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2,772,642

DEHYDRATING AND PELLETING APPARATUS

Filed June 8, 1954

2 Sheets-Sheet 1

FIG. 1.

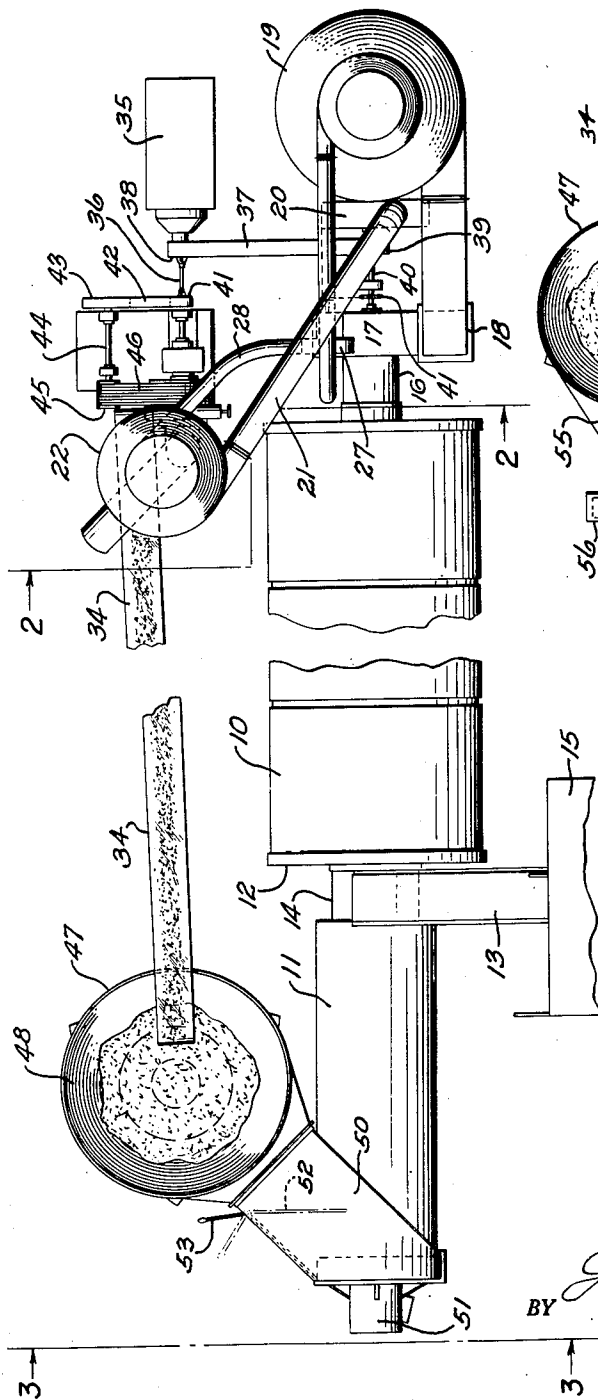
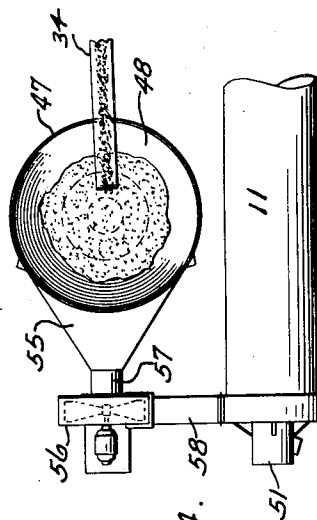


FIG. 4.



