METHOD FOR PRODUCING COATED BITUMEN PELLETS

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METHOD FOR PRODUCING COATED BITUMEN PELLETS
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The present invention relates to a method of produc-
ing bitumen pellets or granules, such as asphalt or coal
tar. The term asphalt, as hereinafter used, is intended
to be synonymous with and embrace coal tar.

In converting bitumen, whether asphalt or coal tar,
into the form of finely divided pellets, granules, or drop-
lets, it is an essential requirement to coat the pellets
with an appropriate powdered mineral so as to prevent
the pellets from adhering to one another. The purpose
of achieving the granular form is to permit the bitumen
to be handled in the manner of a granulated material;
and if this end is to be attained it is necessary that the
coating be adequately applied so as to completely elim-
ninate any adherence of the pellets. Moreover, any meth-
odel which achieves this end must be commercially prac-
tical so that the cost may be held down to a minimum.
In accordance with the present invention, the method
which is provided is substantially continuous.

With the foregoing conditions in mind, the present in-
vention has in view as its foremost objective the pro-
vision of a method of the character indicated which is
characterized as including the basic feature of providing
an upwardly directed air stream carrying the coating
material in powdered form with the asphalt being sprayed
thereinto in the form of pellets or granules so as to
achieve two results. One of these is the initial coating
of the pellets, and the second is a cooling which solidifies
the molten asphalt.

It has been found that this initial coating of the pellets
is not entirely adequate, hence the invention has in view
as a further object the provision of a method of the type
indicated in which a second zone of swirling air carrying
the powdered coating material is created beneath the up-
wardly directed stream and into which the initially coated
pellets fall and pass to acquire additional coating material
which supplements that supplied by the air stream and thus
give an adequate coating.

In providing a practical method of the type noted, it is
important that the asphalt be in a proper molten state be-
fore it is delivered to the spray nozzle. To achieve this
end, the present method provides for the recirculation
of the molten asphalt as it is heated to the required tem-
perature, whereupon the recirculation is interrupted and
the molten asphalt delivered to the spray nozzle.

After the pellets have passed through the second zone
of coating material, it is important that they be col-
clected and further cooled before having a spray nozzle
another object in view is to provide, in a method of the
type noted, the step of collecting and further cooling the
coated pellets and then delivering them to a packaging
machine.

Various other more detailed objectives and advantages of
the invention, such as arise in connection with carrying
out the above-noted ideas in a practical embodiment, will
in part become apparent and in part be hereinafter stated
as the description of the invention proceeds.

The apparatus for carrying out the novel method con-
sists essentially of a pride tower having a spray no-
zen at the top and a discharge chute at the bottom, with
an upwardly directed air stream being introduced into the
tower at the bottom and a cyclone dust separator pro-
viding a lower zone of swirling or agitated coating ma-
terial, together with an asphalt supply including a recir-
culating system which is connected to the spray nozzle
by a three-way valve, a rotary cooler which is connected
to the discharge chute, a supply hopper for the coating
material, feed screws associated therewith, and blowers
for generating the air stream and lower zone aforesaid,
and a conduit system for exhausting dust from the tower
and the lower end of the rotary cooler.

For a full and more complete understanding of the
invention, reference may be had to the following descrip-
tion and accompanying drawing, wherein:

FIGURE 1 is a side view, partly in section and partly
in elevation and largely diagrammatic, depicting the ap-
paratus and method of this invention;

FIGURE 2 is a detail showing the position of the
three-way valve which it assumes when delivering molten
asphalt to the spray nozzle; and

FIGURE 3 is a transverse section taken on an en-
larged scale through the rotary cooler.

In describing the preferred embodiment of the present
invention, the materials employed, the apparatus utilized,
and the method of operation will be described in that
order.

The Materials
The basic and essential material is asphalt or coal
tar, which is preferably delivered to the processing plant
in molten form so that it may be pumped into the stor-
age tank provided thereof. The method and apparatus
of this invention will be described in conjunction with
asphalt, but it is to be clearly understood that the same
method and apparatus embraces coal tar.

The coating material may be any of several finely
ground minerals, among which are noted limestone, Por-
land cement, clay, mineral flour, and distannous earth.
For the preferred form of the invention, powdered
limestone, which is commercially known as grade FF,
is employed.

The Apparatus
Referring to the drawing, the apparatus includes an
asphalt-storage tank that is referred to in its entirety by
the reference character T. The tank T has a top wall
10, a bottom 11, and vertical wall or walls 12 which may
be cylindrical. A delivery conduit is shown at 13 as com-
municating with the side wall 12, and included therein
is a supply pump 14. It is intended that the conduit 13
be connected to a tank truck or other mobile supply
source, and a function of the pump 14 is to pump the
asphalt from the tank truck into the storage tank T.

