May 19, 1953 L. HORNBOSTEL 2,638,819

DIAPHRAGM CONTROL FOR PRESS ROLL ASSEMBLIES

Filed March 18, 1948 2 Sheets-Sheet 1

Fig. 2

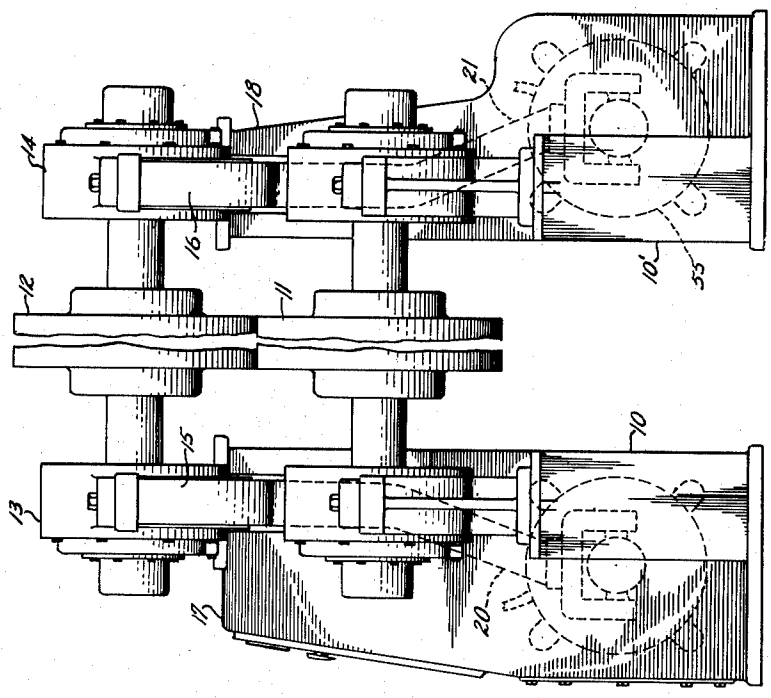
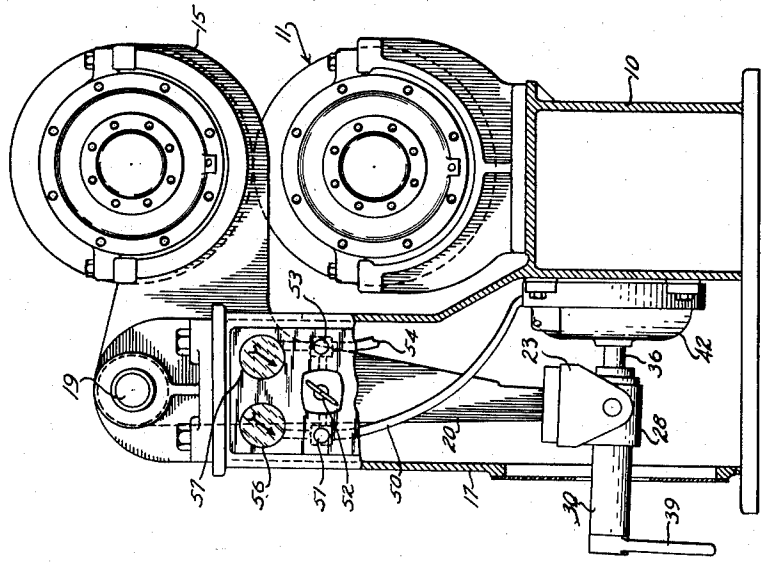


Fig. 1



Inventor

LLOYD HORNBOSTEL

By The Firm of Chandler, Hall & Attys.

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Filed March 18, 1948 2 Sheets-Sheet 2

