

Jan. 14, 1958

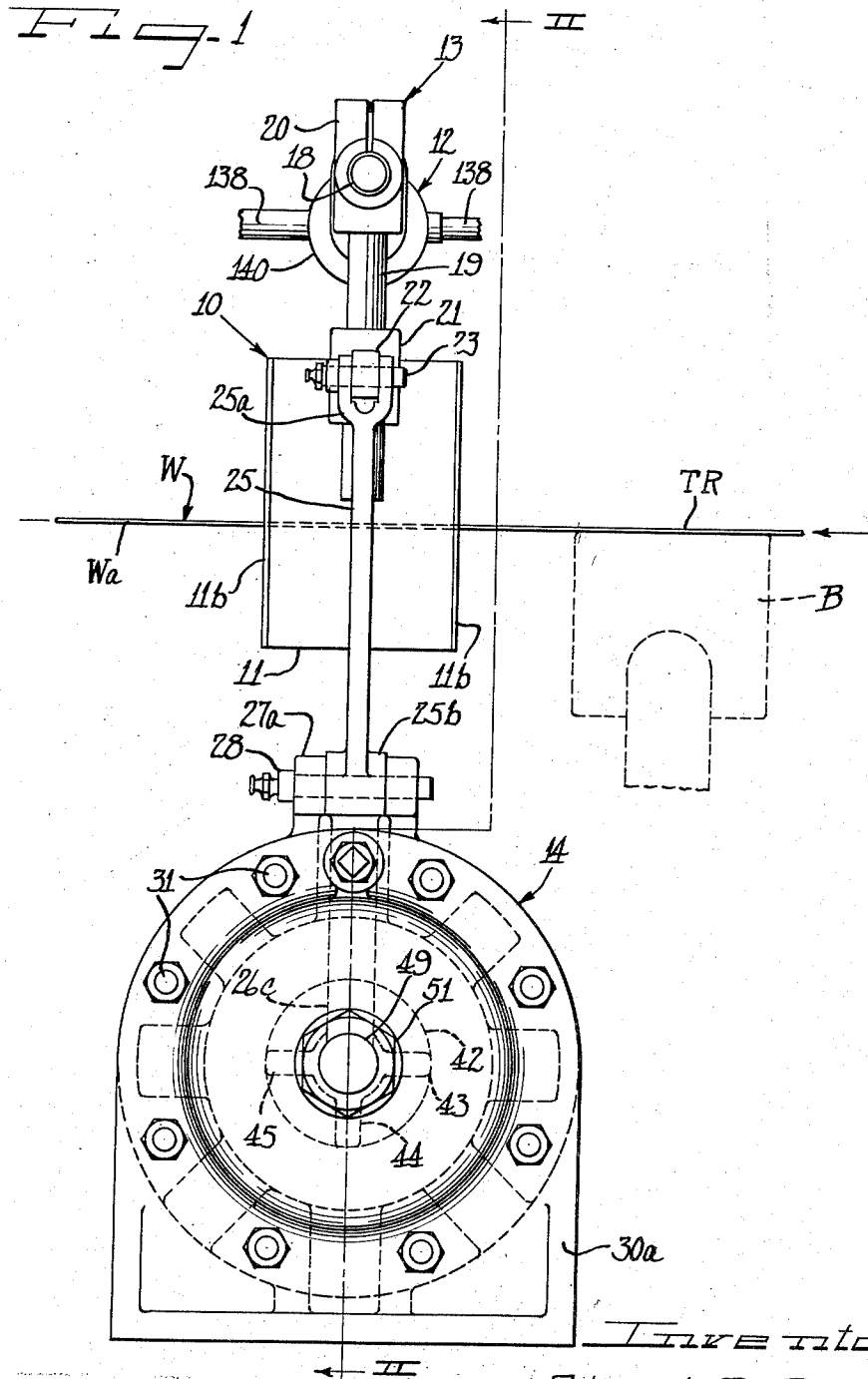
E. D. BEACHLER

2,819,655

GUIDE PALM OSCILLATING DEVICE

Filed Dec. 9, 1954

4 Sheets-Sheet 1



Inventor
Edward D. Beachler

W. Sherman, Merri, and Associates
Attorneys

Jan. 14, 1958

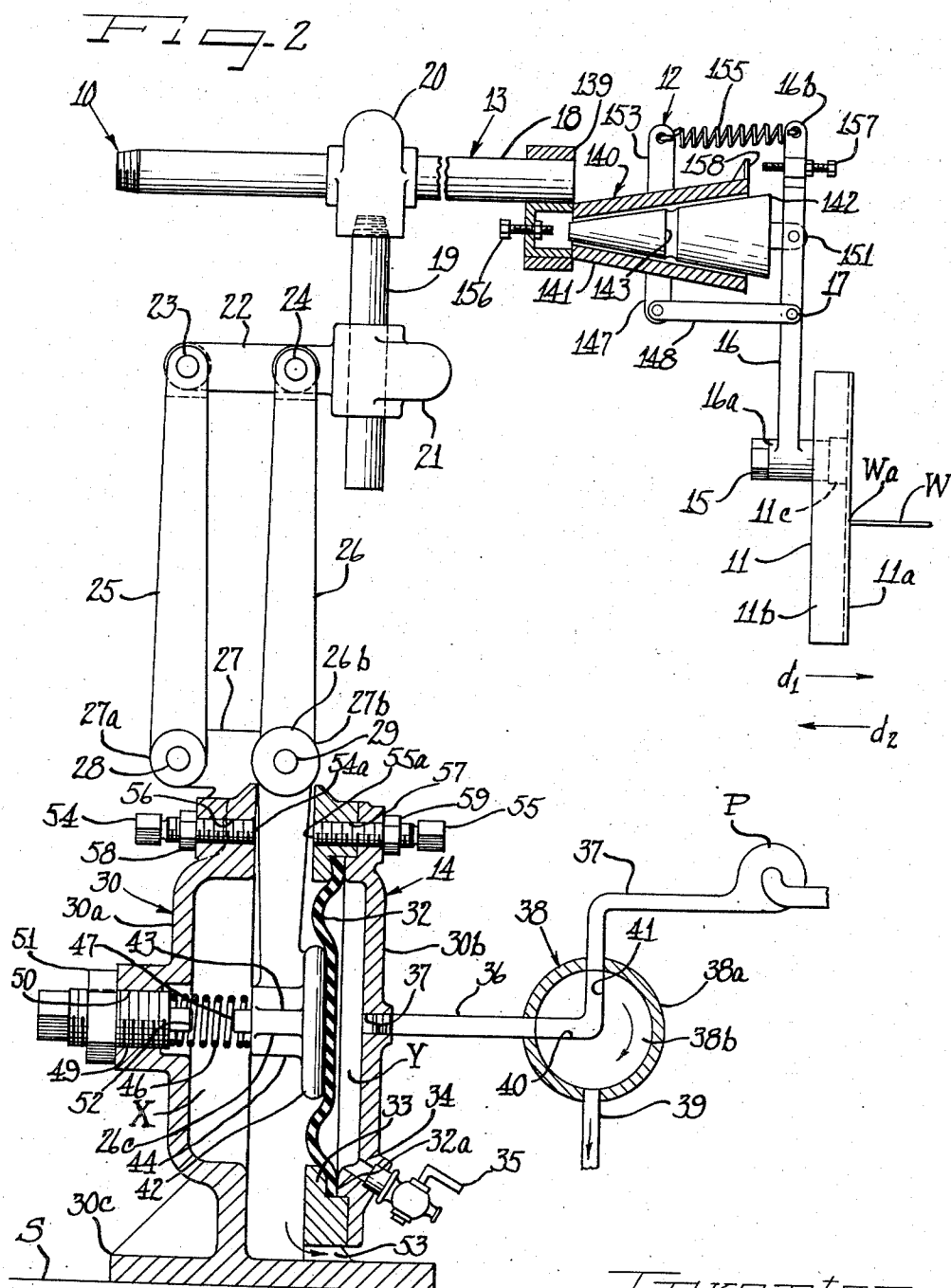
E. D. BEACHLER

2,819,655

GUIDE PALM OSCILLATING DEVICE

Filed Dec. 9, 1954

4 Sheets-Sheet 2



Inventor
Edward D. Beachler

Attorney

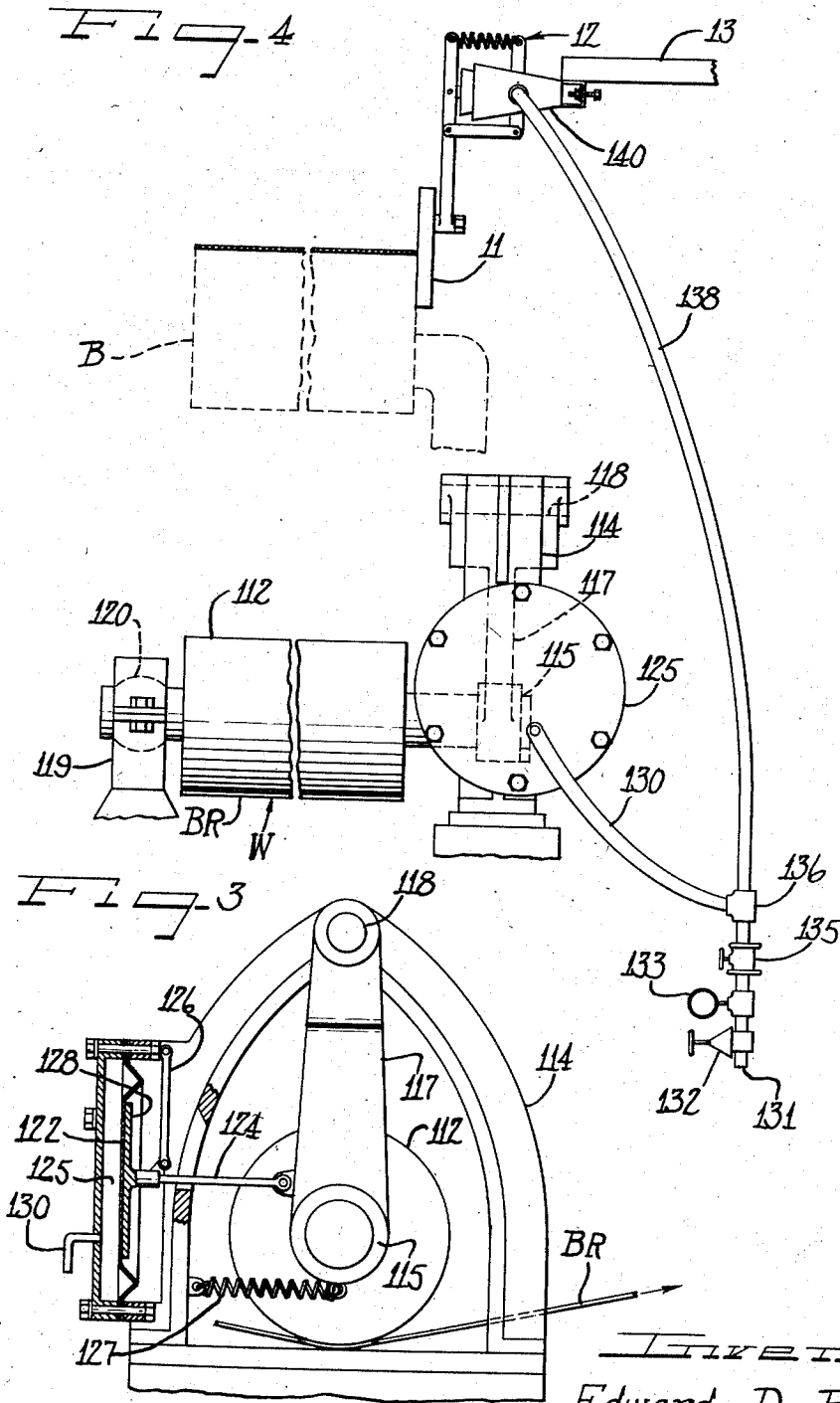
Jan. 14, 1958

E. D. BEACHLER
GUIDE PALM OSCILLATING DEVICE

2,819,655

Filed Dec. 9, 1954

4 Sheets-Sheet 3



Inventor
Edward D. Beachler

Edward D. Deacher
 Miss Sherman, Merion, Class of 1898

Jan. 14, 1958

E. D. BEACHLER

2,819,655

GUIDE PALM OSCILLATING DEVICE

Filed Dec. 9, 1954

4 Sheets-Sheet 4

FIG. 5

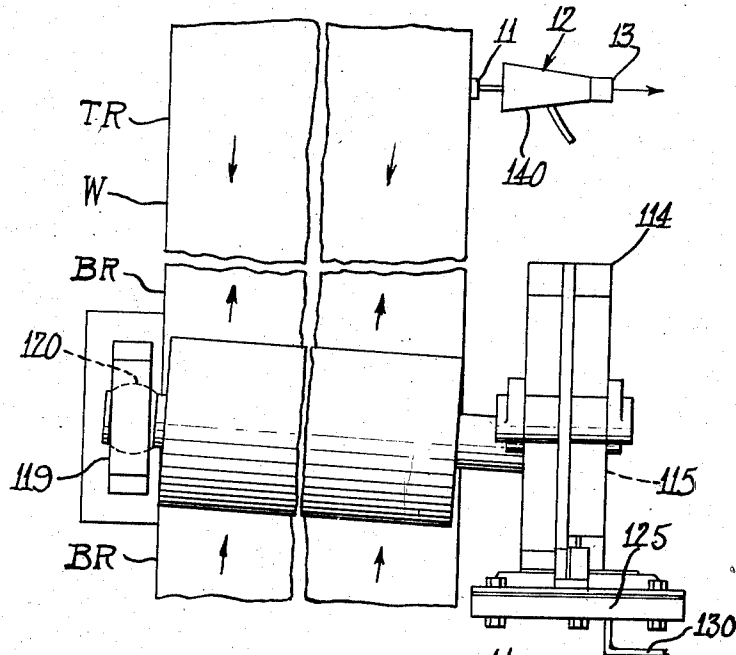
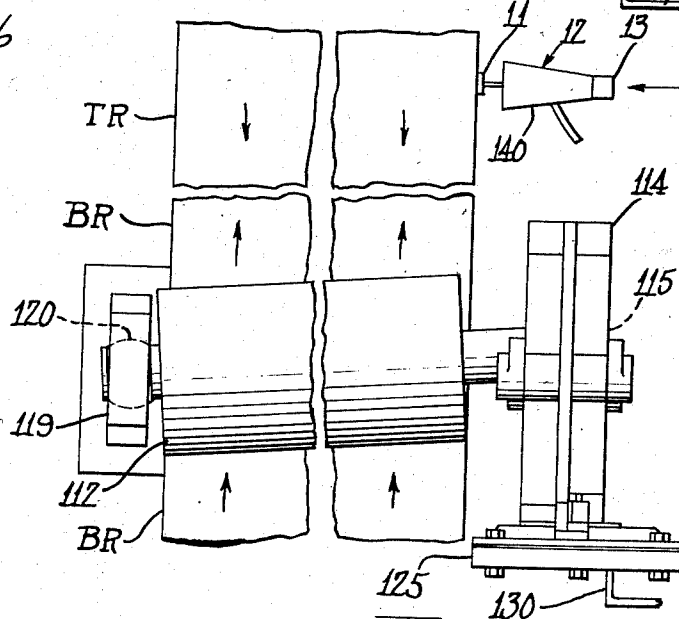


FIG. 6



Inventor

Edward D. Beachler

Walter Sherman, Miami, Fla., Attorney

1

2,819,655

GUIDE PALM OSCILLATING DEVICE

Edward D. Beachler, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Application December 9, 1954, Serial No. 474,214

2 Claims. (Cl. 92—45)

