Sept. 26, 1961 C. A. BLESCH ET AL 3,001,298

DRYER WITH BURNER

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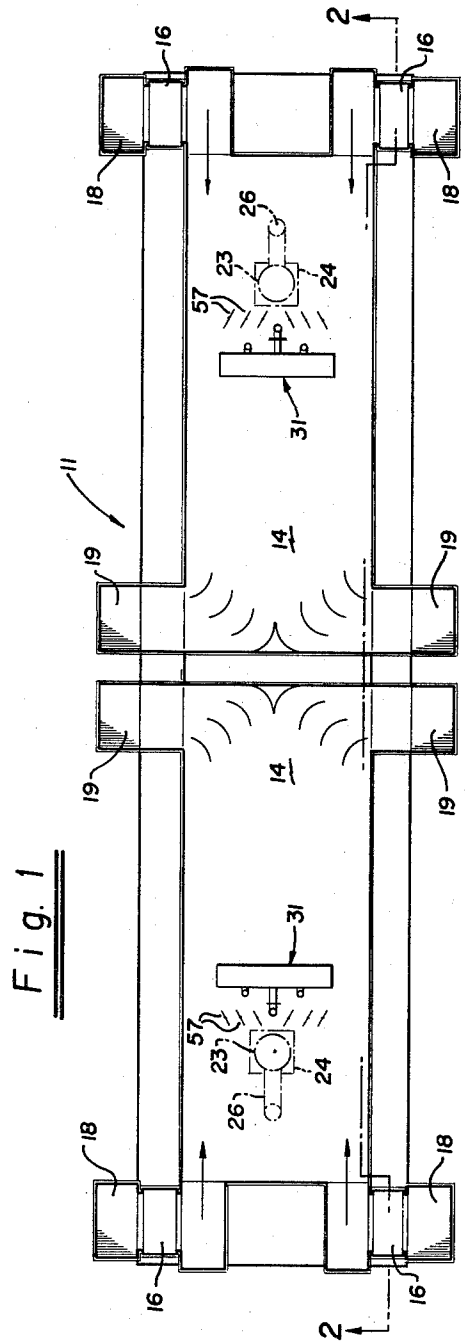