Fig. 3

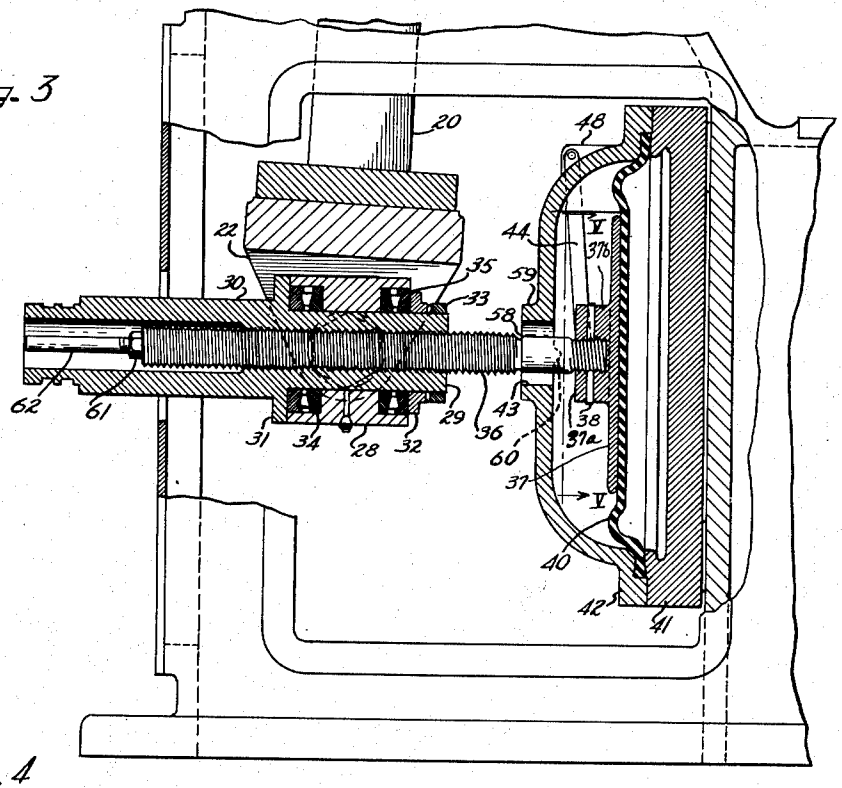


Fig. 4

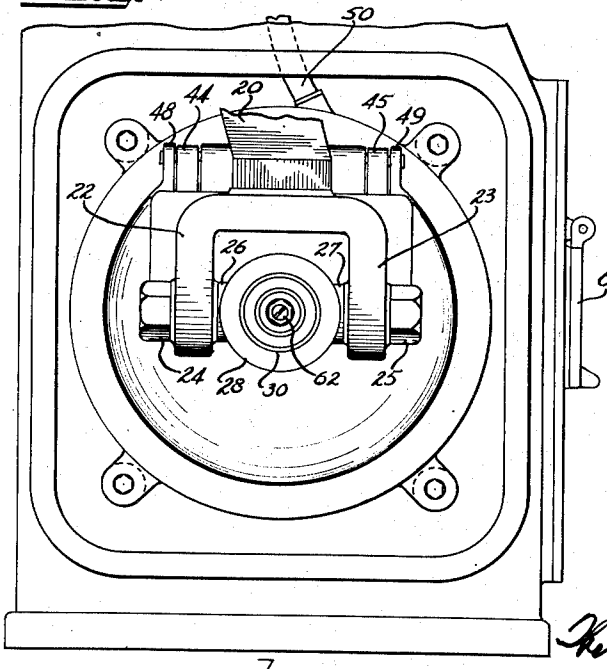
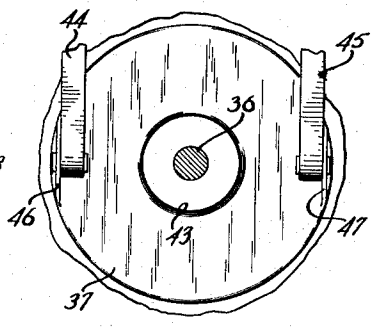


Fig. 5



Inventor
LLOYD HORNBOSTEL

By

Attys.

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DIAPHRAGM CONTROL FOR PRESS ROLL ASSEMBLIES

Lloyd Hornbostel, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Application March 18, 1948, Serial No. 15,596

6 Claims. (Cl. 92—49)

1

This invention relates to a fluid pressure controlled mechanism for regulating the nip pressure in a roll assembly, and more particularly for a press roll assembly used in paper making.

In press roll assemblies wherein one roll is mounted on stationary bearings and the other is mounted for swinging movement toward and away from the fixed roll, it is frequently found desirable to support the axis of the movable roll at its opposite ends on a pair of pivoted levers or bell cranks, and to apply pressure to the depending ends of the bell crank arms to press the movable roll against the stationary roll. One method of applying this pressure to the depending ends of the crank arms is to employ in association with each crank arm an air pressure operated diaphragm and to regulate the pressure on each diaphragm to effect the desired pressure at the nip of the rolls. Uniform pressure throughout the length of the nip is, of course, desired and it is desirable to connect pressure gauges with each of the diaphragms to show at all times the pressure existing within each diaphragm housing.

