Dec. 19, 1933. C. H. R. JOHNSON ET AL 1,940,594

SUCTION BOX

Filed May 22, 1933 4 Sheets-Sheet 1

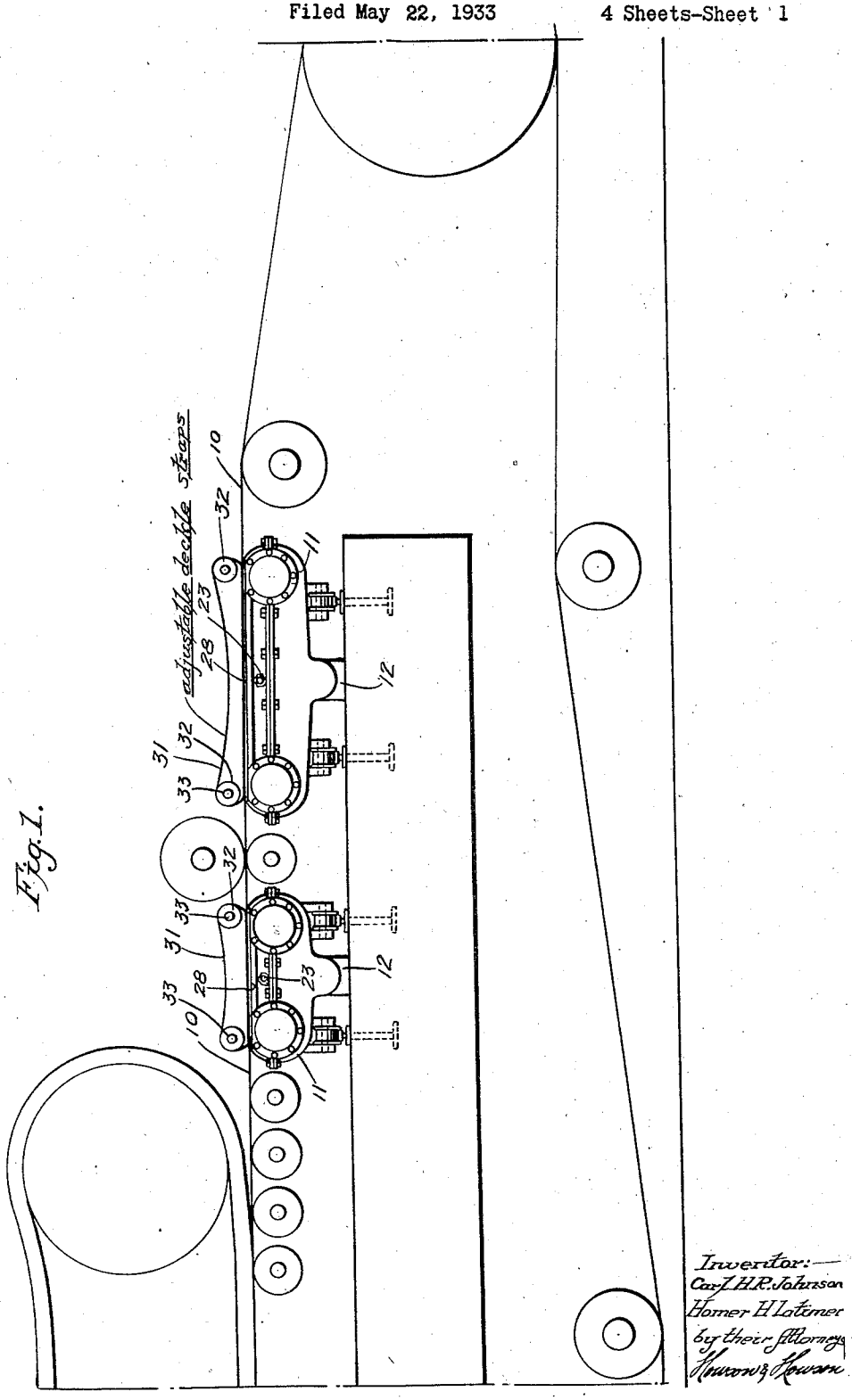


Fig. 1.

