

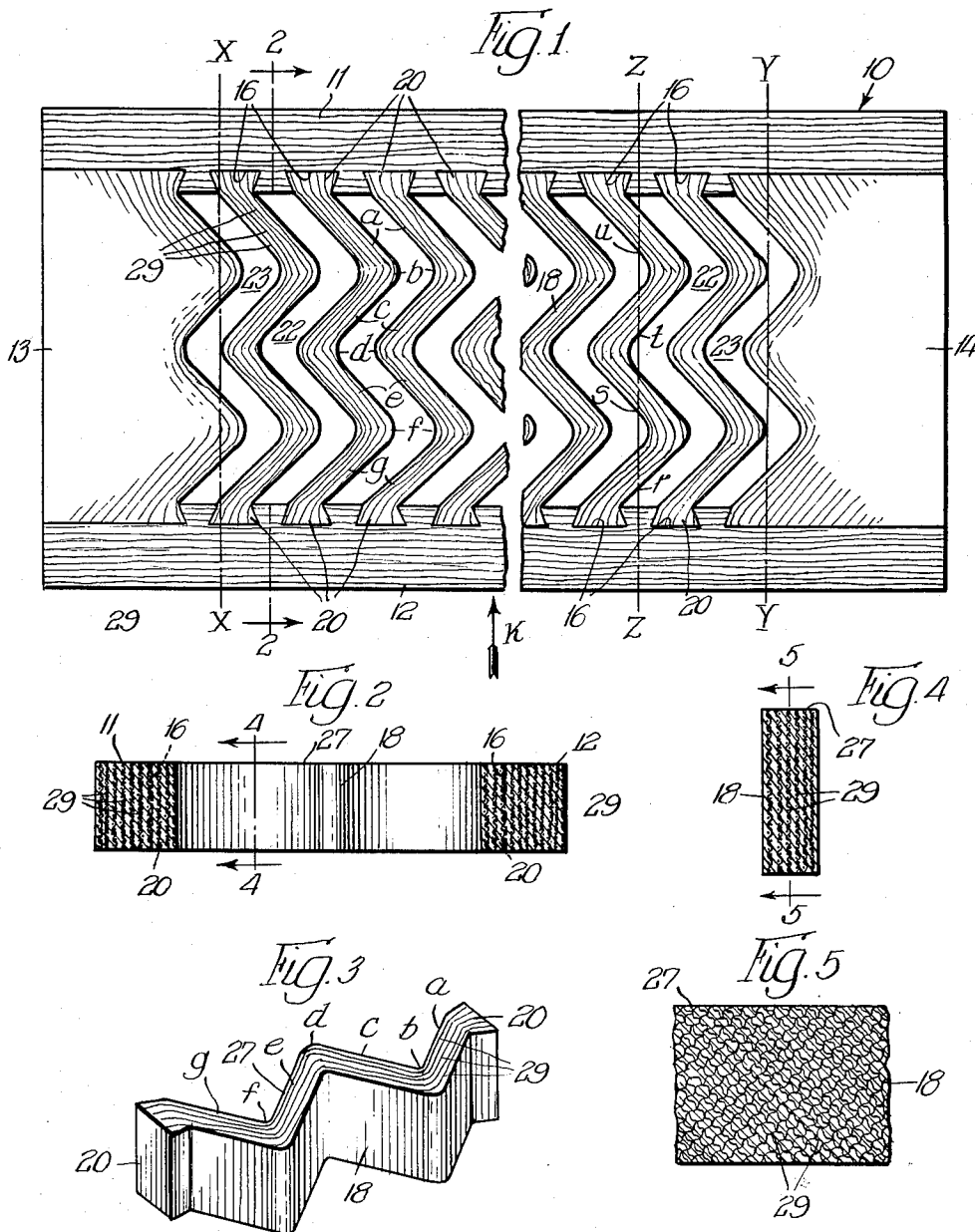
Oct. 25, 1960

T. L. GATKE
SUCTION BOX COVER

2,957,522

Filed Jan. 30, 1958

2 Sheets-Sheet 1



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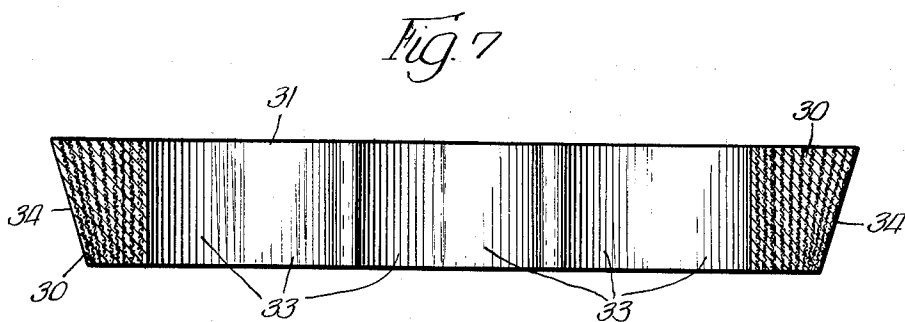
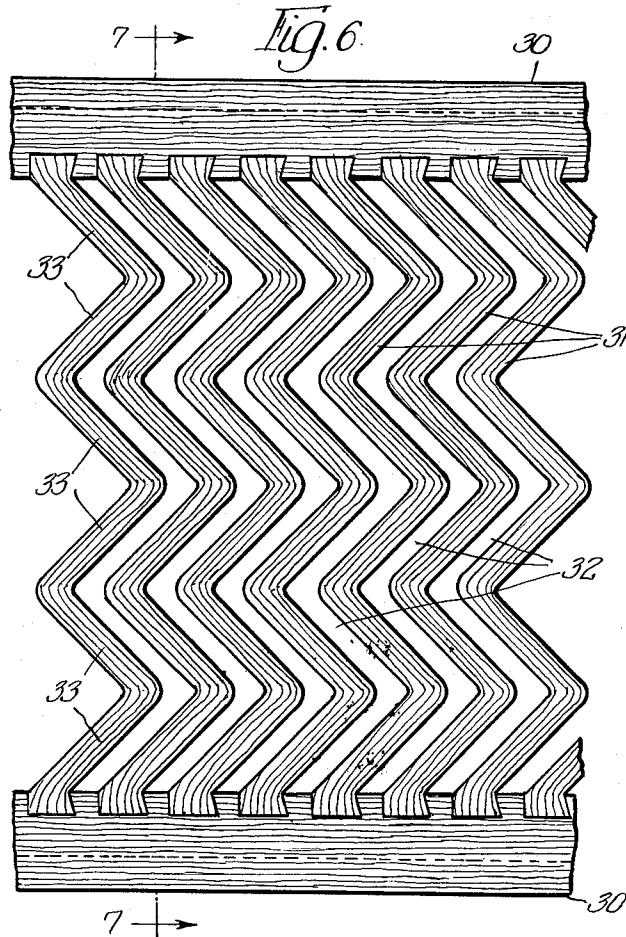
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SUCTION BOX COVER

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13 Claims. (Cl. 162—374)

This invention relates to paper making apparatus, and particularly to improvements in the covers for the suction boxes ordinarily employed in such apparatus.

The invention is particularly well suited for use with a paper making machine which utilizes a so-called Fourdrinier wire to convey the wet paper pulp over a series of suction boxes. It should be understood, however, that the invention is also applicable to other kinds of paper making or pulp treating machines.

In making paper on a machine of the type described, suitable fibers are first dispersed or beaten in water to form a pulp. The pulp is then flowed onto a continuously moving fine mesh wire belt, which belt constitutes the conventional Fourdrinier wire. The pulp carrying wire then passes over a series of suction boxes, which boxes are disposed below the wire and have perforated covers in flatwise engagement with the underside of the wire, whereby suction applied through the boxes effects removal of the water from the pulp on the wire.

The speed of travel of the wire has always been limited by the capacity of the suction boxes to eliminate the water from the pulp and by the frictional wear caused by too rapid a movement of the wire in frictional contact with the covers of the boxes.

