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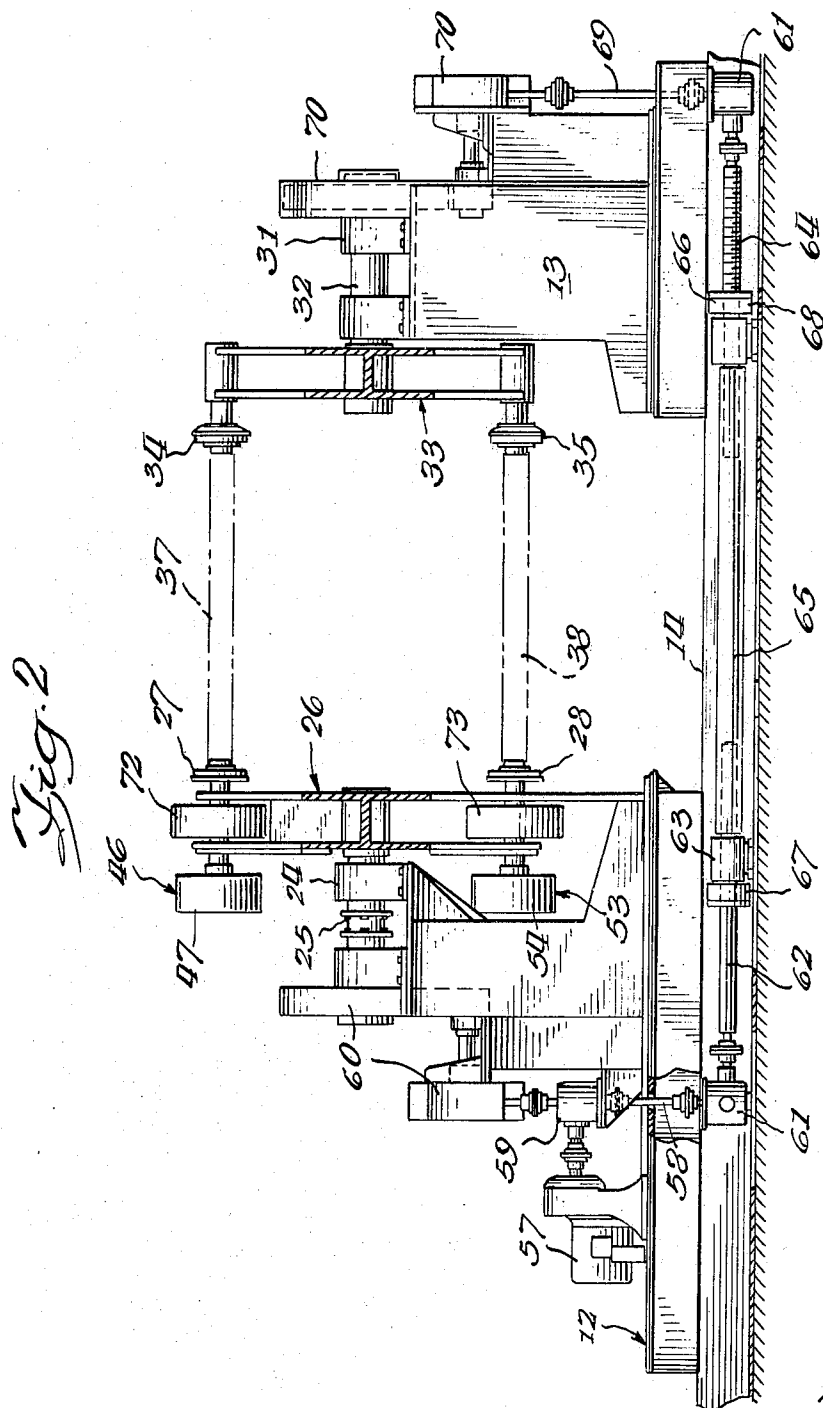
D. E. LAMON

