

Jan. 27, 1959

I. R. WISNER ET AL

2,870,692

FOURDRINIER PAPER MAKING MACHINE

Original Filed March 28, 1952

9 Sheets-Sheet 1

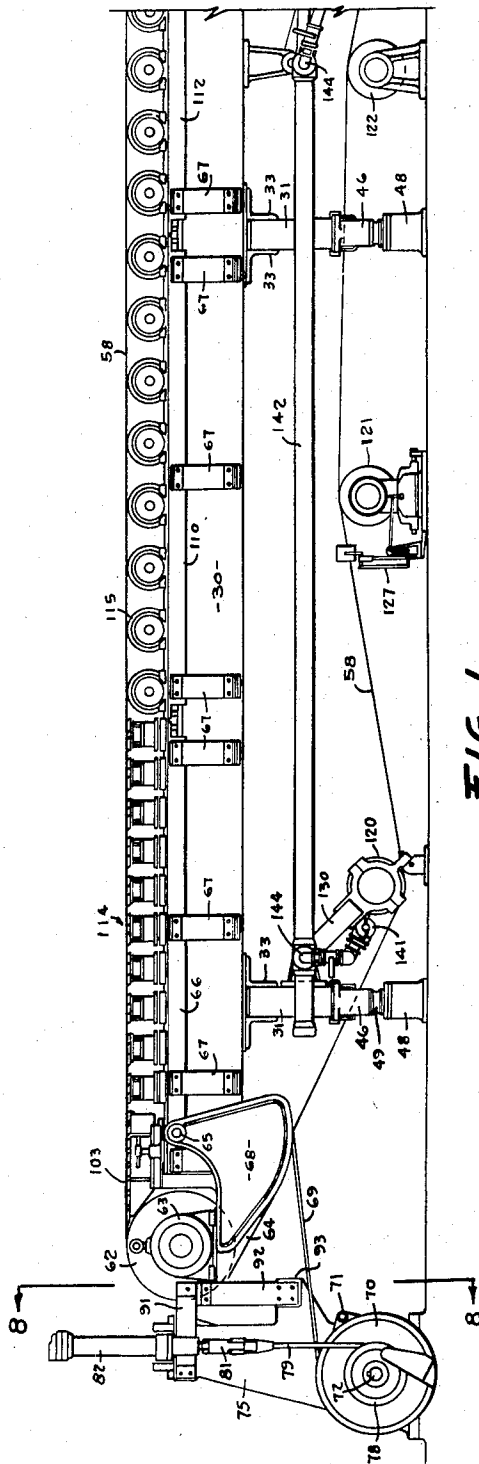


FIG. 1

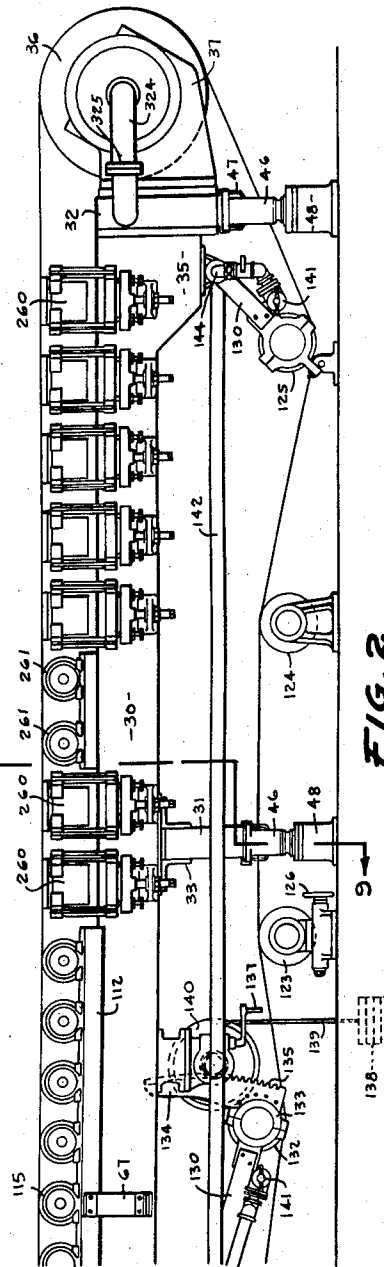


FIG. 2

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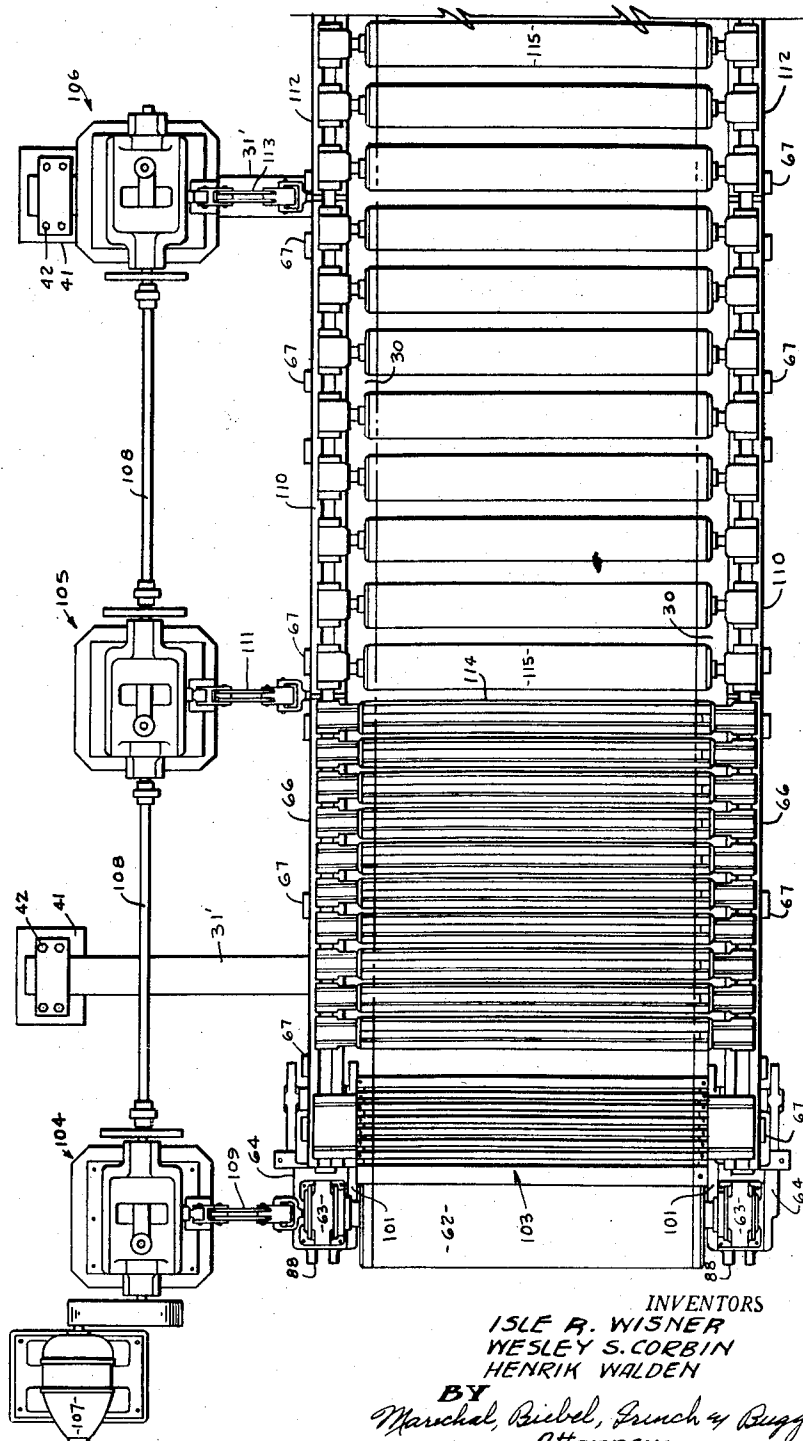
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FIG. 3