The general purpose of the invention is to provide a new and improved suction box cover which is so designed as to permit of very rapid and thorough withdrawal of the water from the pulp while at the same time permitting of high speed travel of the wire without appreciable wear.

One of the more salient features of the improved cover is the novel arrangement of the suction slots and intervening wire supporting ribs. The slots, as well as the ribs, instead of extending straight or diagonally in the direction of movement of the wire, extend in a zigzag path in that direction, repeatedly swerving sidewise first toward one end of the cover and then toward the other, affording a plurality of continuous and uninterrupted passes of constantly changing direction, in which the bordering edges of the wire supporting ribs which separate the passes will wipe the under surface of the wire laterally first in one direction and then in the other with a clean, shearing action, thereby inducing maximum continuous flow through constantly changing areas of the wire.

A further object of the invention is to provide an improved suction box cover which is of relatively simple yet sturdy construction, which is highly efficient in eliminating water from the pulp, which minimizes wear on the pulp carrying wire, and which has a wear-resistant supporting surface which is of such construction as to substantially reduce the frequency of cover replacement.

A more specific object of the invention is to provide a new and improved suction box cover which is characterized by a transversely elongated rectangular frame having a pair of relatively long side rails, and a series of sinuous zigzag divider bars or ribs fitted between and secured to the side rails in the plane of the upper surface of the latter, which divider bars are so spaced apart as to provide in the cover suction openings having the same wavy configurations as the divider bars, whereby a pulp carrying wire moving across the transversely disposed cover encounters wiping edges of changing direction provided by the upper edges of the divider bars, which edges

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are for the most part disposed angularly with respect to the direction of movement of the wire, and which edges are disposed alternately in opposite angular directions along any longitudinal section through the wire to afford an evenly balanced wiping action.

A further object of the invention is to provide such a cover wherein any transverse section taken through the wire has substantially the same area exposed to the suction, so as to provide uniform withdrawal of the water from the pulp across the full width of the wire.

A still further object of the invention is to provide a new and improved cover which is formed of a molded synthetic resin laminated fabric composition, with the fabric laminations extending vertically thereof and with such laminations cut on the bias to present at the wear-resistant surface of the cover an end grain effect, exposing the ends of both the warp and woof strands of the fabric at such surface.

While the foregoing statements are indicative in a general way of the nature of the invention, other more specific objects and advantages will be apparent to those skilled in the art upon a full understanding of the construction, arrangement and purpose of the features of novelty incorporated in the new cover.

In the accompanying drawings two embodiments of the invention are illustrated by way of exemplification but it will of course be appreciated that the invention is susceptible of incorporation in still other forms coming equally within the spirit of the invention and the scope of the appended claims.

In the drawings:

Fig. 1 is a broken top plan view of a suction box cover which embodies the invention.

Fig. 2 is a vertical sectional view taken generally on line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the divider bars or ribs shown in Fig. 1;

Fig. 4 is an enlarged vertical sectional view taken generally on line 4—4 of Fig. 2;

Fig. 5 is an enlarged vertical sectional view taken generally along line 5—5 of Fig. 4;

Fig. 6 is a fragmentary top plan view of an intermediate portion only of a modified form of the invention; and

Fig. 7 is a vertical sectional view taken generally on the line 7—7 of Fig. 6.

The cover shown in Figs. 1 to 5, inclusive, comprises a transversely elongated rectangular frame 10 having a pair of long side rails or members 11 and 12 and a pair of short end members 13 and 14, all of which may be connected together in any well known manner. It will be understood that this cover is sealingly secured in any suitable manner to the upper open face of a suction box, which box has outlet means connected to a source of suction. As suction box covers are usually quite long relative to their width, the side rails 11 and 12 may either be formed as single elongated members or by joining together a series of sections secured by cementing or otherwise. The inner edges of the side rails 11 and 12 are provided with spaced vertically extending grooves or slots 16, with the grooves in one rail aligned with those in the other rail. The grooves 16 may be formed with any desired configuration and the dove-tail configuration shown is therefore not intended to be critical.