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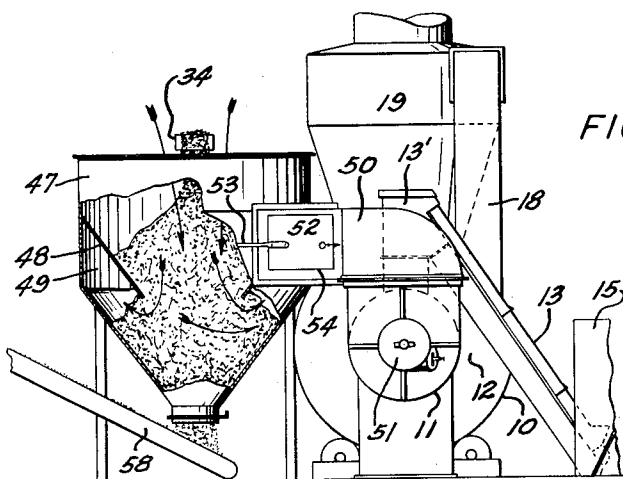
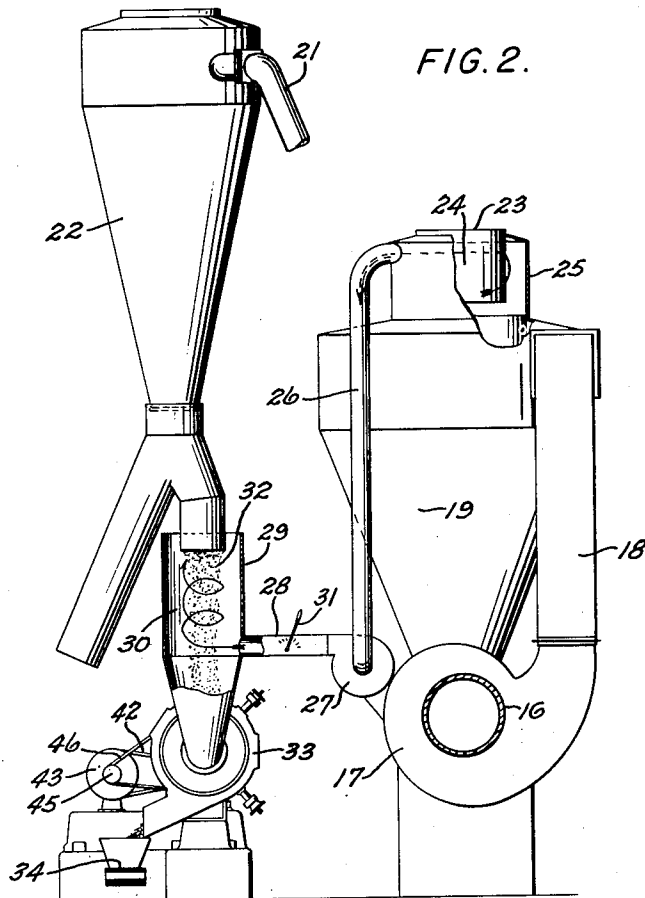
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DEHYDRATING AND PELLETING APPARATUS

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Application June 8, 1954, Serial No. 435,271

3 Claims. (Cl. 107—4)

This invention relates to improvements in dehydrating and pelleting apparatus.

In Henry C. French Patent No. 2,651,269, issued September 8, 1953, a dehydrating and pelleting device is disclosed wherein moisture laden gases including steam are diverted from the main drying collector and delivered to a pelleting device to thereby eliminate the necessity of having a separate source of steam connected with the pelleting apparatus. In constructions such as that shown in said prior patent it is customary to have one fan for moving the material to be dehydrated through the dehydrating apparatus and a separate fan to cool the pellets.

It is an object of the present invention to provide improved apparatus of the class described wherein the same fan which moves the product through the dehydrator may be used to cool the pellets which are discharged from the pelleting apparatus.

A further object of the invention is to provide an improved drying and pelleting apparatus wherein the same air which cools the pellets is used as a dehydrating and conveying medium to move the product which is to be dehydrated through the dehydrating drums, this same air also serving as the secondary combustion air. Thus the air which is used in the dehydrator is preheated due to the fact that it has previously extracted heat from the pellets while cooling the latter.

A further object of the invention is to provide dehydrating and pelleting apparatus wherein there is improved means for thoroughly treating the dehydrated material with moisture laden gases prior to pelleting.

A further object of the invention is to provide improved dehydrating and pelleting apparatus in which a reduced number of parts is required and in which there is a saving in fuel due to the use of preheated air.

Other objects of the invention are to provide an improved apparatus of the class described which is efficient in operation, relatively inexpensive, and well adapted for the purpose described.

With the above and other objects in view, the invention consists of the improved dehydrating and pelleting apparatus, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a top view of the dehydrating and pelleting apparatus, part of the rotary dehydrator and part of the pellet conveyor being broken away;

Fig. 2 is a sectional view taken approximately on the line 2—2 of Fig. 1, parts being broken away and shown in vertical section;

Fig. 3 is an end elevational view looking in the direction indicated by the line 3—3 in Fig. 1, parts being broken away and part of the pellet cooler being broken away and shown in section; and

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Fig. 4 is a fragmentary top view of the pellet cooler and its connection with the furnace showing a modified arrangement.

