Nov. 14, 1967 W. LITHGO ETAL 3,352,747

APPARATUS FOR REPLACING AN ENDLESS BELT IN A PAPERMAKING ROLLER PRESS ASSEMBLY

Filed April 23, 1964 5 Sheets-Sheet 1

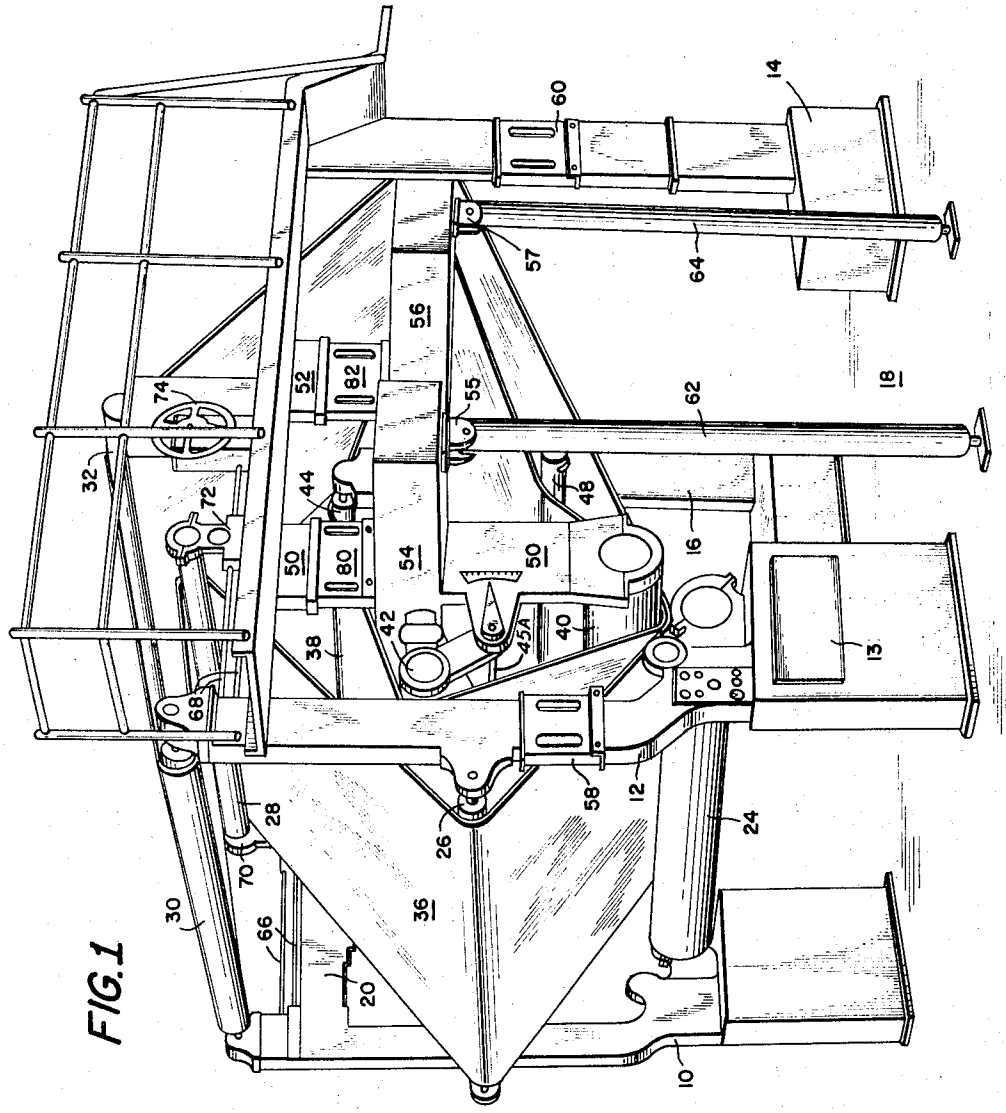


FIG. 1

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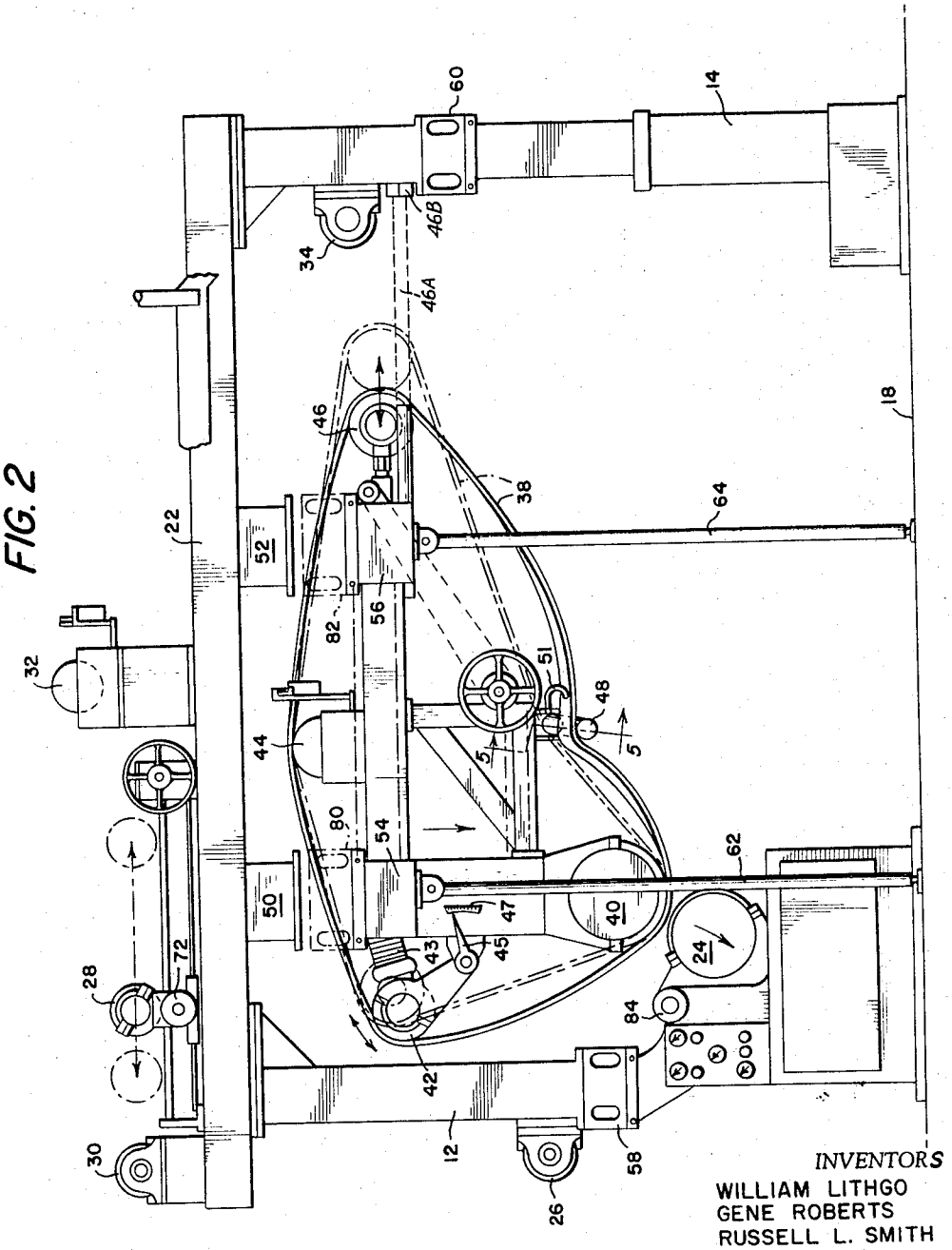