This invention relates to the operation of paper machines, and more particularly, to improved apparatus for operating the forming wire of a Fourdrinier type paper machine.

In the Fourdrinier type paper machine a looped forming wire is trained over a breast roll (at one end receiving stock from the head box), a plurality of suction boxes and the like dewatering devices, and then over a couch roll and a turning roll at the end of the wet forming zone. The forming wire is a critical and comparatively delicate element in the paper machine and it must be handled with care. One of the difficulties encountered in the ordinary operation of a paper machine involves the presence of irregularities in the various structures which the wire must pass over. In particular, in the flat boxes or suction boxes there is a tendency for irregularities to develop on the covers of these boxes and, if the wire runs continuously over the same spot there is a tendency for such irregularity to "ridge" the wire. Also, the wire itself may tend to cause wear and tear on the box covers or to wear grooves therein. Heretofore, the only remedy proposed for this difficulty involved oscillation of the flat boxes, but this, of course, involves the use of rather heavy equipment and, although this procedure is used generally, it is relatively awkward.

In accordance with the instant invention, a greatly simplified and relatively lightweight structure is provided to effect limited lateral reciprocatory motion of the wire itself. It has now been found that very slight lateral movement of the wire using a rather slow timing cycle has no harmful effect upon the web formation on the wire and apparently does not involve any new difficulties in the operation of the paper machine. On the other hand, by the use of this limited lateral movement of the wire it is possible to continuously change the portions of the wire which are passing over various points in the flat box covers so as to avoid the difficulties hereinbefore mentioned. Also, the oscillatory movement of the flat boxes is no longer necessary.

It is, therefore, an important object of the instant invention to provide an improved forming wire operation, and more particularly, an improved apparatus for carrying out the operation of the forming wire.

It is a further object of the instant invention to provide an improved reciprocating palm device which effects slow reciprocating lateral movement of the wire over a relatively limited lateral distance so as to completely eliminate the necessity for equipment for oscillating the flat boxes in a paper machine.

Other objects, features and advantages of the instant invention will become apparent to those skilled in the art from the following detail disclosure of a preferred embodiment thereof and the drawings attached hereto which form a part hereof.

In the drawings:

Figure 1 is a rear elevational view of a device embodying the instant invention;

Figure 2 is a side elevational view taken generally along

2

the broken line II—II of Fig. 1, with parts broken away and parts shown in section;

Figure 3 is an end elevational view partly in cross-section, showing a wire guide embodying a preferred form of the present invention;

Figure 4 is a side elevational view of the guide roll and actuator shown in Figure 3, also showing in elevation the guide palm device of the invention engaging the upper run of forming wire;

Figure 5 is a top plan view with parts broken away and parts shown diagrammatically, of the roll guide and the guide palm in one operating position; and

Figure 6 is a view comparable to Figure 5 showing a second operating position of the relative elements.