3,486,708

WEB SUPPLY

Filed May 13, 1968

4 Sheets-Sheet 2



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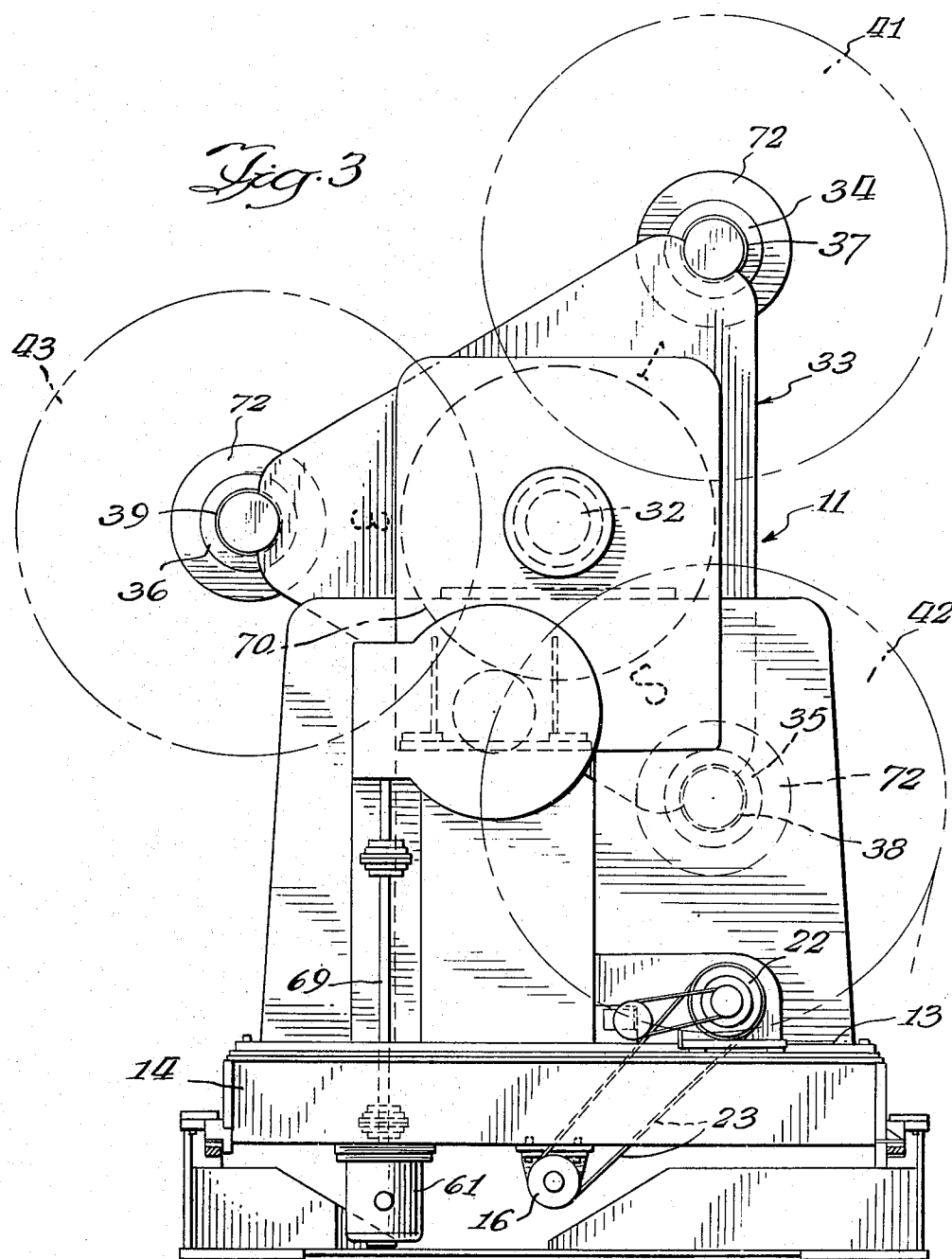
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4 Sheets-Sheet 3