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FIG. 2



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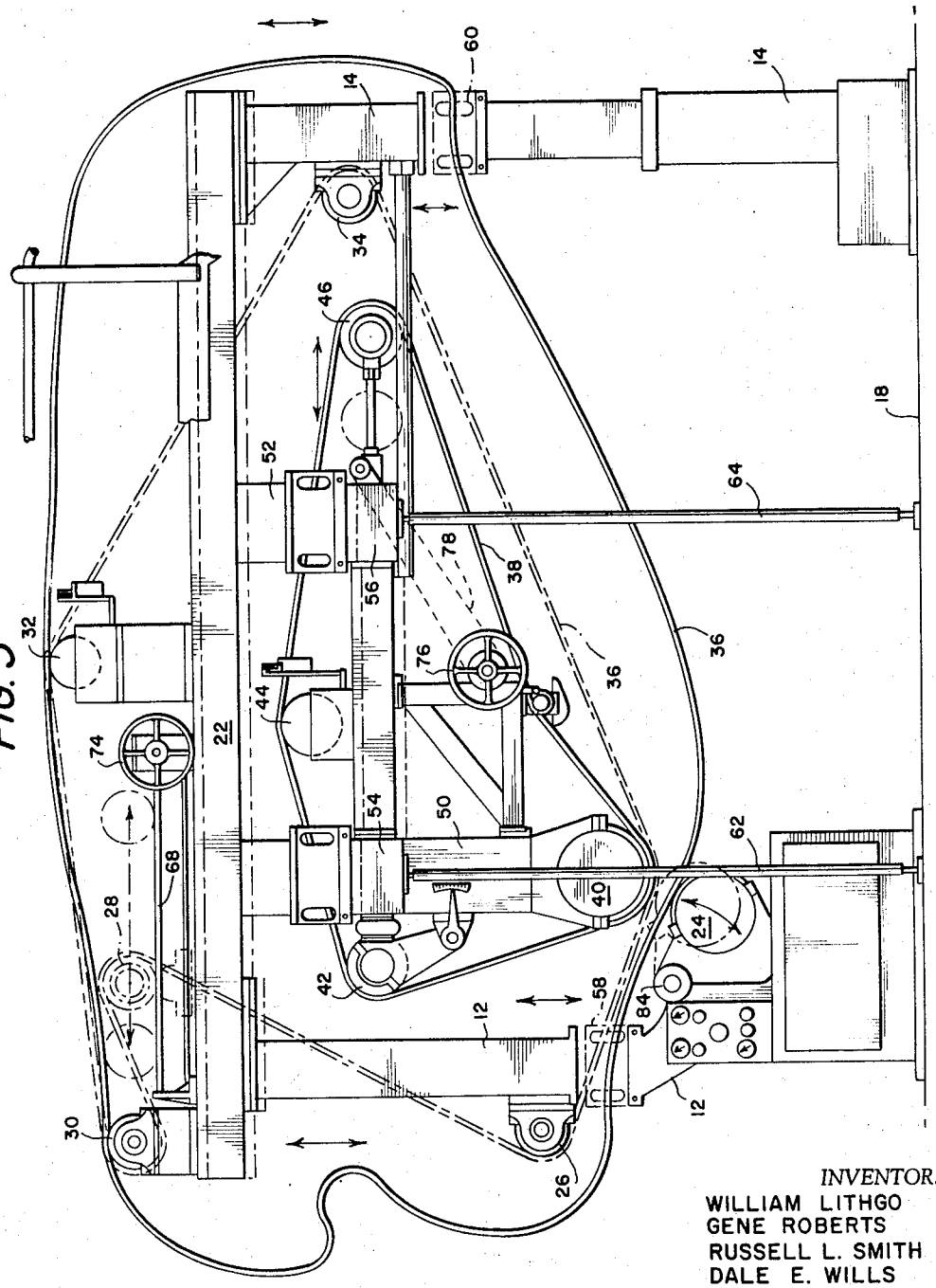
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APPARATUS FOR REPLACING AN ENDLESS BELT IN A PAPERMAKING ROLLER PRESS ASSEMBLY

