Dec. 29, 1953 C. P. MANN 2,664,282

DRIER

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FIG. 1

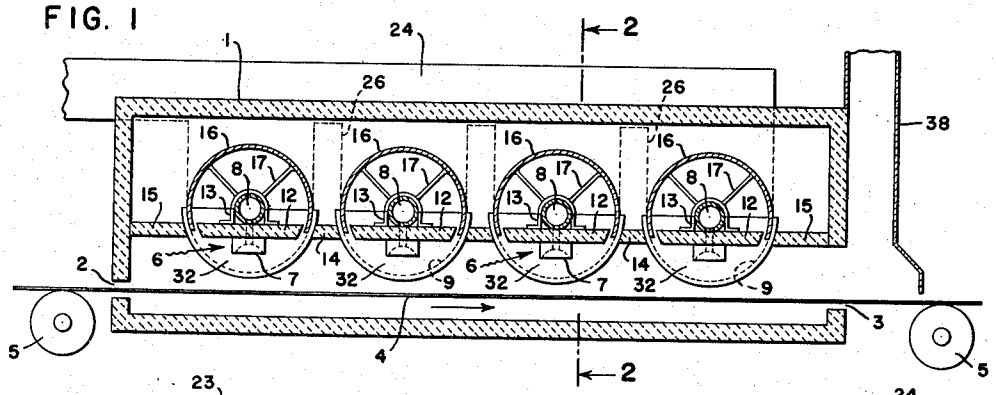


FIG. 2

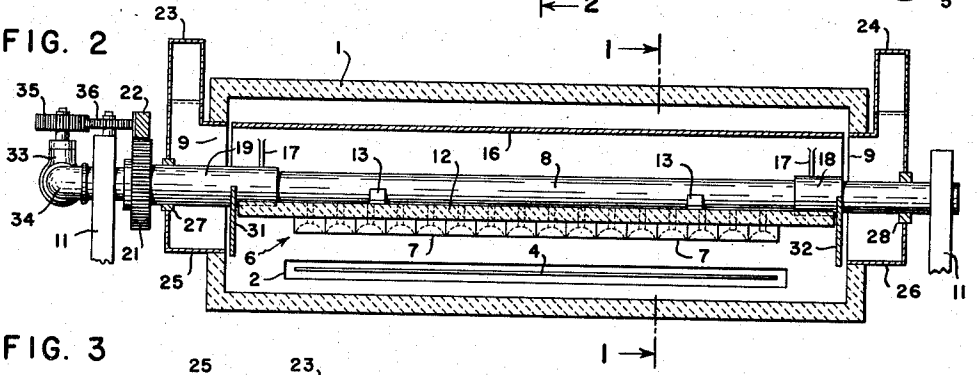


FIG. 3

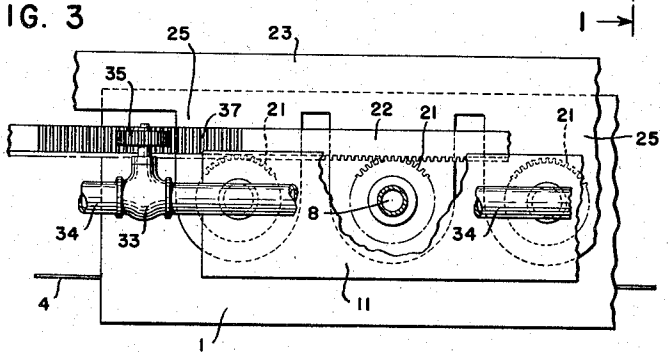


FIG. 4

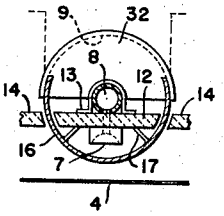
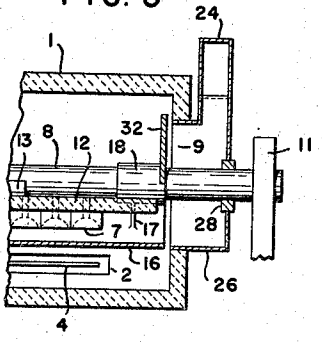


FIG. 5



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2,664,282

DRIER

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7 Claims. (Cl. 263—3)

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The present invention relates to driers, and more particularly to mechanism for drying a coating on a web as it is moving through the mechanism.

