls 16, 18. The top of the container 8 is closed by a lid 20 such that the entire container 8 can be sealed in an air-tight fashion to retain heat and prevent the loss of the volatile component of the paving material. Means (not shown) are provided to prevent unauthorised opening of the container 8.

15

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Above the base 10 of the container 8 is situated a screw conveyor 22 comprising an Archimedes screw which is driven by a power supply 24 comprising an electric motor or internal combustion engine with suitable gearing. Alternatively, the screw conveyor 22 may be driven by an external power take off (not shown).

25

Wheels or rollers 21, 23 are provided in the base 10 of the container 8 to support the container 8 on the lorry 2 and to enable the container 8 to be moved around when it is demounted from the lorry 2.

30

Referring to Figures 2 and 3, the lower portions of the side walls 12, 14 and end walls 16, 18 taper inwardly towards the base 10, such that the container 8 as a whole has the shape of an elongated funnel. The screw conveyor 22 lies in the neck of this funnel, so

35

that any paving material put into the container 8 will be fed under gravity to the screw conveyor 22.

5 The base 10, side walls 12, 14, end walls 16, 18 and lid 20 of the container are of doubled skinned construction which is best shown in Figure 3. Insulating material such as Rockwool (registered trade mark) is sandwiched between the inner and outer skins to enhance the insulation properties of the container 8.

10 The front end of the base 10 of the container 8 is provided with an outlet 26 for paving material conveyed by the screw conveyor 22. The outlet 26 is closed by a sliding gate 28 which allows metered discharge of paving material from the container 8.

15 Support legs 29 are pivotally mounted to the base 10 towards the front end 16 of the container.

20 In Figure 4, the container 8 is shown demounted from the lorry 2 by means of the hook lift assembly 6. The hook lift assembly 6 is of conventional design and hence is not described in detail. However, in essence the system operates as follows. A pair of hooks 30 engage on a bar 32 fixed to the container 8 and operation of hydraulic rams (not shown) lifts the front end 16 of the container 8 up and pushes the container 8 backwards off the chassis 4 of the lorry 2. Finally, the front end 16 of the container 8 is lowered until the wheels 21, 23 on the base 10 of the container 8 touch the ground or, with the support legs 29 extended, until the support legs 29 touch the ground. The hooks 30 are then released from the container 8 and the hook lift assembly 6 is retracted back on to the chassis. The lorry 2 can then be driven away to pick up another container 8.

35 At the manufacturing plant, the container 8 is lowered onto all four wheels 21, 23 so that it can be moved around to an appropriate position for storage or

filling, by means of a loading shovel, bulldozer, fork lift or other suitable plant. To facilitate movement of containers 8 around the manufacturing plant a system of rails or rollers may be provided along which the containers can be run. The containers 8 may also be provided with tow hitches or hitching points.

When a full container 8 is unloaded at the distribution or work site, as it is lowered from the back of the lorry 2 the support legs 29 are extended from the base 10 of the container 8 to support the front end 16 of the container 8 above the ground.

In this orientation, when the lorry 2 has been driven away, a contractor's or customer's vehicle such as a dumper truck or pick-up truck can be reversed beneath the front end 16 of the container 8, such that its load bed is beneath the outlet 26. The gate 28 is then opened and the screw conveyor 22 operated to convey a metered quantity of paving material into the truck. In order to check the amount of paving material loaded into the truck, the truck may be weighed before and after the paving material is loaded into it.

Once all of the paving material in the container 8 has been used up, or a predetermined time has elapsed since the container 8 was last filled, or when the measured temperature of the paving material has fallen below a predetermined level such that the paving material is no longer within an acceptable specification, the lorry 2 returns and its hook lift assembly 6 is operated to mount the container 8 on the chassis 4. The lorry 2 is then returned to the paving material manufacturing or bulk distribution plant for reprocessing of the unused paving material and for refilling.

Filling of the container 8 is achieved by opening part or all of the lid 20 and pouring paving material directly into the container 8 from a hopper (not shown) or by use of a loading shovel or any other known means.

5           The method is applicable to any number of containers 8 and lorries 2. For example, ten containers 8 may be provided for use with three lorries 2. Thus as one container 8 is being filled, one or more other containers will be supplying paving material at one or more distribution or work sites and one or more other containers will be in transit between the distribution and/or work sites and the manufacturing or bulk distribution plant.

