

March 16 , 1926.

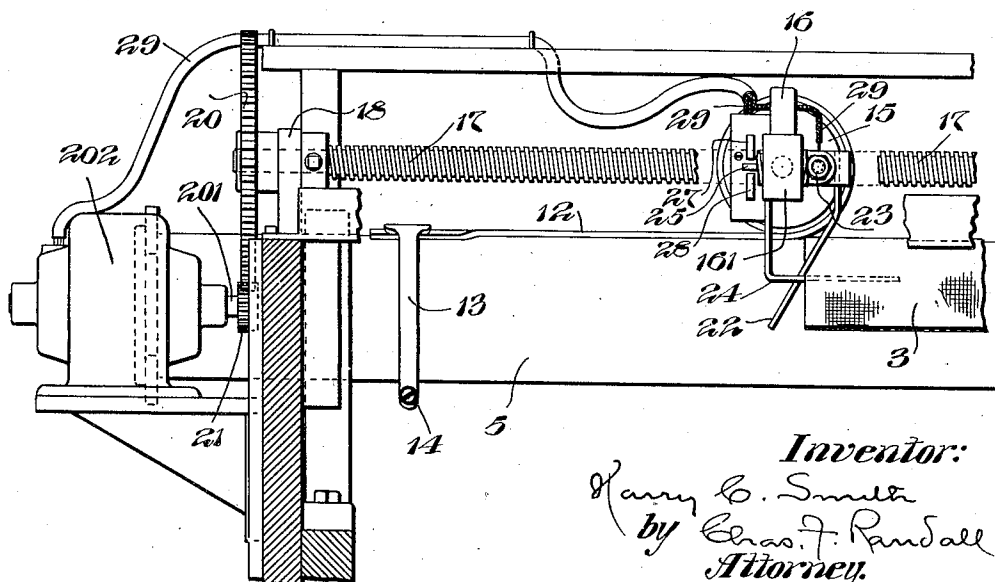
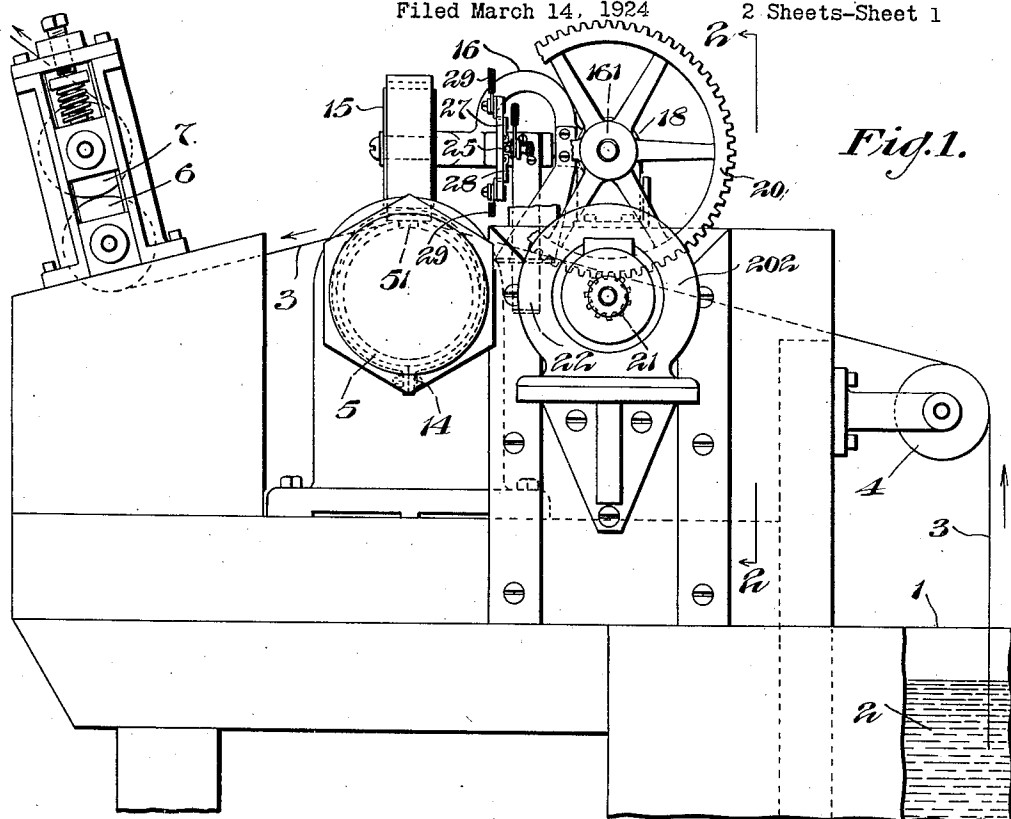
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APPARATUS FOR WITHDRAWING MOISTURE BY SUCTION

