Oct. 28, 1930. C. J. MERRILL 1,779,611

CONTINUOUS WEB DRYING MACHINE

Filed June 27, 1929

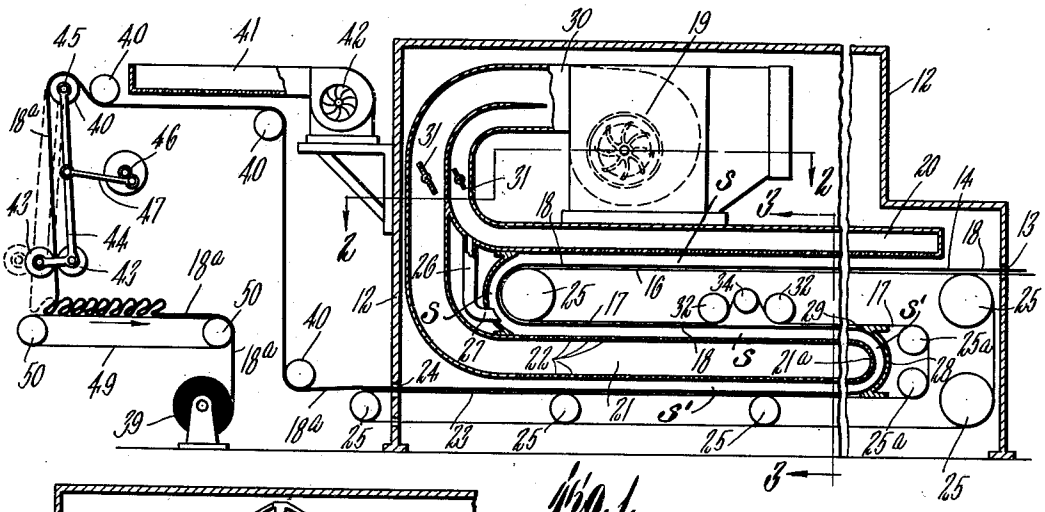


Fig. 1.

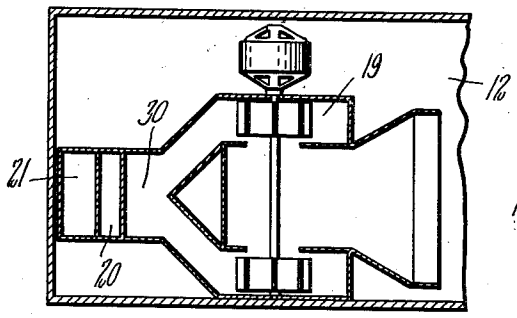


Fig. 2.

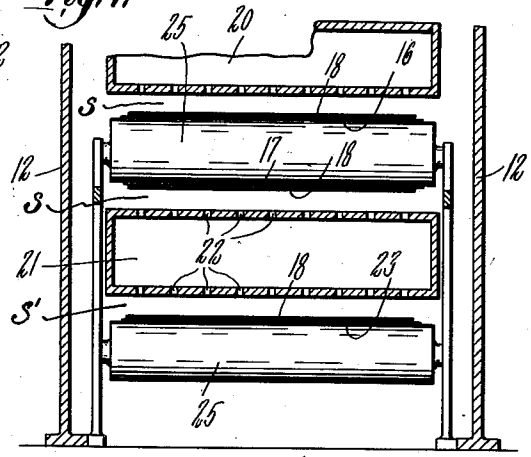


Fig. 3.

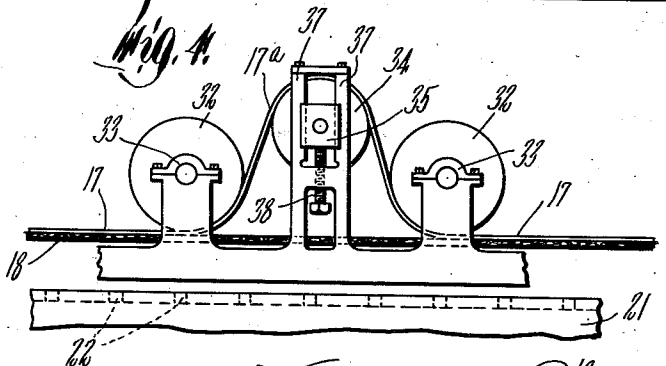


Fig. 4.