At the present time there are many devices available for drying webs that have been coated or impregnated with some material. One of the most successful of these is a furnace that is heated by rows of radiant burners that are directed toward the web. These burners produce an intense heat that is capable of drying the web, but is also capable of burning or scorching the web if it is stopped in front of them. Therefore, means is provided to rotate the burners away from the web and to reduce their fuel supply when the web is slowed down or stopped. The structure for accomplishing this requires some type of flexible or rotating connection in the fuel supply line to the burners. Inasmuch as most burners of this type use gas as a fuel there is always the danger of a gas leak with its consequent explosion hazard as well as the fact that the burners and their manifolds are heavy and require considerable power to move them.

In accordance with the present invention, radiant type gas burners are used to dry the web. In this case, however, the burners are stationary and are directed at all times toward the web passing in front of them. There is provided a light rotating baffle that is normally behind the burners, but which can be moved to a position between the burners and the web. The moving means for the baffles may be connected with a valve in the fuel supply line so that the fuel is reduced or shut off when the baffles are moved. Ducts are also provided through which cooling air can be blown. This air is directed over the burners to cool the manifolds during normal operation, and in front of the burners to blow heat from them when the device is stopped.

It is an object of the invention to provide apparatus for drying a coating on a moving web in which open burners are used and in which a baffle is moved between the burners and web when the latter is stopped.

It is a further object of the invention to provide drying apparatus in which there is provided means for simultaneously moving a baffle between the source of heat used for drying and the material being dried, and for reducing the supply of heat from the source.

It is a further object of the invention to provide a means in a drying apparatus to direct a supply of cooling air over a group of heating elements used to dry the material being processed

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during operation, and to direct the air in front of the heating elements when the apparatus is not operating.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Referring to the drawings—

Figure 1 is a section through the furnace taken on line 1—1 of Figure 2,

Figure 2 is a transverse section of the furnace taken on line 2—2 of Figure 1,

Figure 3 is a view of a portion of the furnace with parts broken away taken from the left of Figure 2,

Figure 4 is a sectional view similar to a portion of Figure 1 with the baffles in active position, and

Figure 5 is a section similar to a portion of Figure 2 with the baffles in a position corresponding to the position of Figure 4.

In the manufacture of an adhesive coated paper web, for example, it is necessary to dry the adhesive material before the web can be wound into rolls of a size adaptable for commercial usage. The apparatus of the present invention is operative to dry the material that has been placed upon the web while the web is being moved from a coating machine to a winding machine.

Referring to the drawings, there is shown a furnace 1 having an entrance opening 2 and an exit opening 3 through which a web 4 may be passed into and out of the furnace while it is being dried. The web is supported for travel through a predetermined path in the furnace by means of guide rollers 5 that are located adjacent to the entrance and exit ends thereof.

Heat is supplied to the web as it is moving through the furnace chamber by means of a plurality of rows 6 of burners that are shown herein as being four in number. It will be apparent, however, that a greater or lesser number of rows of burners can be used, depending upon the material that is being dried, and the speed of the web. Each of the rows of burners is shown herein, by way of example only, as comprising a plurality of radiant cup type burners 7. Each of these burners is provided with a cup in which is burned a combustible gaseous mixture to heat this cup to incandescence. Radiant heat from

the cups is projected downwardly against the surface of the web to dry the same. Drying is also obtained by the hot products of combustion which are discharged from the burners. It will be apparent to one skilled in the art that ribbon-type burners, or even electrical heating elements could be used in place of the burners disclosed herein if it was so desired, provided the heat is sufficiently intense adequately to dry the web. The type of burner in itself can be varied in accordance with the conditions obtainable where the installation of the furnace is made. The burners 7 are mounted upon the lower side of a tubular manifold 8 which extends through openings 9 in each side of the furnace wall. These manifolds are rigidly mounted in suitable supports 11 extending along each side of the furnace. Also, attached to each manifold 8 by brackets 13 is a partition member 12 that serves to keep the products of combustion closely adjacent to the web. These partition members are symmetrically disposed with respect to the manifolds and are separated for a purpose to be described below. The space between the partitions, however, is taken up to some extent by small partition members 14, while the space between the ends of the furnace and the partition members closest to these ends is covered by end partition pieces 15.