As shown on the drawings:

Although it will be appreciated that the instant device may be used to effect lateral reciprocal movement of any sort of travelling band, travelling paper web, or the like, it will be appreciated that the instant device has particular utility with respect to the Fourdrinier type paper machine wire for the reasons hereinbefore mentioned, and the operation of the instant device will be described with respect to its use in a Fourdrinier type paper machine.

Referring first to Figures 1 and 2 only, a Fourdrinier type paper machine wire W travels in a generally horizontal direction, as indicated by the arrows in Fig. 1, with its top reach TR (the bottom reach BR of the looped wire W being omitted in Figures 1 and 2 for purposes of simplification) travelling over the various elements of the wet end of the paper machine including flat boxes such as the flat box B indicated in light lines in Fig. 1.

The instant device indicated generally by the reference numeral 10 comprises means for effecting reciprocal lateral movement of the travelling forming wire W in a paper machine, comprising a hand 11 presenting a palm, plate or flat surface 11a to an edge Wa of the wire W, actuating means 12 on an arm indicated generally at 13 operatively connected to the hand 11 and movable relative thereto, said actuating means 12 (which will be described in detail hereinafter in connection with Figures 3, 4, 5 and 6) effectively controlling lateral movement of said wire W in response to relative movement between the arm 13 and the hand 11, and drive (diaphragm) means indicated generally at 14 in control of movement of the arm 13, which alternately move the arm in the first lateral direction d₁ and then in the opposite lateral direction d₂. As will be appreciated the normal tension on the wire W will tend to resist movement of the palm 11a against the wire edge Wa and the position of the palm 11a generally depends upon the position of the wire edge Wa. As the drive means 14 urges the arm 13 back and forth relative movement between the arm 13 and the hand 11 is created and this controls the actuator 12.

Relative movement between the arm 13 and the hand 11

As will be seen, the hand 11 is a generally flat vertically extending member, presenting a vertically extending palm 11a of appreciable height to accommodate variations in the height of the wire W and having flared back or flanged edges 11b along the opposite vertically extending sides for smooth engagement with the wire edge 12. A threaded nipple 11c suitably welded to the back of the hand 11 receives a bolt 15 slipped through a collar 16a of a depending support 16 to secure the hand 11 to the support 16. The support 16 extends upwardly and is pivotally mounted on a pin 17 in the actuator 12 which in turn is secured to the horizontally extending arm 13. The relative movement between the arm 13 and the hand 11 is thus pivotal movement (about the pin 17) in a generally lateral direction.

The horizontal extending arm 13 extends in a direction generally normal to the palm surface 11a and laterally of

3

the travelling wire W. The horizontal arm 18 is secured to a vertically extending leg 19 by means of a T-shaped pipe fitting or clamp 20 holding the horizontal arm 18 against relative axial movement; and the vertical leg 19 is in turn secured to and held against axial movement by a second T-shaped fitting or clamp 21 securely mounted to a cross piece 22 extending in a horizontal direction. The cross piece 22 carries a pair of spaced pivots 23 and 24 each pivotally mounting supporting legs 25 and 26, respectively. As shown in Fig. 1, the top 25a of the leg 25 is bifurcated to receive the pivot pin 23 which also passes through the cross piece 22. The leg 26 is similarly mounted on the pivot pin 24. A bracket 27 secured against movement to the top of the diaphragm means by welding or other suitable mounting means also carries two pivot pins 28 and 29. The pivot pin 28 (Fig. 1) is received through both legs of a bifurcated end 27a of the bracket 27 and the pivot pin 28 pivotally receives a collar 25b at the lower extremity of the vertical leg 25. At the opposite end 27b of the bracket 27 a similar bifurcated mounting for the pivot pin 29 is provided and the pivot pin 29 affords pivotal mounting for the vertical leg 26 which receives the pivot pin 29 in a collar portion 26b and which extends downwardly from the collar portion 26b to its bottom end 26c within the diaphragm means 14.

As will be appreciated, the diaphragm means 14 will act upon the lower extremity 26c (in a manner to be described hereinafter) of the leg 26 so as to swing the leg 26 back and forth about the pivot 29. The four pivots 23, 24, 28 and 29 mounted to the various elements at the four corners of a rectangle will, of course, serve to translate swinging or pivotal movement of the leg 26 to substantially horizontal movement of the cross piece 22 and all of the elements carried thereby including the arm 18.