Fig. 1

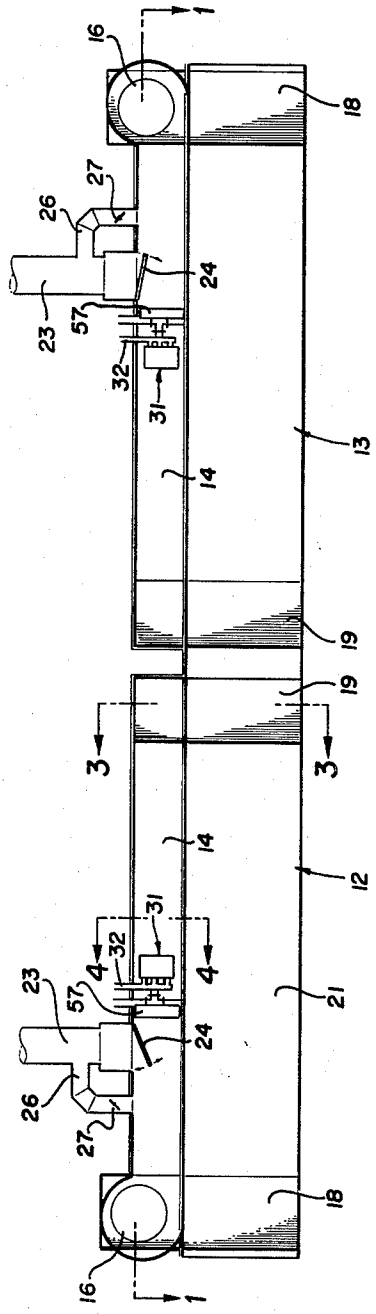


Fig. 2

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Fig. 3

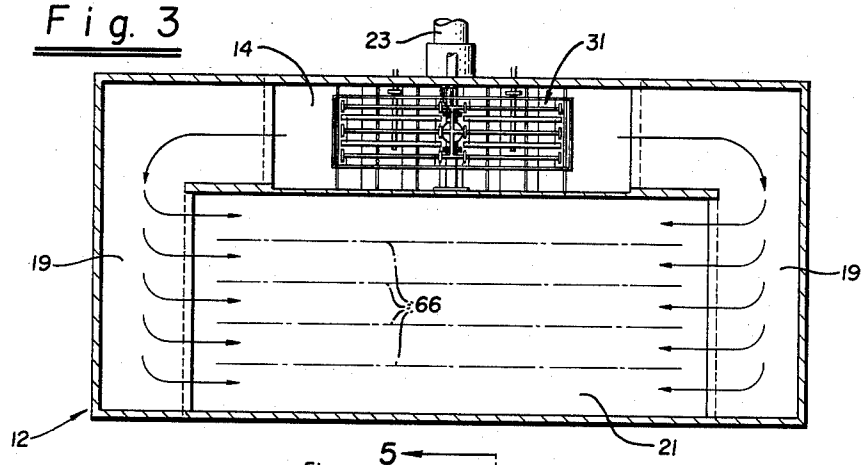


Fig. 4

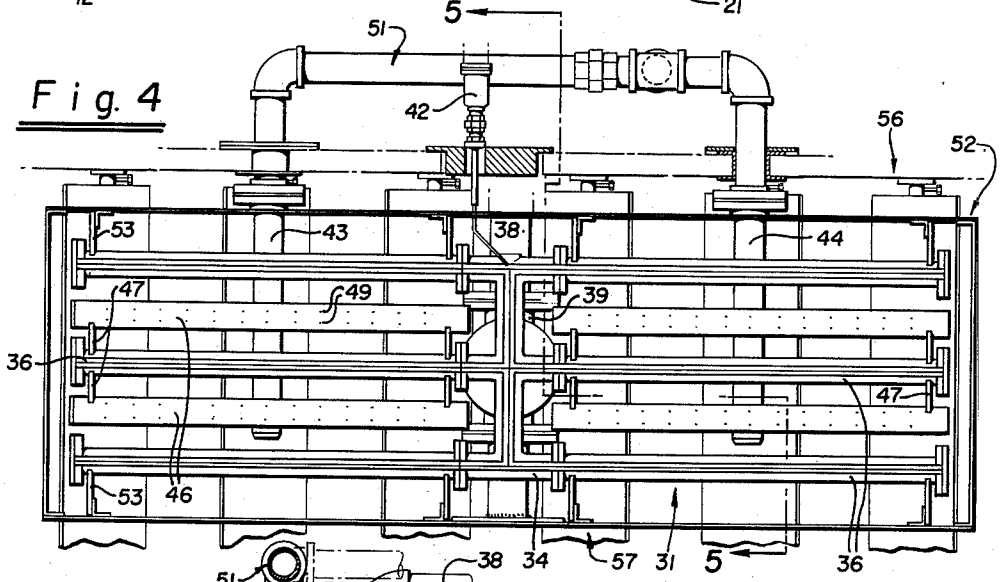
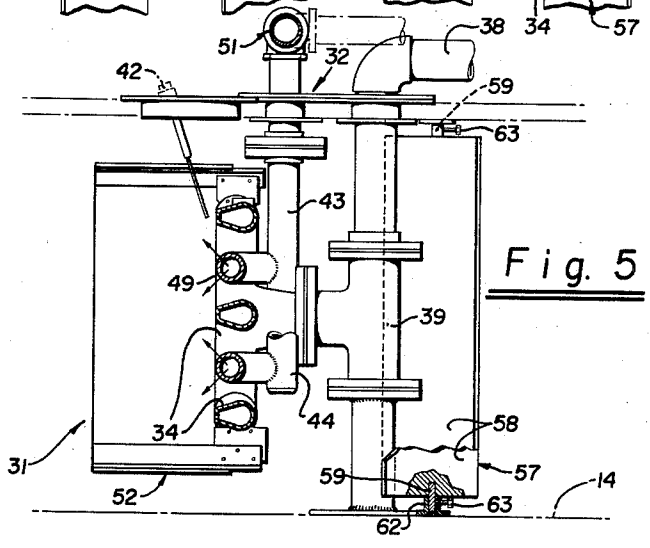


Fig. 5



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DRYER WITH BURNER

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This invention relates to a dryer and method and more particularly to a dryer and method for drying veneers and other similar materials containing volatiles.