During normal operation of the apparatus, the burners are supplied with a combustible mixture under a suitable pressure and the heat from the burners is directed toward the web to dry the same. The heat produced by burners of this type, and other burners that could be used for drying purposes, is so intense that the web would be scorched or burned if for some reason it was stopped and means were not provided to protect the web from the burners. To this end there are provided substantially semi-cylindrical baffles 16 that are adapted to be moved between the burners and web. These baffles are supported by means of arms 17 extending from sleeves 18 and 19, respectively, that are rotatably mounted on the manifolds 8. Each baffle can be moved from the position shown in Figure 1, in which it is above the partition and helps to close the spaces between the partitions 12 and 14, to the position shown in Figure 4 in which it is located between the burners and the web 4. In the latter position the baffle protects the web from direct action of the radiant heat produced by the burners. All of the baffles are rotated together when it is necessary to reduce the heat applied to the web. To this end each of the sleeves 19 is provided with a gear 21 that is located beyond the furnace side wall. These gears are engaged by a horizontally extending rack member 22 so that when the rack is moved lengthwise, the baffles will be rotated in unison from their Figure 1 to their Figure 4 position and vice versa. The baffles can be made of light weight metal so that they will require only a small amount of power to move them.

During the operation of the apparatus it is desirable to cool the manifolds and the upper part of the furnace. To this end, means is provided through which air can be circulated from one side of the furnace to the other. This means includes a pair of ducts 23 and 24 located on opposite sides of the furnace. Duct 23 has individual branches thereof extending downwardly to enclose the openings 9 adjacent to that side of the furnace. In a like manner, duct 24 has individual branches 26 which are of a size to close the openings 9 on the right side of the furnace as shown in Figure 2. Each of the ducts 23 and

24 is provided with a seal 27 and 28 respectively, between the rotating sleeves or the manifold and the duct so that a substantially air-tight connection is obtained. In order to direct air above the partition at such times when the drying operation is taking place, there are provided shields 31 and 32 that are fastened to the sleeves 19 and 18, respectively, and displaced 180° from the baffles. These shields, as shown in the drawing, are substantially semi-circular in shape and are of such a size that they will block either the lower or the upper half of the openings 9, depending upon the position of the baffles. The shield can also be weighted to counterbalance the baffle movable therewith. This will permit easier rotation of the assembly. When the baffles are in the position shown in Figures 1 and 2, for example, air is supplied through duct 23 and ducts 25 and is exhausted through ducts 26 and 24. Due to the fact that the shields 31 and 32 are in their lower position, the air will be directed through the semi-cylindrical baffles and over the partitions 12 to cool the manifold. When, however, the baffles have been moved to their active position, as is shown in Figures 4 and 5, air will be directed below the partitions 12 for the purpose of carrying away heat from the burners and also to cool the baffles. Thus, cooling-air can be directed above or below the burners, depending upon the baffle position.

Ordinarily, it is desirable, if not necessary, to turn off the burners when the baffles are in their active position. To this end means is provided to reduce the fuel supplied to the burners simultaneously with the movement of the baffles from their Figure 1 to their Figure 4 position. The manifolds 8 are supplied with a combustible gas mixture through pipe 34 that has a valve 33 in it. This valve is opened and closed by means of a gear 35. Gear 35 is rotated through an idler 36 that engages gear teeth 37 formed on the side of rack member 22. The parts are so arranged that when the rack is moved in a direction to rotate the baffles from their Figure 1 to their Figure 4 position, valve 33 will be closed or substantially closed. When the rack is moved to move the baffles back from their Figure 4 to their Figure 1 position, the valve will be opened. Suitable electrical ignition means of a type well-known in the art may be used to light the burners automatically when the gas supply is turned on. It is noted that the products of combustion will have a tendency to be carried along with the web as it is moving through the furnace and can be exhausted through a stack 38 provided for this purpose. A suitable exhaust fan can be used in the stack if it is desired or necessary.

