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R. C. GERMANSON

1,928,286

FOURDRINIER PAPER MACHINE

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Fig. 1.

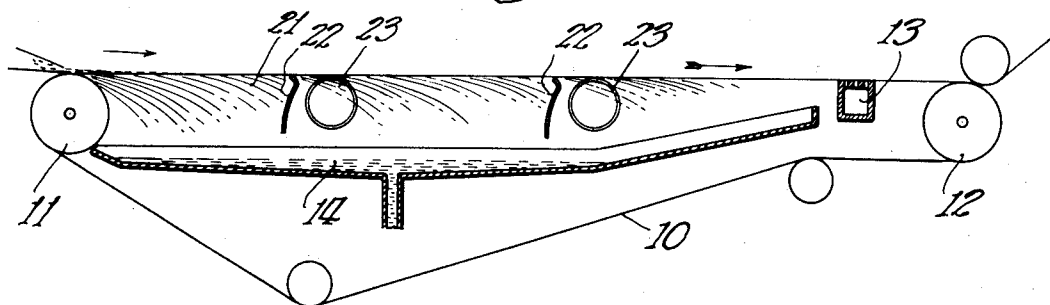


Fig. 2.

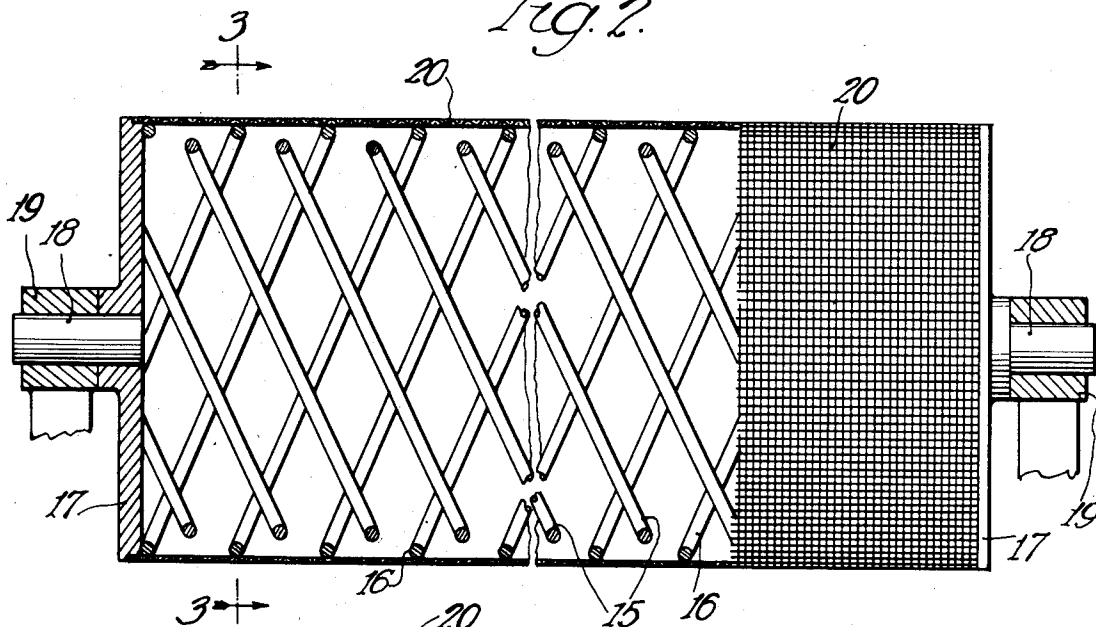
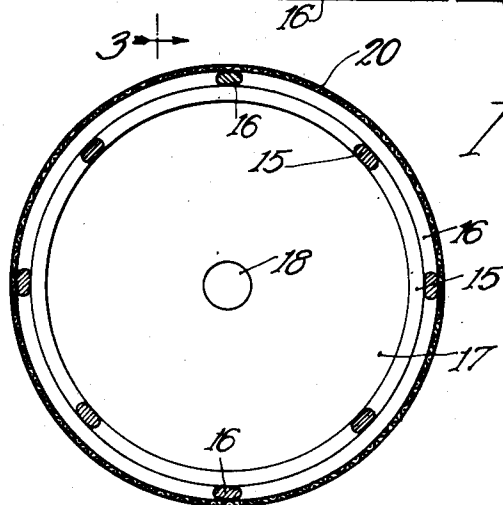


Fig. 3.



