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(54) CONTAINER FOR LOOSE MATERIAL, IN PARTICULAR HOT COAL

(71) We, HARTUNG, KUHN & Co., MASCHINENFABRIK GmbH., a German company of Oberhausenser Strasse 14, 4000 Düsseldorf, Germany (fed rep), do hereby

declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a container for loose material, in particular for hot coal during the operation of a coke oven battery, which container is provided with an upper inlet opening and a lower, funnel-shaped outlet opening for the loose material.

When such containers for loose material are filled, the air present in the container is displaced by the coal flowing in. This can lead to extensive emissions of dust into the atmosphere, in particular when the coal is dry or pre-heated. In order to prevent this it has already been proposed to connect the stationary coal tower to the charging hopper by tight telescopes and to extract and purify the displaced dust-laden gases via stationary pipelines and dust collectors. Since, however, the dust loading of the displaced gases usually is extremely high, high-performance dust-collecting units are necessary which entail high investment costs and operating costs. Furthermore, the high loading of the displaced gases causes dust deposits in the stationary pipelines.

It is the object of the invention to design the initially mentioned known container for loose material in such a way that an intensive pre-settling of the dust-laden gases is possible within the container for loose material, with the aim of recycling the dust of the loose material, which has settled out, to the loose material present in the container.

According to the present invention there is provided a container for loose material, which container is provided with an upper inlet opening and with a lower funnel-shaped outlet opening for the loose material, the container including in the upper portion thereof a gas extraction opening which communicates with the interior of the container via a gas discharge channel which is spaced from the path of incoming loose material, the cross-section of the gas discharge channel being adjustable and increasing in the direction of flow of gas to be discharged from the container during filling thereof.

An intensification of the deflection of the gases laden with dust of loose material can be achieved by means of one or more settling plates which protrude transversely into the gas discharge channel.

Advantageously a settling plate can form a valve seat for a movable element in order to adjust the free flow cross-section of the gas discharge channel and, according to an appropriate embodiment, this movable adjusting element can form a wall bounding the gas discharge channel, which wall advantageously is designed as an umbrella-shaped guide plate.

Preferably, the guide plate is dimensioned to leave an annular gap between the container wall and the plate, the guide plate tightly surrounding a feed pipe for the loose material in the upper portion of the container, but in such a way that the guide plate is movable axially relative to the feed pipe. The feed pipe can here be surrounded, at a radial spacing, by a cylindrical gas extraction duct, the lower end of which is joined to a container cover in the shape of a flat cone, the settling plate or plates being fixed to the inside thereof. The or each settling plate is advantageously annular and in a concentric arrangement relative to the main axis of the container. Advantageously that annular settling plate provided, as viewed in the direction of flow of the gases, behind the annular gap formed by the inner wall of the container and the umbrella-shaped guide plate, forms the seat for the umbrella-shaped guide plate when the latter is in a position in which it blocks the gas discharge channel.

The feed pipe can also be connected to the gas extraction duct of the container by radial web plates aligned parallel to the main axis of the container, whilst a piece of pipe joined to the umbrella-shaped guide plate is mounted, so that it can be shifted vertically, on the outside of the filling pipe and is provided with

diametrically opposite pivot bolts, to each of which a strap is hinged, the free end of which is connected by a hinge to the ends of a fork which is pivotable about a horizontal pivot axis on one of the web plates and of which the lever end opposite the ends of the fork projects outwards through a sealed slot of the container and is hinged to the free end of the piston of a hydraulic control cylinder.

If complete blocking of the gas discharge channel by the umbrella-shaped guide plate abutting on the annular settling plate, which is first as viewed in the direction of flow of the gases to be discharged, is not desired or necessary, it is possible, in order to limit the length of stroke of the umbrella-shaped guide plate and hence to limit the free cross-section of the gas discharge channel, to provide a radially inwardly protruding shoulder, which reaches under the lower end of the feed pipe, at the lower end of the piece of pipe which is coaxially joined to the umbrella-shaped guide plate.

Finally, if it is intended to obtain a more extensive separation of the stream of loose material from the gas stream which is to be discharged and is laden with dust of loose material, the radial shoulder of the piece of pipe carrying the umbrella-shaped guide plate can be flanged to the upper end of an extension of the feed pipe, which extension projects from the shoulder, coaxially with the feed pipe, into the interior of the container.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawing which shows one embodiment of a container for loose material in accordance with the present invention.

In the drawing, a container for loose material is generally designated as 1 and its cylindrical container wall 2 continues at its lower end as an outlet funnel 3 which is shown broken off so that its outlet opening for the loose material cannot be seen.

The upper side of the cylindrical container wall 2 carries a cover 4 which has the shape of a flat cone and which is adjoined at its upper end by a cylindrical gas extraction branch 5. The inside of this gas extraction branch is provided, distributed at intervals over its circumference, with web plates 6, to the inner ends of which a feed pipe 7 for the loose material to be filled into the container is fixed coaxially to the central longitudinal axis of the container. On the outside of the feed pipe 7, a piece of pipe 8 is guided, so that it can be shifted. An umbrella-shaped guide plate 9 extends radially outwards from the lower end of the piece of pipe 8 to the vicinity of the inside of the cylindrical container wall 2, an annular gap 10 being left. On the outside of the piece of pipe 8 there are two diametrically opposed pivot bolts, to each of which a strap 11 is hinged, the ends of the two straps being hinged at 12 to the ends of a fork 13 which is rigidly joined to a pivot 14 which can turn in bearings in the web plates 6. The pivot 14 extends outwards through the gas extraction branch and is there rigidly joined to a lever 15, the free end 17 of which is connected by a hinge to the piston rod 18 of a control element, for example a control cylinder.

