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(19)

(54) METHOD OF PURIFYING A GASEOUS EXHAUST

(71) We, AIR INDUSTRIE, a body corporate organised under the laws of France, of 19—21, Avenue Dubonnet, 92401 Courbevoie, France, 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 present invention concerns a method of purifying a gaseous exhaust.

The exhaust products of some processes are liable to rapidly clog and obstruct the porous walls of a conventional filter, especially where these walls are of filtering fabric, so that the filter then fails to carry out its intended function. Such products are referred to hereinafter as sticky exhaust products and are gaseous or vapour products liable to condense in the form of a viscous condensate, or products in the form of drops or sticky particles, or atomised liquid. For example, the tars issuing from an installation for the production of electrodes are present both in the form of sticky solid particles and in the form of a condensable gas.

Before evacuating exhaust products into the atmosphere sticky exhaust products such as tars should be removed. However, hitherto this problem could not be satisfactorily solved by simple filtering because these products rapidly clog and obstruct the filters.

According to the present invention, there is provided a method of purifying a gaseous exhaust carrying a sticky exhaust product, the method comprising the steps of supplying, initially in an auxiliary current of clean gas, an adsorbent, porous and finely divided material, causing the said auxiliary current to pass through a filter so that the said adsorbent material forms a coating on the filtering surface or surfaces of the filter, and thereafter replacing the current of clean gas with the gaseous exhaust carrying the sticky exhaust product so that the sticky exhaust product forms a mixture with the said coating, while maintaining the supplying of the adsorbent, porous and finely divided material.

The auxiliary current of clean gas carries the adsorbent, porous and finely divided material onto the surface(s) of the filter, where it forms a protective coating. Subsequently, the auxiliary current of clean gas is replaced by the gaseous current which carries the product which is to be removed. This product does not reach the surface(s) of the filter but forms a deposit on the protective coating of finely divided material.

When a certain thickness of the product to be removed has formed on the protective coating, the coating with this deposit is preferably detached from the surface(s) of the filter by, for example, deforming or shaking the filter surface(s).

Preferably, the adsorbent, porous and finely divided material is initially introduced into a clean gaseous current, travelling upwards in a flow-pipe to the filter, and forms a dense suspension in this flow-pipe. The introduction of the adsorbent, porous and finely divided material into the flow-pipe is preferably effected downstream of a venturi constriction incorporated in the said flow-pipe. The rate of supply of the adsorbent, porous and finely divided material is adapted to the flow rate of the current of gas in the flow-pipe, so that the adsorbent material forms there downstream of the venturi constriction a suspension stratum whose particles are carried progressively to the top of the flow-pipe, so avoiding displacement of material against the current in the flow-pipe.

Preferably, the surface(s) of the filters are periodically deformed or shaken so that the mixture comprising the adsorbent, porous and finely divided material and the sticky product is detached, and at least a portion of the detailed mixture is reinjected into the flow-pipe. Saturation of the adsorbent, porous and finely divided material by the sticky product which is to be removed can thus be achieved. Furthermore, if the sticky product which is to be removed from the exhaust product and the adsorbent, porous and finely divided material are utilisable in the process which

results in this exhaust product, at least a portion of the said mixture which is detached from the filtering surface(s) can be returned to the installation in which the said process is being carried out.

Thus, an important economy is achieved, since the adsorbent, porous and finely divided material and the sticky product are finally utilised in the installation in question. For example, this economising step can be carried out where the installation uses carbon, the sticky product is a tar and the said adsorbent, porous and finely divided material is coke.

A method embodying the present invention will now be described, solely by way of example, with reference to the single figure of the accompanying drawing, which represents schematically equipment for carrying out the method.

The equipment represented in the drawing comprises a vertical flow-pipe 1 which is a branch conduit from an industrial production installation 2 which is, for example, a furnace for the baking of electrodes used in electrolysis chambers in the aluminium industry. In this furnace, pitch, coke and tar are used. The fumes which are emitted by the installation 2 and which are evacuated by the flow-pipe 1 contain products, especially tars, which should be eliminated before the fumes reach the atmosphere. The fumes may contain about twenty milligrams of tar per cubic metre at normal temperature and pressure, the production of the fumes at 165°C being of the order of 40 000 cubic metres per hour reduced to normal temperature and pressure. The tars can be in condensable gaseous form, or in the form of droplets or of sticky particles.

The flow-pipe 1 is fitted with a venturi 3 and opens at the top into a filter 4. The filter 4 consists of an assembly of filtering pockets or sleeves made of fabric, well known in the art, which an appropriate blast-apparatus inflates periodically, so that their walls may be traversed by a counter-flow of clean gas and thus deformed, so that the particles of product which have accumulated on their outer surfaces are detached. The detached particles fall into a hopper 5 at the base of the filter 4. The filtered gases leave the filter 4 through a flow-pipe 6 equipped with a suction apparatus 7.

