

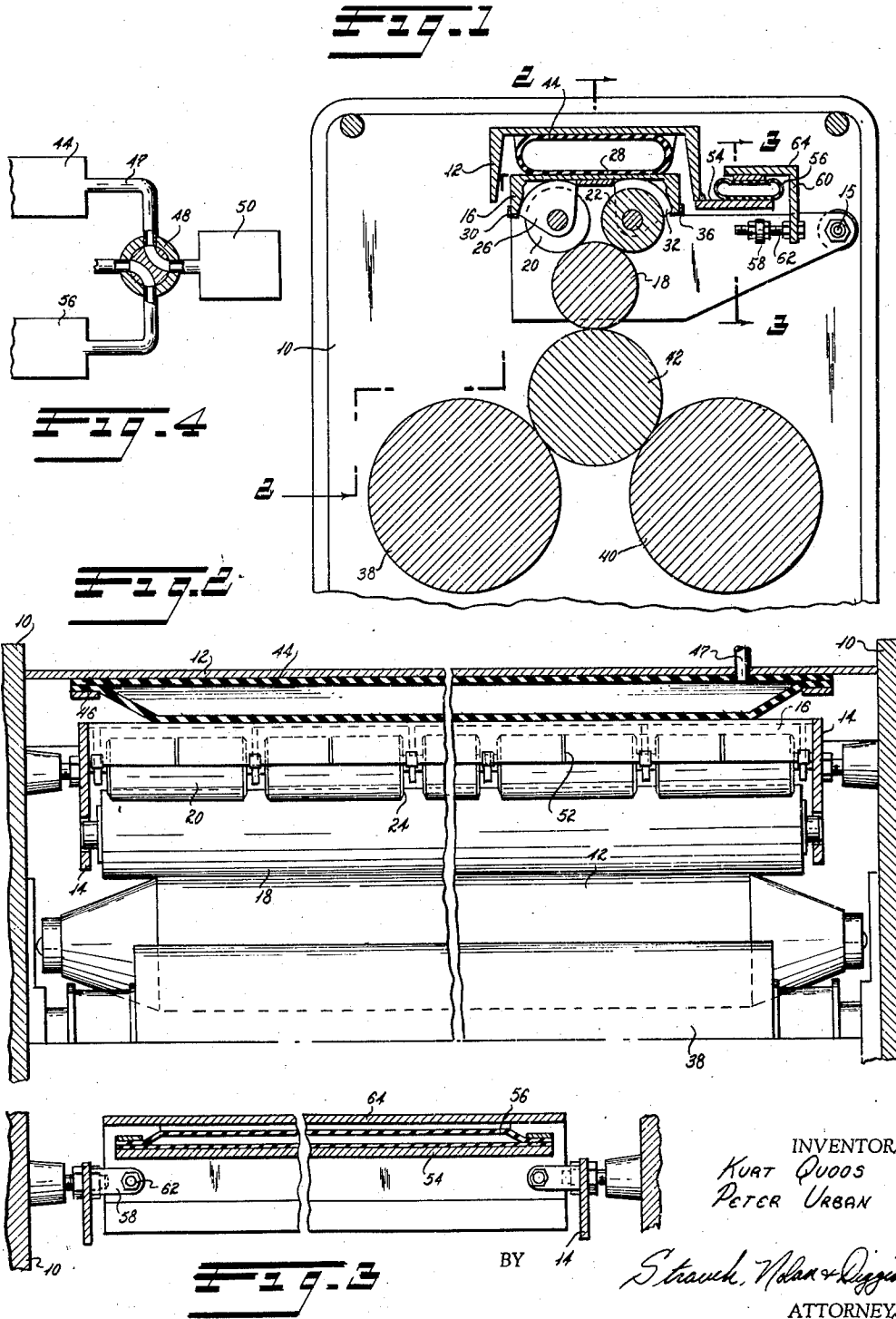
Sept. 16, 1958

K. QUOOS ET AL
SQUEEZE ROLL APPARATUS

2,851,869

Filed Jan. 17, 1955

2 Sheets-Sheet 1



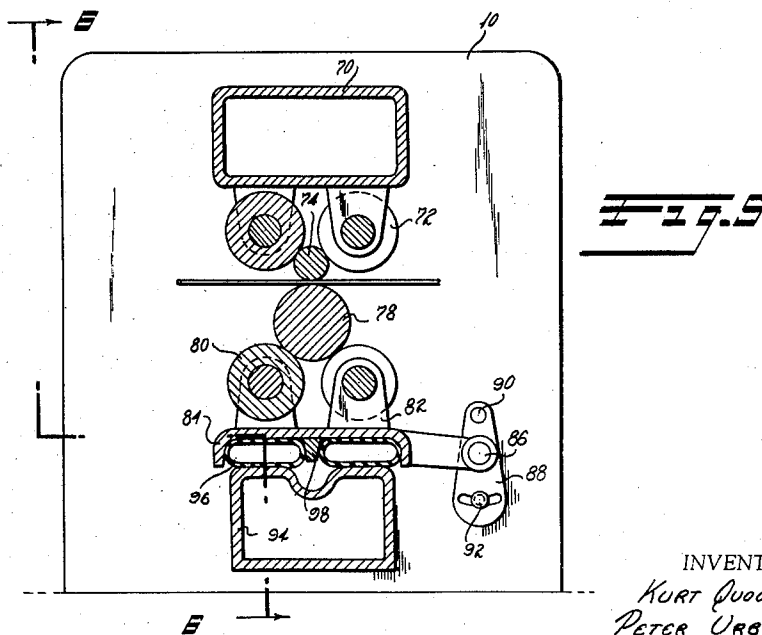
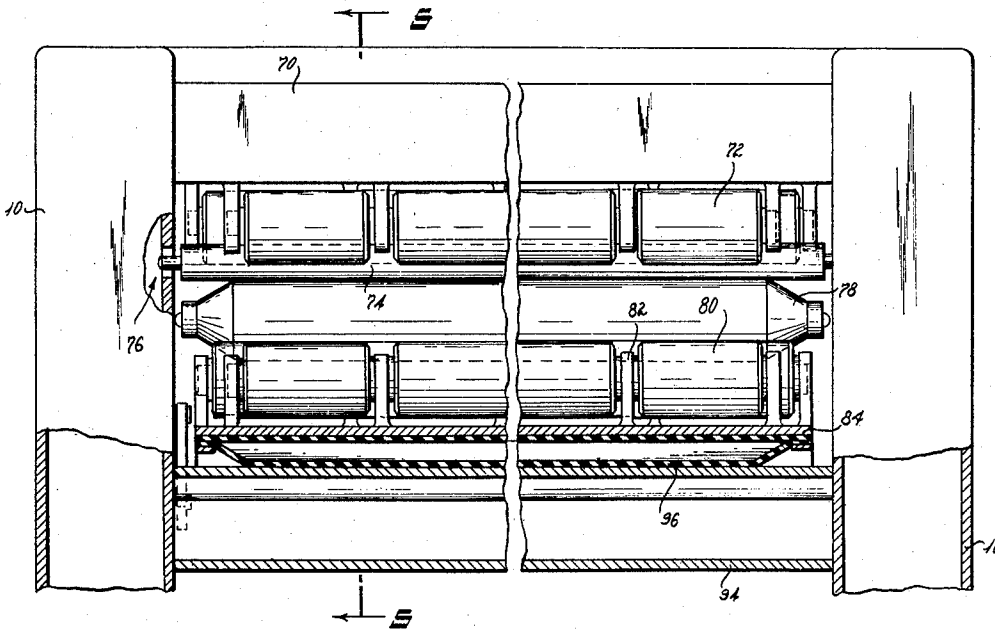
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SQUEEZE ROLL APPARATUS

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Application January 17, 1955, Serial No. 482,279

10 Claims. (Cl. 68—258)

The present invention relates to apparatus for actuating squeeze rolls and more particularly to apparatus for applying and removing pressure from squeeze rolls such as those used in the textile, paper and other industries.

This application is a continuation-in-part of application Serial No. 341,132 filed March 9, 1953, and now abandoned, entitled Apparatus for Squeezing Moisture From Textile Fabrics.

This invention is applicable to squeeze rolls generally such as the squeeze rolls used in the textile, paper and other industries for removing liquids from webs and for pressing dyes, pigments or other materials into webs. However, for simplicity, the invention will be described with primary reference to its use for removing liquids from textile webs but it is to be understood that the invention is not limited to any particular use or application.

In the production and finishing of textiles, there are many treatments such as washing, bleaching, dyeing and the like which involve saturating the textile with a liquid and then removing the liquid by passing the textile web between a pair of squeeze rolls. In order to remove most of the liquid from the web it is necessary to employ high specific pressures between the squeeze rolls and, when the web is wide, the high specific pressures are difficult to obtain because when the squeeze rolls are of sufficient diameter to withstand deflection at the pressures employed, they do not make line contact with each other but rather make contact over an area. This area contact reduces the specific pressure on the web.

