March 5, 1963 W. E. ROJECKI 3,079,805

PAPER MACHINERY

Filed Nov. 16, 1960 3 Sheets-Sheet 1

FIG-1

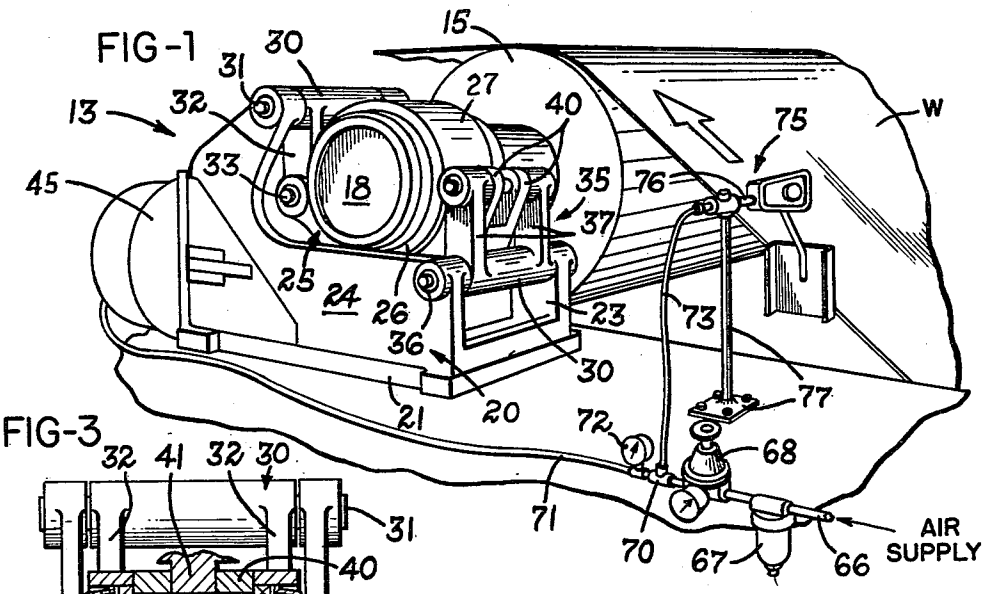


FIG-3

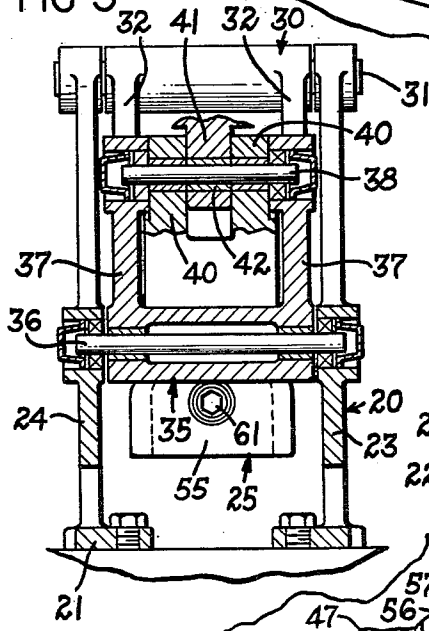


FIG-2

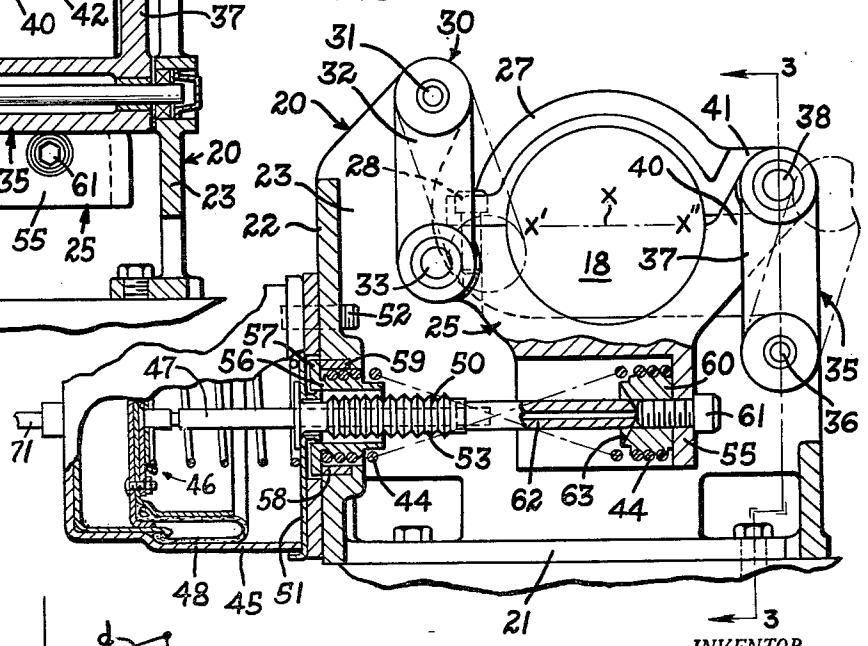
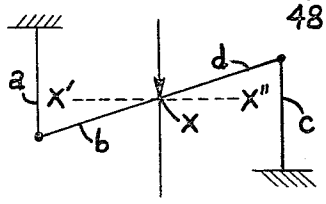