The bottom 11 of the hopper 5 communicates with the flow-pipe 1, downstream of venturi 3, through a recycling flow-pipe 8, and with the installation 2 through a return flow-pipe 9. Finally, another flow-pipe 10 communicates with the flow-pipe 1 slightly downstream of the venturi.

At the bottom 11 of the hopper 5, a porous wall and a blast chamber can be provided for fluidising particles which are detached from the outer surfaces of the filtering walls of the filter 4. Communication between the bottom of the hopper 5 and the flow-pipes 8 and 9 may be effected by overflow and siphoning. The flow-pipes 8 and 9 can also be provided with discharge-regulating valves for regulation of their respective discharges of material into the venturi 3 and the installation 2.

Initially, an adsorbent, porous and finely divided material is supplied through the flow-pipe 10, a dense suspension of this material is established in the flow-pipe 1 slightly downstream of the venturi constriction 3, and the material is made to sweep the flow-pipe 1 by a clean auxiliary gas, the connection between the flow-pipe 1 and the installation being closed or the installation not yet being in operation.

For preference, porous coke is used, the particles of which measure for example, between 0 and 300 μ, at a flow rate, for example, of 30 g per cubic metre at normal temperature and pressure. The auxiliary gas carries the fine particles of coke to the top of the flow-pipe 1, and these particles finally form a deposit on the exterior surfaces of the filtering walls of the filter 4, wherein they form a coating which protects the filtering surfaces without stopping them up or clogging them.

The auxiliary gas current is then stopped and the flow-pipe 1 is put into communication with the installation 2 from which tar laden fumes issue. The tars in gaseous form are adsorbed by the porous particles of coke forming a cloud of moving particles in the flow-pipe 1, and they then form a deposit on the filtering walls of the filtration system 4. This deposit is not formed directly on these walls, but on the aforesaid coating of coke particles. The tars cannot then condense or form a deposit on the fabric of the filtering walls, which avoids their being rapidly clogged up. The thick or liquid tars are on the contrary fixed on the front surface of this porous coating. Supplying of the coke particles from the flow pipe 10 to the flow-pipe 1 is maintained while the tar laden fumes are passing through the flow-pipe 1.

Periodically, the filtering walls are deformed, for example, by a counter-flow blast of clean gas, or instead they are shaken, so that the coke particles laden with tars fall into the hopper. They are constantly evacuated from there by the flow-pipes 8 and 9.

The coke particles laden with tars are returned to the venturi 3, where they are put into suspension concurrently with the fresh coke particles which are introduced by the flow-pipe 10. Thus, the density of the suspension is increased, so that the coke particles can become saturated with tar. To increase adsorption, by the coke particles, cooling can be provided in the flow-pipe 8.

Those coke particles laden with tars which are evacuated from the hopper 5 by the return flow-pipe 9 and reintroduced into the

furnace 2, permit economical use of coke and tars in the making of electrodes.

The use of porous coke allows adsorption of products other than tars issuing from furnace 2, so that the gas in the evacuation flow-pipe 6 is pure and dust-free. Instead of coke, in certain applications, aluminium, for example, may be used.

WHAT WE CLAIM IS:—

1. A method of purifying a gaseous exhaust carrying a sticky exhaust product, the method comprising the steps of supplying, initially, in an auxiliary current of clean gas, an adsorbent, porous and finely divided material, causing the said auxiliary current to pass through a filter so that the said adsorbent material forms a coating on the filtering surface or surfaces of the filter, and thereafter replacing the current of clean gas with gaseous exhaust carrying the sticky exhaust product so that the sticky exhaust product forms a mixture with the said coating, while maintaining the supplying of the adsorbent, porous and finely divided material.

2. A method according to claim 1, wherein the adsorbent, porous and finely divided material is so introduced as to form dense suspension in the said auxiliary current, and the auxiliary current travels upwards in a flow-pipe to the filter.

3. A method according to claim 2, wherein the adsorbent, porous and finely divided material is supplied to a region downstream of a venturi constriction in the said flow-pipe.

4. A method according to claim 2 or 3, wherein the said surface or surfaces of the filter is or are periodically deformed or shaken, so that the mixture comprising the adsorbent, porous and finely divided material and the sticky product is detached therefrom and at least a portion of the detached mixture is introduced into the said flow-pipe.

5. A method according to claim 4 wherein the said gaseous exhaust current which carries the sticky product issues from a production installation working process which uses the same substance that is used, in porous form, to constitute the said adsorbent, finely divided material, and at least a portion of the said mixture which is detached from the said surface or surfaces is introduced into the production installation.

6. A method according to any preceding claim, wherein the said substance is carbon, the said sticky product is a tar, and the said adsorbent, porous and finely divided material is coke.

7. A method of purifying a gaseous exhaust carrying a sticky exhaust product, substantially as described hereinbefore with reference to the accompanying drawing.

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