

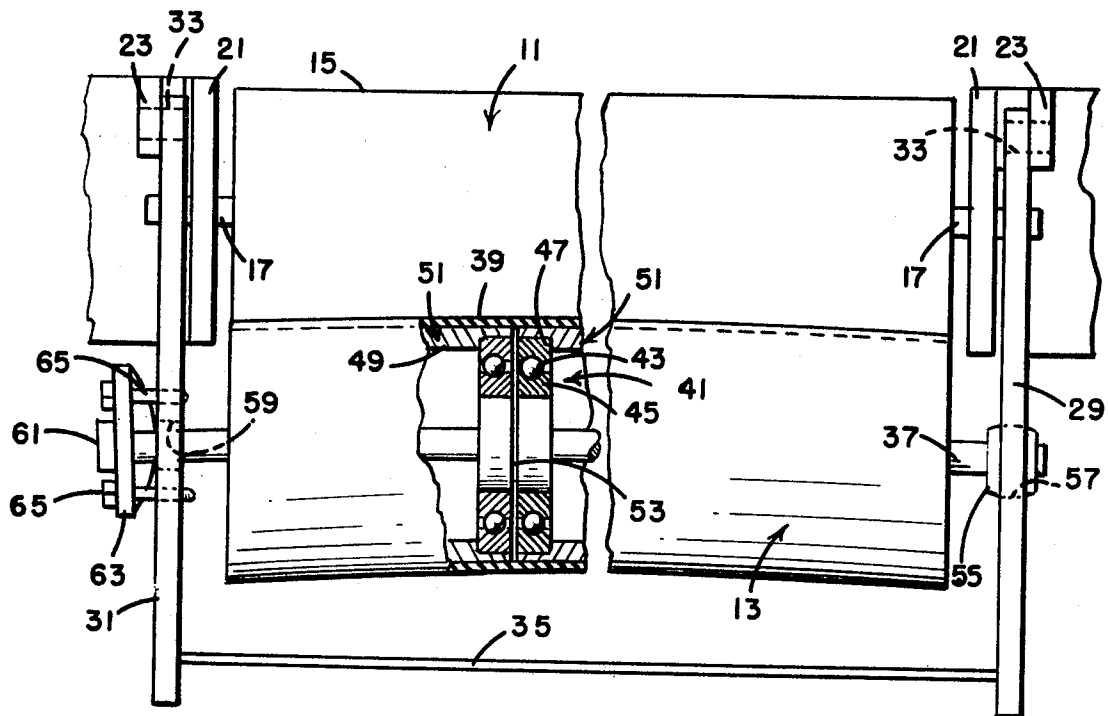
[72] Inventor **Henry J. McDermott**
Collingdale, Pa.
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[73] Assignee **FMC Corporation**
Philadelphia, Pa.
a corporation of Delaware