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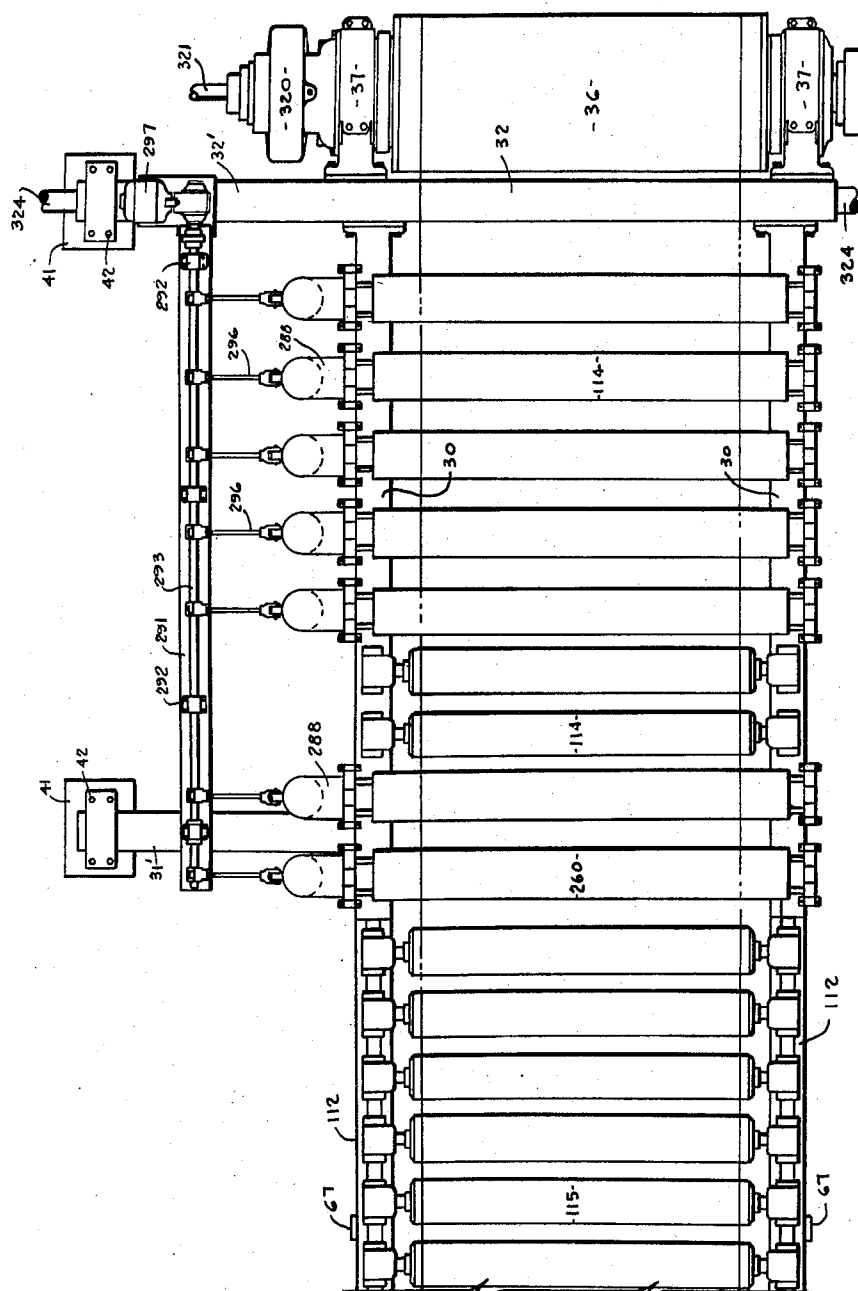
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9 Sheets-Sheet 4