Furthermore, in order to obtain true load applying pressure readings from the gauges it is also necessary to balance deflections or distortions of the diaphragms. Thus the same air pressure applied to two diaphragms in different stages of distortion will have different loading effect on the diaphragms due to variations in the effective areas of the diaphragms. According to this invention the mechanical linkage between each diaphragm and its associated crank arm can be easily adjusted to balance deflection of the diaphragms for causing the diaphragm-controlled mechanism to operate at best advantage.

In an improved form of such a press roll assembly, made in accordance with this invention, each depending crank arm is disposed within a housing forming a pedestal or constituting part of the pedestal supporting the crank arm, and the associated diaphragm is also disposed within the same housing. The linkage between the crank arm and diaphragm includes an adjusting sleeve to which a wrench may be applied for adjusting each crank arm relatively to its associated diaphragm. This sleeve, for the sake of convenience, is allowed to protrude through an opening in the housing, as will be better understood by reference to the accompanying drawings.

The present invention provides improved means for enabling the operator to determine by observation from outside of the housing whether, when the movable press roll has been adjusted to an operating pressure, the two crank arms are adjusted equally with respect to their controlling diaphragms.

2

Accordingly, one of the objects of this invention is to provide a conveniently visible indicator of the relative positions of the controlling diaphragm and crank arm in an assembly of the character described above.

Another object of the invention is to provide an indicator having the foregoing advantages and which is capable of ready adjustment.

Another object of the invention is to provide an indicator of the character described which will reveal at a glance whether a previously adjusted operating condition has been restored after the movable roll has been retracted and brought back again to operating position.

Other objects and advantages of the invention will be mentioned hereinafter or will become apparent from a perusal of the specification and drawings in which a preferred embodiment of the invention is illustrated and described.

On the drawings:

Figure 1 is an end elevation of a press roll assembly made in accordance with this invention;

Figure 2 is an elevation of the assembly as viewed from the right side of Figure 1;

Figure 3 is a central sectional view through the crank arm and diaphragm assembly shown in Figure 1;

Figure 4 is an end elevation of the parts shown in Figure 3 as viewed from the left side thereof; and

Figure 5 is a sectional view approximately on the line V—V of Figure 3.

Referring further to the drawings, there is shown a base generally indicated as 10 on which is mounted the stationary roll generally indicated as 11, the details of construction of which do not form a part of this invention.

The upper movable roll 12 is provided with end bearing assemblies 13 and 14 which are supported on the crank arms 15 and 16, these crank arms being in turn pivotally supported on the pedestals 17 and 18. The pivot for one of these crank arms is shown in Figure 1 at 19. The pedestals are so constructed as to serve also as housings into which the free ends 20 and 21 of the crank arms depend.

As the depending crank arms are connected to their associated diaphragms in identical fashion, it will suffice to describe the assembly shown in Figures 1, 3, 4 and 5.

The lower end of the crank arm 20 is bifurcated to provide the yoke arms 22 and 23 in which are secured pins 24 and 25 extending into lateral bosses 26 and 27 integral with a

collar 28. It will be apparent upon reference to Figures 3 and 4 that the crank arm thus has some pivotal movement relatively to the collar 28 which snugly surrounds the reduced portion 29 of a rotatable sleeve 30. The sleeve 30 is provided with a flange 31 and between this flange and a separate collar 32 held in place by a nut 33 the thrust bearings 34 and 35, mounted as shown, permit rotation of the sleeve 30 relatively to the collar 28 while eliminating any endwise play between these two members.

The adjusting sleeve 30 is internally threaded to engage the external threads of a push rod 36, one end of which is secured in non-rotatable relationship to the diaphragm plate 37 by means of a pin 38.

It will be apparent that if a wrench such as the wrench 39, shown in Figure 1, be applied to the outer end of the sleeve 30 and the sleeve rotated, the lower end of the crank arm 20 will be caused to move either toward or away from the diaphragm, in accordance with the direction of rotation.

The diaphragm plate 37 is secured in any suitable manner, not a part of this invention, to a flexible diaphragm member 40 whose margins are clamped and sealed between the diaphragm base member 41 and the diaphragm housing member 42.

In order that the diaphragm assembly itself may always be held in position so that the rod 36 will always extend centrally from the opening 43 in the diaphragm housing, I prefer to provide a pair of arms 44 and 45 pivotally connected at their lower ends to brackets 46 and 47 integral with the diaphragm plate 37 and whose upper ends are pivoted on brackets 48 and 49 integral with the diaphragm housing member 42. Thus no distortion of the diaphragm by any downward thrust from the rod 36 is possible.

Air under pressure is supplied to the diaphragm chamber by means of a pipe 50 which is under the control of an individual valve 51 and a master valve 52. The latter valve also controls the supply of air through the valve 53 and pipe 54 to the other diaphragm 55 associated with the crank arm controlling the opposite end of the roll. It may be noted that associated with each pipe 50 and 54 are gauges 56 and 57 which will indicate the pressure existing at any time in the pipes 50 and 54.

When using an assembly constructed in accordance with this invention, assuming that the rolls are separated, the end face 37*a* of the raised boss 37*b* of the diaphragm plate 37 will be bottomed on raised bumps 60 on the inner face of the diaphragm housing 42, so that the diaphragm 40 will not be carrying the weight of the raised top roll 12. The operator may then bring the rolls into contact by means of wrenches such as 39 acting upon the sleeves 30 associated with each crank arm. As the sleeves 30 are rotated relatively to their stationary threaded push rods 36, they will move outwardly away from their respective diaphragms and enable the rolls to make contact. Further rotation of the sleeves will move the push rods 36 toward the diaphragms to lengthen the linkages between the diaphragms and the sleeves, thereby unseating the face 37*a* of the diaphragm plate from the housing 42 and centering the diaphragm in the housing chamber. Air will be supplied to the two actuating diaphragms at about the pressure desired and the two sleeves 30 will be rotated to adjust the linkage length to place the groove 58 on each threaded push rod 36 in register with the outside surface of the boss 59 on the associated diaphragm housing 42. When this registration is obtained there will then be room for about ½ inch movement between the raised bumps or stop members 60 on the inner surface of the diaphragm housing and the end face 37*a* of the diaphragm 37. This amount of movement is, in the illustrated embodiment, deemed to be about right for ordinary operation and when the diaphragms are thus centered they will have identical effective areas acted upon by the air pressure. The air gauges 56 will then give an accurate reading of the loads on both ends of the roll. The operator by means of the adjusting wrenches and the control valves will thus be able to equalize the pressure throughout the nip of the two rolls. When this has been accomplished and the annular shoulders 58 are still in registration as described above, he will then employ a socket wrench to loosen the nut 61 (see Fig. 3), which locks the indicator pin 62 to the outer end of the threaded push rod 36. The outer end of this rod is provided with an internally threaded bore into which the pin 62 may be screwed a considerable distance. By means of a screwdriver applied to a kerf in the outer end of the pin 62 while the nut 61 is loose, the operator will then adjust the pin 62 until its outer end is flush with the surface of the outer end of the sleeve 30. He will then lock the nut 61.

To facilitate inspection during the initial registration of the annular collar 58 with the surface of the boss 59, I provide, as shown in Figure 4, a peep hole normally closed by the cover 63.

Thereafter, during the use of the machine should it become necessary to release the pressure on the rolls temporarily or separate them this will be done by means of a wrench 39 applied to the sleeve 30 and also by releasing the air pressure. Subsequently when restoration of the previous running condition is desired air pressure will again be restored and the sleeve 30 again rotated to swing the crank arm away from the diaphragm until the operator observes the end of the pin 62 is once again flush with the outer end of the sleeve. He thus will know that the lower end of that crank arm is again adjusted to its same former distance from the associated diaphragm.

In the normal use of the machine, from time to time the rolls will be reground or rolls of different diameters will be substituted and each time the indicator pin 62 should be reset to indicate the normal setting desired for running operations and to facilitate making certain that the pressure is equalized between the ends of the rolls.

While the specification and drawings disclose and describe in considerable detail a preferred embodiment of the invention, it should be understood that the invention is susceptible of some variation and modification within the scope of the appended claims.

I claim as my invention:

1. A press roll assembly comprising a pair of hollow end frames, stationary roll bearings on said frames, a first press roll rotatably mounted on said bearings, bell cranks having their fulcrums pivoted on said end frames and having bearing carrying arms extending from the frames above the first roll and depending arms extending into the chambers provided by the hollow frames, a second press roll mounted on the bearings of said bearing carrying arms and arranged to coact

with the first press roll for providing a pressure nip, diaphragm housings in said hollow end frames, flexible diaphragms spanning the interiors of said diaphragm housings to provide a pressure chamber and an operating space in each housing, each of said housings having an opening to said operating space, a rod anchored on each diaphragm and projecting longitudinally through said opening of the diaphragm housing, a sleeve threaded on each rod, a collar rotatably mounted upon said sleeve and held thereon against relative axial movement, pivots connecting the collar in each end frame with the depending arm of the bell crank, means for rotating each sleeve relative to its rod for varying the distance between the diaphragm and the depending arm of the bell crank, control valves on one end frame, conduits connecting said valves with the pressure chambers of the diaphragm housings, pressure gauges on said one end frame associated with said conduits, and indicator means on said rods for showing the linkage length between the diaphragms and depending bell crank arms whereby distortion of the diaphragms can be easily balanced to provide uniform effective areas to the pressure chambers and thereby make possible accurate load readings on the gauges.

2. In a press roll assembly, in combination with a pivoted crank arm supporting a press roll and a pneumatically operated diaphragm and a casing therefor, a support for said arm including a housing enclosing a depending portion of the arm and said diaphragm, an exteriorly threaded non-rotatable horizontally extending rod operatively connected to the diaphragm, an internally threaded coaxial sleeve telescoped over said rod and having one end thereof protruding from said housing, means connecting said arm with said sleeve, means at the protruding end of the sleeve for rotating the same for axially adjusting the sleeve on the rod, cooperating means on the rod and casing for indicating the distention of the diaphragm within the casing, and a pin telescoped into and threadedly engaged with said rod and having its outer end adjustably extensible into a readily visible registering position aligned with the outer end of the sleeve for indicating a predetermined relative axial adjustment of the sleeve and rod.

3. In a press roll assembly having a fixed press roll and a pivotal crank arm supporting a second press roll for movement relative to the fixed roll in accordance with the position of a pneumatically operable diaphragm, an exteriorly threaded diaphragm thrust rod for operative connection to the diaphragm, an internally threaded rotatable sleeve telescopically received by said thrust rod, means for connecting said sleeve to said crank arm to effect arm pivoted movement as said sleeve is moved axially, and an indicator element carried by said rod and adjustable axially thereof for radial alignment with a corresponding end of said sleeve to indicate an adjusted zero position of said rod relative to said sleeve.

4. In a press roll assembly including a pair of press rolls, one of which is carried by a crank arm for movement in accordance with a pneumatically

operable diaphragm, the improvements comprising an elongated diaphragm-mounted thrust rod having exterior threads, an internally bored threaded sleeve coaxial with and axially movable relative to said thrust rod, means connecting said sleeve to said crank arm, and an indicator rod carried by said thrust rod and axially adjustable relative thereto for extension beyond said rod and through the bore of said sleeve, said indicator rod being adjustable into a readily visible position radially aligned with the corresponding end of said sleeve to indicate the relative positions of said thrust rod and said sleeve when said one roll is in a desired adjusted zero position.

5. In a press roll assembly including a pivoted crank arm supporting a press roll and a pneumatically operated diaphragm and casing therefor, the improvements comprising a support for said arm including a housing for enclosing a depending portion of the arm and said diaphragm, an exteriorly threaded rod for operative connection to the diaphragm, an internally threaded sleeve telescoped over said rod and having one end thereof protruding from said housing, means for connecting said arm with said sleeve, and a pin telescoped into and threadedly engaged by said rod and having its outer free end extending into a coaxial and visible position at the protruding end of said sleeve for indicating a predetermined relative adjustment of said sleeve and said rod.

6. In a press roll assembly including a pivoted crank arm supporting a press roll and a pneumatically operated diaphragm and casing therefor, the improvements comprising a support for said arm including a housing enclosing a depending portion of the arm and said diaphragm, an exteriorly threaded rod operatively connected to the diaphragm, an internally bored and threaded sleeve coaxially telescoped over said rod and having one end thereof extending beyond said rod and projecting from said housing, means connecting said arm with said sleeve, a shoulder on said rod for cooperation with said casing to indicate the extent of distention of the diaphragm within the casing, and a pin telescoped into and threadedly engaged by said rod and having its outer end coaxial with the sleeve bore and adjustably extensible into a readily visible position aligned with the outer end of said sleeve bore for indicating a predetermined relative adjustment of said sleeve and said rod.

LLOYD HORNBOSTEL.

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