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Filed May 22, 1933 4 Sheets-Sheet 2

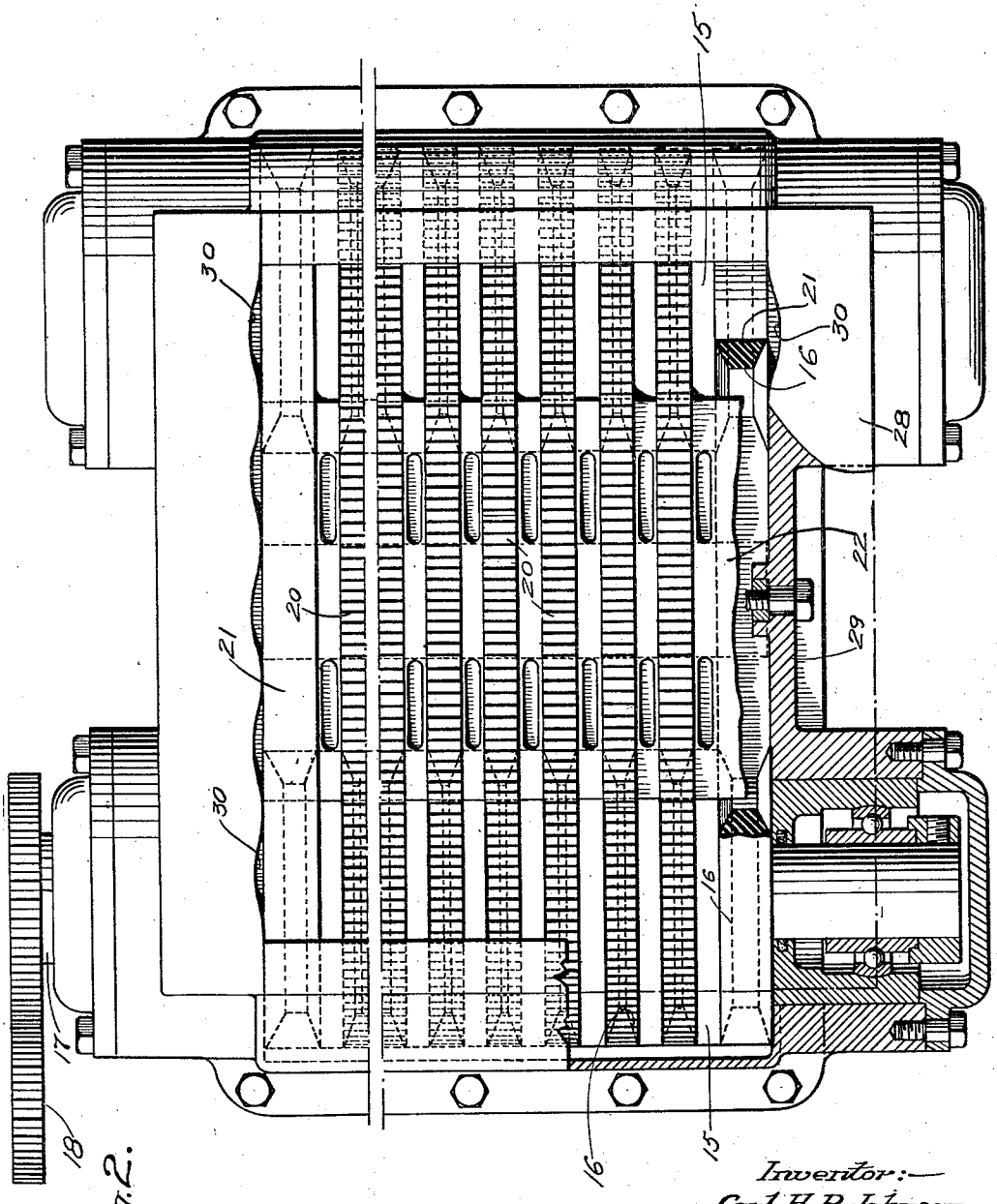


Fig. 2.