Inventor
Rudolph C. Germanson
By: Fisher, Clapp, Loane & Pond
Attys.

UNITED STATES PATENT OFFICE

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FOURDRINIER PAPER MACHINE

Rudolph C. Germanson, Appleton, Wis., assignor
to Paper Patents Company, Neenah, Wis., a corporation of Wisconsin

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10 Claims. (Cl. 92-44)

This invention relates to improvements in Fourdrinier paper machines. It has to do with the means for supporting the Fourdrinier wire in its travel from the breast roll to the first suction box, and the principal objects of the invention are to provide improved supporting means which will maintain the Fourdrinier wire level, i. e., in a plane without sagging due to the load thereon, while at the same time discharge or separation of the white water from the under side of the wire will be facilitated; to provide also an arrangement whereby friction and wear of the wire will be reduced to a minimum; to provide an arrangement of such character that the formation of the web will be maintained or kept intact and the formation of thin spots avoided; to enable the machine to produce paper of fine quality at a higher speed than has heretofore been considered practical; to provide an arrangement which shall be simple and economical in design and manufacture, and, in general, to provide an improved and efficient apparatus or equipment of the character specified.

In the drawing which illustrates the invention as applied to a Fourdrinier wire machine such as is employed in the manufacture of crepe or analogous light weight papers—

Fig. 1 is a conventional side elevation of a machine embodying my invention;

Fig. 2 is a plan view, partly in section, showing one of the reticulated or foraminous wire-supporting rollers, and

Fig. 3 is a section taken on the line 3-3 of Fig. 2.

Referring to the drawing, 10 represents the usual Fourdrinier wire, breast roll 11, couch roll 12, suction box 13, and 14 represents the tray or trough under the upper stretch of the wire for receiving the white water which is drained out of the stock as the web is formed on the wire.

So far as I am aware, wherever the usual table-rolls have been employed for supporting the wire, in machines of this character, it has been the universal practice to use rolls having an imperforate or smooth exterior. I am aware also that attempts have been made to provide a series of relatively large apertures, holes or slots in the circumference of the table-rolls on the theory that water draining from the wire would be drained into the hollow table-roll and would pass out through the holes at the bottom. However, so far as I am aware, none of such attempts have ever been successful, nor are such slotted or perforated table-rolls in use today to any extent, if at all.

By observation and experiment with various speeds of wire, table-rolls of different diameter and number, kinds and consistencies of paper stock, I have discovered that the cause of the failure of the water to separate freely from the under side of the wire and the appearance of "wild" or thin spots in the paper due to a disturbance of the web while undergoing formation are due to a combination of circumstances.

In the first place, in the case of any wire of the Fourdrinier type, there is always a tendency for the white water to adhere to the under side of the wire due to surface tension. Hence, whatever means are employed to support the wire, they should so far as possible aid in breaking this surface tension and thus separating from the wire the water adhering to the under side thereof.

I have also discovered that where the ordinary table-roll is employed, and particularly where a considerable quantity of water after leaving the under side of the wire strikes the surface of the table-roll, said water, due to the speed of rotation of the roll will not descend by gravity down the surface of the roll but will be carried up and into the nip between the top of the roll and the under side of the wire. Hence, due to the forward linear speed of such water into the nip of the roll, and because water is virtually incompressible, considerable liquid pressure will be developed in the nip of the roll. This pressure, of course, can be relieved in one direction only, i. e., upwardly through the wire, with the result that water which had previously been drained from the wire will be forced back through the wire and upwardly into the inchoate web formation, causing a disturbance or partial destruction of the web formation, as herein previously suggested.

Also, as previously stated, a mere perforating or slotting of the table-roll is of no material benefit for alleviating this condition, on account of the fact that the liquid pressure developed in the nip is merely concentrated at the imperforate areas of the roll.

In experimenting with various kinds of surfaces for the table-rolls, it was found that "wild" or thin areas in the formation could be materially reduced by using a foraminous roll surface reticulated in such manner as to present relatively small areas of contact with the under side of the wire, together with sufficient space between adjacent points of contact to enable occluded water to pass readily into or through the periphery of the table-roll.

It was also discovered that when using a roll having such a reticulated or net-like surface, the

full advantage of the same was not attained when using table-rolls of a diameter such as has been customary heretofore in machines of this character, i. e., about five inches. This was found to be due to the centrifugal forces developed by rolls of small diameter, which forces would tend to neutralize the beneficial effect of the reticulations.