Referring now to the details of the diaphragm mechanism 14, it will be seen that the mechanism 14 comprises a pair of opposed generally dish shaped housing members 30a and 30b, which are secured together along their peripheral portions by bolts 31 (Fig. 1), and which sealingly clamp the peripheral edges of a diaphragm 32 (Fig. 2) so as to divide the overall housing 30 into two chambers X and Y. The housing 30 has a base portion 30c that is suitably secured to a fixed supporting member S so as to support the whole assembly 10. The bracket 27 is secured to the top of the housing 30. As here shown the dish shaped housing half 30b is made up of an annular member 33 and a cover member 34 which clampingly engage the peripheral portion 32a of the resilient diaphragm 32, as indicated in Fig. 2. The diaphragm member 32 is made of suitably resilient metal or elastomeric material with or without reinforcements so as to permit repeated flexing of the diaphragm 32 during operation of the instant device.

As will be seen, the chamber Y is thus defined by the diaphragm 32 and the cap member 34, which is equipped with the customary pet cock drawoff 35 near the bottom of the chamber Y and a central fluid pressure inlet line 36 entering through the aperture 37 in the cover member 34 and threadedly received thereby. As shown diagrammatically in Fig. 2, the fluid pressure line 36 provides fluid pressure alternately for successively actuating and deactuating the diaphragm means 14. A source of fluid under pressure such as the compressed air pump B is connected through a line 37 to valve means 38 in control of the fluid pressure line 36. The valve means 38 consist of a housing portion 38a which affords communication with the pump line 37, the fluid pressure line 36 and an exhaust port 39; and the valve means 38 has a central motor driven rotary member 38b with ports 40 and 41 therein. In the operation of the instant device 10, the motor driven rotor 38b rotates slowly until it reaches the position shown in Fig. 2 and, at this point, fluid pressure is delivered from the pump through the lines 37 and 36 and into the chamber Y in a manner which will be de-

4

scribed hereinafter, this fluid pressure operates against the diaphragm 32 so as to move the arm 18 (or the overall arm assembly 13) in the first direction d_1 . The rotor 38b then continues to move in, for example, a clockwise direction until the passage 41 is aligned with the fluid pressure line 36 and the passageway 40 is aligned with the exhaust port 39, at which time the pressure in the chamber Y is released and the diaphragm 32 is deactuated. As will be appreciated, the particular timing for the actuating and deactuating periods can be altered by altering the positions of the rotor passageways and/or the valve ports. The instant rotor 38b is, however, driven relatively slowly so that the resulting lateral movement of the wire W will be comparatively slow.

With respect to the details of construction concerning the support for the diaphragm 32, it will be noted that the lower extremity 26c of the leg 26 carries a disk shaped member 42 which is secured to the central portion of the diaphragm 32 and which is backed by integral ribs 43, 44 and 45, best shown in Fig. 1. The ribs are integral with the disk member 42 and the lower extremity 26c of the leg 26.

In the chamber X there is mounted a resilient member, which is the spring 46. The spring 46 receives a pin 47 on the back of the bottom end 26c of the leg 26 for positioning the spring 46 thereagainst and the resilient force of the spring 46 is adjustable by virtue of the axially adjustable stop member 49 threadedly received by a central aperture 50 in the housing member 30a and secured in position by means of a lock nut 51. The stop member 49 also carries a positioning pin 52 received by the spring 46. The chamber X is vented to the atmosphere through the vent 53 near the base, so that movement of the diaphragm 32 back and forth in the chambers X and Y will not entrap air in the chamber X.

It will thus be seen that the arm (which may actually include the elements 12, 17, 18, 19, 20, 21 and 22) carrying the hand 11 is connected to a diaphragm 32 (by means of the leg 26). The resilient member or spring 46 is also connected to the diaphragm 32 and it urges movement of the arm in one direction, in this case the direction d_2 . The fluid pressure means (which includes the line 36 and associated equipment) communicates with the diaphragm 32 and (when actuated) serves to counterbalance the resilient means 46 and to move the arm in the other direction d_1 . The valve means 38 alternately actuates the fluid pressure means 36 to counterbalance the resilient means 46 and deactivates the fluid pressure means 36 to yield to the resilient means 46. In this manner, the diaphragm means 14 will effectively control relative movement of the arm and of the hand 11 by alternately moving the arm 18 in the first direction d_1 and then in the opposite direction d_2 while the hand 11 remains at the wire edge Wa. This movement is relatively slow as hereinbefore explained so that the actuator 12 will cause the wire to slowly track back and forth during operation, without being moved so rapidly as to interfere in any way with the other phases of the paper making operation including the even distribution of the web upon the wire W.