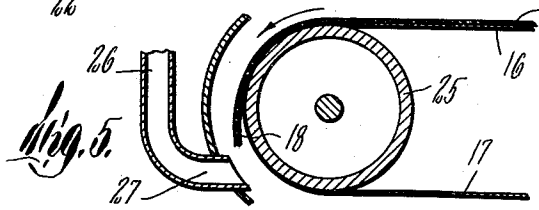


Fig. 5.

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UNITED STATES PATENT OFFICE

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CONTINUOUS-WEB-DRYING MACHINE

Application filed June 27, 1929. Serial No. 374,063.

The invention relates to a continuous web-drying machine including a casing through which a web of paper, coated on one side, may be progressively moved and in which said web is dried during its progress.

The chief object of the invention is to enable the web to be progressively moved through the casing in a sinuous path which is much longer than the casing, so that the floor space occupied by the casing may be reduced to a minimum, to cause the coated side of the encased portion of the web to contact only with air throughout its entire extent, so that the coating cannot be injured by contact with any solid surface, and to be dried by the forcible impingement of air jets against its coated side.

Another object is to enable the leading end of the web to be conveniently passed through the machine at the commencement of the drying operation.

Other objects will appear from the following description.

Of the accompanying drawings forming a part of this specification,

Figure 1 is a longitudinal vertical section, showing a drying machine embodying the invention, parts of the machine being broken away to reduce the length of the figure.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1.

Figure 4 is a fragmentary side view, showing more in detail conveyor tensioning means shown by Figure 1.

Figure 5 is an enlargement of a portion of Figure 1, and shows the leading end of a web.

The same reference characters indicate the same parts in all of the figures.

12 designates a casing having an inlet 13 for a web 14. An endless conveyor is supported by rolls in such manner that the conveyor moves in a sinuous path and has at least two oppositely facing elongated parallel stretches 16 and 17, adapted to support and feed in opposite directions a sinuous encased portion of a continuous web 18 of coated paper. Figure 1 shows the conveyor conventionally by a relatively thin line, and the web by a thicker line.

The web-supporting side of the encased conveyor portion faces an air space *s* (Figure 1) extending from end to end of the stretches 16 and 17. The web 18 is placed on the conveyor with its coated side facing outward and contacting only with air in the space *s*, so that the coating cannot be marred by contact with any solid surface.

The machine comprises drying means for causing the forcible impingement of jets of impingement of drying air simultaneously on the coated sides of the sinuous web portions supported by the conveyor stretches 16 and 17, said means including a blower designated as a whole by 19, and perforated trunks 20 and 21, communicating with the blower and located at opposite sides of the two stretches 16 and 17, and trunks having air outlets or orifices 22 (Figure 3). The trunk 20 delivers air jets downward through the air space *s* on the coated side of the encased web portion on the stretch 16, and the trunk 21 delivers air upward through said air space on the coated side of the encased web portion on the stretch 17.

The conveyor preferably includes a delivering lower stretch 23, which extends through an outlet 24 in one end of the casing and is adapted to support, feed, and deliver an extension of the sinuous portion of the web, the delivered portion being designated by 18^a.

For convenience I call the stretch 16 the upper stretch and the stretch 17 the intermediate stretch, the latter being between the upper stretch 16 and the lower delivering stretch 23.

A conveyor which includes the several stretches 16, 17 and 23 may be supported and guided by the series of rolls 25 and 25^a, shown by Figure 1, one or more of said rolls being power driven.

To change the direction of the leading end portion of the web 18, when it is passing from the stretch 16 to the stretch 17, over a curved portion of the conveyor backed by a roll 25, I provide a deflector which is preferably pneumatic and includes a conduit 26, communicating with the blower 19 and having a

discharge nozzle 27 arranged to blow the leading end of the web 18 shown by Figure 5, against a curved portion of the conveyor, and cause said end to follow the stretch 17.