Further, it often happens that a textile web will have seams or folds and, when this occurs, the entire pressure of the squeeze rolls bears against the seam or fold and bruises or crushes the textile fibers while the remainder of the web passing between the squeeze rolls does not receive the proper squeezing pressure. The thicker and heavier the material is and the greater the width of the web the greater become the difficulties in providing a satisfactory squeeze roll system.

The present invention relates to an improved means for applying pressure over the entire length of such a small squeeze roll while permitting local movement or deflection of the squeeze roll when a fold or seam or the like passes between the squeeze rolls. One of the principal objects of the invention therefore is to provide improved apparatus for applying pressure to squeeze rolls.

Another object is to provide a squeeze roll assembly in which inequalities of web thickness are compensated.

Another object is to provide improved apparatus for separating squeeze rolls.

Another object is to provide a squeeze roll assembly in which squeezing pressure is applied along the length of the roll.

These and other objects and advantages reside in novel features of construction arrangement and combination of parts as will hereinafter be more fully set forth and pointed out in the appended claims.

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Referring to the drawing.

Figure 1 is a fragmentary vertical section of a squeeze roll assembly embodying the present invention.

Figure 2 is a section taken on line 2—2 of Figure 1.

Figure 3 is a section taken on line 3—3 of Figure 1.

Figure 4 is a diagrammatic view of a control system for the apparatus of Figures 1 to 3.

Figure 5 is a vertical section of a modified form of apparatus embodying the present invention.

Figure 6 is a front elevation of the apparatus shown in Figure 5 with parts broken away to show internal structure.

In the drawing, the invention is illustrated as applied to a particular squeeze roll apparatus, but it is to be understood that the invention may be applied to various forms and types of squeeze roll apparatus.

The apparatus illustrated in Figures 1 to 4 comprises spaced upright supports 10 rigidly connected by a cross frame 12. The upper squeeze roll assembly is carried by side frames 14 which are pivotally connected at 15 to the uprights 10 at one side of the cross frame 12. A channel 16 is rigidly connected to the side frames 14 and extends across the apparatus between the uprights 10 in vertical alignment with the cross frame 12.

The upper squeeze roll assembly includes an upper squeeze roll 18 which is normally of steel or other hard material and which is loosely rotatable in the side frames 14. Preferably, the upper squeeze roll 18 has a relatively small diameter (150 mm. or less) so as to provide high specific pressure on a web. To prevent deflection of the upper squeeze roll under pressure, a plurality of short front back-up rolls 20 and a plurality of short rear back-up rolls 22 are spaced along the length of the upper squeeze roll. The back-up rolls 20 and 22 are normally formed of relatively soft material such as rubber and each end of each back-up roll is preferably tapered as indicated at 24.

Each front back-up roll 20 is rotatably journaled in a pair of flat, segment shaped members 26. The channel 16 is provided with a longitudinal shoulder 28 for receiving one flat face of the segment shaped members 26 and a strip 30 is secured along the front edge of the channel 16 and engages the other flat face of the segment shaped members 26 to fasten the members 26 and the front back-up rolls 20 to the channel 16. Similar segment shaped members 32 carry the rear back-up rolls 22 and are secured in the channel 16 between the shoulder 28 and a strip 36. Due to the segmental shape of the members 26 and 32, both vertical and transverse deflection of the upper squeeze roll 18 is prevented. The front and rear back-up rolls are preferably out of alignment so that the spaces between adjacent front back-up rolls 20 are not in alignment with the spaces between adjacent rear back-up rolls 22.

The bottom squeeze roll assembly comprises two parallel back-up rolls 38 and 40 which are rotatably journaled in the uprights 10. The lower back-up rolls 38 and 40 are usually of hard strong material such as steel, ebonite or the like and the lower squeeze roll 42 is normally soft and can be formed of soft, yielding material such as rubber. Normally the lower squeeze roll 42 is also of relatively small diameter and deflection is prevented by the lower back-up rolls 38 and 40.

The invention is not limited to any specific form of soft roll and known types such as rubber or rubber coated steel soft rolls may be used. However, the maximum benefits of the invention are obtained when the soft roll has a soft resilient surface which will not crush or bruise the textile fibers and a hard, dense body which will not become distorted under the pressure of the hard roll.

