

June 2, 1942.

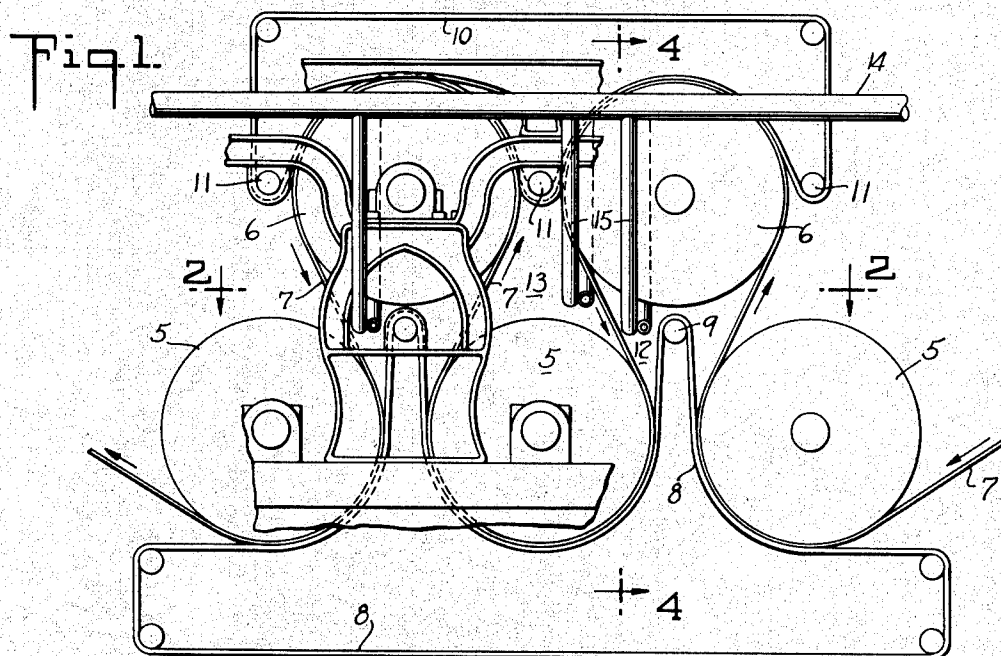
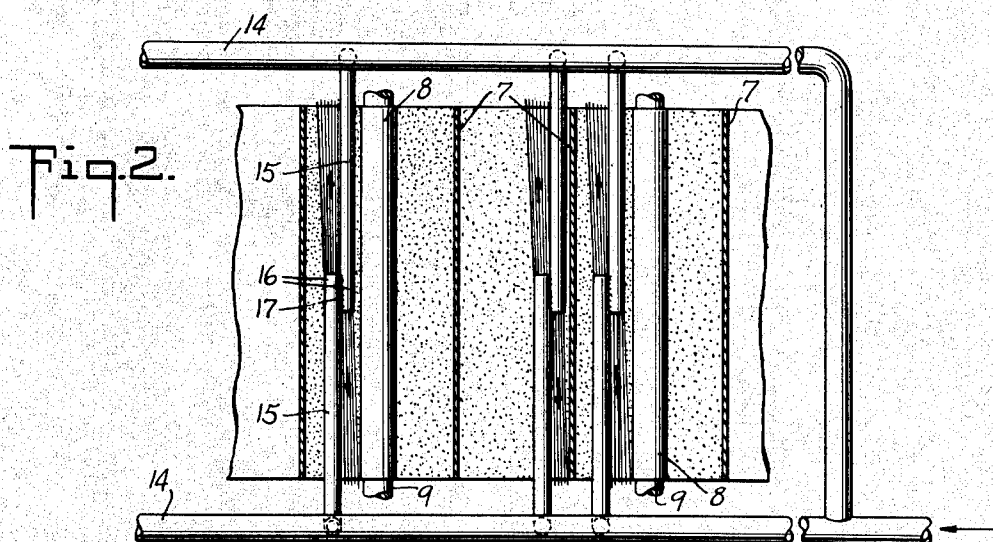
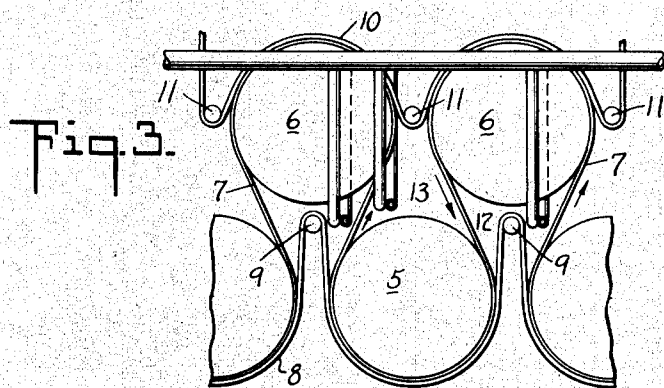
F. J. LANG