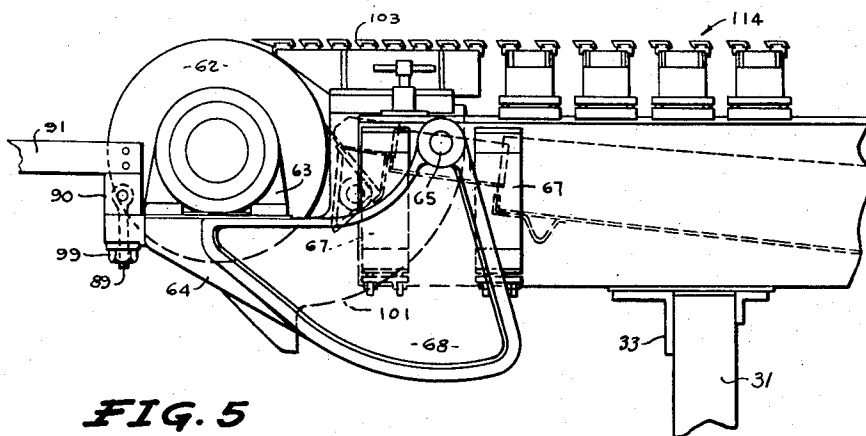


FIG. 5

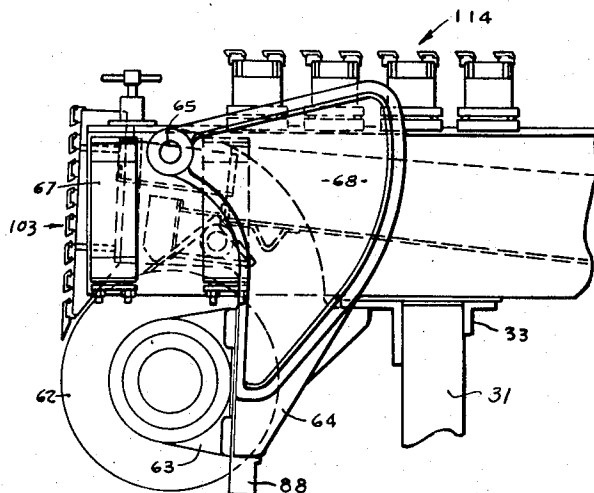


FIG. 6

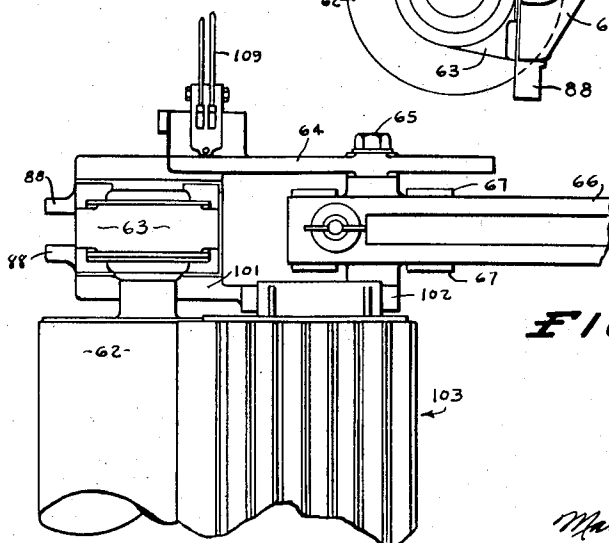


FIG. 7

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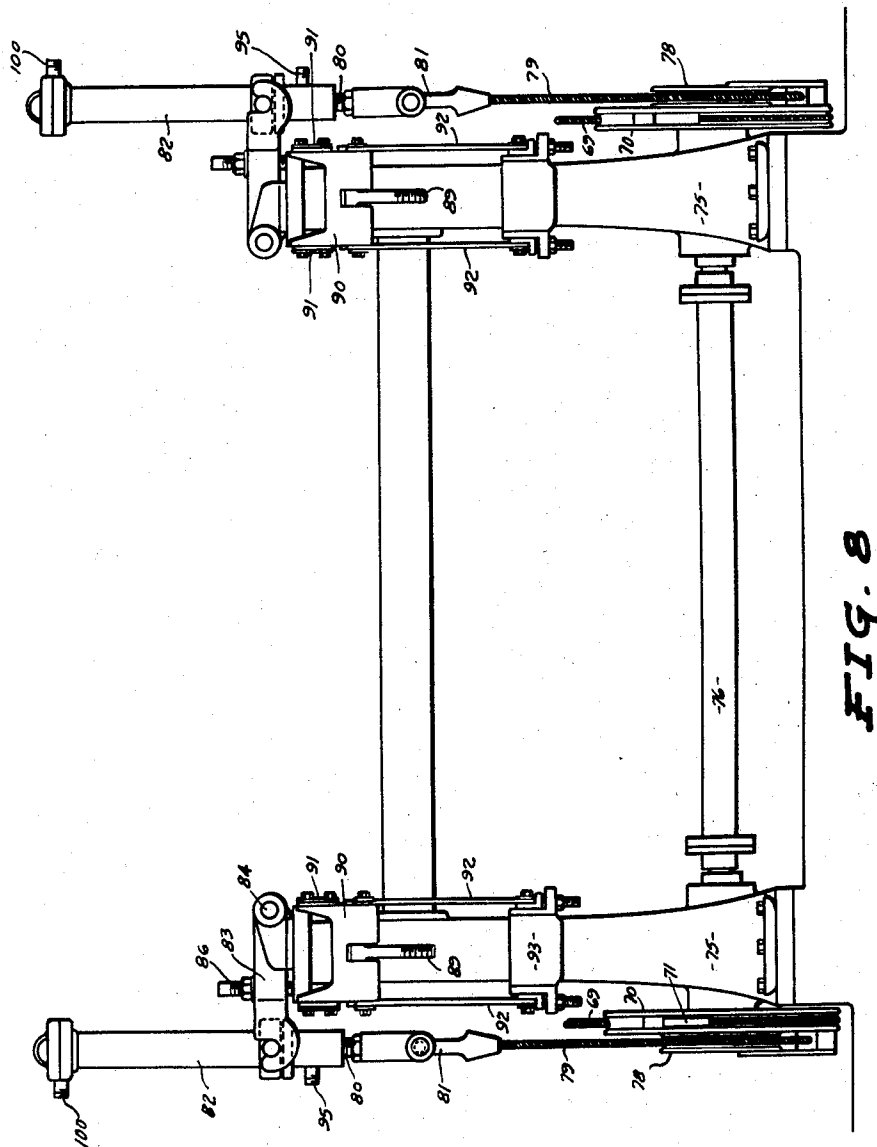
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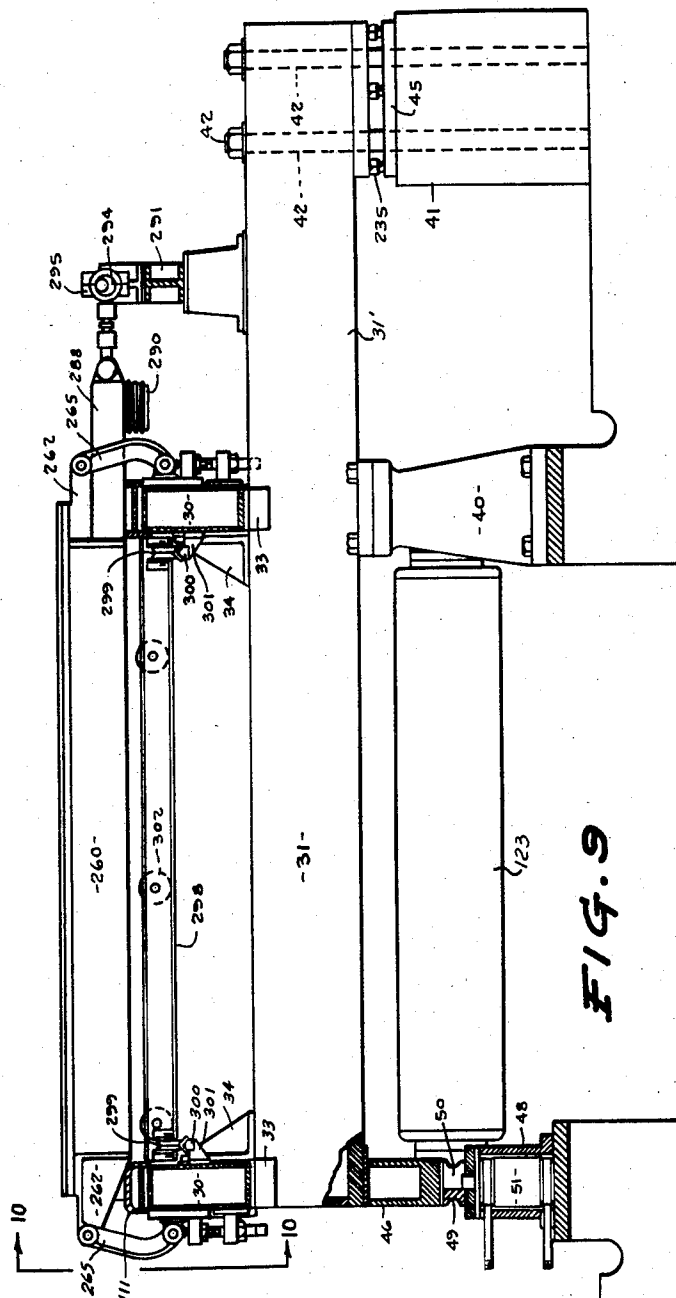


