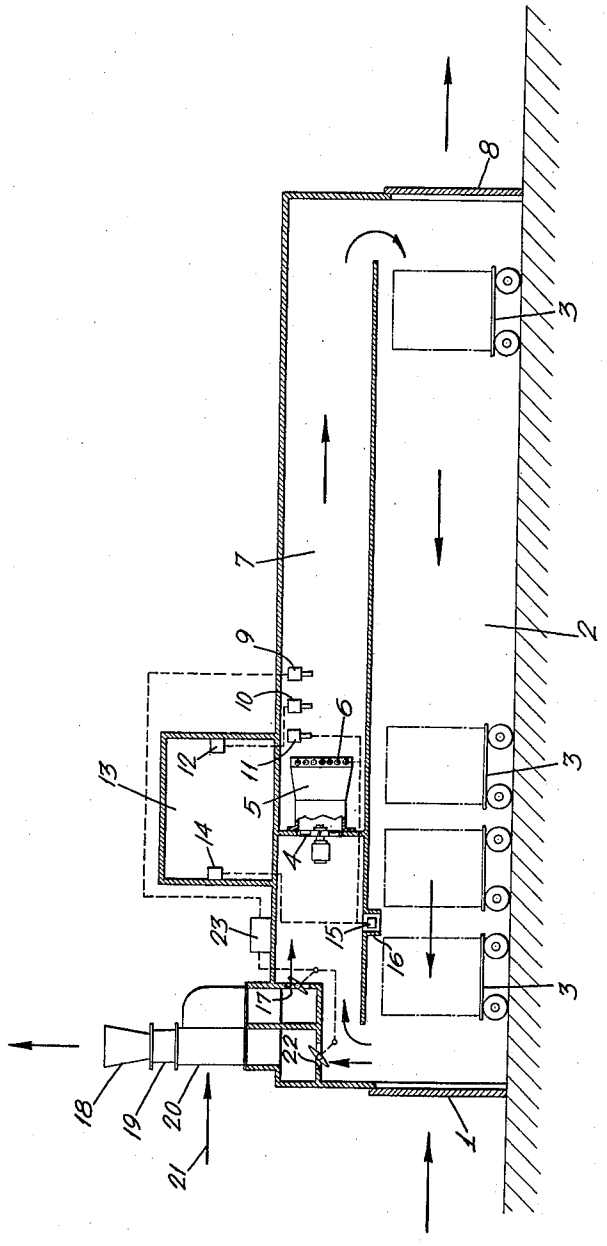
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CHANNEL DRIERS

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CHANNEL DRIERS

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The present invention relates to channel driers with continuously or intermittently fed drying goods in which the drying medium is forced to circulate counter current to the drying goods.

In order to obtain good heat economy with limited ventilation, it is best that the drying medium after passing the drying goods has as high a moisture content as possible. Such a condition of the drying medium is especially important when drying delicate goods or goods sensitive to cracking or checking strains, for instance lumber, in order to prevent the goods from being immediately exposed to a drying medium having an excessive drying force (wet bulb depression). The quantity of circulating drying medium is therefore adjusted to correspond with the calculated evaporation, so that the desired conditions are obtained. In practice it has been found, however, that the moisture ratio of the drying goods varies rather considerably, causing variation in the heat consumption and in the cooling of the circulating drying medium. The drying goods entering the channel are thus exposed to a drying medium of varying drying force (wet bulb depression) resulting in a risk of surface drying and cracking or insufficient drying. It is an object of the present invention to eliminate these drawbacks.

The method according to the invention is characterized in that the wet bulb temperature of the drying medium entering the channel is maintained constant by ventilation regulated in a manner known per se, and the dry bulb temperature of said medium is varied relative to the deviation from a certain predetermined temperature, which the drying medium shows at a point in the drying channel near or next to the feeding point of the drying goods.

An apparatus suitable for the performance of the method consists of a drying channel with circulating and heating means arranged in the return channel for a drying medium which circulates counter current to the drying goods. The circulating means is equipped with damper controlled inlet and outlet openings for the ventilating medium and with temperature and moisture sensitive means together with control means for the regulation of the ventilation and heat supply. The apparatus is characterized by a temperature sensitive means, the bulb of which being arranged in a duct projecting into the drying channel near or next to the feeding point of the drying goods. The duct, by a connection to the suction side of the circulating means, passes a small part of the drying medium, whereby the said temperature sensitive means will indicate or automatically cause the necessary change of the temperature of the drying medium entering the drying channel at the discharge point for the drying goods.

The temperature sensitive means may consist of a remote thermometer, observed by the operator, who then manually regulates the temperature of the drying medium entering the drying channel to a suitable value. Said means may in the alternative consist of a thermostat directly acting upon a motor operated steam valve for

the heating element of the circulating medium, the temperature of the entering medium thereby being automatically controlled in accordance with the invention.

The invention will now be described more in detail with reference to the accompanying drawing, showing a longitudinal section of an apparatus suitable for the performance of the method.

In the drawing reference numeral **1** designates the feeding end of a channel drier **2**. The goods are transported on trucks **3** and are dried by being exposed to a drying medium which by means of a fan **4** is circulating counter current to the direction of travel of the drying goods. Reference number **8** designates the discharge end for the drying goods. The circulating fan **4**, situated in a return channel **7** above the drier, is by means of a diffusor **5** connected with a heating element **6**, whereby the drying medium can be heated to a suitable temperature. Means is provided to control the moisture content of the drying medium. For the removal of the water evaporated in the channel drier, a part of the circulating drying medium is exhausted through an opening **22** equipped with a damper, and a corresponding quantity is supplied through the inlet opening **17**, which also is equipped with a damper. In the illustrated embodiment of the invention, the exhausted ventilating medium, which is exhausted by a fan **19** through the diffusor **18**, is forced to pass first through a heat recovery unit **20**, wherein the outdoor air being supplied at **21** is preheated. In accordance with the invention the wet bulb temperature of the drying medium injected into the drying channel is to be maintained constant. This is done by means of a wet bulb thermostat **9** arranged in the return channel **7** which in known manner actuates manoeuvring motors **23** for the dampers in the openings **17** and **22** for the ventilating medium.