To prevent the coated side of the web from touching the guide rolls 25^a I provide a curved deflector 28, which detaches the web from the stretch 17 at a point near said guide rolls, and guides the web on to the delivering stretch 23, with its coated side facing the trunk 21. The deflector supports a portion of the web out of contact with the portion of the conveyor supported by the rolls 25^a, the exposed side of the deflector-supported portion of the web contacting only with air, as presently described. The coated side of the web is caused to face the perforated end 21^a of the trunk 21, so that drying air impinges thereon. The deflector 28 is preferably a curved smooth surfaced plate having a knife edge 29, adapted to detach the web from the stretch 17.

The web-supporting side of the delivering conveyor portion 23 faces an air space s', which is a continuation of the space s, and extends from the knife edge 29 to the outlet 24, as shown by Figure 1. The sinuous portion of the web backed by the deflector 28 and supported by the delivering portion 23 of the conveyor, therefore contacts only with air in the air space s'.

It will now be seen that the coated side of the entire encased portion of the web between the inlet 13 and the outlet 24 contacts only with the air, so that it is dried without being marred or affected in any way by contact with any solid surface.

The trunks 20 and 21 are preferably branches of a main trunk 30, and each is preferably provided with a valve 31, whereby the flow of air may be regulated or shut off. Any suitable means may be provided for heating air supplied to the blower to facilitate drying.

To tension the endless conveyor, or take up slackness therein, I provide the tensioning means shown diagrammatically by Figure 1, and in detail by Figure 4, said means including a pair of spaced apart idle rolls 32, journaled in fixed bearings 33, and bearing on one side of a stretch of the conveyor, preferably the stretch 17, an idle takeup roll 34, bearing on the opposite side of the stretch, and movable in the space between the rolls 32, and devices for adjusting the takeup roll and maintaining it in any adjusted position, said devices including bearings 35, movable in fixed guides 37, and adjusting screws 38, engaged with the guides and bearings, as shown by Figure 4. The arrangement is such that the rolls 32 and 34 cooperate in forming in the conveyor stretch 17 a loop 17^a, and thereby taking up looseness. The depth of the loop is variable by adjustments of the takeup roll. There may be similar tensioning means at other portions of the conveyor.

The delivered web portion 18^a is wound or rolled on a winding spindle 39, the wound portion being severed and removed when the roll is of sufficient size. To cool the portion 18^a before rolling, I guide it in a predetermined path, by rolls 40, so that it passes beside a perforated trunk 41, supplied by a blower 42 with cool air, either at atmospheric temperature or artifically cooled, the air impinging on the web at a point somewhat remote from the winding spindle.

To prevent communication of the strain or tension exerted on the web by the rotation of the winding spindle, to the portions of the web associated with the conveyor and with the drying means within the casing 12, I provide means for loosely accumulating the web between the outer guide roll 40 and the winding spindle, said means including a reciprocating looper, composed of a pair of idle rolls 43, between which the web portion 18^a passes loosely, an oscillatory frame 44, adapted to swing on a center 45, the rolls 43 being carried by the frame, and means, as a crank 46 and pitman 47, for oscillating the frame. The rolls 43 are thus reciprocated sidewise.

Below the rolls 43 is an endless secondary conveyor 49, carried by rolls 50. The upper stretch of said conveyor is arranged to receive the web dropping from the rolls 15. The reciprocation of the rolls 43 and the movement of the upper stretch of the conveyor 49, in the direction indicated by the arrow, causes the accumulation of the web portion 18^a on said upper stretch in loose plaits or folds, which are opened by the pull exerted on the web by the winding spindle 39.

I claim:

1. A web-drying machine comprising an endless roll-supported conveyor including at least two oppositely facing stretches adapted to support and feed in opposite directions portions of a continuous web of coated paper with the coating thereof exposed, drying means for causing the impingement of air simultaneously on the coated sides of said web portions, said means including a blower, and perforated trunks communicating with the blower and located at opposite sides of the two conveyor stretches, and a pneumatic deflector adapted to change the direction of the advancing end of a web portion passing from one of said conveyor stretches to the other, said deflector including an air conduit communicating with the blower and having a discharge nozzle arranged to cause conformation of said end to a roll-supported portion of the conveyor between said stretches.