FIG. 9

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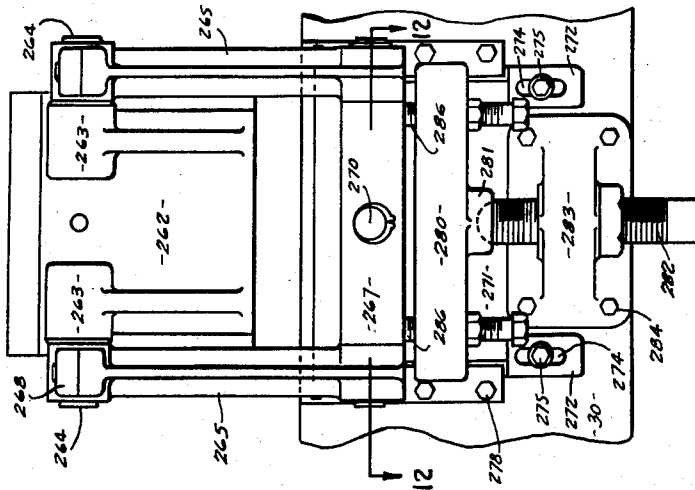


FIG. 10

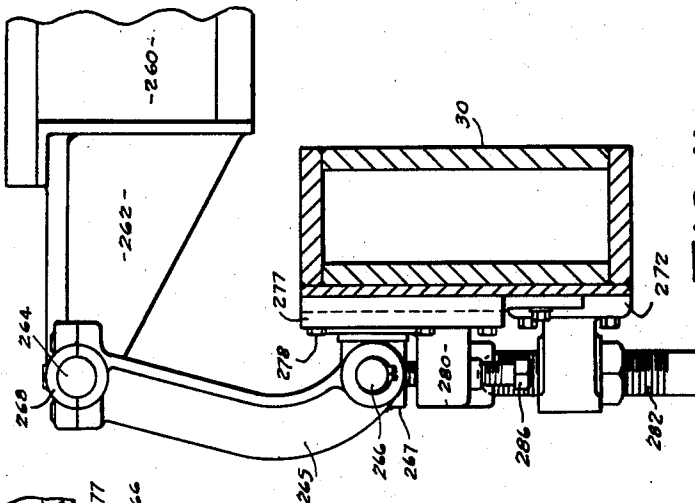


FIG. 11

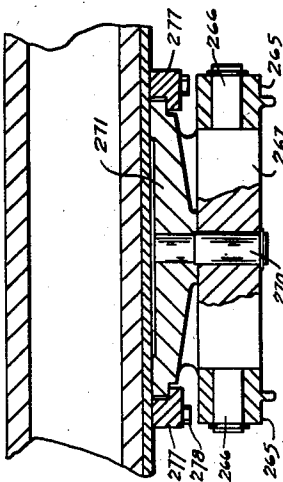


FIG. 12

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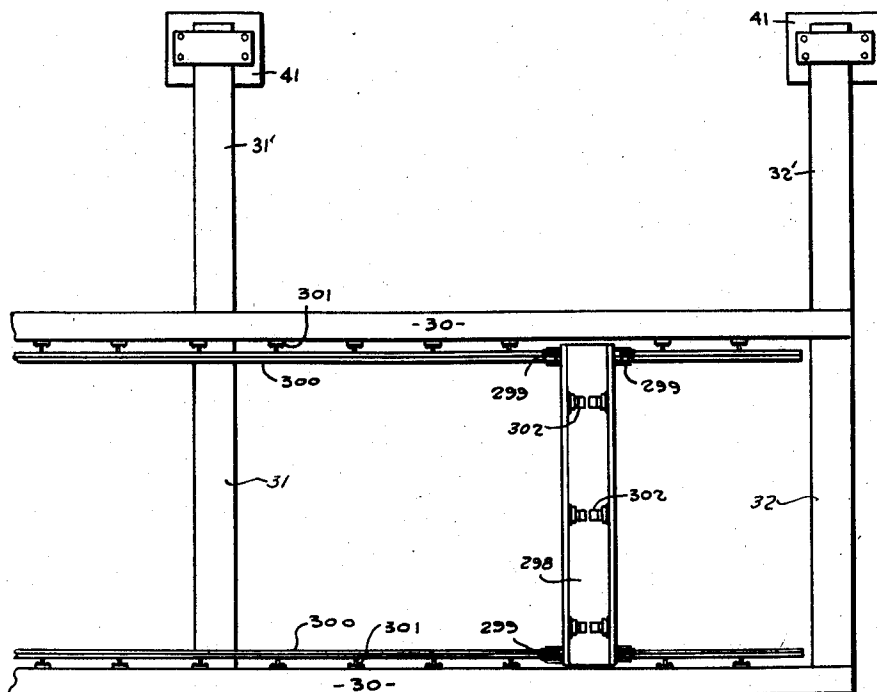


FIG. 14.

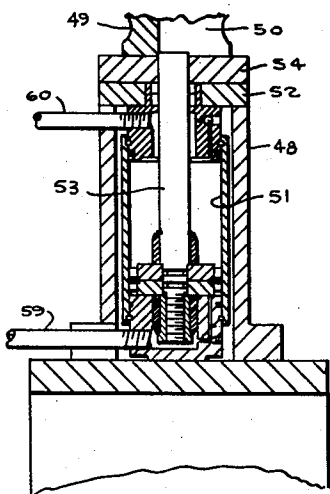


FIG. 13

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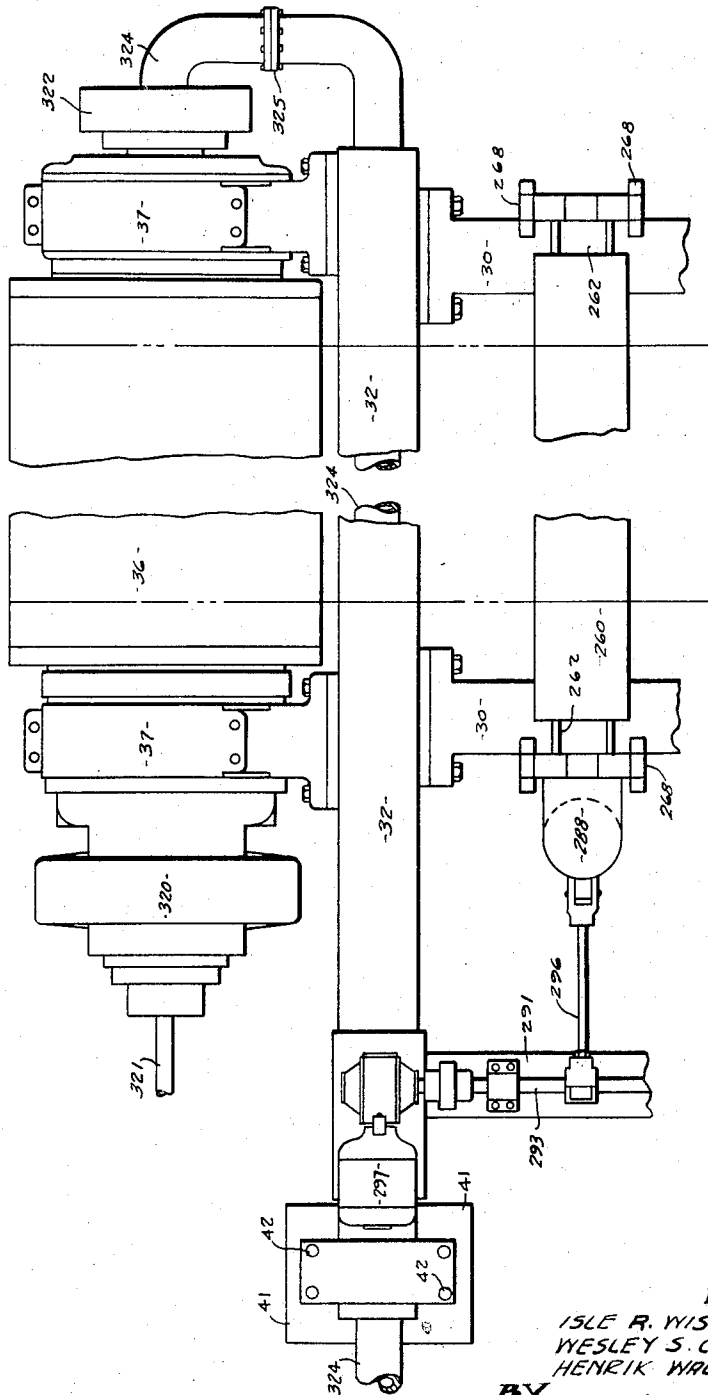


FIG. 15.

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FOURDRINIER PAPER MAKING MACHINE

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Original application March 28, 1952, Serial No. 279,052,
now Patent No. 2,799,209, dated July 16, 1957. Di- 10
vided and this application May 2, 1955, Serial No.
506,153

2 Claims. (Cl. 92—44)

This invention relates to Fourdrinier paper making 15
machines. This application is a division of our applica-
tion Serial No. 279,052, filed March 28, 1952, now
Patent No. 2,799,209, issued July 16, 1957.

In recent years, Fourdrinier paper machines have tend- 20
ed to increase materially in size and are currently manu-
factured with wires in the neighborhood of 300 inches in
width, the machine weighing several tons. Heretofore
in changing a wire, it has been necessary to tilt, or canti-
lever, the entire machine, or to shift the entire machine
laterally from its normal operating position in order to
remove the old wire and insert a new one. These meth-
ods not only require extensive structural arrangements,
but also necessitated disconnecting several parts of the
machine, all whereby the time necessarily consumed in
removing a wire and inserting a new wire amounted to
several hours. With the larger machines producing a
correspondingly larger production, this extensive down
time in changing the wire has become very costly to
paper mills.

