

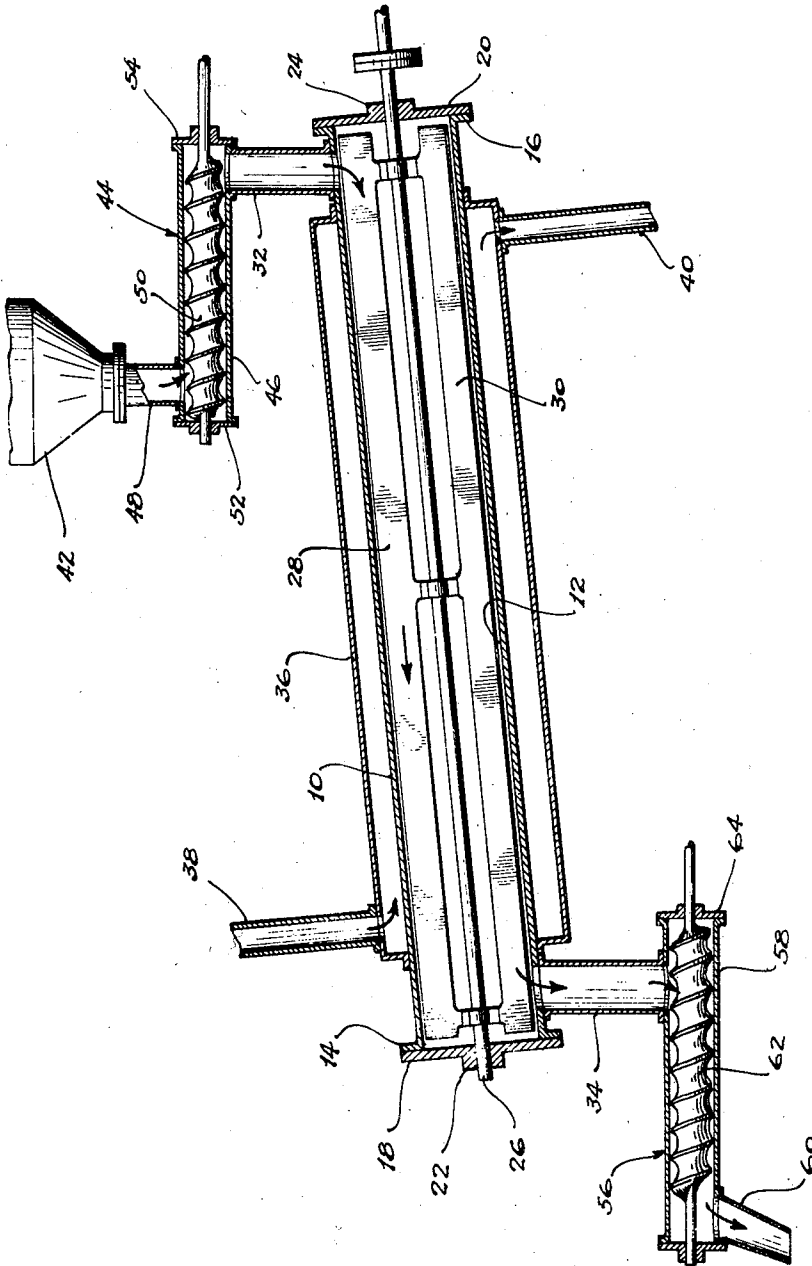
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PROCESS FOR HANDLING POWDERED MATERIAL

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PROCESS FOR HANDLING POWDERED MATERIAL

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3 Claims. (Cl. 259—1)

1

This invention relates to improvements in cooling powdered or granular material such as partly processed soap and powdered milk and eggs where the powdered material is removed from a dryer at relatively high temperature and cooled in an inert atmosphere to a temperature at which material deterioration by oxidation will not be caused by contact with the atmosphere.

It is an object of the present invention to provide a method of cooling oxidizable material involving the continuous feeding and ejecting of said material from the cooler in such a manner as to prevent flow of air through the cooler.

A further object resides in the provision of a method for cooling powdered material in a cooler of the character indicated having a smooth interior metal surface effective for the rapid transfer of heat and for keeping the heat transfer surface clean and free of films or coatings of the material passing through the cooler.

A still further object resides in the provision of a method for cooling powdered material whereby the material to be cooled is maintained in close contact with the heat transfer surface as it passes through the cooler.

Other objects and advantages will be apparent as the description proceeds in connection with the accompanying drawing, and from the appended claims.

In the accompanying drawing, in which like reference numerals are used to designate similar parts throughout, the single figure is a diagrammatic longitudinal sectional view of cooling apparatus for carrying out the method of the invention.