Dryers heretofore provided have operated inefficiently particularly in view of the fact that volatiles, pitches and wood fines driven from the veneers were not combusted but rather condensed on the side walls and rolls of the dryer. This condensation created a serious fire hazard therefore necessitating frequent shut-downs of the dryers for cleaning.

In general, it is an object of the present invention to provide a dryer and method of the above character in which volatiles, pitches and wood fines and the like driven from veneers or other similar materials are combusted.

Another object of the invention is to provide a dryer and method of the above character in which heat liberated from the combustion of the volatiles, pitches and wood fines within the dryer is used for supplementing the heat from the conventional burners.

Another object of the invention is to provide a dryer and method of the above character in which burners are provided in the dryer itself.

Another object of the invention is to provide a dryer and method of the above character in which excess air is provided adjacent the flames from the burner to combust volatiles, pitches and wood fines.

Another object of the invention is to provide a dryer and method of the above character in which a substantial portion of the re-circulated air is deflected around the concentrated heat source.

Another object of the invention is to provide a dryer and method of the above character in which condensation of the volatiles in the dryer is prevented thereby eliminating the necessity for frequent cleaning of the dryer.

Another object of the invention is to provide a dryer of the above character in which the burners are mounted within the dryer.

Another object of the invention is to provide a dryer of the above character in which a radiation shield is mounted on the burner units.

Another object of the invention is to provide a dryer of the above character which does not require external air heater units or external hot piping.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

FIGURE 1 is a plan view in schematic form of a dryer incorporating the present invention taken along the line 1—1 of FIGURE 2.

FIGURE 2 is a side elevational view in schematic form of the dryer shown in FIGURE 1 taken along the line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged cross-sectional view taken along the line 3—3 of FIGURE 2 and showing the burner construction and the secondary air supply mounted within the dryer.

FIGURE 4 is an enlarged detail view of the burner unit and the secondary air supply.

FIGURE 5 is a cross-sectional view taken along the line 5—5 of FIGURE 4.

In general, the present invention consists of mounting the burner means within the housing for the dryer. An excess of air is supplied adjacent the flames from the burner means to cause combustion of the volatiles driven from the material being dried and carried by the re-circulating air. Means is provided for concentrating the heat from the burner to maintain a zone adjacent the burner at a predetermined temperature to ensure combustion of the volatiles, pitch and tar driven off of the veneer or other material being dried. Means is provided for deflecting a certain portion of the re-circulated air around the zone so that no difficulty is encountered in maintaining the zone at the predetermined temperature.

The dryer shown in the drawing consists of a housing 11 which is divided into two zones 12 and 13 which may be termed the wet and dry ends respectively. Each of the zones is provided with an upper duct 14 in one end of which is mounted a motor driven blower. Each of the upper ducts is connected with side ducts 18 and 19 so that air drawn from the duct 14 by the blower 16 may be circulated through the lower portion of the housing for drying purposes as hereinafter described. The lower portion of each of the zones contains certain material handling apparatus (not shown) such as rollers by which the material to be dried can be transferred gradually through the wet zone 12 and then through the dry zone 13.

Since dryers of the type shown in FIGURES 1 and 2 are often utilized for drying sheets of veneer, the side ducts 18 and 19 must be provided to permit the air to be forced downwardly and between the veneer lines within the zones 12 and 13. The sheets of veneer passing through the dryer would normally prevent the re-circulating air from passing directly downwardly.

That portion of the drying apparatus hereinbefore described is substantially conventional and for that reason has not been described in detail. Both the wet and dry ends of the housing are provided with a stack 23, the opening of which is controlled by a purging damper 24. Piping 26 is connected between the stack 23 and the duct 14 and serves to bypass the purging damper 24. A butterfly bypass damper 27 is mounted in the piping 26 for a purpose hereinafter described. The purging damper well known to those skilled in the art is normally used for clearing out all gases from the dryer before starting the dryer in operation to thereby prevent any possible explosions.

Burner means 31 is mounted in each of the ducts 14. Means 32 for supplying secondary air is also mounted in each of the ducts 14. It will be noted that the burner means and the means for supplying secondary air are mounted in the duct 14 in such a manner that they are in the air stream passing through the duct 14 and are positioned so that they are downstream from the stack 23.