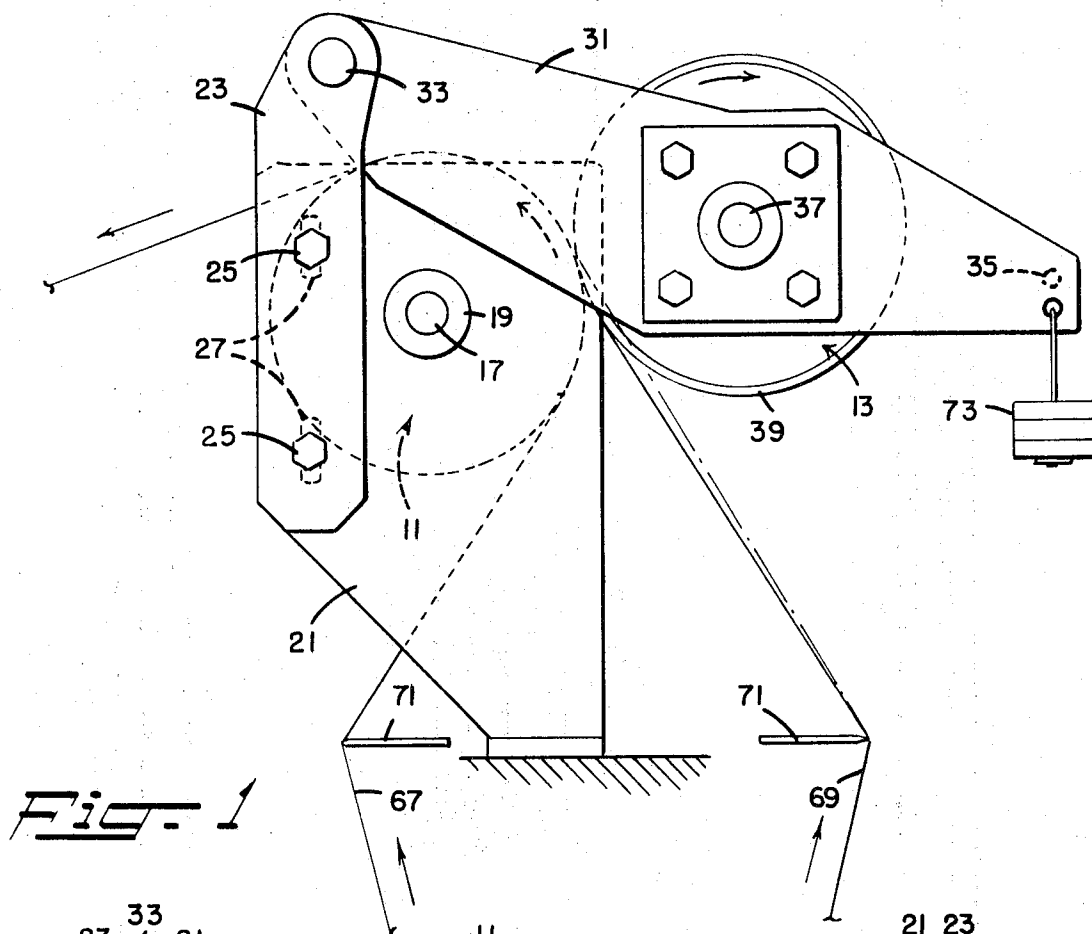
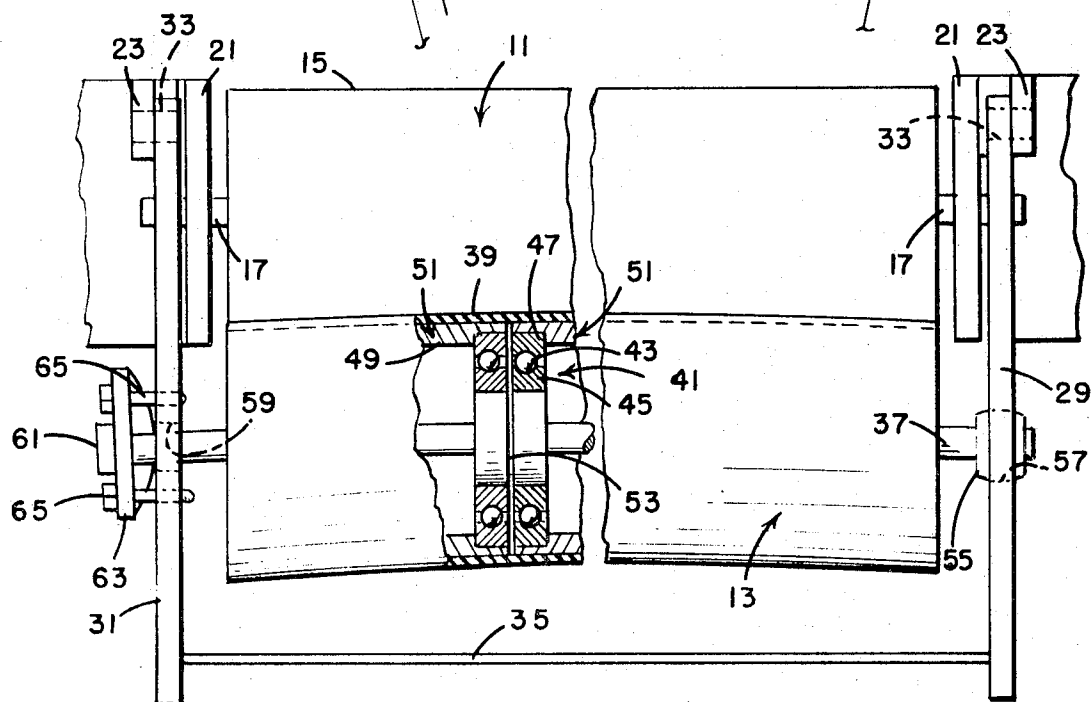
[56] **References Cited**
UNITED STATES PATENTS
3,094,771 6/1963 Robertson..... 29/116(AD)
3,191,263 6/1965 Kuehn..... 100/168X
Primary Examiner—Richard A. Schacher
Attorneys—Thomas R. O'Malley, Eugene G. Horsky and
George F. Mueller