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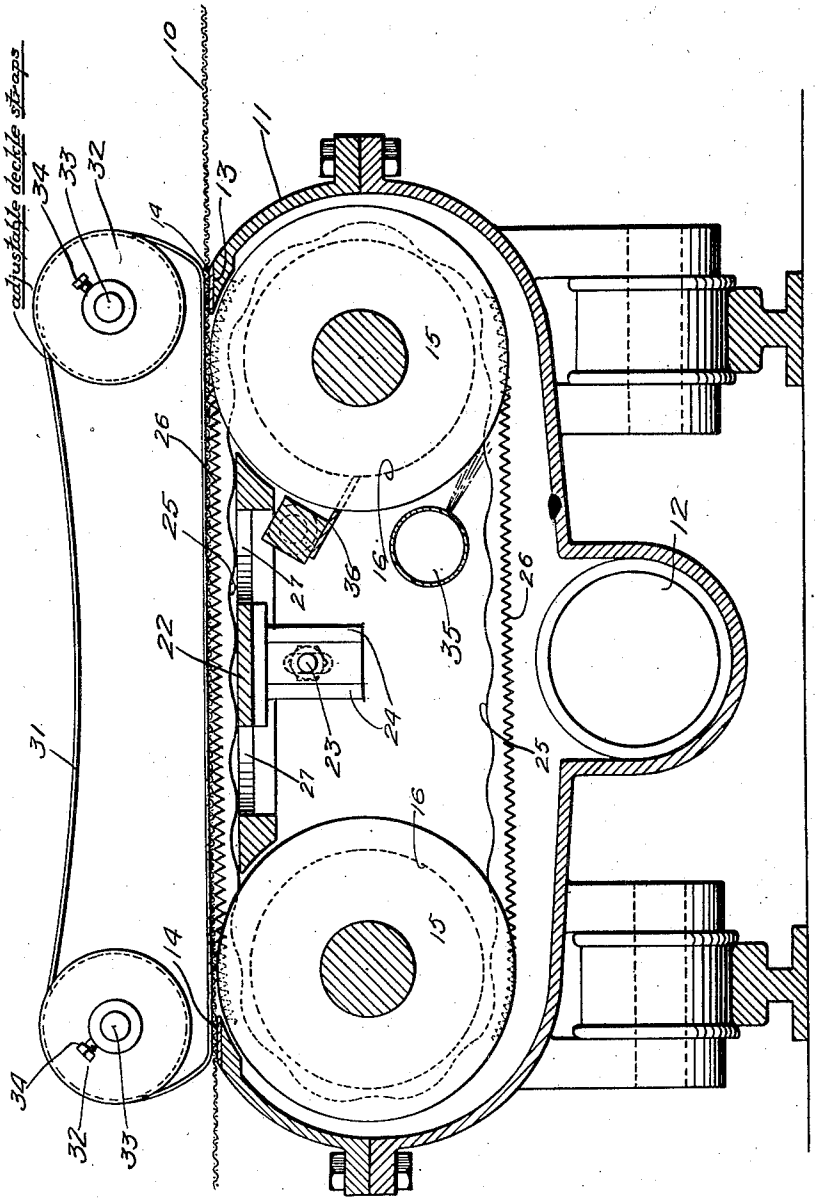


Fig. 3.

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SUCTION BOX

Filed May 22, 1933 4 Sheets-Sheet 4

Fig. 4.