This invention has as a general object a Fourdrinier
paper making machine embodying a construction for very
large machines and which, because of novel structural
arrangements, permits the changing of a wire in a much
shorter time than has been possible with machines heret- 30
ofore.

The invention has as a further object a Fourdrinier
paper making machine embodying a structural arrange-
ment by which the machine is fixedly mounted and which
permits the changing of the wire without disturbing the
mounting or alinement of the machine.

The invention has as a further object a supporting
structure for suction boxes on Fourdrinier machines
which permits the boxes to be quickly and conveniently
removed and replaced.

The invention has as a further object a double suction
box or roll construction wherein the connections to the
suction boxes do not have to be broken or disturbed
during the changing of the wire.

It is also an object of the invention to provide a Four-
drinier paper machine wherein the suction couch roll
is equipped with separate suction connections located
at the front and back ends thereof, and wherein the con-
duits coupled with these suction connections are so
supported by the frame of the machine from the back
that they do not require disconnection during changing
of the wire on the machine.

The invention consists in the novel features and in
the combinations and constructions hereinafter set forth
and claimed.

In describing this invention, reference is had to the
accompanying drawings in which like characters design-
ate corresponding parts in all the views.

In the drawings—

Figure 1 is a side elevational view of the breast roll
end portion of a machine embodying our invention.

Figure 2 is a side elevational view of the couch roll
portion of the machine.

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Figure 3 is a top plan view of that portion of the ma-
chine shown in Figure 1.

Figure 4 is a top plan view of that portion of the
machine shown in Figure 2.

Figure 5 is an enlarged side elevational view of the
breast roll support and the contiguous portion of the
machine, as shown in the upper left hand portion of
Figure 1.

Figure 6 is a view, similar to Figure 5, showing the
breast roll and primary forming table swung downwardly
to shorten the machine for the insertion of a new wire.

Figure 7 is a top plan view of the rear end of the
breast roll and primary forming table and the supporting
mechanism therefor.

Figure 8 is an elevational view of the breast roll sup-
port moving mechanism, the view being taken on a line
corresponding to line 8—8, Figure 1.

Figure 9 is a view taken on line 9—9, Figure 2.

Figure 10 is a side elevational view of one of the
suction box supporting structures, the view being in-
dicated by line 10—10, Figure 9.

Figure 11 is a side elevational view of the structure
shown in Figure 10.

Figure 12 is a sectional view taken on line 12—12, Fig-
ure 10.

Figure 13 is an enlarged vertical sectional view of one
of the hydraulic jacks and housing in which the same is
mounted.

Figure 14 is a top plan view of the suction box, re-
moval carriage and the supporting track on which the
carriage operates.

Figure 15 is a top plan view of the couch roll and
contiguous end portion of the machine frame illustrating
the couch roll provided with two suction boxes.

Referring particularly to Figures 1 to 9, the machine
consists of a pair of front and rear side beams 30 formed
of steel plates welded together to form a box structure
in cross section; see Figure 9. These side beams extend
the entire length of the machine and are supported by a
series of cross beams 31 and a cross beam 32 at the
couch roll end of the beams 30. The cross beams 31
are positioned below the side beams 30 and are fixedly
secured thereto by angle plates 33, 34 to form therewith
a unitary frame. The beams 30 are formed at their
ends with a portion 35 of greater width in the vertical
direction, and the cross beam 32 is affixed to these en-
larged portions 35 and is of substantially greater width
in the vertical direction extending upwardly to the top
edge of the side beams 30. A suction couch roll 36 is
journalled in bearing structure 37 mounted directly on
the cross beam 32.

The cross beams 31, 32, extend laterally from the rear
side of the machine; these beams being supported on
columns 40 positioned directly below the rear side beam
30; see Figure 9. Each of the cross beams 31 and 32 in-
cludes an elongated extension 31', 32' at the back side
of the machine, and these extensions are fixedly secured
to abutments or supports 41, as by bolts 42. The ends of
the beams 31, 32, at the front side of the machine, are
supported by removable spacer blocks 46 provided on
opposite sides with handles 47, these blocks being posi-
tioned on housings 48, or preferably on spacer blocks 49
of relatively small dimension and light weight compared
with the blocks 46. The blocks 49 are formed with
slots 50.

An elevating jack is mounted in each of the housings
48. As shown in Figures 9 and 13, each of these jacks
consists of a hydraulic cylinder 51 provided at its upper
end with a head having a circular flange 52 overlying the
top edge of the housing 48. The piston rod 53 extends
upwardly through an aperture in a circular plate 54 posi-
tioned on top of the flange 52.

This arrangement is provided to permit removal of the spacer blocks 46 for the insertion of a new wire 58. When it becomes necessary to replace the wire, fluid pressure is admitted to the lower end of the cylinders 51 through pipes 59, causing the piston rods 53 to move upwardly through the slots 50 in the blocks 49 and engage the under side of the blocks 46, the hydraulic cylinder and piston structures applying an upward pressure on the blocks 46 to relieve the downward pressure on the blocks 49 and to permit the same to be conveniently removed. The fluid pressure is then released from the lower end of the cylinders 51 and applied to the upper ends thereof through the pipes 60 to move the piston rods 53 downwardly, whereupon the larger spacer blocks 46 may be removed. This provides a space from the plates 54 to the under side of the beams 31, 32, for the insertion of the new wire, the machine being at the time supported in cantilevered position entirely by the cross beams 31 and 32 with the front side of the machine otherwise unsupported.

The breast roll 62 is journaled at its ends in bearings 63, these bearings being mounted upon arms 64 which are pivotally mounted, as at 65, to shake rails 66 supported by flat spring members 67 carried by the side beams 30. The supporting arms 64 are formed at their outer sides with arcuate flanges 68 grooved on their peripheral edges to receive a cable 69, one end of which is secured to the flange portion 68, the cables being trained about sheaves 70, and the opposite ends of the cables being secured to the sheaves, as at 71, see Figures 1 and 8. The sheaves 70 are fixedly secured to shafts 72 journaled in the lower portion of columns 75, the shafts 72 being connected together by a shaft 76, see Figure 8, whereby the sheaves rotate in unison. A smaller sheave 78 is fixedly secured to the outer ends of the shafts 72 to receive cables 79, the upper ends of which are secured to piston rods 80 by means of clevises 81. The piston rods are movable in cylinders 82 which are supported by yoke members 83 pivoted at 84 to the upper ends of the housings 75. The yokes 83 are provided with adjusting screws 86 for properly positioning the cylinders 82.