To provide supporting means for the pulp carrying wire which is adapted to move across the frame 10 at right angles to the side rails 11 and 12 (the lateral expanse of such wire being indicated by the broken lines X and Y in Fig. 1), a series of divider bars 18 or ribs are provided between the side rails 11 and 12 of the frame 10. The divider bars 18 have end portions 20 which are adapted to be received within the vertically ex-

tending grooves 16 in the rails 11 and 12. The end portions 20 are of dove-tail shape and fit tightly in the grooves 16, where they are preferably cemented.

The portions of the divider bars 18 which extend between the end portions 20 are of zigzag, undulating or sinuous configuration, as shown in the drawings. The bars 18 are positioned within the frame 10 in laterally spaced relation to each other and define between the same suction openings or gaps 22 through the cover, which openings extend between the side rails 11 and 12 in the direction of travel of the wire and have the same configurations as the intervening bars or ribs. The two end members 13 and 14 of frame 10 are formed with inner edges which follow the same shape as the endmost bars 18, with the result that the two end openings 23 will have the same zigzag configuration as the openings 22 between the other bars 18.

The shape of the divider bars 18 of the embodiment illustrated in Figs. 1 to 5, inclusive, is best shown in Figs. 1 and 3. Each bar 18 has a first body portion *a* which extends from one of the end portions 20 substantially at an angle of 45° and terminates at a first right-angle curve *b*, about one-quarter of the distance between the end portions 20, with a second body portion *c* extending therefrom approximately at right angles to the first body portion *a* and terminating at a second right-angular curve *d* at the mid-point between the end portions 20. A third body portion *e* then extends from the second portion *c* parallel to the first portion *a* and terminates at a third right-angular curve *f*, which is at a point about three-quarters of the distance between the end portions 20, with a fourth body portion *g* extending from the third portion *e* parallel to the second body portion *c* and terminating at the other end portion 20.

It will be observed that the upper edges of the divider bars 18 are sharply defined and provide wiping edges which contact the underside of the wire and which extend for the most part angularly with respect to the direction of travel of the wire, as shown by the arrow *k*. This angular disposition of the wiping edges minimizes wear on the wire, particularly upon the transverse elements thereof, and acts to maintain the underside of the wire clean, which in turn augments free flow under suction. It will also be noted that every portion of the wire as it moves across the suction box cover encounters angular wiping edges which are disposed alternately in opposite angular directions, as shown at points *r*, *s*, *t* and *u* on the longitudinal section line *Z* in Fig. 1. In the embodiments herein illustrated the alternate wiping edges extend normally with respect to each other due to the particular configuration of the divider bars 18. This structural arrangement provides an evenly balanced wiping action and eliminates any tendency of the wire to work toward either end of the cover, thus keeping the wire properly centered on the cover. With the corrugated divider bar configuration disclosed herein, the area of wet pulp along any transverse section through the pulp carrying wire exposed to the suction action through the suction openings 22 is the same, thus providing uniform water extraction across the wire.

The divider bars 18 are preferably spaced apart a distance substantially equal to the width of one of the bars. With this particular spacing the area of wet pulp exposed to the suction action through the suction openings 22 is substantially equal to the pulp carrying wire supporting area defined by the upper surfaces of the divider bars 18. This spacing may vary, however. The spacing should of course be such as to afford the most efficient water elimination characteristics for each particular installation.

Another important feature of this invention is the highly effective wear-resistant characteristics of the upper surface of the cover, which surface is exposed to wearing action because of the movement of the wire across and in suction-drawn contact with the same. This improved

surface substantially increases the useful life of the cover over that of covers currently in use, which frequently have to be replaced as a result of becoming grooved and generally worn by the action of the wire.