The burner means is shown particularly in FIGURES 4 and 5 and is of the ribbon type. It consists of a central body 34 to which is secured a plurality of laterally extending vertically spaced burner arms 36. The central body 34 is connected to a fuel and air supply line 38 through a T 39. A pilot burner 42 for a purpose well known to those skilled in the art is mounted adjacent the upper portion of the central body 34.

The means 32 for supplying secondary air consists of a pair of supply pipes 43 and 44 which are each connected to a pair of cross pipes 46. The cross pipes 46 are substantially in line with the arms 36 of the burner means and lie in generally the same vertical plane as the burner means. The cross pipes 46 are spaced equidistant between the arms and are supported from the burner arms by brackets 47. Each of the cross pipes is

provided with two rows of openings or orifices 49 which extend in such a direction that jets of air will be discharged from cross pipes 46 into the flames passing from the burner arms 36 for a purpose hereinafter described. The supply pipes 43 and 44 are connected to a suitable supply of air by piping 51.

A radiant shield 52 of suitable material such as metal surrounds the entire burner means and consists of a four-sided structure which is held in place by brackets 53 mounted on the burner arms 36. It will be noted from the drawing that the openings in the radiant shield 52 are in line with the longitudinal axis of the duct 14 and permit the passage of air through the burner means. The sidewalls of the radiant shield are substantially parallel to the sidewalls forming the enclosure for the duct 14.

Baffle means 56 is provided to direct re-circulating air around the radiant shield 52 and to reduce the velocity of the air passing through the burner means. The baffle means consists of a plurality of baffles 57 which are mounted upstream from the burner means. Each of the baffles consists of a flat elongate plate 58 which is fixed to vertical rods 59. The rods 59 are mounted in bearings 62 which are secured to the upper and lower sidewalls of the duct 14. A capscrew 63 is provided in each of the bearings so that the rods 59 can be held in a predetermined position after the baffle has been rotated to the proper position.

Operation of our dryer in performing our method may now be described as follows: Let it be assumed that the baffles 57 have been positioned as shown in FIGURE 4 to deflect the air around both sides of the radiant shield 52 to thereby reduce the velocity of flow through the burner means 31. Let it also be assumed that the dyer is being utilized for drying a veneer such as ⅛" Douglas fir heart and that four veneer lines as represented by lines 66 in FIGURE 3 are being passed through the dryer. As soon as the dryer has been purged by opening the purging dampers 24 and operating the blowers 16, the purging dampers may be closed and the burner means 31 lit in each of the zones 12 and 13. The burner means 31 serves to heat the re-circulating air as it passes through the burner means. The blowers 16 force the heated air through the ducts 14 and then downwardly into the various lines of the veneer and then through the veneer up through the side ducts 18 through the blowers 16 and through the burner means where the air is again heated. The bypass dampers 27 are set to give the proper venting.

As is well known to those skilled in the art, as the veneer is being dried, volatiles, pitches and wood fines are driven from the veneer and are carried by the re-circulating air. To prevent the volatiles and pitches from condensing on the sidewalls of the dryer, they are combusted to supplement the heat from the burner means 31. This is accomplished by introducing secondary excess air by means of the plurality of jets from the cross pipes 41. As hereinbefore described, the jets introduce excess air into the flames from the burner means adjacent thereto. This secondary excess air serves to provide the oxygen needed for combusting the volatiles, pitches and wood fines which are carried by the re-circulating air from the drying veneer.

It has been found however, that to obtain complete combustion of the volatiles, pitches and wood fines, a much higher temperature is required than is normally used in a dryer. For that reason, the radiant shield 52 encompasses the burner means 31 and serves to create a heated zone adjacent the burner means 31 which has a temperature substantially greater than that of the air immediately surrounding the radiant shield. The radiant shield operates in a manner well known to those skilled in the art and serves to prevent radiation of heat from the burner means to the cold or relatively cool sidewalls of the dryer. The area within the radiant shield 52 is a concentrated heat source within the duct 14 and has a sufficient temperature to ensure combustion of all the volatiles, pitches and wood fines driven from the veneer. In this manner, a concentrated heat source is obtained within the duct without unduly raising the temperature of the duct or of the air utilized for drying the veneer.