From the above description it will be seen that I have provided a furnace in which a number of rows of burners are rigidly mounted in position above a web that is to be dried. Such a rigid mounting of the burners does away with flexible or rotary connections and thereby reduces the chances of a leak in the gas line. Furthermore, the rigid mounting of the burners taken in connection with the guide rollers 5 permits an accurate drying operation, since, the exact distance between the web and the burners can be determined and maintained. During the operation of the apparatus the web is moved continuously from the entrance to the exit of the furnace chamber and is dried by the action of the heat from the burners. From time to time, however, it is necessary to stop the web and, at such times, means must be provided to protect

the web from the heat so that it will not be scorched or burned. Such a means in this case includes the rotatable baffles that can be rapidly swung from an inactive to an active position between the burners and the web. The same mechanism which rotates the baffles is used to cut off or reduce the fuel supply to the burners so that the heat is reduced when the web is stopped. Suitable and well-known means can be provided to actuate rack 22 in response to stoppage of the web or the coating apparatus, or in response to reduction of the web speed below some given rate.

While the description above states that the apparatus is intended to be used for drying an adhesive that has been placed upon the web, it will be obvious that the apparatus can also be used for drying a printed web or web upon which material to be dried is placed for movement through the furnace.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention, as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. In apparatus for drying a web, the combination of a furnace having a chamber through which a web of material to be dried is adapted to be moved in a predetermined path, a plurality of heating elements, means to support said elements in a fixed position in said chamber a predetermined distance from said path and directed towards the same whereby a web passing along said path will be dried, a substantially semi-cylindrical baffle, means to mount said baffle for rotating movement around said supporting means from a position between said elements and said path to a position on the opposite side of said supporting means from said path, and means to move said baffles between said two positions.

2. The combination of claim 1 including an elongated partition means in said chamber of a width less than the diameter of said baffle, means to mount said partition means on said supporting means and between the same and said elements and substantially parallel to said path whereby said baffle is on one side of said partition means in said first-mentioned position and on the other side of said partition means in said second-mentioned position, and means to direct a current of air between said baffle and said partition means in either position of said baffle.

3. In a device for drying material in web form, the combination of a furnace through which the material can be moved in a predetermined path, a plurality of burners, stationary manifolds extending through said furnace above said path and parallel thereto, means to mount said burners in fixed position on said manifolds to form a plurality of rows thereof above said path and directed toward the same, an elongated partition attached to each of said manifolds between the same and said burners and substantially parallel to said path with a space between each partition, a plurality of baffles, and means to mount said baffles for rotation around said manifolds and between said partitions from a position on the side opposite said partitions to a position between said burners and said path.

4. In a device for drying material in web form, the combination of a furnace having opposed openings in opposite ends thereof through which a web to be dried is moved into and out of said furnace, a plurality of heating elements, means to support said elements in rows above and directed toward the web, an elongated partition attached to each of said supporting means above said elements and substantially parallel to said web and with a space between each partition, a plurality of baffles and means to mount a baffle for rotation around each of said supporting means and its attached partition and elements from a position above said partitions to a position between said elements and web.

5. The combination of claim 4 including means to control the heat supplied by said elements, means to rotate said mounting means, and means to operate simultaneously said control means and said means to rotate to thereby move said baffles in front of said elements and reduce the supply of heat produced thereby.

6. In a drying device, the combination of a furnace having sides and a chamber, a support extending from side to side of said chamber, an elongated partition attached to said support, a row of heating elements attached to said support beyond said partition and adjacent to one face thereof, a semi-cylindrical baffle having a diameter equal to the width of said partition extending from one side to the other of said chamber, means to mount said baffle for rotation around said support, partition and elements from a position on one side of said partition to a position on the other side thereof in front of said heating elements, said furnace sides being provided with openings adjacent to the ends of said support and of a size to be within the area covered by the outline of said baffle as it is rotated, shields attached to said mounting means and opposite each end of said baffle to obstruct the portion of the openings not within the outline of said baffle, and means to direct a current of air through said openings.

7. In a drying device, the combination of a furnace having sides and a chamber, a support in said chamber extending from one side to the other thereof, a partition and a plurality of burners mounted on one side of said support and extending substantially across said chamber, rotatable mounting means on said support, a semi-cylindrical baffle on said mounting means, said baffle being of a size to extend beyond the edges of said partition, means to rotate said mounting means to move said baffle from a position on one side of said partition to the other side thereof in front of said burners, said sides being formed with openings within the area covered by said baffle as it is rotated, means to direct a current of air through said openings, and shields on said mounting means to block the portions of said openings not enclosed by said baffle.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,802,407	Danninger et al.	Apr. 28, 1931
2,186,032	Mann	Jan. 9, 1940
2,210,032	Hess	Aug. 6, 1940