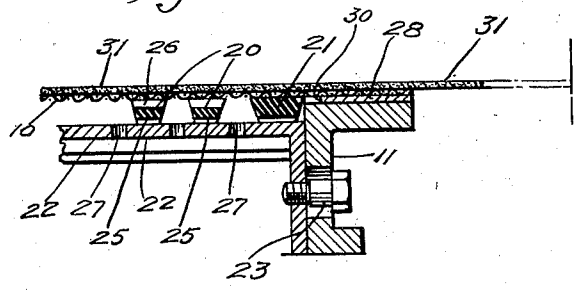
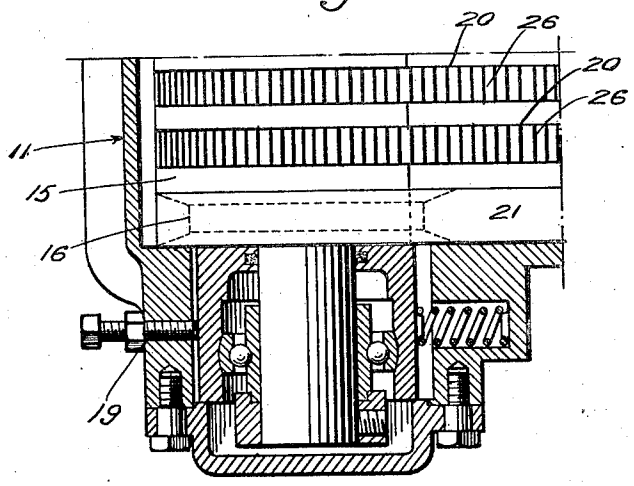


Fig. 5.



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Patented Dec. 19, 1933 1,940,594

UNITED STATES PATENT OFFICE

1,940,594

SUCTION BOX

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Application May 22, 1933. Serial No. 672,280

17 Claims. (Cl. 92—52)

This invention relates to suction boxes for paper-making machines, and more particularly to suction boxes for use in conjunction with the forming wires of Fourdrinier paper machines.

In the standard Fourdrinier machine, as currently employed in the paper industry, the endless wire cloth on which the web of paper is formed travels over a series of stationary suction boxes by means of which water is drawn from the wet web. These suction boxes are usually provided with perforated stationary tops and the wire cloth, which is very flexible, is flexed into the openings of the suction box covered thereby causing considerable wear both upon the cover of the suction box and upon the wire. With this type of installation it is necessary that the wire be frequently replaced and the suction box cover is in constant need of re-dressing and renewal. For this reason, many devices have been proposed to replace the stationary construction with a supporting means moving with the wire, and through which suction is exerted. In the main, devices of this latter type have been failures for the reason that the moving support moved into and out of the suction area with the result that it contantly moved into the suction area a great amount of air trapped in serrations necessarily provided in the supporting faces of the support. Such devices as have been proposed, wherein the movable supports were disposed within the suction area, have been unsuitable for use in that they failed to make provision for deckle adjustment and failed to provide constructions which would effectively seal the suction area without undue wear upon the wire cloth.

Important objects of this invention are the provision of a construction of this character wherein the movable supporting elements are always contained within the suction area and are so arranged that an adjustable deckle may be employed, and to provide a construction preventing undue wear upon the cloth.

A further object of the invention is to provide in a construction of this character an arrangement such that the movable supporting elements are supported during the entire extent of their screen supporting travel.

These and other objects we attain by the construction shown in the accompanying drawings wherein, for the purpose of illustration, we have shown a preferred embodiment of our invention and wherein:

Fig. 1 is a fragmentary side elevation of a Fourdrinier paper machine utilizing suction boxes constructed in accordance with our invention;

Fig. 2 is a plan view partially broken away of the suction box;

Fig. 3 is a longitudinal sectional view through the suction box;

Fig. 4 is a fragmentary transverse sectional view through the suction box illustrating the manner of supporting the edges of the wire cloth from the box; and

Fig. 5 is a fragmentary sectional view illustrating the use of means to take up slack in the supporting belts.