The baffle means 56 is located upstream from the burner means and the radiant shield 52 and serves to permit the temperature build-up within the radiant shield. The baffles are adjusted in such a manner that they serve to deflect a considerable amount of the air passing through the duct around the radiant shield and the burner means so that the velocity of air flowing through the burner means is substantially reduced. Since a smaller quality of air is actually passing directly through the burner means, the air is readily raised to the desired temperature. The radiant shield 52 also serves to heat the air as the air wipes over the sides of the radiant shield.

It has been found that considerable heat is generated by the combustion of the volatiles, pitches and wood fines thereby substantially increasing the efficiency of the dryer. Likewise, the burning of the volatiles, pitches and wood fines makes for a much cleaner drying operation and eliminates a fire hazard and the necessity for cleaning the dryer. As explained previously, the combustion of the volatiles, pitches and wood fines prevents condensation of the same on the sidewalls of the dryer and also minimizes the amount of ventilation required and heat loss through the stack 23.

In one embodiment of our invention, it was found that the air upstream from the burner means had a temperature of approximately 300° F. and that the air passing between the radiant shield 52 and the sidewalls of the duct had a temperature of also approximately 300° F. It was found that the temperature of the air within the radiant shield 52 itself had a temperature of approximately 1300° F. which was more than adequate to ensure combustion of the volatiles, pitches and wood fines. Considerably downstream from the burner means and after the air has been thoroughly mixed in the plenum of the duct 14, it was found that the air had a temperature of approximately 500° F. which is the temperature desired for carrying out a veneer drying operation.

It was also found that satisfactory combustion of the volatiles, pitches and wood fines could be obtained in a temperature range of 1000° to 1500° F. with complete safety of operation. It however, should be appreciated that the various temperatures required would depend upon the material being dried.

It is apparent from the foregoing that we have provided a new and improved dryer in which volatiles driven off from the dryer are combusted to make possible a much cleaner and more efficient drying operation.

We claim:

1. In a dryer, a housing through which the material to be dried is adapted to be passed, the material being of a type containing volatiles, a duct within the housing, burner means mounted within the duct for heating gases in the duct, means for recirculating the heated gases in the duct about the material in said housing and past said burner means in said duct, means extending into said duct adjacent the flame of the burner means for continuously supplying an excess of air to cause combustion of the volatiles driven from the material being dried and carried by the gases recirculated past said burner means, and an open-ended baffle means within said duct and surrounding said burner means to direct a portion of the gases in said duct to and past said burner and for concentrating the heat from said burner means to a limited space within said duct to maintain therein a predetermined high temperature to insure combustion of the volatiles carried through said space.

2. A dryer as defined in claim 1 including means for deflecting a portion of the recirculated gases around said baffle means and said space.

3. A dryer as defined in claim 1 wherein said means

for supplying said excess of air comprises means for directing a plurality of jets of air to the flame of said burner means.

4. A dryer as defined in claim 1 wherein said baffle means for concentrating the heat comprises a radiant shield surrounding said burner means, spaced from the walls of said duct, and through which some of the ri-circulating gases can pass.

5. A dryer as defined in claim 4 including further baffle means in said duct for deflecting a substantial portion of said recirculating gases around said radiant shield and said burner means.

6. In a dryer, a housing through which the material to be dried is adapted to be passed, the material being of a type containing volatiles, a duct mounted in said housing, burner means mounted within said duct for supplying heated gases, means for re-circulating the heated gases through the duct and into the housing about the material being dried, said burner means consisting of a plurality of burner arms disposed in said duct, means for supplying a plurality of jets of air adjacent the flames from the burner arms, said means including a plurality

of cross pipes arranged parallel to said burner arms and having openings therein, and a radiant shield surrounding said burner means for concentrating the heat from said burner means to maintain a zone within said duct at a predetermined temperature to cause combustion of the volatiles driven from the material being dried and carried by the re-circulating gases.

7. A dryer as in claim 6 together with a plurality of baffles positioned upstream from said burner means and said radiant shield for deflecting a portion of the re-circulated gases around said zone.

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