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FIG. 3



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APPARATUS FOR REPLACING AN ENDLESS BELT IN A PAPERMAKING ROLLER PRESS ASSEMBLY

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FIG. 5

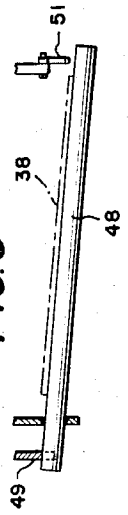


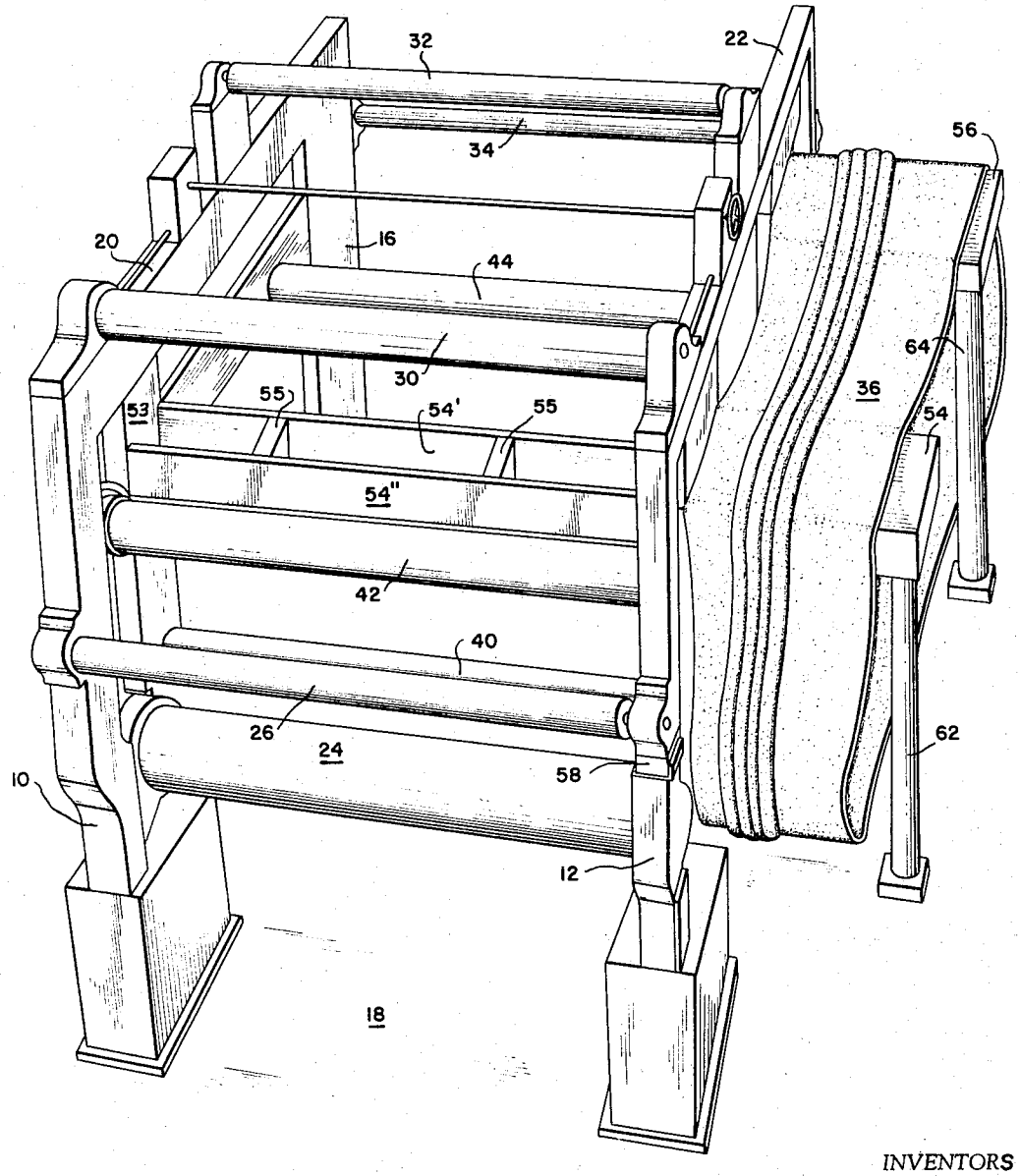
FIG. 4

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FIG. 6



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3,352,747

APPARATUS FOR REPLACING AN ENDLESS BELT IN A PAPERMAKING ROLLER PRESS ASSEMBLY

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Filed Apr. 23, 1964, Ser. No. 361,942
12 Claims. (Cl. 162—274)

The present invention relates to a super-structure or framework for supporting a plurality of rollers and an endless belt about such rollers, which super-structure permits the easy change of such endless belt without removal of such rollers, and the method for making such a change, and, more particularly, the invention relates to such method and apparatus in a papermaking roller press assembly for drying paper wherein the endless belt is a paper drying felt, a screen fabric, or both.

Prior to the present invention, the changing of a paper drying felt or fabric has been a major factor in producing excessive shut-down time in the manufacture of paper. The press section of a papermaking machine involves a plurality of presses, each of which has a number of massive rolls about which a paper-drying, endless felt passes. More recently, a device has been introduced for utilizing a fabric screen along with the paper drying felt (note Patent No. 3,093,535). When a felt or fabric screen wears out, and such felts commonly wear out often, it has previously been necessary to shut down operations for several hours in order to change such felts or fabrics. This has been conventionally carried out by moving in a crane, separating each massive roller at one end from its bearing housing, and one-at-a-time lifting the massive rollers with the crane while the endless felt or fabric is slid over that particular roller.

Not only is such a procedure extremely time consuming and therefore expensive each time it has to be performed, but such operation is necessary often due to the multiplicity of felts used in a single line and the short life of each felt. All previous attempts to solve this excessively time consuming and expensive operation have dealt with applying a felt having two ends (rather than an endless felt) and then subsequently (after it has been placed on the rollers) joining the two ends of the felt to make it endless; this procedure is entirely unsatisfactory because of its deleterious effect on the paper being dried, i.e. at the area where the two ends of felt are joined, marks are produced on the paper which render the paper unsatisfactory for commercial use.