2. A web-drying machine comprising an endless roll-supported conveyor having a sinuous portion including oppositely facing upper and intermediate stretches and a deliv-

ering stretch, said conveyor being adapted to support and feed a sinuous portion of a web of coated paper with only the coated side thereof exposed, drying means for causing the impingement of air on the exposed side of the sinuous web portion, a web deflector adapted to change the direction of a web portion passing from the upper to the intermediate stretch of the conveyor, and a web deflector adapted to change the direction of a web portion passing from the intermediate to the delivering stretch.

3. A web-drying machine comprising a casing, an endless web conveyor, means supporting and progressively moving the conveyor and a coated web carried thereby in a sinuous path through the casing, so that the encased portion of the web is longer than the casing, the arrangement being such that one side of the encased web portion is exposed to contact only with air throughout its entire extent, so that a coating thereon may be dried without contact with a solid surface, and means for causing the forcible impingement of air jets on said exposed side to dry a coating thereon.

4. A web-drying machine comprising a casing having at one end a web inlet, and at the opposite end a web outlet, an endless web conveyor, means supporting and progressively moving the conveyor and a coated web carried thereby, in a sinuous path through the casing, so that the encased portion of the web is longer than the distance between the inlet and the outlet, a portion of the conveyor being alined with the casing inlet, and another portion alined with and extending through the casing outlet, so that a web inserted in the inlet is deposited on the conveyor and conducted thereby through the casing and the outlet, the arrangement being such that one side of the encased portion of the web is exposed to contact only with air throughout its entire extent, and means for causing the forcible impingement of air jets on said exposed side, to dry a coating thereon, said coating being dried without contact with any solid surface, and delivered from the casing through said outlet.

5. A web-drying machine comprising a casing, an endless web conveyor, rolls supporting and progressively moving the conveyor and a coated web carried thereby, in a sinuouse path through the casing, a curved deflector in the casing supporting a portion of the web out of contact with a roll-supported portion of the conveyor, and the exposed side of the said web portion in contact only with air, the arrangement being such that one side of the encased portion of the web is exposed to contact only with air throughout its entire extent, and means for causing the forcible impingement of air jets on said exposed side of the web to dry a coating thereon, said coating being dried without contact with any solid surface.

6. A web-drying machine comprising a casing, an endless web conveyor, rolls supporting and progressively moving the conveyor in the casing, and providing the conveyor and the encased portion of a coated web carried thereby with sinuous portions including at least two substantially parallel stretches, one side of the encased web portion being exposed and facing outwardly from the sinuous conveyor portion and contacting only with air throughout its entire extent, and drying means causing the forcible impingement of air on the exposed side of the encased web portion to dry a coating thereon, said means including a blower and two perforated trunks communicating with the blower and extending substantially parallel with the stretches of the encased web portion, one trunk adapted to direct air jets against the exposed side of one of said stretches, while the other trunk is adapted to direct air jets against the exposed side of the other stretch, the sinuous form of the said conveyor and web portions permitting the drying of the encased portion of the web in a casing whose length is less than that of said encased portion.

7. A web-drying machine comprising a casing, an endless web conveyor, rolls supporting and progressively moving the conveyor in the casing and arranged to provide the conveyor and the encased portion of the coated web carried thereby with sinuous portions including substantially parallel upper and intermediate stretches, and delivering stretches substantially parallel therewith and extending through an outlet in the casing, one side of the encased web portion being exposed and contacting only with air throughout its entire extent, and drying means causing the forcible impingement of air on the exposed side of the encased web portion, including the delivering stretch thereof, said means including a blower and two perforated trunks communicating with the blower and extending substantially parallel with the stretches of the encased web portion, one trunk adapted to direct air jets against the exposed side of the upper stretch, while the other trunk is adapted to direct air jets simultaneously against the exposed side of the intermediate stretch and of the delivering stretch.

In testimony whereof I have affixed my signature.

CARLE J. MERRILL.