A preferred form of soft roll is composed of a number of disks arranged side by side on a metal core and com-

pressed under axial pressure. The individual disks are formed of fibrous fleece impregnated with latex. The fleece consists of fine vegetable fibers including cotton, ramie and sisal-hemp or synthetic fibers including polyamides and super polyamides or a mixture of vegetable and synthetic fibers. The compressed disks may be covered with a coating such as a thin adherent film of material, especially material from the super-polyamide group. Such a roll has a surface so soft that it enters the meshes of the textile to extract moisture. The body of the roll has a hardness above 92° Shore.

In order to apply squeezing pressure, an inflatable tube 44 is located between the cross frame 12 and the channel 16 and extends substantially the entire length of the upper squeeze roll 18. This tube 44 may be formed of any suitable material having the necessary strength and flexibility. A heavy rubber tube reinforced with cord has been found satisfactory.

The tube 44 is sealed at its opposite ends by clamps 46 and is connected intermediate its ends through a pipe 47 and a suitable valve 48 to a source of high pressure air or gas 50. When at rest, the tube 44 is normally flat and when the valve 48 is actuated to introduce the air, the tube 44 tends to assume a cylindrical form and exerts an even pressure over substantially the entire length of the upper squeeze roll 18.

The long inflatable tube 44 provides protection for both the apparatus and the web in the event that there is a local inequality of thickness in the web such as that due to a seam or fold or the like. Because of the large volume of air in the tube 44, it has more resilience and elasticity than a plurality of small air cylinders spaced along the length of the roll 18. Also, because of the length of the tube 44, the upper squeeze roll assembly can tilt longitudinally under excessive local pressure due to a seam or the like in the material being squeezed.

In order to increase the ability of the upper squeeze roll 18 to yield to local inequalities of pressure throughout its length, slots 52 are cut in the sides of the channel 16 so that the channel itself may more readily flex under excessive or unequal stress. These slots 52 are normally located near the center of each upper back-up roll.

In order to lift the upper squeeze roll assembly away from the lower squeeze roll assembly, the cross frame 12 is provided with a shelf or bracket 54 which carries a second inflatable tube 56. Each side frame 14 has a projecting lug 58 to which an angle section 60 is rigidly secured by bolts 62. One arm 64 of the angle section 60 rests on top of the inflatable tube 56 so that when the tube is inflated, the upper squeeze roll assembly is raised. The inflatable tube 56 may be made of the same material as the inflatable tube 44 but may be smaller since it has only to lift the weight of the upper squeeze roll assembly and does not have to exert squeezing pressure. The two tubes may be connected to the high pressure air by a single valve as indicated at 48 or may be controlled by separate valves but it is important that the controls be designed so that it is impossible to introduce high pressure air to both tubes simultaneously.

A modified form of apparatus embodying the present invention is shown in Figures 5 and 6.

In that embodiment the upper squeeze roll assembly is fixed and consists of a beam or channel 70 rigidly secured between the uprights 10. A plurality of short back-up rolls 72 are rotatably mounted on the beam and the upper squeeze roll 74 is loosely rotatably mounted in the uprights 10 as indicated at 76.

The lower squeeze roll 78 is supported on back-up rolls 80 carried by a bracket 82 on the support plate 84 which is pivotally connected at each end at 86 on an arm 88 which is, in turn, pivotally secured at 90 to upright 10 and which may be locked in adjusted position by a screw or bolts 92. By adjustment of the arm 88 the lower squeeze roll 78 may be positioned exactly with respect to the upper squeeze roll.

A cross beam or support 94 is rigidly secured at its ends to the uprights 10 and the support plate 84 is mounted upon one or more inflatable tubes 96 which extend substantially the entire length of the support plate 84. In the embodiment shown in the drawing, the support plate 84 has a downwardly projecting rib 98 and two inflatable tubes 96 are positioned one on each side of the rib 98. When two tubes 96 are used they are inflated simultaneously but it is to be understood that a single inflatable tube could be used.

In squeezing apparatus of this type, it is common practice to form one of the squeeze rolls of hard material such as steel and to form the other squeeze roll of soft material. Either the upper or the lower squeeze roll may be the soft roll but I prefer to use the soft roll as the lower squeeze roll. The back-up rolls which engage the squeeze roll may be either short rolls as illustrated in Figure 5 or may be long continuous rolls of hard material such as steel, ebonite or the like as illustrated in Figure 2. Either of the squeeze rolls may be driven either directly or through the back-up rolls.