The outer end portions of the arms 64 are formed with spaced projections 88 to receive eye bolts 89 depending from blocks 90. These blocks are supported by horizontally extending spring members 91 and vertical spring members 92 extending upwardly from a projection 93 extending laterally from the column 75, see Figures 1 and 8. When fluid pressure is admitted to the lower ends of the cylinders 82 through pipes 95, the piston rods 80 are moved upwardly, effecting rotation of the sheaves 70, 78, in a counterclockwise direction, Figure 1, whereby the cables 69 move the arms 64 about their pivots 65 to swing the breast roll 62 upwardly into operating position, as shown in Figures 1 and 5, and with the breast roll in this position, the eye bolts can be positioned in the slotted extensions 88 of the arms and by means of the nuts 99, the arms become fixedly secured to the blocks 90. In Figure 5, the vertical spring members 92 have been omitted to illustrate more clearly the eye bolt structure.

When the nuts 99 are removed from the eye bolts 89, or are loosened, and the eye bolts are swung out of the slotted extensions 88 and fluid pressure is applied to the upper ends of the cylinders 82 through the pipes 100, the mechanism functions to effect lowering of the breast roll to the position shown in Figure 6, as will be apparent.

The breast roll supporting arms 64 are also formed with portions 101 positioned inside of the shake rails 66. These portions are formed with surfaces 102 extending parallel to the shake rails 66 and forwardly from the pivots 65, and on which a primary forming board, designated generally at 103, is mounted. Accordingly, this board moves in unison with the breast roll 62.

The machine is provided with shake mechanisms designated generally at 104, 105, 106, better shown in Figure 3. These mechanisms are operated by a motor 107 and are connected together by shafts 108, the shake 104 being

connected directly to the rear breast roll bearing 63, or to the arm 64 in proximity to the bearing, see Figure 7, by links 109. The shake mechanism 105 is connected at the joint between the rails 66 and the adjacent rails 110 by links 111. The mechanism 106 is connected at the joint between the rails 110, 112, by linkage 113. It will be observed that the breast roll is carried directly by the shake rail 66 and also the blocks 90, for supporting the outer ends of the support members 64, are mounted on the spring members 91, 92, to permit the free shaking movement of the breast roll and the rails 66 when the breast roll is up in operative position shown in Figures 1 and 5. Cross reference is made to our copending application Serial No. 506,152 filed of even date herewith as a division of our above application Serial No. 279,052 and particularly disclosing and claiming an interlock mechanism for preventing shaking movement of the breast roll and the rails 66 when the breast roll is lowered from its operative position.

The forward run of the wire 58 is supported by the primary forming board 103, the forming board 114 carried by shake rails 66 and table rolls 115 carried by shake rails 110, 112, see Figures 1 and 2. The return run of the wire 58 is supported by idler rolls 121, 122, 123, 124, see Figures 1 and 2. Some of these rolls may be mounted in fixed bearings, as rolls 122, 124, and some of them may be mounted in adjustable bearings to effect proper tracking of the wire. The roll 123 is mounted in bearings provided with a manual adjustment 126 while the roll 121 is adjusted by mechanism indicated at 127 which functions automatically to adjust the roll to effect proper tracking of the wire on the machine.

The wire is also contacted by take-up rolls 120 and 125. The rolls 120, 125, are journaled at their ends in bearings carried by arms 130, the upper ends of which are pivotally mounted on the framework of the machine and are provided with mechanisms for raising them upwardly toward the frame of the machine as shown in our above application Serial No. 279,052. A take-up roll 132 is provided with mechanism for adjustably positioning the roll to effect proper tension on the wire 58. The bearing housings 133 for the roll 132 carry members 134 formed with an arcuate toothed edge 135 engaging a pinion gear mounted in a housing carried by the side beams and including a worm gear reduction operated by a crank 137. The roll 132 and the supporting arms 130 may be counter balanced by a weight 138 attached to a cable 139 operating over a sheave 140, see Figure 2.

One or more of the take-up rolls may be provided with a spray or shower pipe 141, these showers being connected to a supply pipe 142 running lengthwise of the machine through rotatable joints 144 to permit the shower pipes 141 to be moved with the arms 130.

When it becomes necessary to change the wire 58, the take-up rolls 120, 125, 132, are moved upwardly and the breast roll 62 swung downwardly into the position shown in Figure 6. This movement of the breast roll shortens the operating center distance between the breast roll and the couch roll sufficiently to provide ample slack in the wire. Thereupon, the jacks 51 are actuated to permit removal of the smaller spacer blocks 49, the jacks lowered, and the spacer blocks 46 are removed providing ample opening on the front side of the machine for the removal of the wire.

It will be understood that a head box is arranged in juxtaposition to the breast roll 62 and is provided with a discharge opening extending transversely of the wire through which the stock is discharged onto the wire. As the wire moves forwardly, the water drains through the primary forming board 103, the forming board 114, and through the wire supported by the table rolls 115, leaving a commingled layer of fiber on the wire forming the paper sheet. Further moisture is removed from this sheet by suction boxes over which the wire passes.

In the arrangement shown in Figure 2, a pair of suc-

tion boxes 260 are arranged at the end of the shake rails 112, and a series of suction boxes are mounted on the couch roll end of the machine. These suction boxes may be arranged in various groups and are sometimes separated by table rolls 261 journaled in bearings mounted directly on the side beams 30. The suction boxes 260 are formed of metal and have a flat top surface engaged by the wire and provided with openings, usually in the form of slits extending lengthwise of the boxes and transversely of the wire. The interior of the boxes is connected to a suction pump (not shown). A bracket 262 is secured to each end of the suction boxes, the brackets being formed with spaced apart bosses 263 apertured to receive pins 264. The boxes are supported by a pair of vertically extending links 265. The lower ends of the links 265 are pivotally mounted on cylindrical end portions 266 of a member 267. The upper ends of the links 265 are apertured to receive the pins 264, the pins being clamped thereto by detachable cap members 268. The member 267 is mounted for rocking movement intermediate its ends on a supporting pin 270 which is fixedly carried by a plate 271 having depending spaced apart projections 272 formed with elongated apertures 274 to receive clamping screws 275.