10           In the illustrated embodiment, the front end 16 of the container 8 is supported above the ground by means of support legs 29. As an alternative or in addition to this arrangement, a permanent or temporary structure may be provided at the distribution site or work site on which the container 8 may be placed such that at least the outlet 26 from the screw conveyor 22 is supported above the ground.

15           Although it is envisaged that the paving delivery method can be used to deliver a full container to a distribution site from which the paving material in the container can be sold in small quantities to individual customers, it is also envisaged that a full or even partially full container 8 may be supplied to a building site or road works for use as and when required. In this application, after a predetermined time interval has elapsed or when the temperature of the paving material has dropped below a predetermined value a fresh container 8 of paving material is supplied to the site by a lorry 2 and the old partially used container 8 is returned to the manufacturing and/or bulk distribution plant for reprocessing and refilling. The container 8 is weighed before it is

supplied to the building site and after it has been returned to the manufacturing plant. In this way, the workers on the construction site are provided with a constant source of paving material which is within specification and are only charged for the paving material which they actually use. Furthermore there is little or no wastage and associated pollution, since the unused paving material is simply returned to the manufacturing plant, where it is reprocessed.

Although the above method has been described in relation to a road based transport system, it is equally applicable to any other form of transport and any other suitable vehicle, such as a rail carriage adapted to carry containers 8 or any combination of road, rail or other forms of transport by which containers 8 are supplied from the manufacturing plant to the distribution or work site.

It is to be understood that the invention is applicable to my transport system using demountable bodies such as "skip" containers as well as the "roll off" containers using a hook lift system described herein.

CLAIMS

1. A method of delivering aggregate, the method comprising filling a container of a transport vehicle with aggregate at an aggregate manufacturing or bulk distribution plant, driving the container to a distribution site, demounting the container, loading a customer's vehicle with aggregate from the container, mounting the container on to the transport vehicle and returning it to the aggregate manufacturing or bulk distribution plant for reprocessing and/or refilling.

2. A method as claimed in claim 1, in which the container is filled whilst it is mounted on the transport vehicle.

3. A method as claimed in claim 1 or 2, in which the container is returned to the aggregate manufacturing or bulk distribution site when it is empty, when the temperature of the remaining aggregate has dropped below a preset value or when a preset time interval has elapsed since the container was last filled.

4. A method as claimed in any one of claims 1 to 3, in which the aggregate comprises bituminous coated roadstone.

5. A transport vehicle container for transporting aggregate, the container comprising a rigid body having a base and a side wall, a screw conveyor being provided above the base of the container for selectively conveying the aggregate out of an outlet in the base or side wall of the container.

6. A container as claimed in claim 5, further comprising a support which when extended supports at least a portion of the container above the ground.

7. A container as claimed in claim 5 or 6, in which the base and/or the side walls are double skinned.

8. A container as claimed in claim 7, in which

insulation material is situated between the inner and outer skins of the container body.

5 9. A demountable transport vehicle container for transporting aggregate, the container being provided with an outlet for unloading aggregate from the container, the container further comprising a retractable support which, when the container is demounted, is extended to support the outlet above the ground.

10 10. A container as claimed in claim 9, in which the retractable support props up the container such that the outlet from the screw conveyer is supported at a predetermined height above the ground when the container is demounted from the vehicle.

15 11. A container as claimed in any one of claims 5 to 10, further comprising means for metering the amount of aggregate supplied from the outlet.

20 12. A container as claimed in any one of claims 5 to 11, in which the aggregate comprises bituminous coated road stone.

13. A method of delivering aggregate substantially as described herein with reference to the accompanying drawings.

25 14. A transport vehicle container substantially as described herein, with reference to and as shown in the accompanying drawings.





Application No: GB 9720686.6  
Claims searched: 1-4

Examiner: Matt Jefferson  
Date of search: 18 February 1998

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.P): B8Q (QD, QX); B8S (SAB, SCC, SCG)  
Int Cl (Ed.6): B60P 1/64; B65D 88/30; E01C 19/08.  
Other: Online: WPI.

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2304334 (JOHNSTON) See page 7, line 22 to page 9, line 25 and figures 1, 3 and 5.	1, 3, 4.
X	GB 2058178 (TARMAC) See whole document.	1, 2, 3, 4.
X	EP 0554550 (RUPP) See columns 1, 2 and figure 1.	1, 3, 4.
X	EP 0117886 (DESOURDY) See whole document.	1, 3, 4.
X	US 4810159 (STEGMULLER) See column 6, line 30 to column 7, line 8 and figure 9.	1, 3, 4.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.