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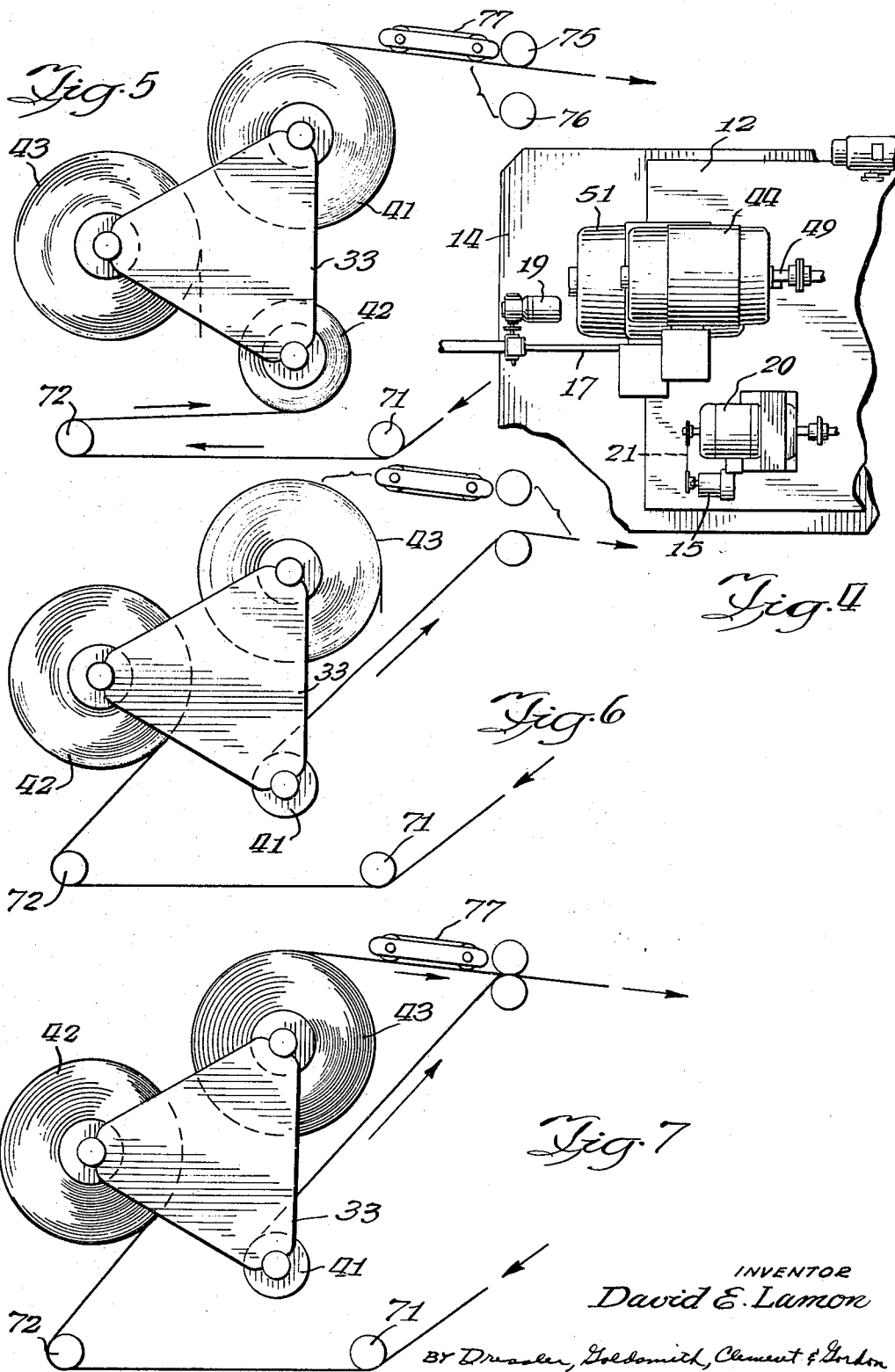
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WEB SUPPLY

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8 Claims

ABSTRACT OF THE DISCLOSURE

Web supply apparatus for feeding a continuous web from a succession of separate rolls of web material and including a pair of support members each having chucks for supporting one end of each of the cores of three rolls of web material. The support members are rotatable about a common axis to interchange the positions of the rolls between supply, take-up, and reserve or replenishment positions. The support members are mounted on stands adapted to be moved laterally, independently of each other or in unison, for handling rolls of different lengths and for facilitating lateral adjustment of the web material. During normal operation of the apparatus one motor fixed in axial alignment with the take-up position drives the take-up roll and another motor fixed in axial alignment with the supply position acts as a brake to maintain a predetermined web tension. One of three small auxiliary brakes operatively connected to each chuck on one of the support members maintains the web tension when the supply roll is out of the normal supply position.