Filed March 14, 1924

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

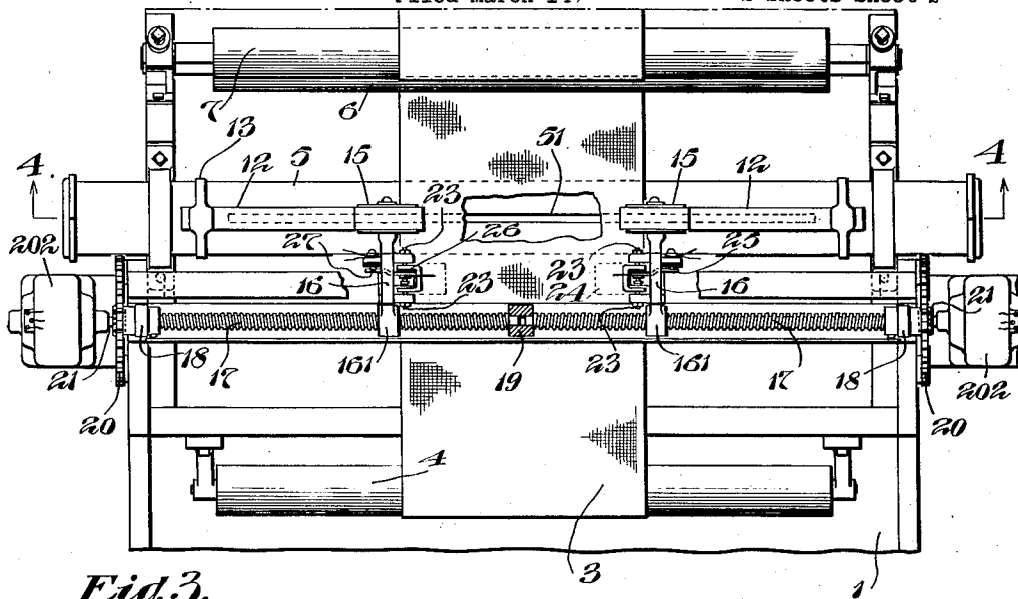


Fig. 3.

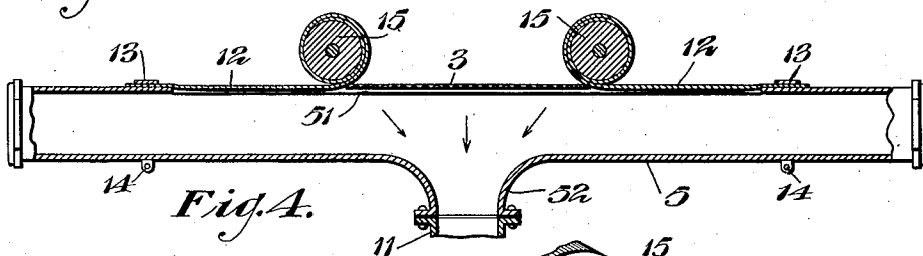


Fig. 4.