2,285,290

DRIER

Filed June 21, 1940

2 Sheets-Sheet 1



INVENTOR
FRANK J. LANG
BY *James D. Bock*
ATTORNEY

June 2, 1942.

F. J. LANG

2,285,290

DRIER

Filed June 21, 1940

2 Sheets-Sheet 2

Fig. 4.

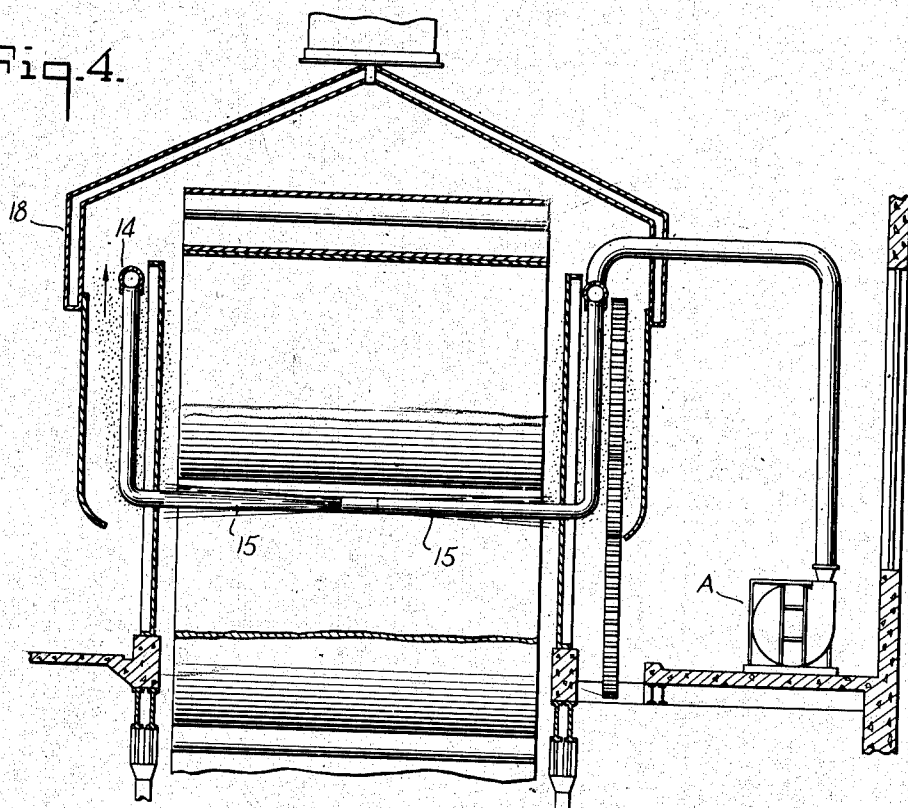


Fig. 5.