Referring now more particularly to the drawings, the numeral 10 designates the traveling wire cloth of a Fourdrinier paper machine, and 11 a suction box arranged therebeneath and connected as at 12 to a suitable source of suction, not herein shown. The box is closed, with the exception of the top thereof which is open, the upper ends of the side and end walls being considerably broadened as indicated at 13 and having plates 14 of anti-friction metal applied thereto and forming a seat over which the wire cloth 10 operates. Within the suction box are arranged a pair of rolls 15, these rolls having grooved peripheries, as more clearly shown at 16 in Figs. 2 and 3. One of the rolls 15 is preferably provided with an extended journal 17 for connection with a suitable drive 18; the other of the rolls may either be stationary, as shown in Figs. 2 and 3, or may be adjustable as suggested at 19 in Fig. 4. The grooves 16 of the rolls 15 have tapered sides for the reception of V-belts which form the supporting surface for the wire cloth during its passage over a suction box. These belts comprise two different types which may be generally referred to as inner belts, designated at 20; and side belts, indicated at 21. The upper or operating run of these belts is supported by a plate 22 which is preferably vertically adjustable, as indicated at 23, and guided in such adjustment by suitable guides 24 formed on the inner walls of the suction box. The inner faces of belts 20 and 21 are sinuous, as indicated at 25, thus serving to both reduce the frictional contact between plate 22 and the belts, and to provide a surface which will carry sufficient moisture to provide lubrication between the supporting plate 22 and the belts. Belts 20 have serrate outer or supporting faces as indicated at 26, the serrations extending transversely of the belts and forming grooves opening through the side edges thereof. The belts 20 and 21 are slightly spaced from one another, as more clearly shown in Fig. 2, and supporting plate 22 has openings 27 formed therein aligning with the spaces between the belts so that the suction in the box may thoroughly distribute itself over substantially the entire area of the box to act upon the entire exposed surface of cloth 10. Belts 21 have smooth upper faces, as more clearly seen in Fig. 2, and these belts are at all times coplanar with the broad upper faces 28 at the upper ends of side walls 29, being maintained in this position through adjustment of plate 22. The inner faces of the side walls, in opposition to said side belts, are serrate as indicated at 30

so that instead of line contact between the cloth 10 and the edges of these side walls at the edge of the suction area, which would produce rapid cutting of the wire, there is a relatively broad contact which distributes the rubbing action and materially lengthens the life of the wire. Furthermore, the upper surfaces of belts 21 which are at all times in close proximity to the side wall, being coplanar with the surface 28, offer little chance for the cloth to be drawn downwardly at such inner edge.

Arranged above the cloth, in opposition to the sides of the box 11, are a pair of adjustable deckle straps 31, adjustment of which may be accomplished in any suitable manner; in the present instance we have illustrated these deckle straps in Fig. 3 as mounted upon guide sheaves 32 which guide sheaves are in turn mounted upon axles 33 upon which they may be held in adjusted positions by set screws 34.

The arrangement just described is purely illustrative, and may be substituted for by any suitable arrangement permitting adjustment and regulation of the position of straps 31.

Deckle straps 31 are in the form of broad, relatively thin webs and in their effective run lie upon the surface of cloth 10 to determine the width of the sheet. These straps will, of course, have associated therewith one of the usual washing devices for clearing away the unused portions of the formed web. Such devices are, however, well known and require no illustration in this application. Deckle straps 31 will at all times have their inner edges at least coincident with the inner edge of side belts 21 and will, accordingly, tend to seal those portions of the screen overlying the spaces between the side belts and the upper edge of the side wall so that suction will not act to draw the wire cloth downwardly into these openings with sufficient force to cause any real wear thereon.

Side belts 21 are formed of relatively soft rubber and will, accordingly, yield to a certain extent and not permit any such sharp deflection of the cloth 10 as will allow the same to be damaged. The belts 20 may be of any suitable construction, and may be well typified by the ordinary fan belt employed on automobile engines with, of course, the added feature of serration of the outer or supporting surface thereof.

In order that the collection of fibre, or other paper ingredients, upon the belts and rolls may be avoided, spray pipes 35 and doctors 36 may be utilized, as suggested in Fig. 3.