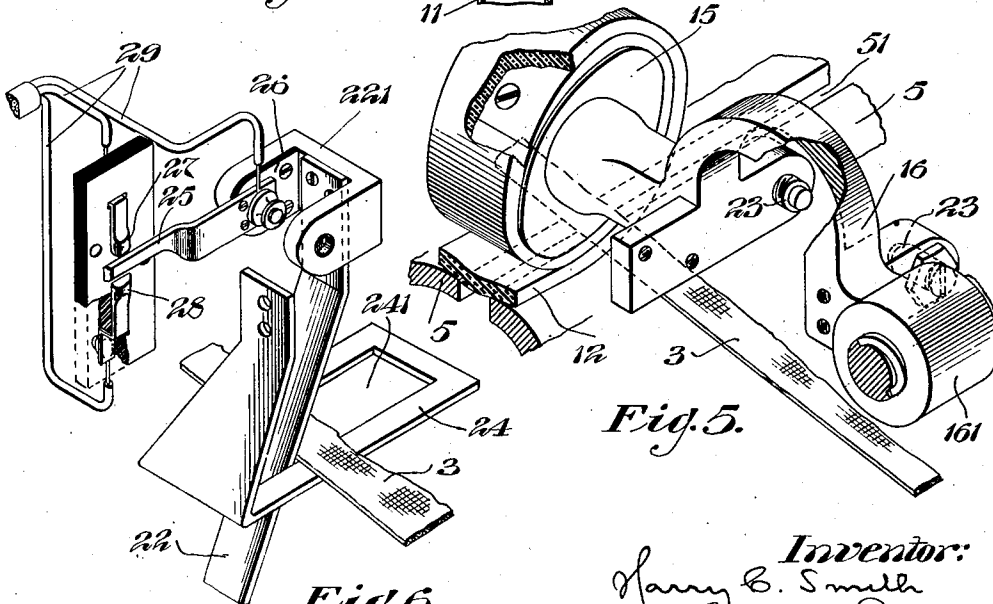


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR WITHDRAWING MOISTURE BY SUCTION.

Application filed March 14, 1924. Serial No. 699,390.

To all whom it may concern:

Be it known that I, HARRY C. SMITH, a citizen of the United States, residing at Arlington, in the county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Apparatus for Withdrawing Moisture by Suction, of which the following is a specification, reference being had therein to the accompanying drawings.

My improvement in apparatus for withdrawing moisture by suction from materials charged therewith has reference, more particularly, to those apparatuses of various forms and construction which admit of being sub-classified as suction boxes. These particular apparatuses in some instance are employed or adapted for withdrawing moisture by suction from traveling aprons, which may or may not be endless, that are themselves charged with moisture or else carry moisture-laden material. In others they are employed for withdrawing moisture from traveling continuous webs of cloth which have become more or less completely impregnated or saturated with liquid, as occurs in various preparing and finishing processes. Apparatuses of the sub-class in question comprise a body, in some cases a rotating body and in others a non-rotating body, from the interior of which air is withdrawn, and one or a plurality of air inlets which may be termed suction mouths, close to which the web travels and inward through which air flows, taking with it moisture abstracted from the web or from its load of material.

The invention consists in automatically adjustable closure devices by which the suction mouth or mouths of a suction box is or are closed so as to prevent inflow of air at points outside the margins of a traveling web, so as to ensure that all of the air flowing into the suction box shall pass through the traveling web. The automatic adjustment compensates for and accommodates the edgewise lateral swaying of a traveling web that occurs in general practice. The invention provides closure devices for the end portions of a suction box which are self adjusting under the control of a traveling web so as to conform with the positions of the web margins laterally.

An illustrative embodiment of the invention is shown in the drawings, in which latter,—

Fig. 1 is a side elevation of web handling apparatus having the said embodiment combined therewith.

Fig. 2 is a view in section on line 2, 2, of Fig. 1, showing more particularly features of the said embodiment.

Fig. 3 is a plan view of the said apparatus, etc., on a smaller scale than Figs. 1 and 2.

Fig. 4 is a view in section on line 4, 4, of Fig. 3, on the said smaller scale.