Referring more particularly to the drawings, the numeral 10 designates a rotatable cylindrical type of dehydrator of the general type disclosed in Arnold Patent No. 1,988,677. A furnace 11, preferably of the liquid fuel burning type is adapted to discharge hot gases of combustion into the end 12 of the dehydrator proper. Material, such as a forage crop which is to be dehydrated, is adapted to be delivered by an endless conveyor 13 leading to a hopper 13' into a passageway 14 which connects the furnace 11 with the dehydrating drum 10. The product may be fed manually onto the conveyor 13 or there may be any well known type of automatic feeder 15.

At the discharge end of the dehydrating drum 10 is a discharge duct 16, which connects with the central inlet opening of a main exhaust fan 17. The fan 17 exerts a suction effect in the passages of the dehydrator 10 and causes movement of the material to be dried through the dehydrator. The dehydrated material is discharged centrifugally from the fan into a duct 18 leading into a centrifugal separator 19.

As the material passes through the dehydrating drum 10 moisture is removed therefrom and is picked up by the hot gases which also flow through the dehydrator. These hot gases become moisture laden and a certain amount of moisture may be converted into steam due to heat in the drum. As the incoming gases and dehydrated product enter the centrifugal separator 19 tangentially, they follow a circular path. The vortex thus created within the separator 19 separates the dehydrated material from the moisture laden gases, and the dehydrated material falls downwardly out of the bottom of the separator 19 and is delivered into a cooling mill 20. This cooling mill may be of any well known type and may include a fan with hammers to reduce the particle size of the material to a size which can be pelleted. The cooling mill delivers the material upwardly through a conduit 21 into a cooling collector 22.

Referring now to Fig. 2, the construction at the upper end of the centrifugal separator 19 is the same as is disclosed in French Patent No. 2,651,269, heretofore referred to, there being a restricted upper end opening 23 in the top of an inner sleeve 24. Thus, the moisture laden gases cannot escape freely through the opening 23 and a back pressure is created. This causes a substantial portion of the moisture laden gases and steam to move upwardly between the sleeve 24 and the dome 25 of the separator 19 and then into the conduit 26. A fan 27 draws the moisture laden gases and steam down the conduit 26 and delivers said gases through a connecting conduit 28 into the mixing chamber 30 of a hopper 29. Flow through the connection 28 may be regulated by a suitable damper 31.

The hopper 29 is adapted to receive dehydrated material from the cooling collector 22, and the hot gases and steam are adapted to pass upwardly through the chamber 30 of the hopper 29, as indicated by the arrows in Fig. 2, to contact the falling stream 32 of dehydrated material. Thus, the surfaces of the particles of dehydrated material are thoroughly moistened by the hot gases and steam and are thus lubricated in preparation for the pelleting operation. This arrangement for causing the moisture laden gases to contact the dehydrated particles in the chamber 30 is an improvement over the arrangement disclosed in the prior Patent No. 2,651,269.

The steamed and moistened material is delivered by the hopper 29 into a pellet mill 33 of any well known type where it is extruded through holes to form small cylindrical pellets in the usual manner, the pellets being

discharged onto one end of an endless conveyor 34, as shown in Figs. 1 and 2. French Patent No. 2,651,269 discloses one type of pellet mill.

A power unit 35 drives a shaft 36. An endless belt 37 connects a pulley 38 driven by the power unit with a pulley 39 on a shaft 40. The shaft 40 drives the main exhaust fan 17 and also the cooling mill 20. The shaft 36 on the power unit 35 also drives a pulley 41 and the latter is connected by an endless belt 42 with a pulley 43 on a shaft 44. The shaft 44 in turn drives the pulley 45 which is connected by V-belts 46 with the pellet mill 33 to drive the latter. The steam delivering fan 27 may be driven from the shaft 40 through suitable connection with a sprocket wheel or pulley 41 thereon.

The conveyor 34 delivers the pellets into the top of a pellet cooler 47. The latter is hopper shaped as illustrated in Fig. 3, and includes a frusto conical baffle member 48 which prevents material from entering a circular space 49, which space forms a circular air chamber. Connected with the circular air chamber is a breeching passageway 50 which leads into an end of the furnace 11 at the top thereof, as shown in Figs. 1 and 3, the fuel burner proper being designated by the numeral 51. A door 52 operated by a handle 53 controls the admission of auxiliary air through an opening 54 in the side of the breeching.