Disposed beneath the bottom wall 11 are three gas
burners 15 which provide the heat necessary to maintain
the asphalt in the tank T at a required temperature. The
asphalt, which is represented at 16, is preferably main-
tained at a temperature of 450° F.

Extending from the side wall 12 is another conduit 17
which is included through a strainer 18 and a circulat-
ing pump 19. From the circulating pump 19 the conduit 17
is continued upwardly to the point where it is connected
with a three-way valve, which is represented diagram-
atically at V. Another recirculating conduit 20 ex-
tends from the valve V to the upper end 10 of the tank
as indicated at 21.

It is evident that, with the valve V in recirculating posi-
tion, the molten asphalt is recirculated by the pump 19
through tank T, strainer 18, conduit 17, valve V, and
conduit 20, respectively.

A process tower is referred to in its entirety by the
reference character P. This tower P comprises a main
body portion defined by a cylindrical wall 22, a conical
base 23, and a conical bottom 24 which terminates in a
discharge chute or spout 25.
The conical top 23 at its upper central portion communicates with a cup-shaped cap portion 25 including a top wall 26 and a cylindrical wall 27. A conduit 28 extends through the top wall 26 and at its lower end carries a spray nozzle, depicted diagrammatically at 29. The other or upper end of the conduit 28 is connected to the three-way valve V.

A large air conduit 30 has an open end that is connected to an entry port in the conical bottom 24 as indicated at 31. A smaller air conduit 32 passes through an opening in the conical bottom 24 as indicated at 33; and at its lower end is mounted a cyclone dust separator 34, represented diagrammatically at 34. It will be noted that this cyclone dust separator 34 is located substantially within the conical bottom 24.

A supply hopper is referred to in its entirety by the reference character H, and contains a supply of powdered limestone represented at 35. Supply hopper H is open at the top, with the open top being protected by a dust hood 36. The bottom, which is represented at 37, is provided with two discharge spouts 38 and 39a, respectively. Communicating with the discharge spout 38 is a feed screw 39 having a vibrator 40 associated therewith. Feed screws of the type are commonly known as “vibrascrews.” A conduit 41 extends from the feed screw 39 to another conduit 42. This conduit 42 extends to a blower, represented diagrammatically at 43. The other side of the blower is connected to the conduit 30. It is evident that the vibrascrew 39, 40, together with the blower 43, and together with the conduits 41, 42, and 30, are effective to deliver an upwardly directed air stream into the tower P through the entry port 31, with the air stream carrying the powdered limestone.

A second feed screw 44 is mounted below and communicates with the discharge spout 39a of the hopper H; and associated with this feed screw 44 is a vibrator 45, with the twoconstituting a second vibrascrew. The air conduit 32 is connected to this vibrascrew 44, 45, and includes a smaller air blower 46. It is evident that the vibrascrew 44, 45, blower 46, and conduit 32 deliver air carrying powdered limestone to the cyclone dust separator 34.

A rotary cooler is referred to in its entirety by the reference character C and is shown in section in FIGURE 3. This cooler C comprises a cylindrical wall 47 carrying inwardly directed ribs or vanes 48 which affect a tumbling action on the material therein. The rotary cooler C is mounted in an inclined position as illustrated, and its upper end receives the lower end of the discharge chute 25 so that coated pellets coming from the discharge chute 25 are delivered into the upper end of the rotary cooler. The lower end of the rotary cooler C, which is represented at 49, is positioned over a funnel 50 that is carried at the top of a packaging machine, such as a bagger, represented at 51. This bagger delivers coated pellets to valve bags, one of which is represented at 52.

It will be noted that a dust hood 53 is positioned over the lower end 49 of the cooler C and the open top of the funnel 50. An exhaust line 54 is connected to this dust hood 53 and also to a second exhaust line 55. This exhaust line 55 is connected at one end as indicated at 56 to dust collector 57. The latter has an exhaust fan 58 associated therewith, and also has discharge spouts 59 through which collected dust is removed from the collector 57.

The other end of the exhaust conduit 55 is connected to the conduit 42 as indicated at 60. It will be noted that the conduit 42 extends to a point where it is connected with the cylindrical wall 27 of the cap 25 as indicated at 61. A branch exhaust conduit 62 has its lower end connected with the hopper H and its upper end to the exhaust conduit 55 as indicated at 63. Properly positioned relative to the conical top 23 of the tower P are water sprays 64 which deliver cooling water onto the tower. Additional water sprays 65 are associated with the rotary cooler C.