Figs. 5 and 6 are isometric views on an enlarged scale of details hereinafter explained.

In the drawings a suction box having the said illustrative embodiment of the invention combined therewith is shown associated with a tank 1, Figs. 1 and 2, containing liquid 2, Fig. 1, through which a continuous web 3 of cloth is caused to pass lengthwise. A guide-roll 4 is shown located at one end of the liquid-containing space, mounted above the level of the liquid, so that the web in being drawn over said roll is raised out of the liquid. The said suction box is shown at 5, located adjacent the guide-roll 4 so that the web, after leaving the guide-roll passes over the top of the suction box. At 6, 7, are squeezing and feeding rolls by which the web is drawn through the apparatus and delivered therefrom.

The suction box in this instance is of a well-known form comprising a non-rotating hollow body, with closed ends, having its length disposed transversely relative to the path of the traveling web, the said body having in its top a longitudinal slot, 51, Figs. 1, 3 and 4, constituting a narrow elongated suction mouth, and the body being formed at its under side with a tubular neck, 52, Fig. 4, which is connected with a duct 11 extending to suitable air-withdrawing means (not shown).

Speaking in general terms with reference to the mode of operation of a suction box, a traveling web in being subjected to the action of a suction box is conducted across the suction mouth or mouths thereof, as indicated in Figs. 1, 2, 3 and 4 in the case of web 3. As thus conducted it makes contact with the lips constituting the sides of the

mouth or respective mouths. See Fig. 1 for illustration thereof. As the web travels past the suction mouth or mouths, the air which goes through the interstices of the web in entering the suction box by way of the said mouth or mouths carries with it moisture abstracted from the web, leaving the latter materially reduced in moisture-content.

Ordinarily the length of the suction mouth of a suction box, or of the series of suction mouths in the case of a suction box having a plurality of suction mouths or inlets in the length thereof, exceeds the width of a web that is operated upon. This is illustrated by Figs. 3 and 4. This is partly in order to accommodate the tendency of a traveling web to work edgewise, transversely of the path in which it travels, and partly because often a given web which is being operated upon is less in width than the maximum width which the suction box is capable of accommodating. The excess in the length of the suction mouth lessens the effectiveness of the suction box unless the inflow of air into the suction box at points beyond the web margins is prevented. That is to say, in operation, when an unclosed opening leading to the interior of a suction box exists beyond one or each of the margins of a web, the amount of air passing through the web is reduced by reason of the inflow of air through such opening or openings, and thereby the effectiveness of the suction box in extracting moisture from the web is reduced. It has been proposed to employ suction mouth closures at the opposite ends of a suction box, to avoid or reduce this loss of effectiveness. Heretofore in practice such closures have been placed or adjusted by hand, in all cases known to me. Satisfactory results have not been attained heretofore, however, in practice. In the case of closures placed and adjusted by hand the duty of placing and adjusting the closures is liable to be forgotten or neglected. Through inattention or mistake of judgment the closures are liable to be improperly positioned. It is inconvenient to pay the close attention and make the frequent shifts that are called for by the tendency of the traveling web to work edgewise, transversely of its path in passing the suction box, and to sway back and forth edgewise.

In carrying the invention into effect I combine with end closures for a suction box novel means for automatically adjusting such end closures under the control of the web margins, properly coordinated to maintain such closures in near proximity to such margins, whether the web is wide or narrow and also so as to cause the end closures respectively to accompany the respective web margins in all the lateral shifts of the web

margins as the web works transversely in one direction or the other.