The drawing illustrates one form of reticulated table-roll which according to my invention has been successfully employed in the production of light weight crepe or tissue paper. In the particular case mentioned, the distance between the breast and couch rolls was about twelve feet and the speed of the wire was about 520 feet per minute. Under these conditions, it was not necessary to use more than two table-rolls; in fact, the equipment operates very successfully with but a single table-roll spaced approximately midway between the breast roll and the suction box.

Although these reticulated rolls may be constructed in other ways, one of the best forms of construction comprises an open grillage of helically arranged rods or wires 15, arranged according to a plural screw-thread, over which are arranged a somewhat similar series of helical rods or bars 16, the threads being of opposite inclination or pitch so as to form the grillage on which the actual supporting surface of the table-roll is secured. In order to provide a rigid structure, the supporting wires 15, 16, are preferably welded, brazed or soldered where they intersect each other, and, also, in order to provide the necessary bearing support, the wires at the ends of the table roll are suitably secured to a pair of spiders 17, said spiders having studs or stubshafts 18 secured therein and rotating in the usual supporting bearings 19.

The grillage formed by the helical wires 15 and 16 furnishes a foundation for the actual surface of the table-roll, which, in the present instance, was found to work very satisfactorily when constructed of square-mesh brass wire screen 20 having about ten meshes to the inch. In place of making the rolls five inches in diameter, as is customary, these particular rolls in question were made with a diameter of ten inches, which appeared to be entirely satisfactory under the speed and other conditions mentioned.

In order to prevent overloading of the table-roll with the spray 21, it was found desirable to provide baffles 22 to deflect the spray directly into the receiving trough 14 rather than to permit it to impinge upon the surface of the table roll. It was also interesting to observe that in respect of the relatively small amount of spray coming from the wire between the top edge of the baffle 22 and the periphery of the table-roll, such spray appeared to pass directly through the roll as indicated at 23 and did not appear to go lower than about half way down between the top of the roll and its axis. Whether this phenomenon is of any importance except to indicate the efficiency of the particular reticulation used, or the absence of adverse effect due to such centrifugal force, I do not know.

The described details of operation and construction are illustrative of only one application

of my invention, the scope of which should be determined by reference to the appended claims, which should be interpreted as broadly as possible consistent with the state of the art.

I claim as my invention:

1. A Fourdrinier paper machine having a table-roll with a mesh-like supporting surface.

2. A Fourdrinier paper machine having a table-roll, the supporting surface of which is composed of wire mesh.

3. A Fourdrinier paper machine having a table-roll, the supporting surface of which is composed of wire mesh, and the diameter of which roll, for speeds of five hundred or more feet per minute, is not materially less than ten inches.

4. A Fourdrinier paper machine having a hollow table-roll, the wall of which is composed of wire mesh so as to permit water to pass inwardly through the wall over the entire surface thereof.

5. A Fourdrinier paper machine having a table-roll, the supporting surface of which roll is composed of spaced members of small surface area whereby the major portion of the surface of said roll will consist of spaces between said members, said members being spaced approximately ten to the inch whereby the surface tension of the water may be broken so that water may quickly be drained from the under side of the wire and will pass through said spaces.

6. A device as defined in claim 5, wherein said roll is at least approximately ten inches in diameter when the speed of the Fourdrinier wire is approximately five-hundred or more feet per minute.

7. A Fourdrinier paper machine having a table roll, the supporting surface of which roll comprises a wire-mesh screen of approximately ten mesh to the inch.

8. A device as defined in claim 7, wherein said table roll is not substantially less than ten inches when the speed of the Fourdrinier wire is approximately five-hundred or more feet per minute.

9. A table roll for supporting the wire of a Fourdrinier paper machine, comprising a supporting grille provided with a wire engaging covering, said covering embodying spaced members of small surface area adapted to engage the wire, the spaces between said members being such that water in the nip between the wire and the roll covering will quickly drain from the under side of the wire through said spaces and through the openings in the grille.

10. A table roll for supporting the wire of a Fourdrinier paper machine, comprising a supporting grille provided with a wire engaging covering, said covering embodying spaced members of small surface area adapted to engage the wire, the spaces between said members being such that water in the nip between the wire and the roll covering will quickly drain from the under side of the wire through said spaces and through the openings in the grille, and the parts of the grille being spaced sufficiently from the wire engaging areas of the spaced members to prevent said parts from retaining water in the spaces between said members when in contact with the bottom surface of the wire.

RUDOLPH C. GERMANSON.