It is therefore an object of the present invention to eliminate the difficulties presented in the prior art, such as those indicated above.

It is another object of the present invention to quickly, simply, and inexpensively change an endless belt on a plurality of rollers.

It is another object of the present invention to provide a method and apparatus for replacing an endless belt and/or fabric in a papermaking press, which method is quick and simple to execute and which apparatus is simple and inexpensive, yet effective.

These and other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view schematically illustrating one stage of a paper drying press assembly utilizing an embodiment of the present invention;

FIG. 2 is a front elevation of the device in FIG. 1 showing different steps of applying a fabric screen to the rollers;

FIG. 3 is a front elevation of the same embodiment as shown in FIGS. 1 and 2 showing different steps of the application of a paper drying felt in accordance with the present invention;

FIG. 4 is a front elevation of another embodiment showing in addition to the apparatus of FIG. 1, a second stage press assembly in which the felt is being changed;

FIG. 5 is a detailed view of one part of the apparatus of FIG. 1; and

FIG. 6 is a perspective view of the apparatus of FIG. 1 with parts removed during the application of a felt or fabric.

One stage of a roller press felt drying assembly is shown generally in FIG. 1. In this embodiment, the device comprises four vertical pillars **10**, **12**, **14** and **16** which rest upon some foundation such as a horizontal floor means **18** which may be either a factory floor or the ground. Between the vertical pillars **10–16** are provided two horizontal beams **20** and **22** which join pillars **10** and **16**, and **12** and **14**, respectively. These pillars and beams serve to support a first series of rollers **24**, **26**, **28**, **30**, **32**, and **34**. Passing in contact with each of these rollers and around all but roll **24** is an endless and continuous drying felt **36** such as is well known in the art.

In the preferred embodiment of the present invention, the drying felt **36** has, passing inside, a continuous and endless fabric screen **38** passing around and in contact with a second series of rollers **40**, **42**, **44** and **46** and a fabric spreader **48**. The felt **36** and the fabric screen **38** come in contact at the nip between rolls **24** and **40**; thus the felt **36** also passes around the roller **40** which is a roll common to both series of rollers. In a conventional paper machine press section, the wet paper web passes through a series of roller nips (more commonly referred to as presses or press positions) for the purpose of pressing water from the web. The framework presented in the present invention may be utilized in any of these press positions; typical of these is the nip between roller **24** and roller **40**.