Since the construction is obviously capable of considerable modification without in any manner departing from the spirit of the invention, we do not wish to be understood as limiting ourselves thereto except as hereinafter claimed.

We claim:

1. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, and belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier.

2. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, and a supporting plate spanning the space between said rolls and with which the inner faces of the belts contact during their carrier-engaging run.

3. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, and other belts likewise operating in grooves in said rolls, said other belts being disposed in close proximity to the inner faces of the side walls of the suction box, the outer faces of said other belts being smooth and coplanar with the upper surface of the side walls of the suction box.

4. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, and other belts likewise operating in grooves in said rolls, said other belts being disposed in close proximity to the inner faces of the side walls of the suction box, the outer faces of said other belts being smooth and coplanar with the upper surface of the side walls of the suction box, the inner faces of the side walls of the suction box at the upper edges thereof being sinuous.

5. In a paper-making machine, an endless web carrier, a suction box over which the carrier passes, said suction box having an open top, and endless supporting elements within the box for supporting the carrier in its passage over the box, the upper portions of the side walls of the box having sinuous surfaces.

6. In a paper-making machine, an endless web carrier, a suction box over which the carrier passes, said suction box having an open top, and endless supporting elements within the box for supporting the carrier in its passage over the box, the upper portions of the side walls of the box having sinuous surfaces, the upper ends of the side and end walls of said box comprising plates of material having a relatively low coefficient of friction.

7. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, a supporting plate spanning the space between said rolls and with which the

inner faces of the belts contact during their carrier-engaging run, and means to vertically adjust said plate.

8. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, other belts likewise operating in grooves in said rolls, said other belts being disposed in close proximity to the inner faces of the side walls of the suction box, the outer faces of said other belts being smooth and coplanar with the upper surface of the side walls of the suction box, and a supporting plate spanning the space between said rolls and with which the inner faces of the belts contact during their carrier-engaging run.

9. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a pluraliity of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, other belts likewise operating in grooves in said rolls, said other belts being disposed in close proximity to the inner faces of the side walls of the suction box, the outer faces of said other belts being smooth and coplanar with the upper surface of the side walls of the suction box, and deckle straps flatly engaging the side edges of the carrier in opposition to the side edges of the box and said other belts.

10. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, and endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces.

11. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, and endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces, the inner edges of said flat surfaces being sinuous.

12. In a paper-making machine, an endless web carrier, a suction box over which the carrier passes, said suction box having an open top, and endless supporting elements within the box for supporting the carrier in its passage over the box, the upper surfaces of the end and side walls comprising renewable plates of material having a relatively low coefficient of friction, the plates applied to the side walls having sinuous inner edges.

13. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces, and deckles flatly engaging the side edges of the wire in opposition to the box sides.

14. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces, and deckles flatly engaging the side edges of the wire in opposition to the box sides and said belts.

15. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces, the inner edges of said flat surfaces being sinuous, and deckles flatly engaging the side edges of the wire in opposition to the box sides.

16. In a paper-making machine, a traveling forming wire, a suction box over which the wire moves, said suction box having flat surfaces at the upper ends of the side walls thereof over which the edges of the wire travel, endless supporting belts within the suction box immediately adjacent the side walls thereof, said supporting belts during one run thereof supportingly contacting the wire with their outer faces, said outer faces during such run being coplanar with said flat surfaces, the inner edges of said flat surfaces being sinuous, and deckles flatly engaging the side edges of the wire in opposition to the box sides and said belts.

17. In a paper-making machine, a suction box for use at one face of an endless web carrier, said suction box having an open top the side edges of which support the carrier, a plurality of rolls mounted in said box and having circumferentially grooved peripheries, belts operating in the grooves of said rolls and having their outer faces constructed and arranged for the distribution of suction over substantially the entire area of such outer faces while such faces are in contact with the carrier, and a supporting plate spanning the space between said rolls and with which the inner faces of the belts contact during their carrier-engaging run, the plate-contacting faces of the belts being corrugated.

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