The temperature of the drying medium entering the drying channel is governed by a motor valve **11** in the steam supply pipe of the heating element **6**. The motor valve **11** in its turn is operated by a thermostat **12**, the bulb **10** of which is arranged in the medium flow after the heating element **6**. The thermostat **12**, which suitably is arranged in a control room **13**, is set at different temperature values relative to the deviation from a certain predetermined value for the temperature of the drying medium after said medium has passed the goods, said deviation being observed on a remote thermometer **14** also situated in the manoeuvring room. The bulb **15** of the remote thermometer is arranged in a short duct **16** communicating with the suction side of the fan and projecting into the drying channel. The function of said short duct is to insure that the bulb **15** is influenced by drying medium which positively has passed through the drying goods and not beside them. Instead of the remote thermometer **14**, **15**, the bulb of a thermostat can be arranged in the short duct which thermostat directly actuates the motor steam valve **11**, whereby an entirely automatic control can be obtained. The bulb **15** and the short duct **16**, which in the shown case are located between the truck being lastly fed and the next to the last ones, may also be placed on the opposite side of the last truck, i.e. at the feeding point for the drying goods.

Thus, in the operation of the device, the wet-bulb temperature of the drying medium entering the drying channel is maintained constant by the dampers **17** and **22** under the control of the wet-bulb thermostat **9**. Since the drying is adiabatic in the channel, the wet-bulb temperature remains substantially constant throughout the channel, the dry bulb temperature dropping and the moisture content rising. As the medium passes from the drying channel back to the wet-bulb thermostat **9**, fresh air is mixed into it, as controlled by the dampers **17** and **22** which are operated by the control motors **23**

actuated in turn, by the wet-bulb thermostat, to reduce the moisture content and maintain the wet-bulb temperature of the medium entering the drying channel constant. The dry-bulb temperature of the injected drying medium is changed in accordance with changes in the dry-bulb temperature of the exhausted drying medium to thereby maintain the exhausted medium at a predetermined temperature. When the dry bulb temperature in the duct **16** drops, more heat is added by the heater **6** to raise the dry-bulb temperature of the injected medium prior to passing the wet-bulb thermostat 9, thereby raising the dry-bulb temperature of the medium a corresponding amount throughout the dryer, including the dry-bulb temperature of the exhausted medium. Since the dry-bulb temperature of the exhausted medium is thus maintained constant, and since the wet-bulb temperature of the drying medium is maintained substantially constant, the drying force (wet-bulb depression) of the exhausted medium is maintained constant.

What I claim is:

1. Apparatus for drying goods comprising a drying channel, said drying channel having a feed end and a discharge end for the drying goods, means to advance the drying goods from said feed end to said discharge end, means to circulate drying medium through said drying channel from said discharge end to said feed end in operative contact with and countercurrent to the drying goods, moisture-content control means including a wet-bulb thermostat responsive to the wet-bulb temperature of the drying medium entering said drying channel to maintain its wet bulb temperature constant, heating means to regulate the dry bulb temperature of the drying medium entering said channel, a duct open at one end into said drying channel adjacent the feed end thereof, and open at the other end to the suction side of said circulating means to thereby pass at least a part of the drying medium after contact with the drying goods, a dry bulb temperature sensing means mounted in said duct, and temperature control means operable upon deviation of said sensing means from a predetermined value to operate said heating means to vary the dry bulb temperature of the medium entering the channel to return said sensing means to said predetermined value.

2. Apparatus according to claim 1 wherein said temperature control means comprises automatic means to actuate said heating means in response to changes in the temperature-sensing means.

3. Apparatus according to claim 1 wherein said temperature control means comprises a thermostat responsive to the dry-bulb temperature of the drying medium entering the channel, and operating to control the heater means to a predetermined value, and means to change said predetermined value in response to changes in the temperature-sensing means.

4. Apparatus for drying goods, comprising a drying channel, said drying channel having a feed end and a discharge end for the drying goods, means to advance the drying goods from the feed end to said discharge end, a fan having its discharge connected to the discharge end of said channel to circulate the drying medium through said drying channel from said discharge end to said feed end in operative contact with and countercurrent to the drying goods, means to exhaust a portion of said drying medium after passage through said channel and recirculate the remainder to said fan, means to inject fresh drying medium into said fan in an amount corresponding to said exhausted portion, damper means to regulate the proportion of recirculated and fresh drying medium entering the fan, means including a wet bulb thermostat responsive to the condition of the drying medium entering the drying channel to control said damper means to maintain the wet bulb temperature of the entering medium constant, heating means to regulate the dry bulb temperature of the drying medium entering said channel, a duct open at one end into said drying channel adjacent the feed end thereof, and open at the other end to the suction side of said fan to thereby pass at least a portion of the drying medium after contact with the drying goods, a dry bulb temperature sensing means mounted in said duct, and temperature control means operable upon deviation of said sensing means from a predetermined value to operate said heating means to vary the dry bulb temperature of the medium entering the channel to return said sensing means to said predetermined value.

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