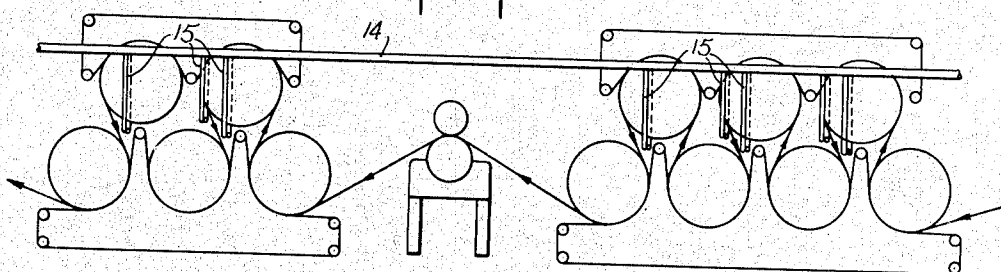
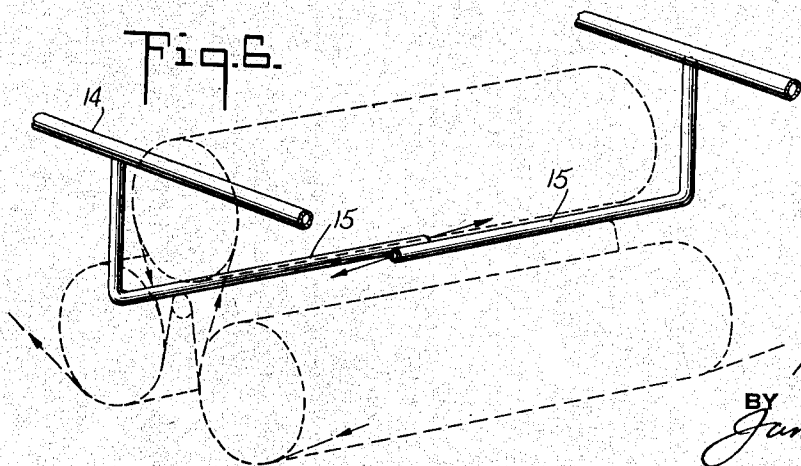


Fig. 6.



INVENTOR
FRANK J. LANG

BY
James D. Boock
ATTORNEY

UNITED STATES PATENT OFFICE

2,285,290

DRIER

Frank J. Lang, Niagara Falls, N. Y., assignor to
International Paper Company, New York, N. Y.,
a corporation of New York

Application June 21, 1940, Serial No. 341,653

2 Claims. (Cl. 34—114)

This invention relates to the drying of materials in general and particularly seeks to provide a novel process and apparatus for drying cylinder-carried paper webbing or the like in such a manner that a substantially level moisture content gradient will be obtained across the full width of the web.

In the drying of paper webbing during the manufacture thereof, much difficulty has been encountered through various attempts to achieve a uniform moisture content throughout the full width of the web. With the drying means heretofore used, the webbing was always characterized by a near bone dry condition at the edges, and a condition of relatively high moisture content as the center of the web was approached; and when the web was run through calendering rolls, a non-uniform finish resulted which included more or less brittle and glazed edge portions.

The above mentioned difficulties have been substantially overcome through the use of this invention.

It is therefore an object of this invention to provide a novel process of and apparatus for drying a web of paper in such a manner that the moisture content of the web is substantially uniform across its full width.

Another object of this invention is to provide a process of drying a web of paper in the manner described which includes the step of blowing air, heated or unheated, outwardly from the middle of the web to thereby carry moisture from the central area of relatively high moisture content outwardly towards the edge portions of relatively low moisture content and establish a substantially uniform moisture gradient across the full width of the web.

Another object of the invention is to provide a process of the character described in which the moisture transferring air streams are located within pockets defined by the rolls, felts, and paper web of the machine with which they are associated.

Another object of the invention is to provide a novel form of apparatus for the purpose stated which includes pairs of oppositely directed, off-set air ducts, disposed within one or more pockets in the machine defined by the rolls, felt and paper web, and which extend inwardly from opposite ends of said pockets to substantially the middle of the length thereof.