BACKGROUND

The present invention relates to a web supply apparatus for feeding webs of different widths to a processing machine and for rewinding the web after it is processed, and is particularly concerned with means for driving the take-up roll, for maintaining web tension, for adjusting the lateral position of the rolls, and for interchanging the positions of the rolls as the supply roll is exhausted.

In the manufacture of paper, the web, defined as a "continuous sheet of paper manufactured or undergoing process of manufacture on a piper machine," is often passed through a large processing machine known as a supercalender. These processing machines may extend as high as three or four stories and are made up of components of corresponding size. Threading a web through such machines is a long and cumbersome affair in which some of the large unwieldy components may have to be removed or otherwise reoriented during threading and thereafter replaced. Additionally, in threading such machines, valuable time is wasted by shutting the machine down and manually "walking" the leading edge of the web to the top of the machine. It is desirable, therefore, to be able to supply a continuous web to such machines in order to eliminate the necessity of rethreading the machine after each supply roll is exhausted.

SUMMARY OF THE INVENTION

A web supply apparatus embodying the novel features of the present invention reduces material handling problems by providing replenishment of the web being fed from a supply roll to eliminate interruptions in operations and time-consuming rethreading delays. Generally, such

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an apparatus is capable of supplying web material from a supply roll to an end use device, such as a supercalender. Furthermore, this web supply apparatus is designed to receive the web as it leaves the end use device and to re-wind it on a take-up roll. In addition, the novel concepts incorporated into this apparatus enable the rapid substitution of a new roll of web material for an expiring roll, to splice the web of the two rolls together to supply a continuous web, and to substitute take-up rolls for incoming web material to further facilitate continuous operations without delay.

One embodiment of the present invention, as illustrated in the accompanying drawings and described in detail hereinbelow, employs a pair of rotatable support members cooperating to support three rolls of material, a supply roll, a replenishment roll and a take-up roll. Each of the support members is rotatably mounted on a separate stand and is provided with three chucks uniformly spaced radially about a common axis for holding one end of each of the rolls. The support members are indexed to rotate simultaneously through 120° in the same direction about a common axis to move each roll to an adjacent position.

The two stands may be moved laterally, either separately or as a unit. The separate lateral movement of the stands permits adjustment of the apparatus to hold rolls of different length, and the unitary lateral movement of the stands facilitates lateral adjustment of the web relative to the processing machine. The usual processing machine comprises a plurality of calender rolls, and the wear on the calender rolls may be distributed more uniformly along the surface thereof by adjusting the lateral position of the rolls relative to the processing machine.

Other advantages of the present invention are provided by improved drive and brake mechanisms. When the web on the supply roll is approaching its end, the support members are rotated simultaneously through 120° about a common axis to shift each of the rolls from its normal position. The supply roll is moved to the normal take-up position, the take-up roll is moved to the normal reserve position of the replenishment roll, and the replenishment roll is moved to the normal supply position. A single drive means that is connected to the chuck holding one end of the take-up roll in its normal take-up position is disconnected therefrom to permit the rolls to be shifted to their new positions. During this shift period the momentum of the previously driven take-up roll is sufficient to continue its rotation at a slower speed. After the leading end of the web from the old replenishment roll has been spliced to the web from the expiring supply roll, the drive means is connected to the new take-up roll and the apparatus is brought back up to its normal operating speed.

A large electrically operated motor having sufficient braking capacity to maintain the desired web tension during normal operation of the apparatus is mounted on one of the stands in fixed axial alignment with the normal supply position of the supply roll. The electric brake motor is disengageably connected to the chuck holding one end of the supply roll in its normal supply position. During the shifting operation, the electric brake motor is disconnected from the chuck, and, after the old replenishment roll has been shifted into the normal supply position, is connected to the chuck holding one end of the old replenishment roll which is the new supply roll.