**The Method**

The asphalt is supplied to the processing plant in any appropriate manner, such as by tank trucks which deliver asphalt in molten form. Limestone in powdered form is charged into the hopper H, preferably by hand.

The molten asphalt is pumped from the tank trucks into the tank T and is maintained at a required temperature, preferably 450° F., by the gas burners 15. Before the process is actually started to produce the coated pellets, the three-way valve V is turned to the position depicted in FIGURE 1, which is the recirculating position, with the pump 19 in operation, the molten asphalt is recirculated through conduits 17, 20, and tank T.

With the asphalt circulating freely, the blowers 43 and 46 are started into operation. The vibrascrew 39 and 40 is then started to feed powdered limestone into the main air duct 30. After this is done, the three-way valve V is turned into the position depicted in FIGURE 2 in which molten asphalt is delivered to the spray nozzle 29. After the elapse of a few seconds, the second vibrascrew 44, 45 is started into operation so that the air stream created by the blower 46 delivers the air and powdered limestone carried thereby to the cyclone dust separator 34.

After the three-way valve V has been moved to the position of FIGURE 2, the recirculating conduit 20 may be cleared of asphalt by blowing steam therethrough.

It is evident that the spray of asphalt coming from the nozzle 29 encounters the upwardly directed air stream emerging from the port 31. This causes a further atomization of the asphalt which breaks the latter down into fine pellets or globules. Moreover, these pellets are initially coated by the powdered limestone or dust that is carried by the air stream and are cooled to a temperature of about 150° F. by the time they reach the lower portion of the tower. After they reach this lower portion, they fall through the lower zone of swirling or agitated air and powdered limestone carried thereby, through which they pass and in so doing acquire additional powdered limestone which completes the coating thereof.

The coated pellets now fall down the sloping sides of the conical bottom 24 and are discharged through the chute 25 into the rotary cooler C and rotated as indicated, and the ribs or vanes 48 affect a tumbling action on the coated pellets. By the time the coated pellets reach the discharge end 49 of the rotary cooler, they are at a temperature of about 120° F.

It is evident that the temperatures in the processing tower P and the rotary cooler C may be accurately controlled through adjustment of the water sprays 64 and 65, respectively.

The packaging machine depicted at 51 may be of the flywheel-bolt type, which is effective to receive the coated pellets from the discharge end 49 of the cooler and throw them through a nozzle into valve-type bags such as indicated at 52.

When the process is to be discontinued, the three-way valve V is turned to the recirculating position depicted in FIGURE 1 and the two feed screws 39 and 44 immediately shut off. The various conduits may then be blown clear with steam.

During continuation of the process, the exhaust fan 58 is maintained in operation to draw limestone dust from the cap 25 at the top of the tower P and the dust hoods 36 and 53.

While a preferred specific embodiment of the invention is hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact steps, constructions, and devices illustrated and described, because various modifications of these details may be provided in putting the invention into practice within the purview of the appended claims.
What is claimed is:

1. In the production of coated bitumen pellets, the method comprising the steps of (a) spraying molten bitumen downwardly into an upwardly directed stream of air carrying a powdered coating material to atomize the bitumen into fine pellets, initially coat, and partially cool the same to a semi-molten state; and (b) passing said initially coated pellets through a second zone of swirling air carrying the coating material whereby the semi-molten pellets acquire additional coating.

2. In the production of coated bitumen pellets, the method comprising the steps of (a) spraying molten bitumen downwardly into an upwardly directed stream of air carrying a powdered coating material to atomize the bitumen into fine pellets, initially coat, and partially cool the same to a semi-molten state; (b) passing said initially coated pellets through a second zone of swirling air carrying the coating material whereby the semi-molten pellets acquire additional coating; and (c) agitating and further cooling the coated pellets.

3. In the production of coated bitumen pellets, the method comprising the steps of (a) spraying molten bitumen downwardly into an upwardly directed stream of air carrying powdered limestone to atomize the bitumen into fine pellets, initially coat, and partially cool the same to a semi-molten state; and (b) passing said initially coated pellets through a second zone of swirling air carrying the coating material whereby the semi-molten pellets acquire additional coating.

4. In the production of coated bitumen pellets, the method comprising the steps of (a) first preparing molten bitumen to a required condition by recirculation; (b) spraying the molten bitumen downwardly into an upwardly directed air stream carrying a powdered coating material to atomize the sprayed bitumen into fine pellets, initially coat, and partially cool the same to a semi-molten state; (c) passing the initially coated pellets through a second zone of air carrying the powdered coating material whereby the semi-molten pellets acquire additional coating; and (d) collecting, agitating, and further cooling the coated pellets.

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