The actual movement of the wire W is effectively and adjustably limited by means of the adjustable stops 54 and 55 which cooperate with the arm assembly, in this case the leg 26, but which effectively control the extent of relative movement created between the arm 18 and hand 11. As will be noted, at the top of the housing 30, opposed adjustable stop members 54 and 55 are mounted in the plane of movement of the pivoted leg 26 closely below the pivot pin 29. The stops 54 and 55 are threadedly received in suitable apertures 56 and 57, respectively, in the housing 30 and are axially movable with respect thereto. The stops 54 and 55 are threaded into the apertures 56 and 57, respectively, so that the ends 54a and 55a, respectively, will be spaced the desired extremely small distance from the sides of the leg 26. Actually, during operation, the leg 26 will be resting against one

or the other of the stops 54 and 55 between movements of the leg 26. Lock nuts 58 and 59, respectively, are provided for the purpose of securing the position of the stops 54 and 55, once the desired adjustment has been made.

Operation of the actuator 12 in response to relative movement between the arm 13 and the hand 11

The foregoing description has related primarily to the creation of continuous alternating relative movement between the arm 13 and the hand 11 by means of the drive means 14. As previously mentioned relative movement (or the swinging movement about the pivot pin 17) between the hand 11 and the arm assembly 13, or the arm proper 18, causes the actuator 12 to effect lateral shifting of the wire W. In this respect any sort of travelling band, web or wire may have its lateral movement controlled. In general, the actuator 12 operates in the manner shown in United States Patent No. 2,530,122 issued to Lloyd Hornbostel on November 14, 1950. In the Hornbostel disclosure, the actuator 12 is mounted in fixed position (held against lateral movement) and the only moving member is a palm guide follower such as the instant hand 11 which signals lateral shifting of a web to the actuator and the actuator in turn effects movement of guide rolls so as to correct for the lateral shifting of the web. In the instant device, however, relative movement between the actuator 12 (carried by the arm assembly 13) and the hand 11 is artificially created by the drive means 14 so that the actuator 12 is really signaling constantly to certain wire guide means (which will be described) in an effort to correct or compensate for an "apparent" lateral shifting of the web which is being signaled to the actuator 12.

In other words, as the drive means 14 urges the arm 18 in the direction d_1 , the wire at first does not shift and the relative movement between the arm 13 and hand 11 gives a signal to the actuator 12 to the effect that the wire W has actually shifted in the direction d_2 . This causes the actuator to shift the wire guide means and urge the wire in the direction d_1 . The urging of the wire in the direction d_1 is not a drastic but merely a slowly shifting process and, as the wire W starts to shift slowly over in the direction d_1 , the drive means 14 suddenly shift the arm assembly 13 back in the direction d_2 and an opposite signal is given to the actuator 12, which in turn is transmitted to the wire guide means, which in turn slowly start to shift the wire back in the direction d_2 . In view of this timing the movement of the wire W is always behind the actual signals given to the actuator 12 and a continuous alternating lateral movement of the wire W is thereby effected.

Referring now primarily to Figures 3, 4, 5 and 6, and also certain details of the actuator 12 shown in Figures 1 and 2, it will be noted that for the sake of simplicity and convenience, reference numerals indicating parts of the overall actuator mechanism 12 are indicated in the 100 series. A bottom reach BR of the wire W in the paper machine passes beneath a plurality of rolls (not shown) which serve generally to guide the wire W. A shiftable guide roll 112 is supported by a frame 114 in any convenient manner, such as by mounting the roll 112 in a spherical bearing 115 in the lower end of a link 117, the link 117 being pivotally supported on a pin 118 in the upper part of the frame 114, as best shown in Figure 3. The other end of the roll 112 is supported on a frame 119 which may be an integral part of the frame 114 by means of a spherical bearing 120 so that as the link 117 pivots about the pin 118, the guide roll 112 will rotate freely between the spherical bearings 115 and 120.

The link 117 is joined to an actuating diagram 122 by a pressure rod 124 which may be rigidly connected to a diaphragm support 128 and pivotally connected to the link 117 in the usual manner. The diaphragm 122 is held in a diaphragm chamber 125 by means of a link 75

126 pivotally connected to both the frame 114 and the central portion of the diaphragm support 128. Pressure in the chamber 125 moves the link 117 to the right (as indicated in Figure 3) against the tension of the spring 127. Upon release of pressure in the chamber 125, the spring 127 moves the lower end of the link 117 to the left (as seen in Figure 3).

Fluid, such as air, may enter the chamber 125 through a pipe 130. The air is supplied from a source (not shown) through a pipe 131 (Figure 4) from whence it passes through a pressure regulating valve 132, the pressure beyond the valve 132 being recorded on a gauge 133. The valve 132 limits the maximum pressure in the line beyond this valve so that it does not rise above a desired maximum and may be set at any pressure desired.

A bleed or needle valve 135 permits the air to pass slowly into a T 136 from whence it enters the pipe 130 to the chamber 125. The second branch of the T 136 has a pipe 138 connected thereto which leads to a relief valve 140 (which has been indicated previously as a component of the actuator 12).