With continued reference to the drawing, the numeral 10 indicates an elongated tubular member preferably of substantially uniform diameter which provides interiorly thereof the cooling chamber 12. While other constructions may be used without departing from the spirit of the invention, it has been found convenient to provide the tubular member 10 with an external flange at each end thereof, as indicated at 14 and 16, to which flanges are secured the respective end cover members 18 and 20. The cover members 18 and 20 are provided with bearings 22 and 24, respectively, which support the end portions of a shaft 26 which is substantially concentric with the tubular member 10 and carries paddle blades as indicated at 28 and 30, the number of blades being variable within the scope of the invention but two oppositely disposed blades having been found desirable. The shaft 26 is connected at one end to a driving means, not illustrated, which rotates

2

the paddle member in the tubular member 10 whenever the apparatus is in use.

The tubular member is interiorly bored and polished to provide a smooth, clean interior surface, and the outer edges of the blades of the agitating paddle have a close fit with the interior surface of the tubular member 10 so that the paddle member has a cleaning action on this interior surface and prevents the coating of the surface by material such as the powdered soap, milk or eggs mentioned above and maintains the surface in condition for rapid transfer of heat.

The tubular member is inclined so that material agitated by the paddle member will pass there-through, and near the upper end the tubular member is provided with an inlet duct 32 and near the lower end with an outlet duct 34. Between the inlet and outlet ducts, the tubular member is surrounded by a water jacket 36 having an inlet 20 and an outlet. In the arrangement illustrated, a tube 38 may be the inlet and the tube 40 the outlet, this arrangement being generally preferred since it gives a counterflow of the cooling fluid with relation to the flow of material through the cooling chamber and normally provides a more efficient cooling action.

The inlet duct 32 is connected with a dryer or flash chamber 42 through a feed screw generally indicated at 44. The screw mechanism 44 may conveniently comprise a tubular member 46 connected near one end with the outlet 48 from the dryer 42 and near the other end with the cooler inlet 32 and a spiral screw member 50 extending through the tubular member 46 and journaled at its ends in the tubular member end covers 52 and 54. Means, not illustrated, are provided to drive the screw 50, which means may have a common power source with the drive of the paddle member or may be driven by a separate motor, as may be found convenient or desirable. The feed screw mechanism 44 is operated to provide a continuous feed of material from the drying chamber 42 to the cooling chamber while excluding air from the inlet of the cooling chamber.

The cooling chamber outlet 34 is connected with an ejecting screw mechanism generally indicated at 56 which may comprise a tubular member 58 connected near one end with the lower end of the cooling chamber outlet duct 34 and may be provided at its other end with a spout 60. A spiral screw member 62 is disposed within the tubular member 58 and is journaled in suitable bearings provided, one in the end closure member 64 and the other in the outer portion of the spout 60. The screw member 62

may be driven from a common power source with the paddle and screw member 58 or may be driven by an independent motor as may be found convenient or desirable. The ejecting screw mechanism not only provides a continuous flow of material from the cooling chamber but is operative to exclude air from the cooling chamber outlet.

With the above described arrangement, cooling of the material in the tubular member 10 is carried on in a substantially inert atmosphere so that hot oxidizable material such as soap powder, powdered milk or powdered eggs from the drying chamber may be cooled without oxidizing deterioration from the drying chamber temperature, which may run as high as 350 to 400° F. to a temperature at which it is not deteriorated by contact with the atmosphere.

This arrangement has been found to be particularly efficient in cooling the type of materials indicated, a small cooler made from a piece of commercial 6" pipe having been found to have a heat transfer rate of approximately 12 to 15 B. t. u. per hour per square foot per degree Fahrenheit temperature difference. It has been found to be important, however, to maintain the smooth interior surface of the tubular member free from a coating of dust or powder in order to maintain the high heat transfer rate indicated.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and language of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. Method of cooling a powdered material having an initial temperature well above that at which relative rapid oxidation will take place, comprising feeding a compact mass of the hot powder into an elongated cooling chamber, distributing the mass of the powder in a thin layer over the surface of the chamber in the absence of air and agitating the powder in the chamber in the absence of air, extracting heat from the powder while it is passing through the chamber, and then removing the powder from the chamber as a compact mass to seal the outlet with the

mass after the temperature has been lowered to a temperature below that at which relatively rapid oxidation will take place.

2. A method of cooling a powdered material having an initial temperature well above that at which relatively rapid oxidation will take place, comprising continuously feeding a stream of hot powder through an inlet port means into an elongated cooling chamber, distributing the stream in a thin layer over the surface of the chamber in the absence of air, extracting heat from the powder while it is passing through the chamber, removing the stream of cool powder from the chamber through an outlet port means, and compacting the stream of powder flowing through said port means exposed to the atmosphere to prevent the entrance of air into the chamber.

3. A method of cooling a powdered material having an initial temperature well above that at which relatively rapid oxidation will take place, comprising continuously feeding a stream of hot powder through an inlet port means into an elongated cooling chamber having a polished inner surface, distributing the stream in a thin layer over the polished surface of the chamber in the absence of air, agitating the layer in a manner to periodically clean the polished surface, extracting heat from the powder while it is passing over the polished surface in the chamber, removing the stream of cool powder from the chamber through an outlet port means, and compacting the stream of powder flowing through said port means exposed to the atmosphere to prevent the entrance of air into the chamber.

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