In the present illustrative embodiment of the invention the closures 12, 12, for the opposite end-portions of the suction mouth 51 are constituted by flexible strips which overlie the said end-portions beyond the web margins. The automatic adjustment means is contrived to vary the extent to which the said strips overlie the length of the said end-portions. In this instance the outer extremity of each of the said strips is made fast at a fixed point, in the drawings for convenience by means of a clamping band 13 which embraces the said extremity and the suction box body, with the ends of the band, located beneath the said body, drawn toward each other by means of a screw 14, Figs. 1 and 2, to tighten the band to clasp the extremity in question against the suction box body. Each strip extends inward over one of the end-portions of the suction mouth along the suction box body, from the point of attachment of the strip thereto to the adjacent margin of the traveling web, and so long as suction continues the strip is held thereby in close contact with the lips of the suction mouth, thereby closing the portion of the said mouth which the strip overlies. The inner end portion of the strip is wrapped around a roll 15, to which the extremity of such end portion is attached. The roll is journaled on a carriage 16 constituted by an arm having an eye 161 fitting a rod 17 which extends from one side of the apparatus to the middle of the width of the latter; such rod being mounted at its ends in bearings at 18 and 19 in connection with fixed stands, one at such side of the apparatus and the other at mid-width thereof. The roll rests upon the strip beneath it by gravity, aided if required by the tension of a spring (not shown) applied to the carriage or arm, and thereby contributes to keeping the strip close to the lips of the suction mouth. When the carriage or arm is moved toward the middle of the apparatus a portion of strip corresponding in length with the extent of the inward movement unwraps from the roll and is laid against the said lips; when the carriage or arm is moved toward the corresponding side of the apparatus the roll is rotated through contact at its periphery with that portion of the strip which lies between it and the suction box, so as to wind up some of the said portion and thereby uncover an increased length of suction mouth. To provide for shifting the roll carriages inward and outward automatically, the rods 17, 17, are screw-threaded and the eyes 161, 161, of the carriages are internally threaded for engagement with the threads of the rods, so that rotation of the respective rods operates

to produce shifting movements of the respective carriages. Also, the rods have combined with them means for rotating them automatically, comprising reversible electric motors 202 each having the shaft 201 of the rotor thereof connected by gearing 20, 21, with one of the rods. To provide for rotating the rotor of the corresponding electric motor under control of the corresponding web margin, I employ a feeler 22 which is attached to a feeler-head 221, Fig. 6, that is mounted pivotally at 23, 23, in connection with one of the carriages 16, the portion of the said feeler which extends downward from the pivot being constituted by a downwardly and outwardly inclined blade which rests by gravity against the edge of the web. The carriage is furnished with a support 24 for the web margin, comprising a plate having the lower portion thereof extended horizontally inward and formed with a slot 241, Fig. 6, within which the feeler blade works and is guided. With the feeler is associated a switch device comprising a terminal finger 25, Fig. 6, that is fastened to the head portion of the feeler, with suitable provision 26 for insulating said finger from the said head portion, the said finger being arranged to play between two fixed switch terminals 27 and 28 which are provided upon the carriage. The switch finger and the two fixed switch terminals are respectively connected by wiring 29, Figs. 2 and 6, (omitted from other views) with the corresponding electric motor so that when the adjacent web margin sways inwardly, with resulting contact of the finger with the lower switch terminal, rotation of the motor in one direction is brought about to cause the carriage 16 to travel inwardly, keeping the suction mouth closed as far as the receding web margin, and until the feeler in being controlled by the web margin is caused to assume a position in which the finger is intermediate the two switch terminals. Conversely, when the web margin sways outwardly, pressing the feeler outward so as to raise the finger 25 into contact with the upper fixed terminal 27, the motor is energized to rotate in the opposite direction and thereby move the carriage outward to uncover the portion of the suction mouth over which the web margin now extends. The automatic adjustments, at either side of the apparatus are effected independently of those at the opposite side.

The features of the invention are capable of being embodied in various forms, and the arrangement may be varied. It is within the scope of the invention to apply the said features in connection with various forms of suction boxes.

As will be apparent, the mechanism by which the respective end closures are shifted along the suction box may be caused to act

at will, independently of the web margins, through manipulation of the switch devices by hand.

What is claimed as the invention is:—

1. The combination with a suction-box and an end-closure, of a screw-threaded adjusting rod by rotation of which said end-closure is adjusted lengthwise of the suction-box, means for reversibly rotating said adjusting rod, and feeler-means controlled by a margin of a web traveling past said suction-box and operatively controlling said rotating means to determine time and direction of rotation of the rod.