In the modification of Fig. 4 the pellet cooler 47, which is the same as that illustrated in Fig. 3, has its circular air chamber in communication with an air manifold 55. A fan 56 has its inlet connected with the manifold by a duct 57. The centrifugal discharge from the fan is connected by a duct 58 with the furnace 11.

Operation

In the operation of the principal form of the invention, the main exhaust fan 17 of the dehydrator, which serves to move the gases as well as the material to be dehydrated through the drier 10 also creates a suction effect in the duct 50 to cause air from the exterior to enter the top of the pellet cooler 47, as shown by the arrows in Fig. 3. This air travels through the pellets as indicated by the arrows to thoroughly cool the pellets, at the same time picking up heat therefrom. By the time this air enters the circular air chamber 49 it is preheated. This preheated air is then pulled into the furnace 11 and through the dehydrator. Thus, the same air which cools the pellets is used as a drying and conveying medium in the drier 10 and also furnishes the secondary combustion air. The pellets may be discharged onto a discharge conveyor 58.

In view of the fact that this air is preheated there is a saving in fuel consumption. Any desired amount of outside air may be mixed with the preheated air in accordance with the setting of the valve 52 in the duct 50.

In the principal form of the invention just described, the main exhaust fan 17 of the dehydrator not only serves to move the gases and material through the dehydrator, but also serves as the air moving means for moving fresh air through the pellets in the pellet cooler. Thus, there is a substantial saving in expense.

If, in any particular installation, a separate fan in connection with the pellet cooler is deemed desirable, then the arrangement of Fig. 4 may be adopted where the auxiliary fan 56 serves to draw air through the pellets in the pellet cooler 47, and to deliver the preheated air into the furnace 11.

From the above it is believed clear that a very useful and novel arrangement has been worked out whereby in both forms of the invention the same air which cools the pellets also serves as a preheated drying and conveying medium in the dehydrator and also furnishes the secondary combustion air.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated, as may come within the scope of the claims.

What I claim as my invention is:

1. In combination with a dehydrating machine having a drying unit for receiving a product to be dehydrated and having a furnace connected with said drying unit and having discharge means for the dehydrated product, a pelleting device positioned to receive the dehydrated product from said discharge means, a pellet cooler having an open top spaced a substantial distance from said pelleting device, an endless conveyor exposed to the atmosphere having one end positioned to receive pellets from the pelleting device and having its other end positioned to discharge pellets by gravity into the open top of said cooler, means for drawing atmospheric air into said cooler around said stream of falling pellets and through the pellets in the cooler so that said air cools the pellets while they are falling from the conveyor and while in the cooler and so that said air itself becomes preheated, and means for conducting said preheated air into said dehydrating machine for use as a drying medium and to furnish the secondary combustion air for the furnace.

2. In combination with a dehydrating machine having a horizontal drying unit with a feed opening at one end for receiving a product to be dehydrated and having a furnace connected with said drying unit and having discharge means for the dehydrated product at the opposite end, a pelleting device positioned adjacent said opposite end to receive the dehydrated product from said discharge means, a pellet cooler having an open top adjacent the feed end of the drying unit, an endless conveyor exposed to the atmosphere having one end positioned to receive pellets from the pelleting device and having its other end positioned to discharge pellets by gravity into the open top of said cooler, means for drawing atmospheric air into said cooler so that said air cools the pellets therein and itself becomes preheated, and means for conducting said preheated air into said dehydrating machine for use as a drying medium.

3. In combination, a dehydrating machine having a drying unit and having discharge means connected to said unit which includes a discharge opening for the dehydrated product and a discharge means for the moisture laden gases from the drying unit, a pelleting device positioned adjacent said dehydrating machine, a vertically disposed feed hopper for said pelleting device which is of substantial height having an open upper end positioned to receive a falling stream of the dehydrated product from the discharge opening of the drying unit, and means including a conduit having one end connected to said gas discharge means for intercepting gases which have become moisture laden in said drying unit, said conduit having its other end connected to the feed hopper for the pelleting device a substantial distance below the top thereof and a substantial distance below the top of a falling stream of dehydrated product therein so that said moisture laden gases will rise in a direction counter to the flow by gravity of the stream of falling material to act on the latter for a substantial distance prior to entry of the material into the pelleting device.

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