With these and other objects in view, the nature of which will become more apparent, the invention will be more fully understood by reference to the drawings, the accompanying detailed description, and the appended claims.

In the drawings:

Fig. 1 is a fragmentary and somewhat diagrammatic elevation of a web drier to which an embodiment of the invention is applied;

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1 and shows the overlapped relation of the opposed air pipes;

Fig. 3 is a diagrammatic elevation of a portion of a web drier in which the air pipes are located in alternative positions;

Fig. 4 is a somewhat diagrammatic transverse section showing a hood over the drier;

Fig. 5 is a diagrammatic elevation of a multi-section drier including a size press and illustrates the manner in which the invention may be utilized throughout the drier; and

Fig. 6 is a perspective view specifically illustrating the positions of the opposed air pipes relative to the web and cylinders, the web, felt, and cylinders being indicated in dotted line outline.

Referring to the drawings in detail, the invention as illustrated is embodied in a web drier which includes a plurality of lower cylinders 5 and a plurality of upper cylinders 6 disposed in offset relation to the lower cylinders. A web of paper 7 entering the drier from the wet end is directed progressively under the lower cylinders and then over the upper cylinders in sequence in the well known manner. In passing under the lower cylinders 5 the web is maintained in pressure contact therewith by the usual lower felt 8 that is maintained in pressure contact with the web through the medium of felt or idler rolls 9. In passing over the upper cylinders 6 the web is maintained in pressure contact therewith through the medium of the usual upper felt 10 carried by the felt or idler rolls 11.

The upper cylinder 6 together with the web portions leading thereto and therefrom in conjunction with the lower felt 8 define a "closed" pocket 12. A complementary pocket 13 is defined by the lower cylinder 5 together with the web portions leading thereto and therefrom in conjunction with the upper felt 10. The pockets thus defined are apt to entrap moisture laden air therein during the drying of the web as it passes through the machine. This is true since moisture is driven from the web into the air as a result of contact with the heated surfaces of the cylinders. The normal tendency of the moisture thus released from the web is to rise from the surface of the web. However, if no means are provided to carry off the moisture laden air from the middle or intermediate portions of the pockets outwardly to the sides of the machine, there will be a marked area of relatively high moisture content along the middle portions of the web and marked areas of relatively low moisture content along the edge portions of the web. As a result when the web undergoes finishing operations such as calendering, it is very difficult, if not impossible, to achieve a high degree of uniform finish.

This invention provides means for effecting a flow of the moisture laden air in the pockets

which has been released as a result of the drying of the web from the middle portions of the pockets towards the outer ends thereof and thereby effects a more uniform distribution of moisture throughout the full width of the web. In order that the moisture may be controlled in the manner desired the drier is provided with a pair of longitudinally extending main air ducts 14 disposed along either side of the machine. Each air duct 14 is provided with a plurality of depending air pipes 15 which are so shaped as to extend horizontally into the respective pockets 12 and 13 and terminate at approximately the middle of the length of the pockets. The ends of the opposed pipes 15 are disposed in slightly overlapped relation as indicated at 16 in order that the flow of air from the ends thereof will not be in opposed relation and thereby create an undesired turbulent effect. The overlapping ends 16, of the pipes may be secured together by welding 17 or by any suitable form of hand clamps or the like. It is preferable that the axes of pipes 15 be disposed substantially parallel to the plane of the web in order that the air currents emitted therefrom will not directly impinge upon the web and should be located in those portions of the complementary pockets 12 and 13 in which the web is entering into contact with a lower cylinder 5. Heated air may be supplied to the pipes 15 through the medium of a heater and blower assembly generally indicated at A.

It will be readily apparent that when heated air is directed through the pipes 15, the oppositely directed currents set up thereby in the space of the pockets with which the pipes are associated, will effect a removal of moisture laden air from the central portions of the pockets towards the ends thereof, and the major quantity of the moisture laden air so directed outwardly will be carried completely out of the pockets. Therefore most of the moisture laden air which had heretofore been entrapped in the pockets will be disposed of and the drying of the webs will be rendered more efficient. Through the use of the outwardly directed currents of air carrying the moisture laden air as described, the central portions of the web which had heretofore remained too moist, are dried to a greater degree, and the edge portions of the web which had heretofore remained too dry, are not dried to as great an extent, thereby establishing a substantially level moisture gradient across the full width of the web.

In Fig. 3 of the drawings there is illustrated an alternative arrangement of the pipes 15 in which they are located on either side of that portion of the web which is entering into engagement with the upper cylinder 6 rather than the lower cylinder 5. It is, of course, possible to have the pipes 15 disposed in such manner that they will be effective to distribute the moisture over both that portion of the web which is entering into contact with the upper cylinder and also that portion of the web which is entering into contact with the lower cylinder.

Fig. 5 of the drawings discloses a diagrammatic elevation of a multi-section drier in which the sections are separated by a size tub. It will be seen that the air pipes 15 can be disposed throughout the full length of even a drier of the multi-section type to thereby assure a substantially even lateral distribution of moisture across the full width of the web throughout the full length of the drier.

The drier may be provided with the usual hood 18 which serves the dual purpose of minimizing heat losses due to radiation and to carry off the moisture laden air that is displaced from the pockets by the air currents from the pipes 15.

It should not be necessary to provide air pipes 15 adjacent either the first lower or first upper cylinder of the drier, since the web merely has its temperature raised to drying temperature by contact with those first two cylinders and does not give off any great amount of water vapor at that location in the machine.

Thus it will be seen that the herein disclosed invention provides novel means for the handling and disposing of moisture laden air entrapped in the pockets of a drier; which effects a movement of moisture from the central portions of the pockets to and out of the ends thereof to thereby provide a substantially uniform moisture gradient across the full width of the web.

It is, of course, to be understood that certain details of arrangement in proportions of parts may be variously modified without exceeding the scope of the appended claims.

I claim:

1. In a continuous web drier having a plurality of cylinders over which the web is carried, laterally extending open-ended pockets defined by the cylinders and web, and means associated with said pockets and including pairs of generally opposed unrestricted horizontally disposed air pipes having their open, inner ends disposed in overlapping relation and terminating in the central portions of said pockets for discharging streams of air in a direction parallel to the web and slightly spaced therefrom to thereby carry moisture laden air entrapped in the central portions thereof outwardly towards the ends thereof whereby the moisture content adjacent the central portion of the web will be decreased and the moisture content adjacent the edge portions of the web will be increased to thereby effect a substantially uniform moisture gradient across the full width of the web, said pipes being disposed in substantial parallelism with respect to said web whereby said currents of air will not impinge on the web.

2. In a continuous web drier having a plurality of upper and lower cylinders over which the web is carried, laterally extending open-ended pockets defined by the cylinders and web, and moisture regulating means associated with each of said pockets and including pairs of generally opposed air pipes having their open unrestricted inner ends disposed in overlapping relation and terminating in the central portions of said pockets, said pipes being disposed substantially parallel to the planes of the web for discharging streams of air in a direction parallel to the web without direct impingement thereon and each pair being located in that portion of a pocket where the web is entering into contact with a cylinder whereby moisture laden air entrapped in the central portions of the pockets will be carried outwardly towards the ends thereof and the moisture content adjacent the central portion of the web will be decreased and the moisture content adjacent the edge portions of the web will be increased to thereby provide a substantially uniform moisture gradient across the full width of the web.

FRANK J. LANG.

CERTIFICATE OF CORRECTION.

Patent No. 2,285,290.

June 2, 1942.

3

FRANK J. LANG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 31, claim 1, for the words "unrestricted horizontally disposed" read --horizontally disposed unrestricted--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of July, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.