As best shown in Figure 2, the relief valve 140 is mounted by means of a clamp 139 on the arm member 18 in rigid engagement to be carried laterally with the arm 18. The relief valve 140 may comprise a hollow conical member 141 and a solid conical member 142 having an annular groove 143 thereabout, the member 142 fitting within the member 141 and capable of forming a tight fit therein. The air from the pipe 138 enters the hollow conical member 141 at the front (as shown in Figure 1) adjacent the groove 143 and may bleed out between the members 141 and 142, the amount of bleeding depends upon the separation between the conical members 141 and 142.

The maximum rate of bleeding of the valve 140 is small as compared to the capacity of the diaphragm chamber 125 so that small changes in the starting of the valve 140 do not immediately effect the movement of the diaphragm 122, or at least such small changes are quite slow in producing any driving movement of the diaphragm 122.

A bracket 147 is mounted on one side of the bleed valve 140 and has a link 148 pivotally connected to the bracket 147 at one end and pivotally connected to the hand support 16 at the pin 17 at its opposite end. The hand support 16 is also pivotally connected to the conical member 142 through an ear 151 formed on the base of the conical member 142. A second bracket 153 is formed on the valve 140 substantially opposite to the bracket 147 and carries a tension spring 155 which is connected at its opposite ends to the bracket 153 and the upper extremity of the hand support 16, at 16d. The tension spring 155 resiliently urges the valve 140 into closed position.

Regulating screws 156 and 157 contact the tip of the cone 142 and an ear 158, respectively, to limit the inward movement of the conical member 142 and permit complete closing of the valve 140, while at the same time preventing binding of the conical members 141 and 142.

Although it will be appreciated that actuator assemblies other than the instant actuator 12 may be used, it has been found that the structure here shown is preferred for a number of reasons.

In reviewing the operation again, it will be noted that movement (1) of the hand 11 in the direction d_2 or (2) of the actuator assembly 12 in the direction d_1 will cause the valve 140 to be open; and movement alternatively back and forth of the actuator assembly 12, as caused by alternate moving of the drive means 14, will cause alternate opening and closing of the valve 140, which in turn causes ultimate actuation and deactuation of the diaphragm 122 and consequent alternate shifting of the pivotally mounted spherical guide roll bearing 115 forward and backward.

Referring briefly to Figures 5 and 6, it will be noted

that an initial movement of the actuator assembly 12 in the right hand direction which is laterally away from the wire W will tend to cause closing of the bleed valve 140 and an increased pressure in the diaphragm assembly 125. The increase in pressure in the diaphragm assembly 125 will then urge the roll spherical bearing 115 forwardly to the position shown in Figure 6. This, in turn, serves to shift the bottom reach BR of the wire W also to the right (and, for that matter, the entire wire W will be shifted to the right). In the meanwhile, the actuator assembly 12 will be reversed in movement so as to be moving in the direction to the left indicated in Figure 6; and this, in turn, will cause opening of the bleed valve 140, a release of pressure in the diaphragm 125 and a shifting of the spherical bearing 115 rearwardly toward the position indicated in Figure 5.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a paper machine, in combination, a tensioned travelling wire, a hand presenting a palm to an edge of said wire and movable in response to lateral movement of said wire, and arm resiliently connected to said hand, actuating means controlling lateral movement of said wire in response to relative movement between said arm and said hand, diaphragm means in control of lateral movement of said arm, fluid pressure means in control of said diaphragm means, and valve means in control of fluid pressure actuating said fluid pressure means al-

ternately opening and closing thereby alternately moving said arm in a first lateral direction and then the opposite direction.

2. In a paper machine, in combination, a tensioned travelling wire, a hand presenting a palm to an edge of said wire and movable in response to lateral movement of said wire, an arm resiliently connected to said hand, actuating means controlling lateral movement of said wire in response to relative movement between said arm and said hand, a diaphragm connected to said arm, a resilient member engaging said diaphragm urging movement of said arm in one lateral direction, fluid pressure means communicating with said diaphragm counterbalancing said resilient means and moving said arm in the other lateral direction and valve means alternately actuating said fluid pressure means to counterbalance said resilient means and deactuating said fluid pressure means to yield to said resilient means thereby alternately moving said arm in the first direction and then the opposite direction.

References Cited in the file of this patent

UNITED STATES PATENTS

25	Re. 16,883	Devine	Feb. 21, 1928
	1,885,164	White	Nov. 1, 1932
	2,530,122	Hornbostel	Nov. 14, 1950
	2,632,642	Cooper	Mar. 24, 1953
	2,635,475	Hornbostel	Apr. 21, 1953