As is conventional, the pressing rollers **24** and **40** are pneumatically loaded. At the bottom of pillars **10** and **12** are located the load producing air units which supply pressure to the nip into which the fabric, felt and paper web enter for water removal. A cover plate **13** is provided near the base of the pillar **12** for access to the air unit.

Depending from the horizontal beams **20** and **22** are vertical beams, such as beams **50** and **52** which extend from horizontal beam **22** and beam **53** which extends from horizontal beam **20**. Extending through the vertical beam **50** essentially parallel to the rollers and preferably extending to the back beam **53** corresponding to vertical beams **50** is a second horizontal beam **54** which extends outward from the plane formed by the vertical pillars **12** and **14**. Similarly extending through the vertical beam **52** is another second horizontal beam **56**, also extending out of the plane formed by the vertical pillars **12** and **14**. It is an important feature of the present invention (in the preferred embodiment) that the horizontal beams **54** and **56** lie within the annuloids or their projections formed by both the felt **36** and the fabric **38**.

If desired, the beam **54** and/or beam **56** may extend entirely through the press structure to provide additional support. Since the beam **54** is directly above press roller **40**, such beam must have an open design through which a crane may act. The compactness of the overall superstructure design in many cases necessitates the open cross-beam design exemplified by beam **54** in FIG. 6 to permit lowering a chain fall or hoist down to the press framework to be able to handle the heavy press rolls when desired. The framing is designed to provide a roll-out device for removing the rolls from the press; however, the

top press roll must be lowered onto the roll-out carriage. Thus, the beam **54** comprises two separate portions **54'** and **54''** in its center, which portions are connected by struts **55**.

A critical aspect of the present invention is the inclusion in the normally supporting superstructure of removable sections. In the preferred embodiment in FIG. 1, such removable sections **58** and **60** are located in the vertical pillars **12** and **14** in a position between the floor **18** and the series of rollers about which the felt must pass.

Another important and critical aspect of the present invention is the utilization of temporary supporting means, such as hydraulic jacks, or other removable supports. In the embodiment of FIG. 1 such temporary supports **62** and **64** extend between the floor **18** and the bottoms of the extensions of the horizontal beams **54** and **56**, respectively. Such temporary supports **62** and **64** may be hinged at **55** and **57** to beams **54** and **56**, respectively, as shown in FIGS. 1 and 2, or they may be entirely separable therefrom as shown in FIG. 3.

During use of the drying press, the felt **36** and fabric **38** have a tendency to first stretch and then to eventually become worn out and useless. With regard to the felt **36**, the roll **28** is provided as a stretch roll. Thus, as the felt stretches, the roll **28** is moved to the right (note FIG. 3) as shown by the arrow to accommodate for the stretch in the felt. In order to provide such lateral movement of the roll **28** above the horizontal beams **20** and **22**, the stretch roll **28** is provided on tracks **66** and **68**. The supporting brackets or journal housings **70** and **72** ride along the tracks **66** and **68**, respectively, and are controlled by a wheel **74** which operates through a suitable and conventional linkage to move the brackets **70** and **72**. Such a suitable linkage may comprise a screw thread associated with one of the tracks **66** or **68** which is turned by the wheel **74**.

In a similar manner the roller **46** is a stretch roller for the fabric **38**. The position of the stretch roller **46** is controlled by a hand wheel **76** which may operate through a chain **78**. A stabilizing bar **46A** is provided between the vertical pillar **14** and the second horizontal beam **56** to help support the stretch roller **46**. The stabilizing bar **46A** is threadedly attached to the pillar **14** via a nut **46B**. As shown in FIG. 2, the stabilizing bar, when released from pillar **14**, may be telescoped towards the horizontal beam **56**. The stretch roller **46** is, in addition, provided with a squaring adjustment (not shown) in its mounting mechanism to provide a mechanical takeup for imperfections resulting in a differenece in the total length of the fabric **38** on its front side relative to its back side.

In addition to the large degree of control provided by the stretch roller **46**, the fabric **38** is also provided with a fine control automatic tension unit associated with the stretch roller **42**. The stretch roller **42** is controlled automatically by such a tension sensing element to maintain the fabric **38** at a constant tension and is moved outwardly, independent at each end, to compensate for stretch in the fabric by spring means, or hydraulic or pneumatic air-diaphragm means **43**. Independent loading at each end of the roller **46** is necessary to compensate for irregularities in the uniformity of the fabric **38**. Stability is maintained between the independent units by a cross-shaft **45A** which acts as a torsion bar. When this fine control tension unit is expanded to its maximum, it will be indicated by the pointer **45** moving to the end of the scale **47** and then a manual change will have to be made with stretch roller **46**, to bring the pointer and tension roll back to proper tension. The auto tension unit is most important to maintain wrinkle-free fabric operation. The mechanical stretch roll **46** is in proper position when the automatic tension roll indicator **45** is in the center position on the pointer scale **47**.