To provide the wear-resistant characteristics referred to above, the frame 10 and the divider bars 18 are formed of a molded synthetic resin laminated fabric composition. A preferred composition utilizes a plurality of layers or laminations 29 of cotton or other fabric impregnated with any of the well known synthetic resins and molded under suitable pressure and temperature. The molded material for the divider bars 18, as well as for the rails of the frame, may advantageously be molded in a long corrugated panel which may then be cut crosswise at intervals to provide individual bars of the dimensions shown in Fig. 3. Obviously other fabrics and materials of moldable character may also be used in forming the cover of the invention. The laminations 29 are arranged in the molded elements with the laminations extending vertically thereof, as shown in Fig. 4. The fabric laminations 29 are preferably arranged not only on edge but on the bias, as shown in Fig. 5, whereby to provide an end grain effect at the surface of the cover, which utilizes the ends of both the warp and woof strands of the fabric at the surface 27 and is highly resistant to wear.

By molding the divider bars 18 in a long corrugated panel and then cutting the same crosswise to obtain bars of the correct depth, as above described, the side faces of the resulting bars are outer molded faces in the nature of slick hard skin formations, which faces tend to eliminate any clogging of the openings between the bars by freely and frictionlessly passing such fine particles of pulp as escape downwardly through the meshes of the wire with the water. This skin-like surfacing on the side faces of the bars also affords sharp relatively hard and well defined corners along the upper edges of the bars for slidingly shearing coaction with the under face of the wire and materially reduces wear along such edges.

In the embodiment shown in Figs. 6 and 7 of the drawings, a modified cover 30 is shown which includes all of the novel features hereinabove described but which differs from the first embodiment in the number of angularly disposed sections which make up the divider bars 31. The bars 31, like the intervening suction slots 32, are composed of a large number of angularly disposed sections 33, namely, six instead of four. The outer margins 34 of the frame of the cover are also shown as beveled, and are adapted to sealingly wedge within the correspondingly beveled rim of the box.

With the suction box cover of the present invention it has been found that considerably less vacuum is required in the box in order to obtain the same degree of water removal, and that both the wire and the upper surface of the cover are subjected to much less wear, such wear on the upper surface of the cover as unavoidably occurs over a period of time being uniform over the entire cover, with the result that less frequent dressing of the cover is required.

I claim:

1. A cover for a suction box for a paper making machine of the type in which a fine mesh pulp carrying wire travels across and is supported by the cover in flatwise engagement with the same, said cover being characterized by a laterally elongated flat topped frame and by a plurality of laterally spaced drainage slots in the frame, which slots are elongated and extend without interruption generally in the direction of travel of the wire but zigzag laterally back and forth intermediate their ends first toward one end of the box and then toward the other.
2. A cover for a suction box for a paper making machine of the type in which a fine mesh pulp carrying wire travels across and is supported by the cover in flatwise engagement with the same, said cover being characterized by a laterally elongated flat topped frame and by a plurality of laterally spaced drainage slots in the

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frame, which slots are elongated and extend without interruption generally in the direction of travel of the wire but zigzag laterally back and forth intermediate their ends first toward one end of the box and then toward the other, the slots being so spaced from each other that the intervening portions of the cover between the slots are of approximately the same lateral dimensions as the slots.

3. A cover for a suction box for a paper making machine of the type in which a fine mesh pulp carrying wire travels across and is supported by the cover in flat-wise engagement with the same, said cover being characterized by a laterally elongated flat topped frame and by a plurality of laterally spaced drainage slots in the frame, which slots are elongated and extend without interruption generally in the direction of travel of the wire but zigzag laterally back and forth intermediate their ends first toward one end of the box and then toward the other, each of said slots having portions which are overlapped intermediate their ends in the direction of travel of the wire by portions of the slots on both sides thereof.

4. A cover for a suction box for a paper making machine, comprising an elongated frame which is disposed transversely of the direction of movement of the pulp carrying wire, and means defining a series of identically shaped suction openings through the frame, spaced side by side and extending without interruption between the sides of the frame generally in the direction of movement of the wire, said openings having an elongated generally corrugated configuration, and the wire supporting portions of the cover disposed between said suction openings defining angularly extending wiping edges with each portion of the wire adapted to encounter angular wiping edges extending alternately in generally opposite directions.

5. A cover for a suction box for a paper making machine, comprising a longitudinally extending cover member disposed transversely to the direction of travel of a pulp carrying wire, and means in said cover member for supporting the wire and defining a series of suction openings which are elongated and extend generally in the direction of travel of the wire, said means and said openings having uninterrupted corrugated configurations defining wiping edges disposed angularly with respect to the direction of travel of the wire, said wiping edges along a vertical section taken through the wire in the direction of travel thereof extending alternately in opposite angular directions to provide an evenly balanced wiping action on the wire.

6. A cover for a suction box for a Fourdrinier paper making machine, comprising a pair of long, side members extending transversely to the direction of movement of the Fourdrinier wire, means defining a series of vertically extending, dove-tail grooves formed on the inner surface of each of said side members with the grooves in one side member aligned with the grooves in the other side member, a series of divider bars having end portions formed to fit within said dove-tail grooves and having sinuously corrugated intermediate portions extending without interruption between said end portions, each of said bars having its end portions fixedly secured in an aligned pair of said grooves so that the series of spaced bars define suction openings between adjacent bars having the same corrugated shape as said bars, and defined by the upper edges of said corrugated portions extending angularly to the direction of movement of the wire, said angular wiping edges in any transverse section through said side members extending alternately and without interruption in angular directions generally normal to each other to provide an evenly balanced wiping action.

7. A suction box cover of the construction described in claim 6 wherein each transverse section through said Fourdrinier wire has the same total area exposed to suction action through said suction openings.

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8. A cover for a suction box for a Fourdrinier paper making machine comprising, a frame having a pair of long side members disposed transversely of the direction of movement of the Fourdrinier wire, and divider means in said frame defining a series of vertical suction passages in said cover with said divider means extending between said side members generally in the direction of movement of the wire and having a corrugated configuration, said corrugated divider means defining wiping edges at the top surface of the cover disposed angularly with respect to the movement of the wire to provide minimum resistance to the movement of the wire thereacross, said wiping edges along a vertical longitudinal section through the wire extending alternately and without interruption in opposite angular directions at substantially right angles to each other to provide an evenly balanced wiping action.

9. A cover for a suction box for a paper making machine comprising, a frame including a pair of long side rails adapted to be disposed crosswise of the direction of movement of the pulp carrying wire, and divider bars secured in said frame between said side rails to support the pulp carrying wire and spaced to define vertical suction openings, said bars being formed of a synthetic resin laminated fabric composition with the laminations extending vertically and lengthwise of the bars in the direction of movement of the wire to provide end grain wear-resistant surfaces at the upper faces of the bars.

10. A cover for a suction box of the type described in claim 9 wherein the fabric in said laminated bars is disposed on a bias, whereby to utilize both the warp and woof ends of the fabric in said end grain wear-resistant surface.

11. A cover for a suction box of the type described in claim 10 wherein said divider bars are all formed with corrugated configurations, whereby to provide angular wiping edges extending alternately and without interruption in opposite directions transversely of said side rails.

12. A cover for a suction box for a paper making machine comprising, horizontally disposed supporting means for a pulp carrying wire movable thereacross and including means defining suction openings therein, said supporting means being formed of a synthetic resin laminated fabric composition with the fabric laminations extending vertically thereof in the direction of movement of the wire and arranged on a bias, and with the horizontal supporting surface of said supporting means flatly ground off to expose equally the ends of both the warp and woof strands of the fabric and provide an end grain wear-resistant surface.

13. A cover for a suction box for a paper making machine comprising, a frame having a pair of long side rails disposed transversely to the direction of travel of a pulp carrying wire, and having in the confronting faces of said side rails a series of vertical grooves, which grooves are spaced along the inner margins of each of said side rails, with the grooves in one rail in alignment with the grooves in the other rail, and a series of elongated divider bars having end portions which are tightly secured in aligned grooves in said side rails and intermediate portions which are corrugated intermediate said end portions, said bars being molded from a synthetic resin fabric laminated composition, with the fabric laminations extending vertically lengthwise of the bars in the direction of travel of the wire, and with the upper wire supporting faces of the bars ground off to provide an end grain wear-resistant surface.

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