2. The combination with a suction-box and end-closures at opposite sides of the path of a web traveling past said suction-box, of screw-threaded adjusting means by rotation of which the end-closures are adjusted lengthwise of the suction-box, means for reversibly rotating said adjusting means, and feeler-means controlled by the opposite margins of said web and operatively controlling said rotating means to effectuate adjustments of the end-closures.

3. The combination with a suction-box and end-closures at opposite sides of the path of a web traveling past said suction-box, of screw-threaded adjusting means by rotation of which the end-closures are adjustable independently of each other lengthwise of the suction-box, means for reversibly rotating said adjusting means, and means controlled by the opposite margins of said web and operatively controlling said rotating means to effectuate independent adjustments of the respective end-closures.

4. The combination with a suction-box and an end-closure, of screw-threaded adjusting means by rotation of which the end-closure is adjusted lengthwise of the suction-box, a reversible electric motor for reversibly rotating said adjusting means, and a switch device controlled by a margin of a web traveling past said suction-box and operatively controlling said motor to determine time and direction of rotation of the latter.

5. The combination with a suction-box and end-closures at opposite sides of the path of a web traveling past said suction-box, of screw-threaded adjusting means for the respective end-closures by rotation of which the end-closures are adjustable independently of each other lengthwise of the suction-box, reversible electric motor driving means for reversibly rotating said adjusting means, and switch devices controlled by the opposite margin of said web and operatively controlling said driving means to effectuate independent adjustments of the respective end-closures.

6. The combination with a suction-box and an end-closure, of a reversible electric motor, means actuated by said motor for

adjusting the end-closure, and a switch-device controlled by a margin of a web traveling past said suction-box and operatively controlling said motor to determine
5 time and direction of adjustment of the end-closure.

7. The combination with a suction-box and an end-closure, of two reversible electric motors, end-closure adjusting means inter-
10 mediate the respective motors and the respective end-closures, and switch-devices controlled by the respective margins of a web traveling past said suction-box and operatively controlling the respective motors
15 to effectuate independent adjustments of the respective end-closures.

8. The combination with a suction box and an end closure therefor, of adjusting means and an actuating electric motor oper-
20 atively combined with said end closure, and a switch device controlled by a margin of a traveling web that is operated upon by the suction box and itself controlling the actuation of the adjusting means by the electric
25 motor so as to keep the suction mouth closed by the end closure in proper relation to the said web margin in the various positions assumed by the latter.

9. The combination with a suction box
30 and opposite end closures therefor, of electric-motor-driven adjusting means operatively combined with the respective end closures, and switch devices respectively controlled by the respective margins of a
35 traveling web that is operated upon by the suction box, and controlling the adjustment

of the end closures to keep the suction mouth closed by each thereof in proper relation to the corresponding web margin.

10. The combination with a suction box
40 and opposite end closures therefor, of adjusting means and an actuating electric motor therefor for each end closure, and switch devices respectively controlled by the re-
45 spective margins of a traveling web that is operated upon by the suction box, and controlling the electric motors to adjust independently the respective end closures so as
50 to keep the suction mouth closed in proper relation to the corresponding web margins.

11. The combination with a suction box, of an end closure for the suction mouth comprising a flexible strip overlying such
55 mouth, a roll resting against the strip and having one end portion of the strip wrapped around the same, and a mounting for said roll adjustable lengthwise of the suction
60 box, said closure strip winding upon and unwinding from the roll as the mounting and roll are adjusted inward and outward.

12. The combination with a suction box, of an end closure for the suction mouth comprising a flexible closure strip, a roll resting
65 against the strip and having one end portion of the strip wrapped around the same, a swinging arm on which said roll is jour-
70 nalled, and a screw-threaded adjustment rod extending lengthwise of the suction box, on which the arm is mounted to swing, with the arm engaged by the thread of the rod.

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