The plate 271 is slidably mounted in ways or gibs 277 fixedly secured to the outer surface of the side beams 30, as by screws 278, see Figures 10, 11 and 12. The plate 271 is formed with an outwardly extending rib 280, the under side of which has a recessed boss 281 engaged by the upper end of an adjustment screw 282. This screw is threaded for vertical movement into a casting 283 also fixedly secured to the side beam 30, as by screws 284.

The member 280 is also provided with a pair of leveling screws 286, the upper ends of which engage the under side of the member 267. When the screws 275 are loosened, the plate 271 and the member 267 carried thereby may be adjusted vertically by the screw 282 and inasmuch as the suction box is supported by this structure at both ends, the box can be leveled in a direction transversely of the wire and by manipulation of the screws 286 the box can be moved about the axis of the pin 270 to level the top surface of the box in a direction lengthwise of the wire.

Each of the suction boxes 260 is formed with a rearwardly extending hollow structure 288 attached to a flexible conduit 290 which extends downwardly and is connected to the suction pump. A shaking movement is usually imparted to the suction boxes 260 and, as shown in Figures 4 and 9, a supporting beam 291 is mounted on the cross beam 32 and the next adjacent cross beam 31. A series of bearings 292 are mounted on the beam 291 and a shaft 293 is journaled in the bearings and is provided in registration with each box with an eccentric 294, encircled by an eccentric strap 295 connected to the suction outlet member 288 of each box, by a link 296. Rotation is imparted to the shaft 293 by a motor 297 mounted on the rear end of the cross beam 32.

The rapid movement of the wire 58 over the top surface of the suction boxes effects considerable wear on these surfaces which require the boxes to be removed and resurfaced periodically. The removal of the boxes is conveniently accomplished by means of a carriage 298 provided at its ends with rollers 299 which ride on a track 300 fixedly mounted on the inner surface of each of the side beams 30, by a series of brackets 301.

Referring to Figures 9 and 14, the carriage 298 is provided with a plurality of rollers 302. When it is desired to remove a suction box 260, the carriage 298 is moved along the tracks 300 to position the carriage under the suction box, which is to be removed. The shake link 296 is disconnected from the box, as well as the flexible conduit 290. This permits the box to be removed laterally on the supporting links 265, the links acting as a parallelogram movement to lower the box onto the

rollers 302. The caps 268 are then loosened and the pins 264 removed, whereupon the box can be withdrawn laterally from the front side of the machine and during this movement it is supported on the rollers 302.

The couch roll 36 usually has a perforated shell and there is a suction box located within the roll to remove further moisture from the sheet. The rear end of the couch roll is provided with a housing 320 which is connected to a suction pipe extending downwardly through the floor structure. This housing 320 has extending rearwardly from it a shaft 321 which is connected to a suitable source of power, such as an electric motor, to effect rotation of the couch roll.

There are occasions when it is desired to have two separate suction boxes mounted in the couch roll, these boxes being connected to separate sources of suction or vacuum of different values. When this arrangement is employed, it is necessary to provide a suction outlet, as 322, at the forward end of the couch roll, or at the front side of the machine. Heretofore, these housings 320 have been also connected with a vertically arranged suction pipe and it was necessary to disconnect and remove this pipe in order to remove and replace the wire 58.

In our machine, we make provision for the second suction box in the couch roll and connect it with a source of vacuum in such a manner as it is not necessary to remove any connections to the couch roll for the removal of the wire. As previously stated, the cross beams are of hollow box formation and the cross beam 32 is provided with a suction pipe 324 extending therethrough and projecting from the rear end thereof, as illustrated in Figure 15. This suction pipe 324 is connected to the housing 322 on the forward end of the couch roll as by a flanged coupling 325. With this arrangement, the suction pipe 324, exposed on the forward side of the machine, is well within the diameter of the couch roll, see Figure 2, and accordingly, in no way interferes with the removal and insertion of the wire 58.

From the structure described, it will be apparent that the wire 58 can be removed and replaced quickly and conveniently. In carrying out this operation, it is not necessary to change the position of the machine frame by cantilevering it on a horizontal axis, moving it in a lengthwise direction, or in a transverse direction. Because the machine is not moved, it is not necessary to disconnect the shake mechanisms, the conduits to the suction boxes and suction couch roll, or other appurtenances.

The spacer blocks and/or jacks serve to relieve the cross beams from unnecessary stresses and strains during the actual operation of the machine. However, the cross beams are entirely sufficient to support the machine when it is not in actual operation.

What we claim is:

1. A Fourdrinier paper making machine comprising a pair of front and rear side beams, a plurality of cross beams located in spaced relation along said machine and connecting said side beams to form a unitary frame, base means connected with said frame at the back thereof and supporting the front thereof in cantilevered position, a suction couch roll, means mounting said couch roll directly on one end of said frame for support thereby with the front end thereof in cantilevered position, means forming separate suction connections at both the rear and front ends of said couch roll, a suction pipe extending transversely of said frame and connected to said suction connection at the front end of said couch roll, and means supporting said suction pipe on said cantilevered portion of said frame to maintain said pipe with the front portion thereof unsupported except by said frame and said couch roll.

2. A Fourdrinier paper making machine comprising a pair of front and rear side beams, a plurality of cross beams located in spaced relation along said machine and connecting said side beam to form a unitary frame, base

means connected with said frame at the back thereof and supporting the front thereof in cantilevered position, one of said cross beams being formed of hollow boxlike structure and being arranged at one end of said frame, a suction couch roll, means mounting said couch roll entirely on said hollow cross beam for support thereby with the front end thereof in cantilevered position, means forming separate suction connections at each end of said couch roll, a suction pipe extending transversely of said frame from the back thereof connected to said suction connection at the front end of said couch roll, and said pipe being received within said hollow cross beam for support thereby in cantilevered position with said frame.

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