The major feature of the supporting structure shown and described herein, is the simple and efficient changing of the felt **36** and/or the fabric **38** when they become worn out and must be discarded. In the embodiment of FIG. 1, the structure necessary to accomplish such an end are: the vertical pillars **12** and **14** which have removable sections **58** and **60**, respectively; the extensions of the horizontal beams **54** and **56**, which extend beyond the plane through the pillars **12** and **14** and upon which extensions the fabric and felt must be temporaritly draped (e.g., note FIG. 6); and the temporary supporting members **62** and **64** with which to temporarily support the entire structure while the removable sections **58** and **60** are removed from the pillars **12** and **14**, respectively.

FIGS. 1 and 4 show the felt **36** and the fabric **38** in the press assembly ready for operation. FIG. 2 shows the installation of the fabric **38** and FIGS. 3 and 6 show the installation of the felt **36**.

Just as the removable sections **58** and **60** in the pillars **12** and **14**, respectively, are necessary to quickly and easily change the felt **36**, so are removable sections **80** and **82** in vertical beams **50** and **52**, respectively, necessary to change the fabric **38**. Similarly these removable sections **80** and **82** must also be located between the fabric rolls and the support element or foundation for the vertical beams **50** and **52**, in this case the horizontal beam **22**.

Noting principally FIG. 2, the installation of the fabric **38** is accomplished as follows: the pressing roll **24**, which is hingedly mounted about a pivot **84**, is lowered to that a gap exists between it and its mating pressure roll **40**. The fabric stretch roller **46** and the stabilizing bar **46A** are retracted from the right (shown in phantom) to the positions at the left so there is sufficient slack and a gap between the pillar **14** and the roller **46** through which to install the fabric **38**. The endless fabric **38** is then draped over the extension of beams **54** and **56** in exactly the same manner as felt **36** is draped over the same beam extensions in FIG. 6. The temporary support elements **62** and **64** are then positioned underneath the horizontal beams **54** and **56** but at a position beyond the draped fabric **38**, so that at this point of the operation the draped fabric lies between the temporary support element **62–64** and the plane through the pillars **50–52**, similar to that shown in FIG. 6. The bolts in the removable blocks **80** and **82** are then removed and the temporary supports **62** and **64** are then adjusted downwardly a sufficient amount to remove the blocks **80** and **82** (this is greatly exaggerated in FIG. 2 in which the original position is shown in phantom). This provides a gap between the upper sections of the beams **50** and **52** rigidly attached to the horizontal beam **22** and the lower parts of beams **50** and **52** to which the fabric rollers are all attached. When the blocks **80** and **82** are removed, the temporary support jacks **62** and **64** are holding the beams and all the fabric carrying rolls. The main press framework is still being supported by the blocks **58** and **60** plus the framing beneath these two blocks.

At this point the fabric spreader **48** is cantilevered from the rear side at **49** (note FIG. 5) so that by removing the attaching bolts and rotating the hook **51** on the front, the front end drops a sufficient amount to permit the fabric **38** to be draped over the top of the fabric spreader **48**. The fabric **38**, which is still draped over the extension of beams **54** and **56**, is then pulled into place through the openings vacated by the removable blocks **80** and **82** and over all the fabric rollers **40** to **46**. The spreader **48** is then resecured with the hook **51** and the fabric **38** is stretched smooth. The blocks **80** and **82** are replaced and the temporary support members **62** and **64** are raised so that the blocks **80** and **82** may be bolted to secure the installation. The jacks **62** and **64** are then retracted to their original position and removed. To complete the installation, the stabilizing bar **46A** is returned to its mounting position on the pillar **14** and the stretch roller **46** is extended to tighten the fabric loop **38**.

Referring principally to FIG. 3, the endless felt **36** is replaced as follows: the pressing roll **24** is lowered by pivoting around its hinge **84** to provide a gap between the press rollers **24** and **40**. The felt stretch roller **28** is

retracted toward the left. The felt 36 is then draped over the horizontal pillar extensions of pillars 54 and 56 to the position as shown in FIG. 6 and the temporary support jacks 62 and 64 are then fixed in place under the ends of the extensions of beams 56 and 54, respectively. The bolts in the removable sections 58 and 60 are then removed and the temporary support elements 62 and 64 jack up the framework including beam 22 and the upper sections of the vertical pillars 12 and 14 to the position shown in the solid lines in FIG. 3 (the original position is shown in phantom and the difference in position is greatly exaggerated in the figure). The removable sections 58 and 60 are then removed. The temporary supports 62 and 64 will then carry the load of the press section at the front of the device.

The felt 36, which is still draped over the extended beams 54 and 56, is then pulled into place through the openings caused by removing the blocks 58 and 60. The felt 36 is then pulled over the framework including horizontal beam 22 and all the rollers except for the pressure roll 24, the felt passing into the gap between pressure rolls 24 and 40. The front end of the stretch roller 28 is then lifted from out of its front side saddle or bearing housing 72, which is constructed to separate, and is then removed from the inside of the felt loop and placed on the outside of the felt (i.e. the felt is worked to the inside of the roll), after which the stretch roll 28 is returned to its position within its bearing housing 72. For a felt change, this is the only roll that requires handling. The removable blocks 58 and 60 are then returned to their respective positions within the pillars 12 and 14, the upper framework is lowered on the temporary supports 62 and 64 to the position shown in phantom, and the bolts in the blocks 58 and 60 are replaced securing the regular framework. The support posts 62 and 64 are then returned to their normal position and removed.

To complete the installation, the felt 36 is then stretched smoothly across the machine and the stretch roll 28 is moved towards the right as shown in phantom to tighten up the felt loop and provide the proper felt tension. The pressing roll 24 is then raised to contact the felt 36 and provide a nip with the roll 40. The press is then ready for operation.

Because of the outward support design of the present invention, the felt can be installed by slipping it around the framework as indicated, thus eliminating the need to handle all felt-carrying rolls except for the stretch roll, one end of which must be lifted from its bearing housing 72 to permit passing the felt to the inside of this roll 28.

FIG. 4 shows the installation of a felt in another stage of the press. Generally (after passing), a newly formed paper web is passed through a plurality of pressing stages. These may be entirely separate, in which case their supporting structures will be similar to that described above with regard to the changing of felt 36, or they may be integrally attached to the superstructure of the adjacent press such as shown in FIG. 4.

Here the rolls and supporting structure are essentially similar, but because of the use of a common pillar 14', certain changes are necessary. Thus, pillar 14' not only has a removable section 60 which is necessary for the first press, but it also contains removable sections 86 and 88. The vertical pillar 12' requires only one removable section 58'. As in the other press, a series of rollers 40', 26', 32', 34', 30' and 28' are provided. As in the other press, roller 28' is a stretch roller having a front bearing housing from which the roll may be lifted. In this embodiment the temporary support elements 62' and 64' are provided in a different manner. Thus, the temporary support elements 62' and 64' are still jacks but in this case are each shaped as an inverted L which fits into the side of the elongated beam 23. The inverted L-shaped supporting members 62' and 64' may be either permanently embedded in the side of the horizontal beam 23 to provide a rotatable fitting or, alternatively, they may slide into and out of the recesses into which they fit in the side of beam 23.

In the installation of the felt 36', one of the temporary support jacks, such as jack 64, nearest to the press roll 40, is placed under the beam 56 as with the previously described installation. The pressroll 24' is then raised about its pivot 84' to provide a gap between the pressure rolls 24' and 40'. The bolts on the removable section 86 are removed and the temporary support 64 is jacked up a sufficient amount to remove the block 86. The felt loop 36' is then draped over the horizontal extensions of the temporary jacks 62' and 64' and such jacks are then placed in position (as shown in FIG. 4) to support the horizontal beam 23. At this point the felt loop 36' is between the beam 23 and the vertical portions of the temporary supports 62' and 64'. The stretch roll 28' is retracted towards the left and the support jacks 62' and 64' then raise the horizontal beam 23 as well as the attached rolls a sufficient amount to remove the blocks 58' and 88.

The felt 36' is then passed through the openings caused by removing blocks 86, 88 and 58' and over the rollers 34', 30', 40', and 26' and under the horizontal beam 23 and the roller 32'. The stretch roll 28' is then removed from the inside of the felt loop and placed on the outside of the loop by lifting it free of its front bearing housing to permit passing the felt to the inside of this roll. The blocks 58' and 88 are reinserted and the support jacks 62' and 64' lower the framework to the position shown in phantom so that bolts can be installed to secure the blocks 58' and 88. The support jacks 62' and 64' are then either removed or rotated to their normal positions.

The block 86 is then put into place and the temporary support post 64 lowers the remaining framework onto the block 86 which is then secured with bolts. The temporary support post 64 is then removed or returned to its normal position. To finish installation, the felt 36' is stretched smoothly and the felt stretch roller 28' is moved to the right, thereby tightening up the felt 36'. Lastly, the pressure roller 24' is lowered onto the pressure roller 40' to provide a nip therebetween through which the felt 36' passes. The press is then ready for operation.

The present device affords compactness of equipment and a minimum of equipment handling and relocation for replacing a felt or fabric. An important advantage of this device is that once the fabric or felt has been draped over the beam extensions and the supporting posts or jacks placed in support position, the entire fabric run or felt run mechanism is a free unit from the standpoint of placing the fabric or felt in its proper position.

It will be understood that a variety of changes can be made from the illustrated embodiments without departing from the inventive concept. Thus, the entire back of the press superstructure as illustrated by the pillars 10, 16 and the beams 20 and 53 can be replaced by a solid vertical wall, for example. Also, a single beam extension may replace the two extensions 54 and 56 and such a beam itself could be permanently anchored at its end and have a removable section along its length without departing from the invention.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. In a roller press assembly frame comprising a plurality of rollers, superstructure for supporting said rollers upon a foundation including at least two pillars and an endless belt passing about said rollers, the improvement comprising a removable section in one of said pillars between said rollers and said foundation, a beam extending from said superstructure upon which to drape an endless belt, and means to temporarily support said one pillar

from said extending beam while said removable section is removed.

2. In a papermaking roller press assembly comprising a plurality of rollers, superstructure for supporting said rollers upon a foundation including vertical pillars supporting said rollers and at least one horizontal beam between said vertical pillars, and an endless paper drying element passing about said rollers, the improvement comprising a removable section in at least one of said vertical pillars between said rollers and said foundation, an essentially horizontal beam section extending from said superstructure beyond said one vertical pillar upon which to drape said endless drying element, and means to temporarily support said extending horizontal beam when said section has been removed.

3. An apparatus in accordance with claim 2 wherein said superstructure comprises two said vertical pillars, each having a said removable section, and two said horizontal beams each having a said extending section, wherein said two horizontal beams are parallel to said rollers and extend beyond the plane formed by said two vertical pillars having said removable sections, and wherein said temporary support means comprise vertical support elements extending between the floor and said extensions of said horizontal beams.

4. An apparatus in accordance with claim 3 wherein said vertical support elements are hydraulic jacks.

5. In a papermaking roller press assembly comprising a plurality of essentially parallel rollers, an endless paper drying element passing around said rollers, at least four vertical pillars supporting said rollers, supporting means for said vertical pillars, two first horizontal beams between said vertical pillars perpendicular to said rollers, and at least one second horizontal beam between said first horizontal beams parallel to said rollers, the improvement comprising a removable section in each of two of said vertical pillars between said rollers and said supporting means, said two vertical pillars defining a plane substantially perpendicular to the axes of said rollers, wherein said at least one second horizontal beam is within said endless drying element and extends beyond the plane formed by said two vertical pillars having removable sections, and further comprising temporary support means for the end portion of said extension of said at least one second horizontal beam.

6. An apparatus in accordance with claim 5, further comprising a stretch roller parallel to said other rollers, and means to disengage said stretch roller from the support at one end, wherein said endless drying element comprises a felt which passes inside of said stretch roller, and wherein said supporting means for said vertical pillars comprises the floor.

7. An apparatus in accordance with claim 5 further comprising a fabric spreader parallel to said rollers, and means to disengage said fabric spreader from its support at one end, wherein said endless drying element comprises a water retaining fabric screen which passes inside of said fabric spreader, and wherein said supporting means for said vertical pillars comprises further horizontal beams.

8. An apparatus in accordance with claim 5 wherein said temporary support means comprises a jack member hingedly supported to said second horizontal beam.

9. In a papermaking roller press assembly comprising a plurality of essentially parallel rollers, an endless paper drying felt passing around said rollers, four vertical pillars supporting said rollers, floor means for supporting said vertical pillars, two horizontal beams between said vertical pillars perpendicular to said rollers, the improvement

comprising a removable section in each of two of said vertical pillars, said two pillars defining a plane substantially perpendicular to the axes of said rollers, and temporary support means extending between said floor and the horizontal beam between the vertical pillars having the removable sections, the connection of said temporary support means and said horizontal beam lying within the projection of the annuloid defined by said endless felt, and said removable sections being located between said rollers and said floor.

10. A papermaking roller press assembly resting on a floor comprising a first series of parallel rollers, an endless felt passing around said first series of rollers, a second series of rollers having one roller in common with said first series and disposed within said first series of rollers and said felt, an endless fabric screen passing around said second series of rollers, said felt and said fabric contacting at said common roller, means to support said first series of rollers including first pillar means for supporting one side of said roller and at least one other pillar for normally supporting the other side of said rollers, said other pillar having a removable section, at least one first horizontal beam supported by said other vertical pillar and being substantially perpendicular to said rollers, at least one vertical beam extending from said first horizontal beam to support said second series of rollers, at least one second horizontal beam supported by said vertical beam and being substantially parallel to said rollers and extending beyond said other pillar to provide means upon which to drape a felt and a fabric, and temporary support means depending from said second horizontal beam to said floor beyond said draping means, said removable section in said pillar being located between said rollers and said floor.

11. An apparatus in accordance with claim 10 wherein said means to support said first series of rollers includes four of said vertical pillars, two of which have removable sections, said two pillars being in a plane substantially perpendicular to said rollers, said apparatus further comprising two of said first horizontal beams, at least three of said vertical beams, and two of said second horizontal beams, one of said second horizontal beams extending through the apparatus from front to back above said common roller and defining slots therethrough.

12. A roller and endless belt structure comprising a plurality of rollers, an endless belt of material passing about said rollers, means to support said rollers including a foundation and two pillars on said foundation at least one of which has a removable section therein between said rollers and said foundation, means beyond said sectioned pillar upon which to temporarily drape an endless belt, and means to temporarily support said rollers through said draping means from a position beyond the location of draping on said temporary draping means while said removable section in said pillar is removed.

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