FIG-4



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FIG-5

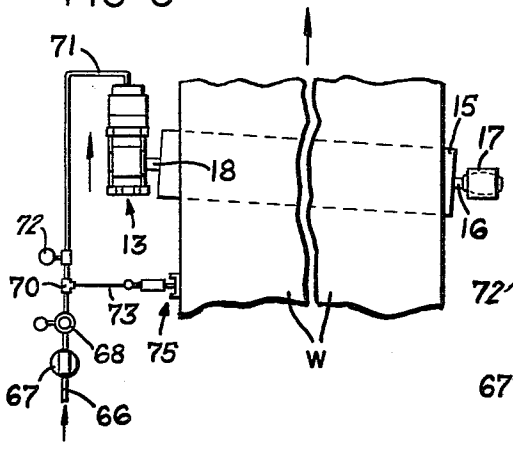


FIG-6

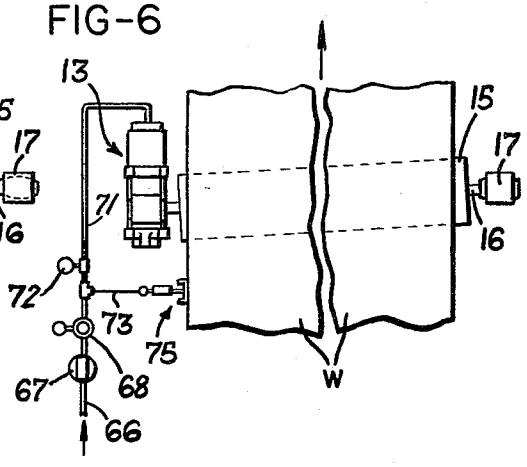


FIG-7

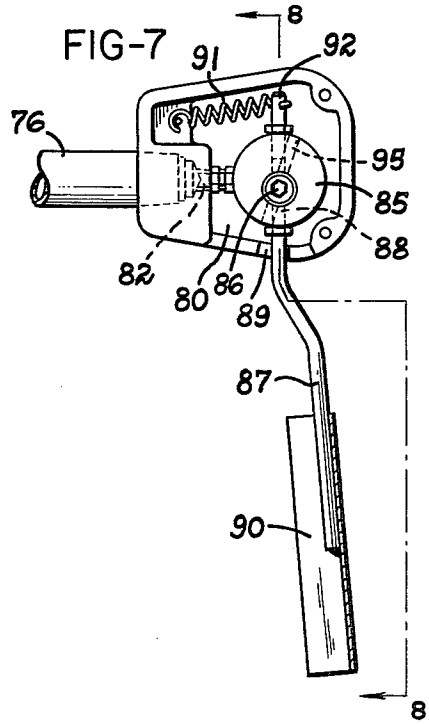
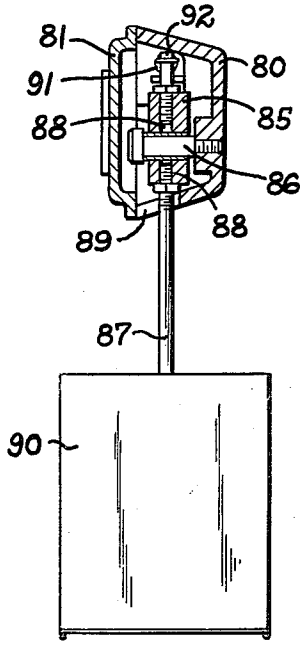


FIG-8



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FIG-9

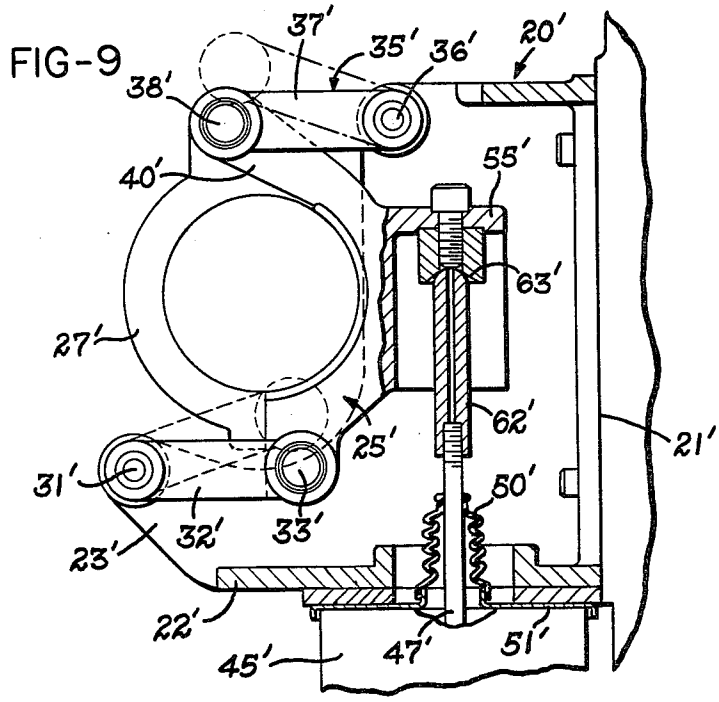


FIG-12

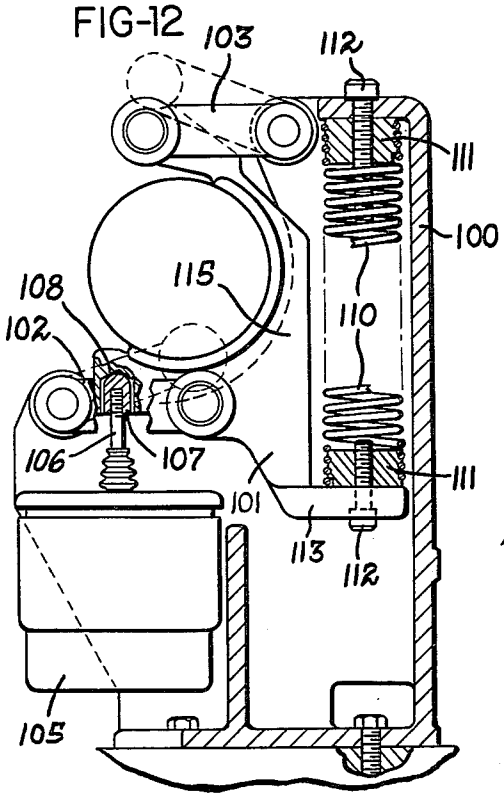


FIG-10

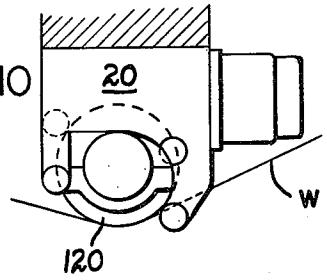
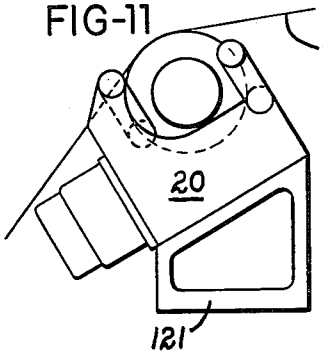


FIG-11



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United States Patent Office 3,079,805 Patented Mar. 5, 1963

3,079,805
PAPER MACHINERY

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Filed Nov. 16, 1960, Ser. No. 69,582
9 Claims. (Cl. 74—241)

This invention relates to paper making machines and more particularly to a web guide for retaining a web of felt or wire used in such equipment in properly guided relation with its intended course.

One of the principal objects of the present invention is to provide a web guide of simple construction which is economical to manufacture and of high accuracy in use.

Another major object of the invention is to provide a web guide of such construction that the moving parts which support the associated guide roll follow arcuate paths but the correcting movements of the guide roll itself are in a direction parallel to the direction of travel of the web in such manner that the tension on the web remains constant.

It is also a particular object of the invention to provide a web guide which may be mounted in many different positions to facilitate the handling of webs traveling in different directions and the selection of the location of the web guide roll.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a perspective view of a web guide and associated control mechanism constructed in accordance with the invention;

FIG. 2 is a view in side elevation partly broken away, of the web guide of FIG. 1;

FIG. 3 is a section taken on the line 3—3 of FIG. 2;

FIG. 4 is a schematic diagram illustrating principles of operation of the web guide of the invention;

FIG. 5 is a somewhat diagrammatic plan view illustrating the operation of the web guide of FIGS. 1–3 and showing the guide roll in one limit position of its guiding movement;

FIG. 6 is a view similar to FIG. 5 showing the guide roll in its other limit position;

FIG. 7 is a view in side elevation of the palm and valve assembly for controlling the web guide of FIG. 1, looking from left to right in FIG. 8 with the cover removed;

FIG. 8 is a section on the line 8—8 of FIG. 7;

FIG. 9 is a view similar to FIG. 2 showing a construction of web guide in accordance with the invention for installation in guiding relation with a vertical run of the web to be guided;

FIG. 10 is a diagrammatic view in side elevation showing the web guide of the invention mounted above the web to be guided;

FIG. 11 is a view similar to FIG. 10 showing an inclined mounting of the web guide; and

FIG. 12 is a view similar to FIG. 9 showing another form of web guide in accordance with the invention.

Referring to the drawings, which illustrate preferred embodiments of the invention, FIG. 1 shows a web guide of the invention which is indicated generally at 13 as mounted in conjunction with a guide roll 15 for a web W, which may be, for example, the forming wire of a Fourdrinier paper machine. As illustrated diagrammatically in FIGS. 5–6, one journal 16 of the roll 15 is supported for swiveling movement by a suitable bearing 17, such as a spherical bearing. The other journal 18 of the roll 15 is supported by the web guide 13 for back and forth movement about the bearing 17 to effect correction of movement of the web to one side or the other of its intended path of travel. It is a major feature of the invention that during this correcting movement, the axis of the roll 15 travels so nearly in a plane that substantially no change occurs in the tension of the web across its width such as would be caused by arcuate movement of the roll.

The web guide 13 is illustrated in detail in FIGS. 2–4 and includes a supporting frame 20 comprising a base 21, end wall 22, and opposed side walls 23 and 24 which extend substantially higher at one end than the other. The web guide 13 also includes a carriage 25 supporting the bearing 26 for the journal 18, and a retaining cap 27 for the bearing 26 is secured on the carriage 25 as by screws 28.

The mounting of the carriage 25 on the frame 20 provides for swinging movement of the carriage in a controlled path such that the axis of the bearing 26 moves in a substantially straight line parallel with the base 21. One end of the carriage 25 is supported by first linkage means 30 of generally U-shape pivoted by a shaft 31 on the raised end portions of the end walls 23 and 24, and the depending arms 32 of the linkage means 30 are pivoted by a shaft 33 to the adjacent end of the carriage 25. A second linkage means 35 similar to the linkage means 30 is pivoted on the side walls 23—24 by a shaft 36, and its upwardly extending arms 37 are pivoted by a shaft 38 to ear portions 40 of the carriage 25. A tongue portion 41 of the bearing cap 27 extends between the ears 40 and includes a through bore provided with a bushing 42 for the shaft 38.

It will now be apparent that the linkage arms 32 and 37 extend in opposite directions from a line connecting their pivot shafts 33 and 38, and they form a suspension system of the type known as a Watt's mechanism which has the ability to produce substantially straight line motion over a short distance through constraint of the moving parts. The principle of operation of this linkage is shown diagrammatically in FIG. 4, wherein the link a corresponds to the links 32, the link c corresponds to the links 37, and the line connecting the axes of the pivot shafts 33 and 38 is composed of two segments b and d. The proportions of this linkage are such that $b/d=c/a$, and as the linkage moves about the several pivot shafts, the point x at the junction of the segments b and d moves in a substantially straight path as indicated by the broken line $x'—x''$ in FIG. 4.

In accordance with the invention, the proportions of the carriage 25 and the linkage means 30 and 35 are established to locate the axis of the bearing 26 in coincidence with the point x derived as explained in connection with FIG. 4. Under these conditions, movement of the carriage 25 will include a rocking motion, but the point x which corresponds to the axis of the guide roll 15 will move in a substantially straight line as indicated by the broken line $x'—x''$ in FIG. 2.

The movement of the carriage 25 is effected by a system comprising a tension spring 44 and an air cylinder 45 provided with a piston 46 and piston rod 47. The preferred results from the standpoint of minimum friction, the cylinder 45 is of the membrane type employing a rolling diaphragm 48 to support the piston 46 therein. The low pressure side of cylinder 45 is protected against dirt and liquid by the diaphragm cover 50 and cap 51, and it may be vented in any suitable way as by one or more hollow studs 52.

The spring 44 is mounted in the frame 20 between the end wall 22 and a depending portion 55 of the carriage 25. The end of the spring 44 at the wall 22 is threaded on a plug 56 having a peripheral shoulder 57 which seats on a bushing 58 set in a recess in the frame wall 22 against a seat 59. The other end of the spring 44 is

threaded on a plug 60 secured to the carriage portion 55 by a bolt 61. The spring plug 56 has a large center hole through which the piston rod 47 extends freely, and this poston rod carries an extension 62 having a rounded end which is received in a tapered seat 63 in the plug 60 to provide for the necessary small amount of angular movement of the piston rod with respect to the plug 60 as the carriage moves back and forth.

In operation, air pressure is supplied to the cylinder 45 under the control of a leak port in such manner that as long as the web W travels along its extended path, the air pressure in the cylinder 45 will balance the spring 44 to maintain the carriage 25 in its centered or mean position. Movement of the web in one direction laterally will increase the flow of air through the leak port to produce a lowered pressure in the cylinder 45 so that the spring 44 can move the carriage 25 to the left in FIG. 2. Lateral movement of the web in the other direction will decrease air flow through the leak port, thereby increasing pressure in the cylinder 45 and causing movement of the carriage against spring 44 to the right in FIG. 2.

The air supply and control system cooperating as just described is shown in detail in FIGS. 1 and 5–8. The main air supply line 66 is provided with a drain filter 67 and pressure regulator 68. A fitting 70 connects the line 66 with a flexible hose 71 which leads to the cylinder 51, and a pressure gauge 72 is shown as connected with the hose 71. A second rubber hose 73 leads from the fitting 70 to the valve and palm assembly 75, which is mounted by means of its supply pipe 76 on a bracket 77 adjacent the web. Preferably the fittings 70 incorporates an orifice for metering the air supply to the hoses 71 and 73 to control the rate of response of the guide system.

Referring particularly to FIGS. 7 and 8, the valve assembly includes a housing 80 and cover 81 mounted on the end of the pipe 76. The connection between the pipe 76 and valve housing 80 terminates in a hollow screw 82 which is mounted in the valve housing 80 and forms a leak port in combination with the eccentric valve rotor 85 which is mounted for rocking movement on a pivot pin 86 set in the housing 80. A rod 87 is threaded into a bore 88 extending through the valve rotor 85 and depends therefrom through a slot 89 in the under side of the housing 80, and this rod 87 carries the palm 90 which engages the edge of the web W. A spring 91 is connected between the housing 80 and a pin 92 threaded into the opposite end of the bore 88 from the rod 87 to bias the rotor in counterclockwise direction as viewed in FIG. 7 and thereby to urge the palm 90 against the edge of the web.

The arrangement and proportion of the parts in the valve assembly as just described are such that when the web is running in the proper path, the engagement of its edge with the palm 90 will hold the valve rotor 85 in such position that the effective flow area past the rotor 85 from the hollow screw 82 will provide the desired balancing pressure for the spring 44 and the cylinder 45. If the web should move to the left as viewed in FIGS. 5–7, the valve 85 will rock to a more open position with respect to the screw 82, thereby increasing the flow of air, decreasing the pressure in the cylinder 45, and causing the carriage 25 to move to the left in FIG. 2. The resulting movement of the carriage and guide roll 15 is shown in exaggerated fashion in FIG. 5, and it will be seen that this will in turn cause the web to move back to the right.

The reverse of the condition just described will occur if the web should initially move to the right as viewed in FIGS. 5–7. The biased movement of the palm will cause the valve 85 to decrease the outward flow of air from the screw 82, thereby increasing the pressure in the cylinder 45 and causing the carriage 25 to move to the right in FIG. 2 and to produce the correcting movement of the guide roll shown in FIG. 6. If it is desired to locate the palm on the other side of the web without otherwise changing the correcting action, provision is made for such rearrangement by means of the threaded bore 95 in the valve rotor 85 which is laterally and angularly offset from the bore 88. All that is necessary is to turn the valve rotor over, re-locate the rod 87 and pin 92, and the reverse movement of the carraige will take place as the palm moves back and forth with respect to the means position of the valve.

The principles of the invention are readily applicable to the construction of a web guide for use with a guide roll located either above or below the web and where the web may be traveling either vertically or in an inclined plane. Thus FIG. 9 shows details of the construction of a web guide in accordance with the invention which is especially adapted to support a guide roll in conjunction with a vertically moving section or run of a web such as one of the felts of a paper machine.

The majority of the parts in FIG. 9 are the same as in FIGS. 1–3, and they are therefore designated as 20', etc. It will be noted, however, that there is no spring and associated parts in FIG. 9, since in operation the weight of the guide roll itself is directly counterbalanced by the cylinder 45'.

FIGS. 10 and 11 illustrate alternative mountings for the web guide 20 where the associated guide roll is located above the web W or in conjunction with an inclined run of the web. Thus in FIG. 10, the frame 20 is suspended from a suitable mounting to support the guide roll 120 above the web, and no other changes of construction need be made. In the inclined arrangement of FIG. 11, the frame 20 is mounted on an inclined bracket 121 so that the movements of the guide roll axis will still be parallel with the bottom of the frame 20 itself. The only change in the construction or arrangement of any of the parts in FIGS. 10 and 11 which may be desirable as compared with FIGS. 1–3 is that the counterbalancing spring could be progressively softer as the angle of the guide installation approached the vertical.

As noted, the vertical guide of FIG. 9 is constructed without a spring, but it is possible to construct a guide in accordance with the invention which does include a spring, and such guide is shown in detail in FIG. 12. The frame 100 in FIG. 12 is similar to the frame 20, and the construction of the carriage 101 is similar to that of the carriage 25. The linkages 102 and 103 which support the carriage 101 on the frame 100 are arranged in accordance with the principles described in connection with FIGS. 2–4.

The air cylinder 105 in FIG. 12 is mounted below the carriage 101, and its piston rod 106 includes a rounded cap 107 which is received loosely in a socket 108 in carriage 101 to move the carriage upwards as the air pressure supply to the cylinder is increased. The spring 110 which opposes the cylinder 105 is threaded on plugs 111 which are in turn secured by bolts 112 to the upper end wall of the frame 100 and to an ear portion 113 of the carriage 101. Since the weight of the guide roll itself and of its bearing and the carriage 101 will tend to move the carriage 101 downwardly, the spring 110 is a tension spring which counterbalances this weight in conjunction with the mean air pressure for the cylinder 105. It will be noted that the seat portion 115 of the carriage 101 which receives the roll bearing is proportioned to be capable of supporting the bearing without the addition of a bearing cap, but a cap may be supplied similarly to the cap 27 if desired.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A web guide of the class described for supporting

the bearing of a web guide roll, comprising a supporting frame, a carriage for receiving the bearing, first pivoted linkage means interconnecting said supporting frame and said carriage, second pivoted linkage means interconnecting said supporting frame and said carriage, said carriage being proportioned to support the bearing with the axis thereof in predetermined position on a line connecting the pivotal connections of said first and second linkage means on said carriage, and said first and second linkage means being so proportioned and their connections so located as to effect movement of said carriage in such direction that said axis moves in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

2. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage adapted to support the bearing with the axis thereof in predetermined position, first and second pivoted linkage means interconnecting said supporting frame and said carriage, said first and second linkage means being so proportioned and their connections so located as to provide for movement of said carriage in such direction that said axis moves in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame, diaphragm means mounted on said supporting frame for moving said carriage in one direction, and means mounted on said supporting frame biasing said carriage against movement by said diaphragm means.

3. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage adapted to support the bearing with the axis thereof in predetermined position, first pivoted linkage means interconnecting said frame and said carriage, second pivoted linkage means interconnecting said frame and said carriage, and said first and second linkage means extending in opposite directions from a line connecting their connections to said carriage to provide for movement of said carriage in such direction that said bearing axis will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

4. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage adapted to support the bearing with the axis thereof in predetermined position, first linkage means pivotally mounted on said supporting frame, second linkage means pivotally mounted on said supporting frame, means for pivotally connecting said first and second linkage means to said carriage, and said first and second linkage means extending in opposite directions from a line connecting their connections to said carriage to provide for movement of said carriage in such direction that said bearing axis will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

5. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage for receiving the bearing, first linkage means pivotally mounted on said supporting frame, second linkage means pivotally mounted on said supporting frame, means for pivotally connecting said first and second linkage means to said carriage, said first and second linkage means extending in opposite directions from a line connecting their connections to said carriage, and said carriage being proportioned to support the bearing with the axis thereof in predetermined position on the line connecting the connections of said first and second linkage means to said carriage to provide for movement of said carriage in such direction that said bearing axis will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said frame and said bearing carriage.

6. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame having a base and juxtaposed side walls, a carriage adapted to support the bearing with the axis thereof in predetermined position, first linkage means positioned between said side walls and pivotally connected thereto and having a pivotal connection to said bearing carriage, and second linkage means positioned between said side walls and pivotally connected thereto and having a pivotal connection to said bearing carriage, said first and second linkage means extending in opposite directions from a line connecting their connections to said carriage to provide for movement of said carriage in such direction that the axis of said bearing will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

7. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage adapted to support the bearing with the axis thereof in predetermined position, a first pivoted link interconnecting said supporting frame and said carriage, a second pivoted link interconnecting said supporting frame and said bearing carriage, said first and second links extending in opposite directions from a line connecting their connections to said bearing carriage, the ratio of the distance between said axis and the connection of said first link to said carriage to the distance between said axis and the connection of said second link to said carriage being equal to the ratio of the effective length of said second link to the effective length of said first link to provide for movement of said carriage in such direction that the axis of said bearing will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

8. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame having a base and two juxtaposed side wall portions, a carriage adapted to receive and support the bearing with the axis thereof in predetermined position, a first substantially U-shaped link pivotally connected to said side walls and to said carriage, a second substantially U-shaped link pivotally connected to said side walls and to said carriage, and said first and second links extending in opposite directions from a line connecting their connections to said carriage to provide for movement of said carriage in such direction that said bearing axis will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

9. A web guide of the class described for supporting the bearing of a web guide roll, comprising a supporting frame, a carriage adapted to support the bearing with the axis thereof in predetermined position, first linkage means interconnecting said frame and said carriage, second linkage means interconnecting said frame and said carriage, said first and second linkage means extending in opposite directions from a line connecting their connections to said carriage, and said carriage being so dimensioned that said axis is on said line connecting the connections on said carriage to provide for movement of said carriage in such direction that said bearing axis will move in a substantially straight line in response to pivotal movement of said linkage means with respect to said carriage and said frame.

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