When short squeeze back-up rolls are used as illustrated in Figure 5 the back-up rolls on one side of the squeeze roll should be staggered with respect to the back-up rolls on the other side of the squeeze roll and the spaces between successive back-up rolls should not be in alignment. Staggering the short back-up rolls in this manner prevents unequal wear and scoring of the squeeze rolls especially the soft rolls.

One of the advantages of the modification shown in Figures 5 and 6 is that no separate operating means is necessary to separate the squeeze rolls for threading a web between them. When the pressure is relieved in the inflatable bodies 96, the lower squeeze roll assembly drops away from the upper squeeze roll assembly by gravity leaving sufficient room for threading a web between the squeeze rolls.

From the foregoing it will be apparent that we have been able to accomplish the objects of our invention and provide an improved apparatus for applying pressure to squeeze rolls in which high uniform pressures may be applied throughout the length of the squeeze roll regardless of any inequalities of thickness of the web passing between the squeeze rolls.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. Apparatus for squeezing web materials comprising a pair of spaced uprights, a cross frame rigidly secured at its ends to said uprights and extending therebetween, a lower squeeze roll rotatably carried by said uprights beneath and substantially parallel to said cross frame, a movable frame extending between said uprights and disposed between said cross frame and said lower squeeze roll, arms rigidly secured to each end of said movable frame, means pivotally securing said arms to said uprights on an axis spaced from the axis vertical plane of said lower squeeze roll, an upper squeeze roll rotatably mounted in said arms adjacent said lower squeeze roll, a plurality of rolls carried by said movable frame engaging opposite sides of the crown of said upper squeeze roll at spaced points throughout its length, and means between the cross frame and the movable frame for applying pressure to said movable frame over substantially the entire length of the upper squeeze rolls.

2. Apparatus defined in claim 1 in which the means for applying pressure includes an inflatable flexible tube

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positioned between said cross frame and said movable frame, and means for inflating said tube.

3. Apparatus as defined in claim 2 including a second inflatable flexible tube carried by said cross frame, a bracket secured to said arms and extending over the second inflatable tube and means for inflating the second inflatable tube to raise said pivoted arms.

4. Apparatus as defined in claim 3 including a source of fluid pressure, and means for selectively connecting said source to the first mentioned inflatable tube, or to the second inflatable tube.

5. Apparatus as defined in claim 2 in which the movable frame is longitudinally flexible.

6. Apparatus as defined in claim 2 in which the movable frame comprises a channel shaped member provided with slots formed in its sides.

7. In a squeeze roll apparatus, a frame containing a pair of parallel squeeze rolls whose axes lie one above the other and means for moving one squeeze roll into squeezing engagement with the other, said means comprising a support fixed with respect to said frame, a movable support flexible throughout its length, back-up roll means carried by said movable support for engaging said one squeeze roll on opposite sides of the crown throughout substantially the length of said one squeeze roll, and an inflatable tube positioned between said fixed support and said movable support and engaging said fixed and said movable supports, said tube extending substantially the entire length of said one squeeze roll, and means for inflating said tube.

8. Apparatus for squeezing web materials between a pair of squeeze rolls comprising a frame, a support fixed with respect to said frame, a support movable with respect to said frame and carrying a first rotatable squeeze roll, back-up roll means carried by said movable support

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for engaging said first squeeze roll on opposite sides of the crown throughout substantially the length of said first squeeze roll, a second squeeze roll rotatably carried by said frame, said first and second squeeze roll having axes lying one above the other, and an inflatable tube positioned between said fixed support and said movable support and engaging said fixed and said movable supports, said tube extending substantially the entire length of said one squeeze roll, and means for inflating said tube to move said first squeeze roll into squeezing engagement with said second squeeze roll.

9. Apparatus as defined in claim 8 in which the movable support and first squeeze roll are beneath the second squeeze roll, the fixed support is beneath the movable support and the inflatable tube is between the fixed support and movable support, whereby inflation of said tube raises the first squeeze roll into squeezing engagement with the second squeeze roll.

10. Apparatus as defined in claim 9 in which the movable support has a central, longitudinal depending rib, said inflatable tube being positioned on one side of said rib, a second inflatable tube positioned on the other side of said tube, and means for inflating both tubes.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,851,869

September 16, 1958

Kurt Quoos et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 65, for "axis", second occurrence, read -- axial --.

Signed and sealed this 3rd day of February 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents