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[33] **Germany**
[31] **P 18 11 214.6**

[56]

References Cited

UNITED STATES PATENTS

3,016,819	1/1962	Kupka.....	100/163
3,155,029	11/1964	Thomas.....	100/170
3,157,110	11/1964	Goddard.....	100/170
3,369,483	2/1968	Muller.....	100/170
3,373,681	3/1968	Jaegers.....	100/163

FOREIGN PATENTS

1,150,272	6/1963	Germany.....	100/163
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[54] CALENDER ROLL LIFTING MECHANISM 11 Claims, 17 Drawing Figs.

[52] U.S. Cl..... 100/163,
100/168, 100/170
[51] Int. Cl..... B30b 3/04
[50] Field of Search..... 100/168,
169, 170, 47, 163, 161, 162

ABSTRACT: A roll lifting mechanism for a multiple roll calender stack or the like is adjusted automatically to compensate for changes in roll diameter resulting from wear or roll replacement so that predetermined spacing is maintained between the calender rolls when the latter are lifted out of contact with one another.

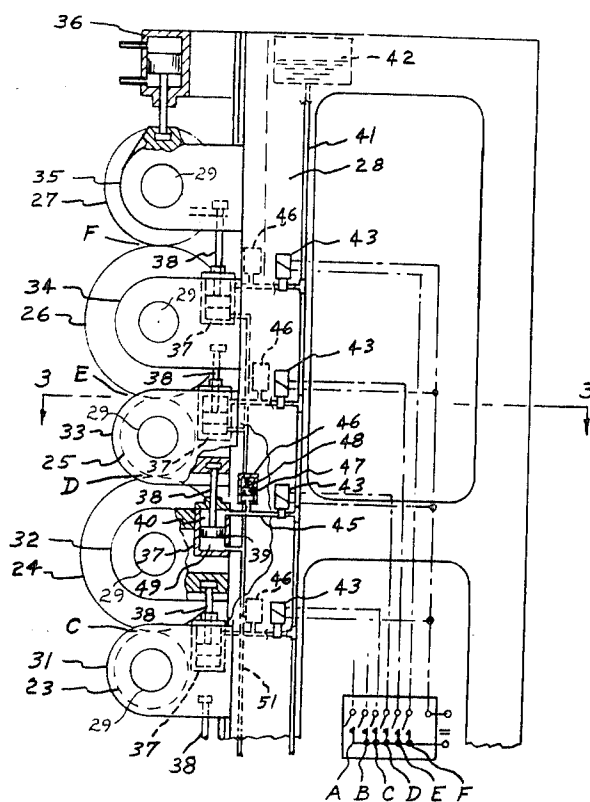
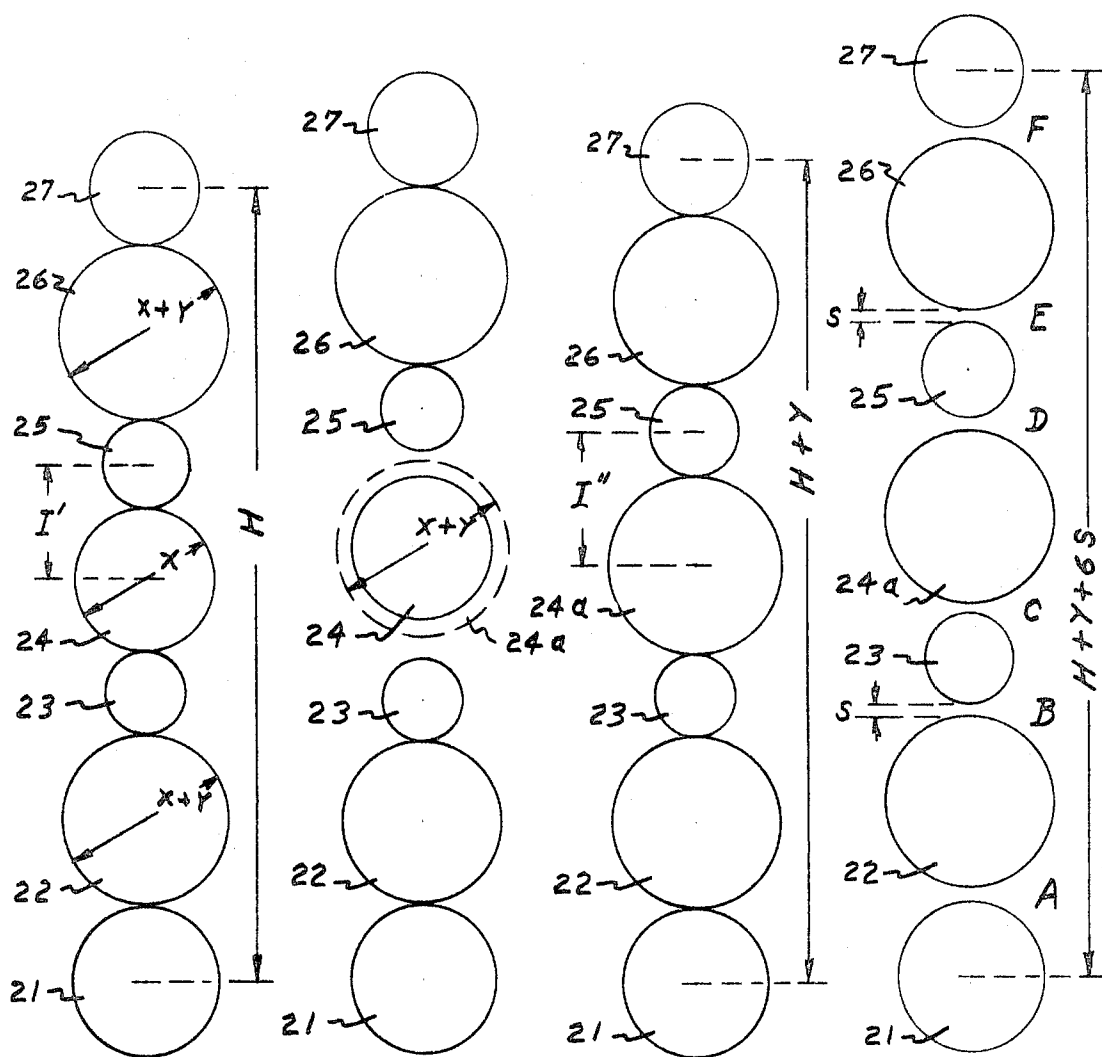


FIG 1 a

FIG 1 b

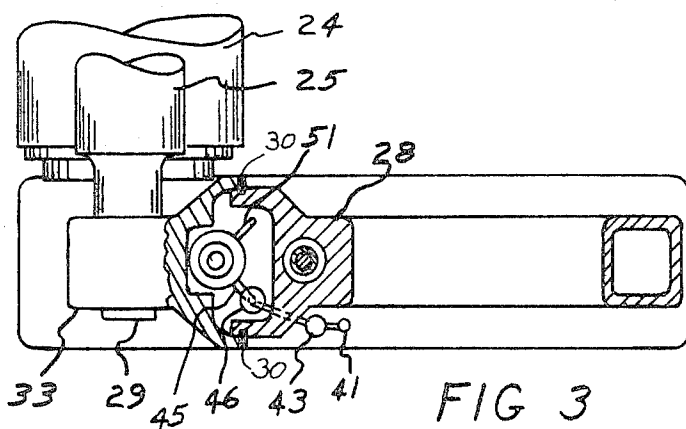
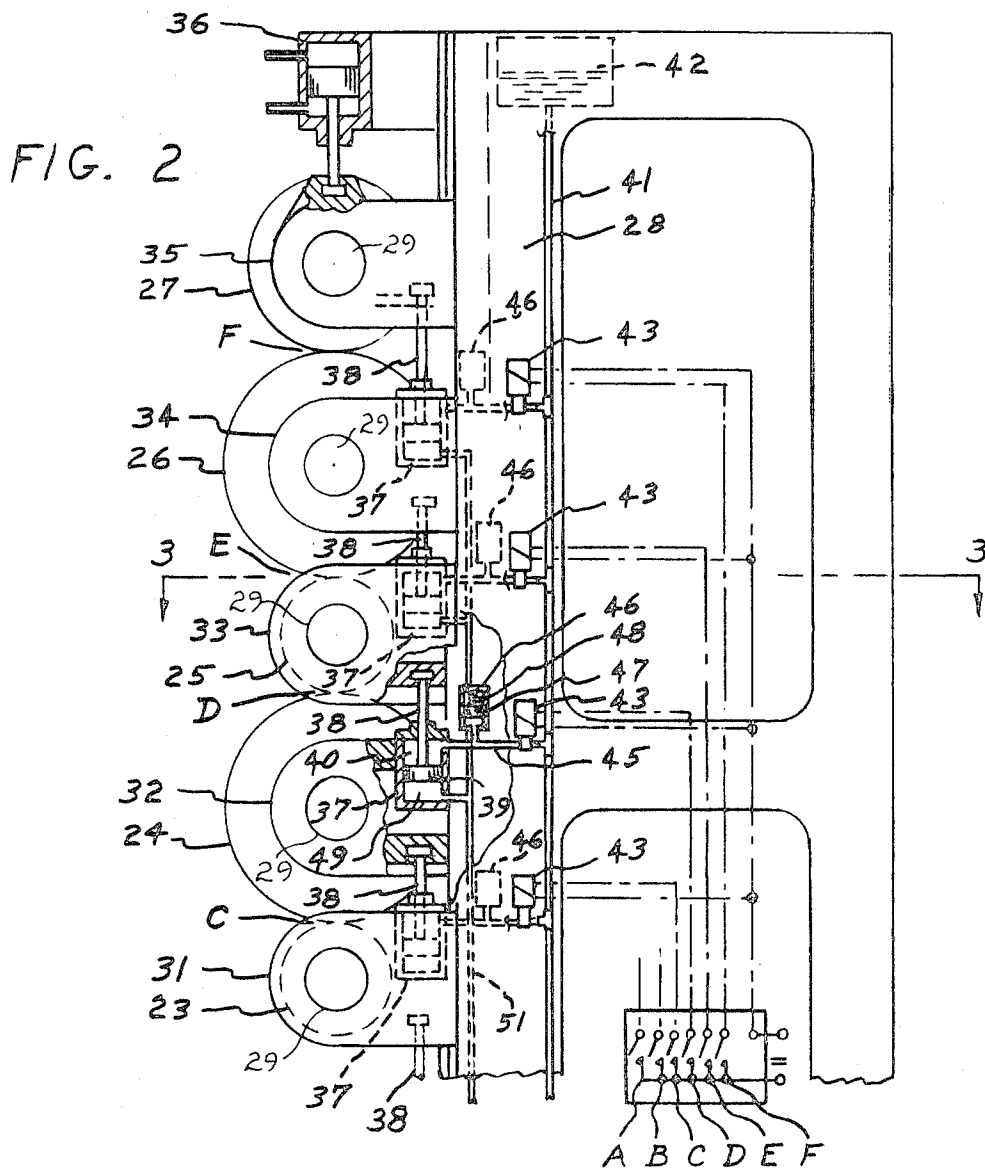
FIG 1 c

FIG 1 d



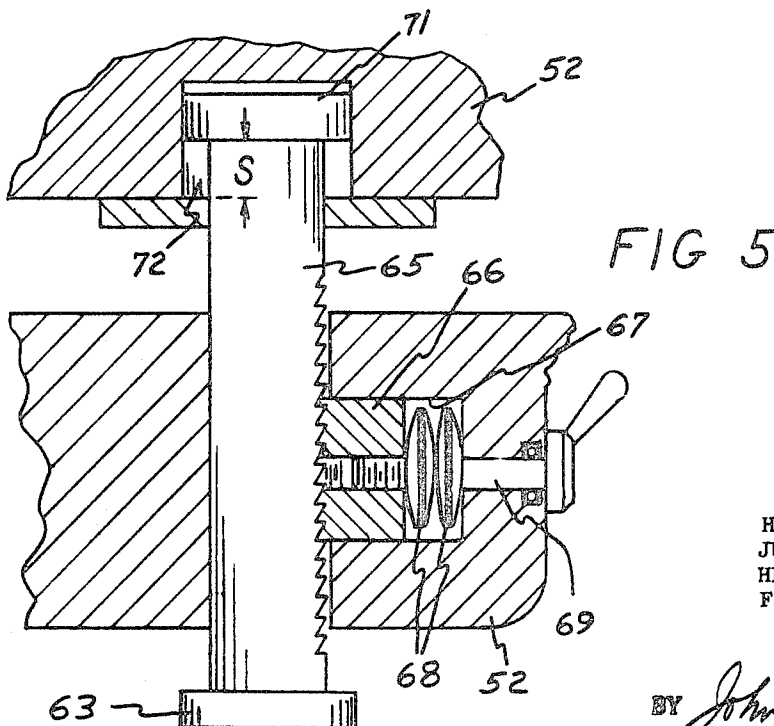
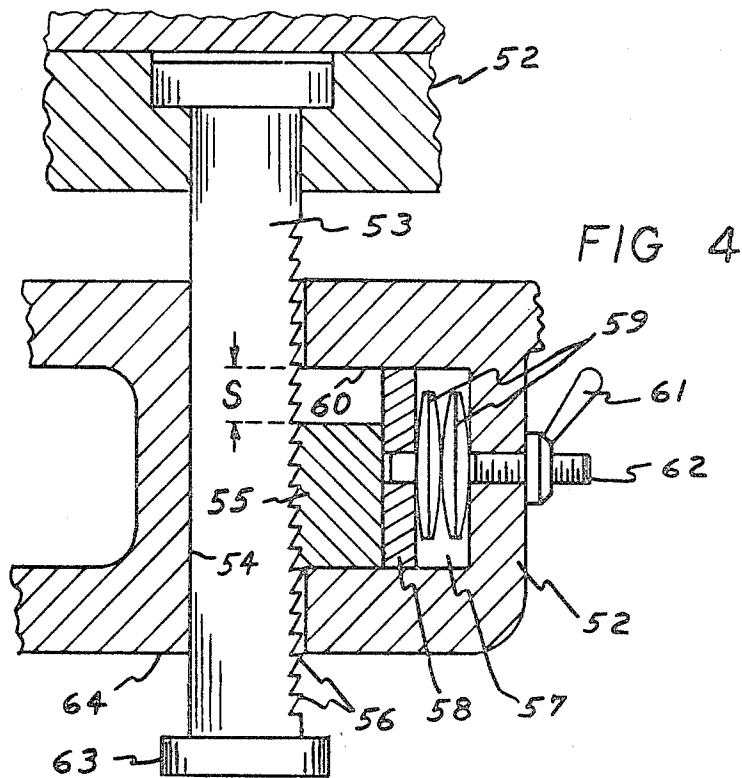
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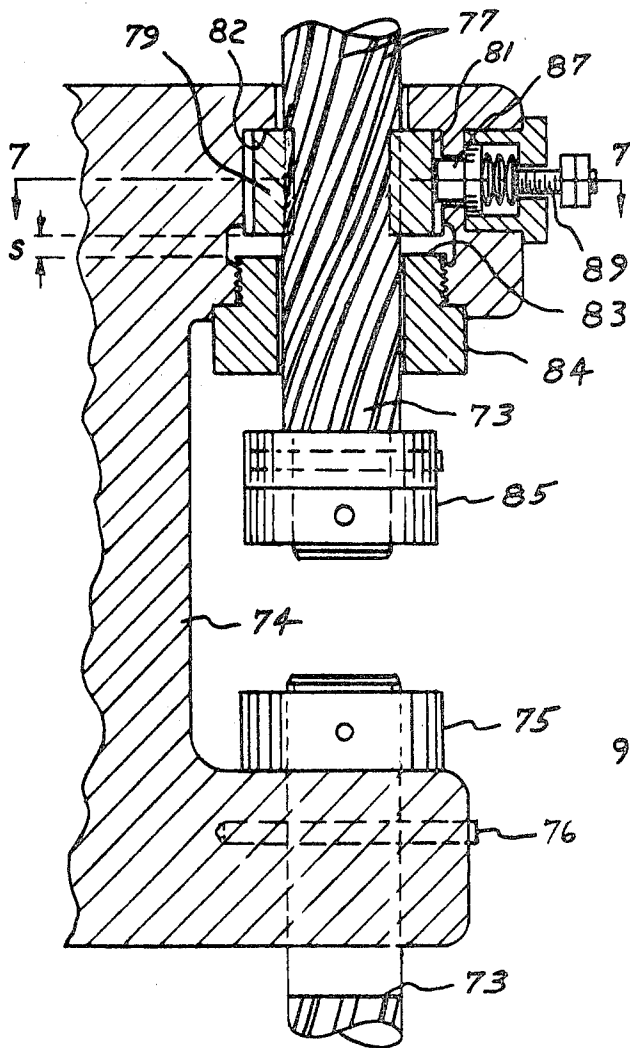


FIG. 6

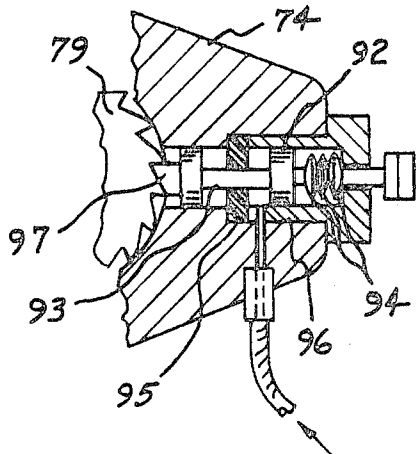


FIG. 8

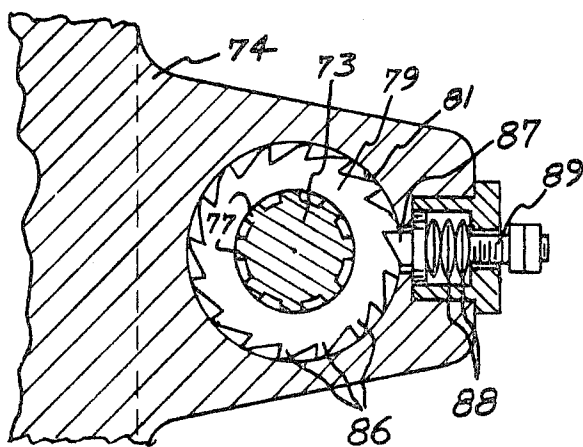


FIG. 7

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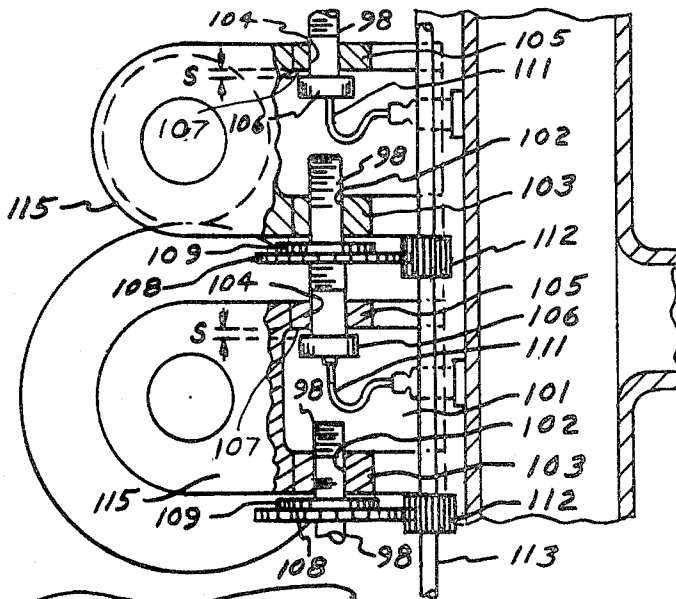


FIG 9

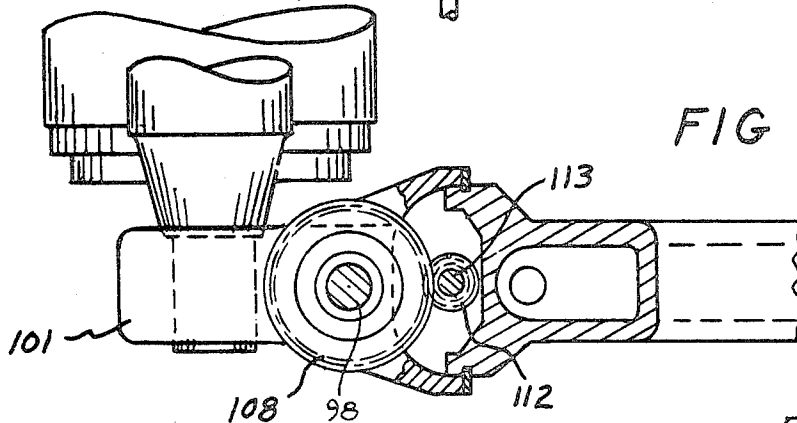


FIG 10

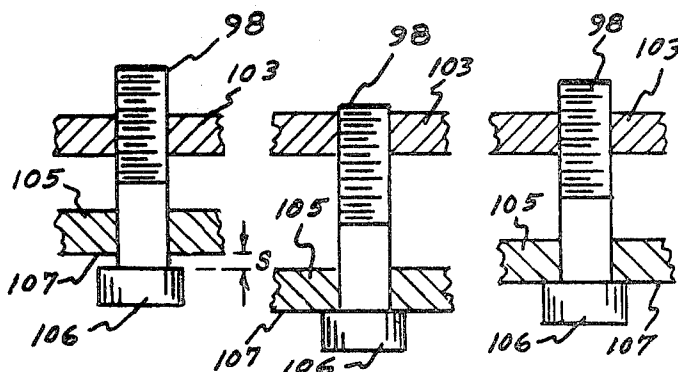


FIG 11a

FIG 11b

FIG 11c

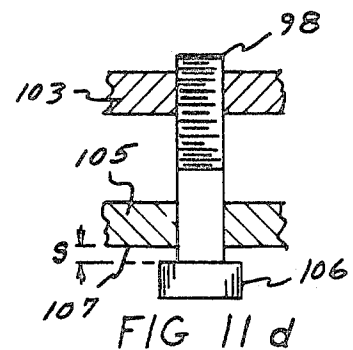


FIG 11d

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CALENDER ROLL LIFTING MECHANISM

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to calender stacks or the like for use in paper machines or related equipment. More particularly, the invention concerns calender roll lifting mechanisms which are adjusted automatically to compensate for changes in roll diameter resulting from wear or roll replacement so that predetermined spacing is maintained between the calender rolls when the latter are lifted out of contact with one another.

2. DESCRIPTION OF THE PRIOR ART

As is well known in the paper machine art, a calender stack comprises a bottom roll, commonly referred to as a king roll, above which are stacked a plurality of superposed parallel calender rolls. When the calender stack is not in operation, it is desirable to raise all of the calender rolls out of contact with one another and with the king roll to accommodate uniform cooling of the rolls and to facilitate the threading of a new web of material through the stack. Furthermore, if the stack is to remain out of operation for an appreciable length of time, it is important to separate the rolls to prevent the formation of flat spots along their lines of contact, particularly if the stack is equipped with resilient rolls covered with rubber or the like.

In a conventional calender stack, the king roll is rotatably mounted in a fixed position below the calender rolls, which are supported at their opposite ends above the king roll in journal members. The journal members, in turn, are supported for vertical movement by rigid vertical columns adjacent opposite ends of the rolls. Each of the columns is provided with a vertically movable lifting bar adapted to be raised in unison with the corresponding bar of the opposite column by either mechanical or hydraulic jack means. A plurality of pairs of adjustable lifting members are clamped to the lifting bars and are spaced from the corresponding journal members by distances which decrease progressively from the top of the stack to the bottom. Therefore, as the lifting bars are raised in unison, the lifting members progressively engage the journal members and cause the rolls to be lifted in succession and to be uniformly separated from one another.

During the operation of the calender stack, the calender rolls experience gradual reduction in diameter due to wear, particularly in the case of those rolls provided with resilient shells. When such wear has progressed to the extent that a roll cannot perform satisfactorily, it must either be reground to a smaller diameter to restore its surface finish or if its diameter is too small to permit refinishing, it must be replaced with a new roll. Accordingly, to maintain the initial spacing of the lifted rolls, the clamp members must be readjusted along the lifting bars as the rolls gradually wear smaller and whenever one or more rolls is reground or replaced. Moreover, to allow a roll to be replaced with a larger one, the clamp members must first be relocated so that the higher rolls will be lifted sufficiently to allow the worn roll to be removed and replaced; whereupon the clamp adjustment must be repeated to restore the desired uniform spacing of all of the rolls. Due to the very substantial weight of the rolls and their attendant journal bearing members and to the correspondingly massive construction of the lift bars and clamp members, this clamp adjusting operation demands considerable physical effort and imposes a substantial burden on production costs due to the time that the machine must be taken out of service.

SUMMARY OF THE INVENTION

The present invention substantially eliminates the manual effort heretofore required to perform the above described adjustment of the roll lifting mechanism of a calender stack and drastically reduces the time required for that operation, thereby effecting a correspondingly great increase in production economy. Briefly, these advantages are accomplished in

accordance with the invention by means of an automatically adjustable roll lifting mechanism which couples each journal member to the one above it by means of a hydraulic or mechanical coupling member which is adjusted automatically while the corresponding rolls are in contact to limit the maximum distance by which they can be separated. Accordingly, when a lifting force is applied to the journal members of the uppermost roll by an appropriate jacking device, that roll is lifted off the next lower roll to establish a predetermined gap. Thereupon, the continuing lifting movement of the uppermost roll imparts corresponding movement to the next lower roll through the coupling members connecting the journal members of those two rolls, so that successively lower rolls are progressively separated in the same manner. Furthermore, the automatic adjusting mechanism can be selectively disabled with respect to any pair of rolls so that those particular rolls will be separated by a predetermined maximum distance sufficient to permit convenient installation of a new roll. After such roll replacement has been accomplished, the lifting mechanism need only be lowered and then again raised with the automatic adjusting mechanism in operation to restore the desired uniform separation between all of the calender rolls.

Various means for practicing the invention and other advantages and novel features thereof will be apparent from the following detailed description of illustrative preferred embodiments of the invention, reference being made to the accompanying drawings in which like reference characters denote like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIGS. 1a through 1d are schematic end elevational views of a seven roll calender stack of the type to which the present invention relates, showing the illustrated rolls in various positions before and after the replacement of a roll with one of larger diameter;

FIG. 2 is a partially cross sectioned fragmentary end elevational view of the upper portion of a calender stack corresponding to the one depicted in FIGS. 1a through 1d and incorporating a roll lifting mechanism according to a preferred embodiment of the present invention;

FIG. 3 is a partially cross sectioned plan view of the front column portion of the calender stack depicted in FIG. 2 taken along line 3-3 of that figure.

FIG. 4 is a cross sectioned fragmentary elevational view illustrating an alternate embodiment of the invention comprising a mechanically adjustable coupling member embodying a serrated coupling bar engageable with a vertically movable serrated stop block;

FIG. 5 corresponds generally to FIG. 4 but shows the use of vertically immovable stop block in cooperation with a coupling rod which is movable relative to one of the journal bearing members to which it is connected;

FIG. 6 is a cross sectioned fragmentary elevational view of still another embodiment of the invention comprising a mechanically adjustable coupling member operated by a steep helical thread or spline engaging the coupling rod with the corresponding journal bearing member;

FIG. 7 is a cross-sectional plan view taken along line 7-7 of FIG. 6;

FIG. 8 corresponds generally to FIG. 7 but shows a hydraulically actuated blocking member adapted to be operated from a remote location;

FIG. 9 is a fragmentary partially cross sectioned elevational view of yet another embodiment of adjustable coupling mechanism in which a threaded coupling rod is adjusted by means of a remotely controlled drive system;

FIG. 10 is a cross-sectional plan view taken along line 10-10 of FIG. 9; and

FIGS. 11a through 11d illustrate four different positions assumed by the threaded coupling rod illustrated in FIGS. 9 and 10 before and after the installation of a new calender roll.

DESCRIPTION OF THE ILLUSTRATIVE PREFERRED EMBODIMENTS

Referring first to FIGS. 1a through 1d of the accompanying drawings, an illustrative seven roll calender stack is represented as comprising a lower or king roll 21 and six calender rolls 22 through 27. For illustrative purposes, it will be assumed that roll 24 is a resilient roll which has been reduced in diameter by wear and refinishing to a diameter X, as shown in FIG. 1a, and which is to be replaced with a new roll having a diameter equal to X plus Y as shown in broken lines in FIG. 1b, and in solid lines in FIGS. 1c, and 1d. With the worn roll 24 installed in the stack, the overall height of the stack measured between the centerlines of the uppermost roll 27 and the king roll 21 is represented as being H and the center distance between rolls 24 and 25 is shown to be equal to I'.

In order to replace roll 24, it will be obvious that the higher rolls 25, 26 and 27 must be raised as shown in FIG. 1b to provide sufficient room for the new roll 24a to be installed between rolls 23 and 25. Accordingly, in a calender stack incorporating the type of prior art roll lifting mechanism described above, the first step in such a roll replacement operation is to adjust the clamping members so that the upper three rolls will be raised as shown in FIG. 1b. After the new roll 24a has been installed and the rolls are lowered again into contact with one another, it will be apparent from FIG. 1c that the overall height of the stack between the centerlines of rolls 21 and 27 has been increased to H plus Y and that the center distance I' between rolls 24 and 25 is larger than the initial corresponding distance I' by one-half of the dimension Y. Therefore, the prior art lifting mechanism must again be adjusted so that it will lift the rolls as shown in FIG. 1d to separate them by a uniform predetermined distance S, thereby increasing the overall height of the stack to H plus Y plus 6S.

In accordance with a preferred embodiment of the present invention, the upper five rolls 23 through 27, illustrated in FIGS. 1a through 1d, are shown in FIGS. 2 and 3 incorporated in a calender stack comprising vertical support columns 28 adjacent the support spindles 29 at the corresponding ends of the rolls. Although only one column is shown, it will be understood that a substantially identical column, along with the other attendant illustrated mechanism, is also provided at the opposite end of the stack. The support spindles of the rolls are received in corresponding journal members 31—35, which are supported by slide gibs 30 for vertical sliding only on the support columns. The two journal members 35 of the uppermost roll 27 are connected to respective double acting hydraulic cylinder assemblies 36 carried by the corresponding column members to exert downward force to increase the contact pressure between the rolls or to exert upward force to lift and separate the rolls.

With the exception of the uppermost journal members, each such member is provided with a lifting cylinder 37 including a vertical piston rod or lifting rod 38 secured to the next higher journal member. A piston 39 within each lifting cylinder defines a fluid tight upper cylinder chamber 40 in communication with supply line 41 of hydraulic fluid reservoir 42 through a solenoid actuated valve 43 in hydraulic connecting line 44; such valves being operable by switches A—F on remote control panel 45. Between each of the upper lifting cylinder chambers and the corresponding valve 43, a collector cylinder 46 is connected to the respective hydraulic line 44. These collector cylinders are provided with internal pistons 47 which are urged downwardly by springs 48 so that each collector cylinder defines a variable volume chamber of a predetermined maximum capacity established by the diameter and maximum stroke of its piston.

When pressurized hydraulic fluid is introduced into the lower chambers of cylinders 36 from an appropriate hydraulic pump, not shown, the resulting initial upward movement of the upper roll journal members 35 is transmitted to the pistons of the lifting cylinders carried by the next lower journal member. Consequently, if the solenoid valves connected to those lifting cylinders are closed, hydraulic fluid is forced out

of the upper chambers of the lifting cylinders of journal members 34 and enters the corresponding collector cylinders by displacing their pistons against the influence of springs 48. As soon as those two collector cylinders are filled, no more fluid can be exhausted from the lifting cylinders of journal members 34. Accordingly, the capacity of the collector cylinders determines the gap established between rolls 27 and 26 before the latter roll is lifted by the lifting bars in unison with the former.

As the upward movement of roll 27 continues, each successively lower roll therefore lifts off the next lower one by a predetermined distance established by the corresponding collector cylinders until all of the rolls are separated from one another as shown in FIG. 1d. When the hydraulic fluid is allowed to exhaust from the lower chambers of cylinders 36, the resulting downward movement of the pistons in the lifting cylinders causes their upper chambers to be refilled with fluid from the respective collector cylinders under the positive pressure provided by springs 48. The lower chambers 49 of the lifting cylinders provide no motive function, but are merely connected to a common drain line 51 which discharges any fluid that might leak past pistons 39.

To replace roll 24 with the larger roll 24a, the operator first opens switches C and D, corresponding to the similarly identified roll gaps in FIG. 2, thereby opening the solenoid operated valves of those lifter cylinders which establish the separation between rolls 23, 24 and 25. Consequently, when the lifting operation is performed, the separation between those three rolls is not determined by the corresponding collector cylinders but rather by the maximum strokes of the piston rods by which the respective journal members of those rolls are connected; thus providing ample clearance for the installation of a new roll. Upon completion of the installation of roll 24a, all the rolls are lowered into contact with one another and all of the solenoid valves are opened temporarily to reservoir 42 so that the upper chambers of the lifting cylinders are filled with fluid and all of the collector cylinders are emptied. Thus, when the solenoid valves are again closed, the mechanism is readjusted automatically to separate the rolls progressively as described above. Also, since each pair of solenoid valves can be controlled individually from the control panel, it will be apparent that the maximum possible separation between any two rolls can be effected during a lifting operation by the simple expedient of actuating the corresponding switch or switches on the control panel.

FIG. 4 depicts an alternate mechanically operated embodiment of the invention in which each two adjacent journal members 52, corresponding to those previously described, are connected by the lifting bar 53 which is substantially immovable relative to the upper journal member but slidable in the vertical hole 54 in the lower one. A serrated dog block 55, engageable with the adjacent serrated surface 56 of the lifting bar, is received at an opening 57 in journal member 52 and is held in engagement with the lifting bar by pressure plate 58. A pair of disc type springs 61 biases the pressure plate toward the dog block to maintain the latter in engagement with the lifting bar. When the rolls carried by the illustrated members are in contact with one another, the illustrated components assume their respective depicted positions. As the upper journal member rises during the roll lifting operation, the dog block can slide upwardly with the lifting rod within opening 57 by a distance S before it engages the upper internal surface 60 of that opening; thereby establishing the gap equal to the dimension S between those two rolls before the lower one is raised by the lifting bars.

To provide maximum separation between the two rolls carried by the illustrated journal members, dog plate 55 is withdrawn from engagement with the lifting bar in opposition to springs 59 by manual rotation of nut member 61, which is threaded onto bolt 62 attached to the pressure plate. Obviously, a corresponding mechanism is provided between the journal members at the opposite ends of the rolls and is likewise operated in the same manner. Accordingly, the upper roll can then rise independently of the lower one until the

maximum available roll gap is established by the abutment of the lower head 63 of the lifting rod against the adjacent lower surface 64 of the corresponding journal member; whereupon nut member 62 is again rotated manually to reengage the dog block with the serrated surface of the lifter bar. As the upper roll is lowered relative to the lower one, the lifting bars ratchet past the dog blocks until the two rolls are in contact. Consequently, the illustrated mechanisms are restored to their depicted conditions so that the rolls will be separated by the distance S during the next roll lifting operation. Although the nut members must be manipulated manually, the time and physical effort required for that operation obviously is much less than that involved in loosening and tightening the relatively massive clamping members heretofore employed for the same purpose and the necessity for measuring and manually adjusting the positions of such clamping members is entirely eliminated. Furthermore, it should be recognized that the nut members or equivalent means could be operated by appropriate servomechanisms controlled from a remote control panel.

FIG. 5 shows an alternate form of the structure depicted in FIG. 4 in which a serrated lifting bar 65 is engaged by a corresponding serrated dog block 66 received in opening 67 in the journal member and biased toward the lifting bar by disc springs 68 encircling retracting bolt 69. In this version, however, the desired gap between the rolls is established by the freedom of the lifting bar head 71 to move vertically in recess 72 in the upper journal member, rather than by vertical sliding movement of the dog block.

FIGS. 6 and 7 show still another embodiment of the invention generally similar to those illustrated in FIGS. 4 and 5, comprising cylindrical lifting bars 73 located between adjacent journal members 74, only one of which is shown in FIGS. 6 and 7. At its upper end, each lifting bar is provided with a collar 75, which prevents it from moving downwardly relative to the journal member from which it is suspended. Additionally, a pin 76 prevents the lifting bar from moving upwardly or rotating relative to that journal member. The lower end of the bar is provided with a steep helical thread or spline section 77 which mates with the correspondingly spline central hole 78 of ratchet nut member 79. The ratchet nut member, in turn, is located within an enlarged opening 81 in the journal housing and is movable vertically therein by the desired gap distance S, which is established by shoulder 82 of the journal bearing member and the upper surface 83 of stop nut 84. A collar 85 at the lower end of the lifting rod limits its maximum upper movement relative to the journal member by abutting against the lower end of the stop nut.

Ratchet nut member 79 is provided about its periphery with ratchet teeth 86, which are engageable by a pawl member 87 under the influence of disc springs 88 encircling pawl retraction bolt 89. When the journal member from which the particular lifting bar is suspended moves downwardly to lower the corresponding roll into contact with the next lower one, the helical spline on the lifting rod forces the ratchet nut down against the stop nut and rotates it in a counterclockwise direction, as viewed in FIG. 7, as the pawl member rides past the ratchet teeth. When the lifting bar is raised by the next higher journal member during the subsequent roll lifting operation, however, ratchet nut 79 is prevented from rotating in a clockwise direction by the pawl member. Accordingly, the lifting rod can move upwardly relative to the lower journal member only by the gap distance S before the ratchet nut abuts against shoulder 82, whereupon that journal member rises with the lifting bar to effect separation of its roll from the next lower one in the same manner, and so on.

If two rolls are to be separated by the maximum possible distance, the pawl members of the journal members that carry the lower one of those rolls are retracted by manually tightening retracting nuts 91 on retraction bolts 89, thereby allowing the ratchet wheel to rotate freely in a counterclockwise direction. Thus, the lifting bars can move upwardly relative to the pair of lower journal members until their lower collars en-

gage journal surfaces 82, before the lifting rods begin to lift the next lower pair of journal members. When the pawl members are reengaged with the corresponding ratchet wheel members and the rolls are again lowered, the resulting counterclockwise rotation of the ratchet wheel members in operative engagement with the pawl members automatically effects the adjustment of the mechanism so that the rolls will again be separated only by the distance S during the next roll lifting operation.

As shown in FIG. 8, the retraction bolt of a pawl member of the type illustrated in FIGS. 6 and 7 can include a piston 92 on retraction bolt 93 between disc springs 94 and a packing member 95 at the end of the cylinder sleeve 96; thereby allowing the pawl member 97 to be withdrawn from the ratchet wheel by the introduction of pressurized hydraulic fluid through tube 98 connected to a remote control valve panel, not shown.

The embodiment of the invention shown in FIGS. 9 through 11d of the drawings likewise employs mechanically adjusted lifting bars or rods 98 located between vertically adjacent journal members 101, two of which are illustrated in FIG. 9. Each lifting rod 98 is threaded into a mating hole 102 in the lower web 103 of a journal member and extends downwardly through a hole 104 in the upper web 105 of the next lower journal member. An enlarged head 106 at the lower end of each lifting rod is engageable with the lower surface 107 of the adjacent lower web 105 to lift the corresponding journal member in unison with the next higher one. Therefore, if a lifting rod is threaded into its mating threaded hole to a position at which its head is spaced from the adjacent surface 107 by a distance S when the corresponding rolls are in contact, as shown in FIG. 11a, it will be apparent that the upper roll will be separated from the lower one only by that distance before the lower roll also starts to rise. If the lifting rod is 11b, downwardly to its lowermost position shown in FIG. 11b, maximum separation of the two rolls will occur. To adjust the mechanism to provide the desired separation S after a larger roll has been installed, the lifting rod is first rotated while the rolls are in contact to screw it upwardly until its head contacts the adjacent surface 107, as shown in FIG. 11c. Thereupon, the lifting rod is rotated in the opposite direction by a predetermined number of revolutions required to again space its head below surface 107 by the required distance S, thus restoring the required separation distance.

To accomplish the above described adjustment of the lifting rods automatically, each such rod is provided with a gear 108 rotatively coupled thereto through an electrically or hydraulically operated clutch 109 which can be controlled from a remote control panel, not shown, through a control line 111 provided with an appropriate rotary union or commutator. Each gear 108 is meshed with a corresponding smaller gear 112 carried by a reversible drive shaft 113 driven by an appropriate reversible motor or the like, not shown. When drive shaft 113 is caused to rotate in one direction while all of the rolls are lowered, the lifting bolts are screwed upwardly in unison. The clutch unit of each lifting rod is adapted to slip or disengage when the head of that rod abuts against the adjacent surface 107; whereby all of the lifting rods are thus adjusted to that position. Thereafter, the direction of rotation of the drive shaft is reversed with the lifting rod clutches engaged so that all of the lifting rods are threaded downwardly in unison. A revolution counter device, not shown, counts and visibly indicates the revolutions of the drive shaft during this operation and is adapted to automatically disengage all of the clutches when the drive shaft has rotated through the predetermined number of revolutions required to establish the desired adjustment of the lifting rods. The pair of clutch units incorporated in each pair of journal bearings can also be controlled manually from the control panel, thus allowing any one or more selected pairs of lifting bars to be adjusted independently of the others, for example to provide greater spacing for purposes of roll replacement.

In addition to the advantageous features of the invention heretofore explained, another important detail is that the lifting bars, cylinders or the like are located generally along the central vertical planes of the corresponding columns and journal members, as best shown in FIGS. 3 and 10, thereby providing balanced vertical support and minimizing the imposition of distortive forces on the calender stack. Also, it should be apparent that the journal members preferably include separately removable bearing support members as shown at 115 in FIG. 9, thus allowing the roll bearings to be removed along with the rolls without disturbing the portions of the journal members which are slidably mounted to the columns and which embody the subject roll lifting devices.

The invention has been described in detail with particular reference to the preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinbefore and as defined in the appended claims.

We claim:

1. A roll lifting mechanism for a multiple roll apparatus including:

- a. a cylindrical bottom roll supported for rotation about a horizontal axis,
- b. a plurality of upper rolls located in superposed relation to each other and to said bottom roll,
- c. two support members respectively adjacent corresponding ends of said rolls,
- d. a plurality of pairs of journal bearing members each of which comprises two such members journaled respectively to opposite ends of the corresponding one of said upper rolls, and
- e. means supporting said journal bearing members for independent vertical movement on corresponding ones of said support members, said mechanism comprising:
 - f. lifting means for vertically raising in unison the two journal members journaled to opposite ends of the uppermost one of said upper rolls,
 - g. coupling means for establishing positive lifting engagement between each pair of said journal bearing members and the next lower pair of said journal bearing members when the two vertically adjacent upper rolls journaled between those pairs of journal bearing members have been separated by a predetermined distance by upward movement of the upper one of those two rolls, and
 - h. adjusting means for selectively adjusting said coupling means to vary the predetermined distance by which any particular two of said upper rolls vertically adjacent one another can be separated before said coupling means established positive lifting engagement between the corresponding two pairs of journal bearing members journaled to those particular two rolls.

2. The invention defined by claim 1 including remote control means for operating said adjusting means from a location remote from said coupling means.

3. The invention defined by claim 1 in which said coupling means comprises a plurality of substantially similar coupling units each of which operatively connects one of said journal bearing members with the next lower journal bearing member vertically adjacent thereto.

4. The invention defined by claim 3 in which each of said

coupling units comprises:

- a. a hydraulic cylinder unit comprising a cylinder member provided with an internal piston connected to a piston rod which is retractable from said cylinder member to reduce the volume of an internal cylinder chamber therein,
- b. means positively connecting said cylinder member and said piston rod to respective vertically adjacent ones of said journal bearing members, and
- c. a fluid receiving element comprising means defining an expansible chamber of predetermined maximum volume, said fluid receiving element being connected to said cylinder unit to receive a predetermined volume of fluid discharged from said cylinder chamber upon retraction of said cylinder rod from said cylinder member to thereby limit such retraction of said piston rod relative to said cylinder member.

5. The invention defined by claim 4 in which said adjusting means comprises valve means for selectively discharging fluid from said cylinder chamber other than to said fluid receiving element to disable the movement limiting effect of said fluid receiving element on said piston rod.

6. The invention defined by claim 3 in which each of said coupling units comprises a lifting bar positively connected at one end thereof to one of said journal bearing members and provided at its other end with an adjusting member adjustable along and movable with said bar relative to the other one of said journal bearing members vertically adjacent thereto through a predetermined distance limited by positive engagement of said adjusting member with a surface of the latter journal bearing member.

7. The invention defined by claim 6 in which said adjusting member is adjustably engageable with said bar by means of cooperating serrations along said bar adapted to mate with corresponding serrations on said adjusting member.

8. The invention defined by claim 6 in which said adjusting member is threaded onto said bar and is adjustable therealong by rotation of said adjusting member relative to said bar.

9. The invention defined by claim 7 in which said adjusting means comprises means for effecting simultaneous synchronized rotational movement of the adjusting members of all of said coupling units.

10. The invention defined by claim 3 in which each said coupling unit comprises:

- a. a lifting bar,
- b. separation defining means connecting one end of said lifting bar with said first journal bearing member to provide for predetermined axial movement of said bar relative to said first journal bearing member, and
- c. adjusting means connecting the other end of said bar with a second journal bearing member vertically adjacent said first journal bearing member to provide for axial adjustment of said bar relative to said second journal bearing member to different positions at which said bar is immovably connected to said second journal bearing member.

11. The invention defined by claim 10 in which said adjusting means comprises mating threads on said other end of said bar and in said second journal bearing member and means for rotating said bar relative to said second journal bearing member.