[54] **NIP ROLL ASSEMBLY**
3 Claims, 2 Drawing Figs.

[52] **U.S. Cl.**..... **226/176,**
100/169; 226/186, 226/192
[51] **Int. Cl.**..... **B65h 17/20**
[50] **Field of Search**..... 100/160,
168, 169; 29/116AD; 226/176, 177, 180, 181,
186, 187, 192

ABSTRACT: A nip roll assembly including a guide roll and a longitudinally arcuate pressure roll which together provide a nip into and through which a web is adapted to travel, with the curvature of the arcuate pressure roll being adjustable to vary the degree of nipping provided by such rolls at selected locations longitudinally thereof.





NIP ROLL ASSEMBLY

The present invention relates to an improved nip roll assembly for use with travelling webs.

Conventional nip roll assemblies generally consist of a cylindrical pressure or squeeze roll which is disposed over and urged against a similar cylindrical web guide or supporting roll. One or both of such rolls may be positively driven, as when the assembly is employed in longitudinally advancing or stretching a web, or both rolls may be driven by the movement of an advancing web, as is normally the case when extracting liquids from a web.

A disadvantage of conventional nip roll assemblies is the difficulty in effecting a uniform grip or squeeze on a web across its entire width. This difficulty is believed to be due to the deflection which occurs along the center of the guide or supporting roll under its own weight and by the load applied by the pressure roll. Such roll deflection may perhaps be further aggravated by a hydraulic pressure which is exerted on the rolls of the assembly by a liquid contained on or within the web which is passing therebetween. Further, with a web, such as regenerated cellulose, which is usually thicker at its longitudinal edges than at its central area a desired gripping or squeezing of such web is not generally provided by the cylindrical rolls of conventional nip roll assemblies.

Some success in minimizing the above-noted disadvantage has been achieved by skewing the cylindrical rolls of conventional nip roll assemblies. The skewed rolls, however, may impart an undesired pattern into the surfaces of the web passing therebetween. More important, greater power is required for rotating the roll which is askewed from the other. Thus, if reliance is placed upon the movement of the web for driving one or both of the skewed nip rolls, the web itself is subjected to greater tensions which may stretch and perhaps tear the same. Accordingly, a primary object of this invention is to provide a generally new or improved and more satisfactory web nip roll assembly.

Another object is the provision of a nip roll assembly which can be readily adjusted for varying the degree of gripping or squeezing exerted at selected locations longitudinally thereof.

Still another object is to provide a nip roll assembly including a pair of rolls in which one roll can be readily adjusted to compensate for deflection which the other roll may experience along its center during operations.

A further object is to provide a web nip roll assembly which can be adjusted to accommodate webs which are thicker at their longitudinal edges than at their center areas.

In the drawing, FIG. 1 is a side view of the nip roll assembly of the present invention; and

FIG. 2 is a plan view of the assembly shown in FIG. 1.

The above and other objects of the invention are achieved by an apparatus which includes a web guide or supporting roll having a cylindrical surface and a longitudinal arcuate pressure or squeeze roll which are supported to together provide a nip into and through which a web is adapted to travel. The arcuate pressure roll includes a shaft which is adapted to be flexed into a desired curvature, an elastic sheath surrounding the shaft in spaced relationship therewith and which forms the working face of the pressure roll, and bearing means mounted on the shaft within the sheath for supporting such sheath for rotation relative to the shaft.

The guide roll is supported for rotation by suitable aligned bearings, while the support for the pressure roll includes means for moving the ends of its longitudinal shaft toward and away from each other so as to adjust the curvature of both the shaft and the elastic sheath supported thereon. In this manner, the degree of nipping or gripping provided by the guide and pressure rolls can be varied at selected locations longitudinally thereof.

Preferably, the pressure roll is carried between a pair of laterally spaced pivot arms which themselves are hinged at one end to the guide roll support so that the arcuate roll is urged toward the guide roll under the force of gravity. This arrangement also permits the arcuate roll to be moved away from the guide roll, as during web lacing, without disturbing the adjustment of such arcuate roll.

In the preferred arrangement, the shaft of the pressure roll is mounted on one of the pivot arms by a self-adjusting bearing, while its opposite end extends through and beyond the pivot arm which is adjacent thereto and carries a bearing. A wobble plate is positioned between this last mentioned bearing and the adjacent pivot arm and means, such as screws, are employed for adjusting the inclination of such plate relative to the adjacent pivot arm. Thus, by rocking the wobble plate in a desired direction relative to the adjacent pivot arm the curvature of the pressure roll shaft can be made more pronounced or can be reduced. The degree to which the pressure roll is curved will depend upon the amount of deflection which the web guide or supporting roll will experience during operation and also the difference in thickness between the longitudinal edges and central area of the web which is being nipped. It will be apparent that the curvature of the pressure roll of the nip roll assembly may be varied while a web is actually moving through such assembly without seriously interfering with the web travel.

The assembly of the present invention is applicable for use with one or more webs and in various operations where web nipping or gripping is desired or necessary. The apparatus of the present invention is hereafter described in detail as employed in squeezing a pair of advancing regenerated cellulose webs or films for extracting liquid therefrom.

With reference to the drawing, the apparatus of the present invention includes a web guide or supporting roll 11 and arcuate pressure or squeeze roll 13. The roll 11 has a cylindrical surface 15 and shafts 17 projecting from opposite ends thereof. Bearings 19, carried by fixed upright members 21, receive the roll shafts 17 and support the roll 11 for free rotary movement.

A hinge plate 23 is secured to each of the upright members 21 by bolts 25, onto which are threaded suitable nuts, not shown. The bolts 25 extend through elongated slots 27 in the upright members 21 so as to permit vertical adjustment of the hinge plates 23 relative to the members 21, for reasons as more fully described hereafter.

The arcuate pressure roll 13 is carried by the arms 29 and 31, both of which are pivotally mounted at one end onto pins 33 which are fixed to the upper ends of the hinge plates 23 and project toward each other. The free ends of pivot arms 29 and 31 are maintained in proper spaced relationship by a brace 35.

The arcuate pressure roll 13 is of the type as employed in lateral spreading of fabrics and includes a longitudinal shaft 37 which is adapted to be flexed into a desired curvature, an elastic sheath 39 and a series of bearings 41, each having balls 43 interposed between an inner race 45 and an outer race 47. The inner race 45 of each of the bearings 41 are fixed to the curved shaft 37, while the outer races of adjacent of such bearings 41 are pressed or otherwise secured into the ends of adjacent metal sleeves 49 so as to thereby provide a series of rollers 51. These segmented rollers 51 are spaced from each other a slight distance, as for example 1/16", by brass discs 53 so that the rollers 51 may rotate freely.

The elastic sheath 39 of the arcuate roll is preferably in the form of a tube made of soft rubber. This sheath 39 fits snugly over the rollers 51 so as to rotate therewith yet is capable of being expanded or stretched in a linear direction as the curvature of the shaft 37 is varied. The outermost surface of the elastic sheath 39 forms the working face of the arcuate pressure roll 13.

As shown in Figure 2, one end of the shaft 37 is fixed to a conventional self-adjusting bearing 55 which is in turn rotatably mounted within a suitable socket 57 formed in the pivot arm 29. The opposite end of this shaft 37 extends through and beyond an opening 59 in the arm 31 and carries a bearing 61. A wobble plate 63, having an arcuate rib on which it may be rocked, is positioned between the pivot arm 31 and the bearing 61. The plate 63 is adapted to be adjusted or rocked relative to the pivot arm 31 by a series of screws 65 which are threaded into the arm 31 itself. Adjustment of the screws 65 so as to rock and thus vary the inclination of the wobble plate 63 relative to the pivot arm 31 will cause the shaft 37 to be flexed into a desired curvature.

In FIG. 1 is illustrated the use of the above-described assembly in extracting liquids from advancing webs of regenerated cellulose webs 67 and 69. The webs may be drawn, for example from a liquid treating bath, in spaced-apart relationship during which time liquid is wiped from their opposing surfaces by blades 71. The pressure roll 13 may be elevated away from the roll 11, by pivoting the arms 29 and 31 about the pins 33, so that the webs 67 and 69 may be laced therebetween. The roll 13 is then permitted to move downwardly and rest upon the uppermost of the now overlapped webs.

The pressure roll sheath 39 may be then flexed to generally conform the same with the portion of the guide roll 11 to which it is opposed, and to accommodate the configuration of the webs 67 and 69. As heretofore described, this flexing of the pressure roll sheath 39 is achieved by adjustment of the screws 65 to vary the curvature of the pressure roll shaft 37.

The movement of the webs 67 and 69 into and through the nip provided by the rolls 11 and 13 serves to drive such rolls in the direction as indicated by arrows. With the sheath 39 of the arcuate pressure roll 13 being properly adjusted, the rolls 11 and 13 will exert a generally uniform squeezing action on the webs as they are advanced therebetween so that good liquid extraction from the webs is provided.

It will be noted that the roll 13 is urged toward the roll 11 under its own weight so that pressure is exerted upon the webs 67 and 69 during their passage through the nip. The location at which the webs are nipped and the pressure exerted on such webs can be varied by adjusting the hinge plates 23 vertically relative to the support members 21. The pressure applied by the arcuate pressure roll 13 may be supplemented by weights 73 suspended from the free ends of the pivot arms 29 and 31 or from the brace 35.

It is to be understood that changes and variations may be

made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A nip roll assembly including a guide roll having a cylindrical surface and an arcuate pressure roll which together provide a nip into and through which a web is adapted to travel, said pressure roll including a longitudinal shaft, an elastic cylindrical sheath surrounding said shaft in spaced relationship therewith and forming the working face of said pressure roll, and bearing means mounted on said shaft within said sheath for supporting said sheath for rotation relative to said shaft, means including aligned bearings supporting said guide roll for rotation, means supporting the ends of said shaft, and means for moving the ends of said shaft toward and away from each other for adjusting said shaft and the pressure roll sheath supported thereon to a desired curvature providing nipping between said guide and arcuate pressure rolls substantially across the entire length of said pressure roll.

2. An assembly as defined in claim 1 wherein said means for supporting said guide roll includes a pair of laterally spaced, vertical members and wherein said means for supporting the ends of said shaft includes a pair of pivot arms between and through which said shaft extends and means hinging each of said arms at one end thereof to said vertical members so that the arcuate pressure roll is urged toward the guide roll under the force of gravity.

3. An assembly as defined in claim 2 wherein said means for adjusting the curvature of the pressure roll shaft and elastic sheath includes a self-adjusting bearing mounting one end of said shaft to an adjacent pivot arm, a bearing on the other end of said shaft located outwardly of the pivot arm adjacent thereto, and means for moving said last-mentioned bearing toward and away from the pivot arm which is adjacent thereto.

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