Settling plates 19 extend in the direction of the umbrella-shaped guide plate 9 from the inside of the cover 4 and at right angles to the lateral surface thereof. Appropriately these settling plates 19 are of an annular design. Since the cone angle of the umbrella-shaped guide plate 9 is more obtuse than that of the cover 4, the cover 4 and the guide plate 9 enclose a gas discharge channel 20 which, starting from the annular gap 10, progressively widens in the direction of flow of the arrow 21 so that the velocity of the gases to be discharged is reduced thereby, taking into account the deflection of the gas stream effected by the settling plates 19, the settling of the dusty constituents present therein is promoted. Since the settling plates 19 and the guide plate 9 extend downwards, these dusty constituents will fall onto the upper side of the umbrella-shaped guide plate 9 and, due to gravity, they are conveyed from there through the annular gap 10 to the loose material present in the container.

As an alternative to the embodiment shown, however, it is also conceivable that the guide plate 9, conjointly with that settling plate 18 which is first in the direction of flow of the arrow 21, forms a valve in such a way that the container can be sealed against the outside by pressing the umbrella-shaped guide plate 9 onto this settling plate 19.

An even sharper separation of the stream of loose material from the gas stream which is to be discharged and is laden with dust can obviously be achieved by means of an extension pipe which is coaxial with the feed pipe.

It can thus be seen that the settled dust of loose material can be recycled again to the loose material present inside the container. The inserts of the container, which are formed by the settling plates 19 and the guide plate 9, enable the gas stream flowing out to be strongly deflected, zones of low dynamic pressure being formed which facilitate the settling of the dust.

Instead of the concentric arrangement in the drawing of the inlet opening for the loose material and of the gas discharge channel, an eccentric arrangement of the channels for the loose material flowing in and the gas flowing out is obviously also conceivable.

WHAT WE CLAIM IS:—

1. A container for loose material, which container is provided with an upper inlet

opening and with a lower funnel-shaped outlet opening for the loose material, the container including in the upper portion thereof a gas extraction opening which communicates with the interior of the container via a gas discharge channel which is spaced from the path of incoming loose material, the cross-section of the gas discharge channel being adjustable and increasing in the direction of flow of gas to be discharged from the container during filling thereof.

2. A container as claimed in claim 1 and including one or more settling plates which protrude transversely into the gas discharge channel.

3. A container as claimed in claim 2, wherein the settling plate, or one of the settling plates, forms a valve seat for a movable element for adjusting the cross-section of the gas discharge channel.

4. A container as claimed in claim 3, wherein the movable element forms a wall bounding the gas discharge channel.

5. A container as claimed in claim 4, wherein the movable wall of the gas discharge channel is in the form of an umbrella-shaped guide plate.

6. A container as claimed in claim 5, wherein the guide plate is dimensioned to leave an annular gap between the container wall and the plate, the guide plate tightly surrounding a feed pipe for the loose material in the upper portion of the container, but in such a way that the guide plate is movable axially relative to the feed pipe.

7. A container as claimed in claim 6, wherein the feed pipe is surrounded, at a radial spacing, by a cylindrical gas extraction duct, the lower end of which duct is joined to a cover of the container, which cover is in the form of a flat cone, the settling plate or plates being fastened to the inside of the cover.

8. A container as claimed in claim 7, wherein the or each settling plate is annular and in a concentric arrangement relative to the axis of the container.

9. A container as claimed in claim 8, the settling plate, or one of the settling plates, forms a seat for the guide plate when the guide plate is in a position in which it blocks the gas discharge channel.

10. A container as claimed in claim 7, 8 or 9, wherein the feed pipe is connected to the gas extraction duct by means of radial web plates aligned parallel to the axis of the container, the guide plate being movable relative to the feed pipe by means of a further pipe secured to the guide plate and extending around the feed pipe, which further pipe is provided with diametrically opposite pivot bolts to each of which a strap is hinged, the free end of each of the straps being hinged to a fork which is pivotable about a horizontal pivot axis on one of the web plates, the free end of the fork projecting out of the container by way of a sealed slot and being hinged to the free end of a piston of a hydraulic control cylinder.

11. A container as claimed in claim 10, wherein the further pipe, the lower end of which is coaxially joined to the guide plate, is provided with a radially inwardly protruding shoulder which extends below the lower end of the feed pipe.

12. A container as claimed in claim 11, wherein the radial shoulder of the further pipe is flanged to the upper end of an extension of the feed pipe which extension projects from the shoulder, coaxially with the feed pipe into the interior of the container.

13. A container for loose material substantially as hereinbefore described with reference to, and as shown in, the accompanying drawing.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*