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The rotational speed of the rolls is slowed down during the shift period, and the same braking power is not required to maintain the web tension during this period. A small auxiliary mechanical brake is connected to each chuck on one of the support members and moves with the chuck as the support member is rotated. The mechanical brake connected to the chuck holding one end of the expiring supply roll maintains the web tension after the expiring supply roll has been shifted out of its normal supply position and before the web from the old replenishment roll has been spliced to the web being fed from the expiring supply roll.

Numerous other advantages and features of the present invention will become apparent from the following detailed description of the invention, taken in conjunction with the drawings illustrating one embodiment thereof, in which:

THE DRAWING

FIG. 1 is a front elevational view of the web supply apparatus incorporating features of the present invention and in which certain parts are omitted for clarity of illustration;

FIG. 2 is a front elevational view complementary to FIG. 1, and showing the indexing mechanism that is omitted from FIG. 1;

FIG. 3 is a right-hand side view of the apparatus;

FIG. 4 is a fragmentary plan view of the drive end of the apparatus;

FIG. 5 is a diagrammatic view of the rolls in normal operating position;

FIG. 6 is a view, similar to FIG. 5, after the rolls have been shifted to new positions before the splicing operation; and

FIG. 7 is a view, similar to FIG. 6, showing the leading end of the web from the old replenishment roll being spliced to the web of the expiring supply roll.

DETAILED DESCRIPTION

Referring to FIG. 1 of the drawings, the web supply apparatus 11 embodying principles of the present invention comprises a drive end stand 12 and a front end stand 13 slidably mounted for lateral movement on a suitable base 14. The stand 12 has a nut 15 rigidly secured thereto, and the stand 13 has a nut 16 similarly secured thereto. Both nuts are in threaded interengagement with a threaded non-rotatable shaft 17 extending alongside both stands and axially movable in pillow block bearings 18. A motorized screw jack 19 connected to one end of the shaft 17 moves it axially in either direction. The threaded interengagement of the nuts 15 and 16 with the shaft 17 causes the stands 12 and 13 to move laterally as a unit when the shaft is moved. This simultaneous lateral movement of both stands facilitates the lateral adjustment of the stands relative to a processing machine to which the web supply apparatus is adapted to feed a web.

The stands may also be moved laterally, independently of each other, to permit them to be used with rolls of different length. A motor 20 mounted on the stand 12 drives a chain 21 adapted to rotate the nut 15 on the shaft 17 to move the stand 12 laterally independently of the stand 13. A similar motor 22 mounted on the stand 13 drives a chain 23 to rotate the nut 16 to move the stand 13 laterally independently of the stand 12.

The means for supporting the rolls is shown in FIGS. 1 and 2 of the drawings. At the drive end of the apparatus, two pillow block bearings 24 bolted to the stand 12 support a short rotatable shaft 25 to which one support member 26 is secured. Three chucks 27, 28 and 29 are mounted on the member 26 in uniformly spaced radial relationship, as shown in FIG. 3. The front end of the apparatus is similarly constructed with bearings 31 supporting a short rotatable shaft 32 to which a support member 33 is secured. The members 26 and 33 are parallel, and three chucks 34, 35 and 36, mounted on the member 33, are aligned axially with the chucks 27, 28 and 29, respectively,

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to hold opposite ends of cores 37, 38 and 39, respectively.

At the start of normal operation, the core 37 carries a supply roll 41, the core 38 is empty, but is adapted to receive a take-up roll 42 comprising the web from the supply roll after it has passed through a processing machine, and the core 39 carries a replenishment roll 43.

The web is pulled from the supply roll by the processing machine and, after it has been processed, is pulled from the processing machine by the take-up core 38. As the web is being fed from the supply roll, it is held under a predetermined tension by an electric motor 44 that is coupled to the chuck 27 through a speed reducing gear 45 and a sliding clutch assembly 46. The clutch assembly comprises a flanged drum 47 keyed to the chuck 27, and an inner element 48 secured to a shaft 49 extending from the speed reducer 45. The motor 44 acts as a brake to maintain the web tension until the supply roll 41 is nearly empty.

The chuck 28 is rotated by another electric motor 51 that is coupled thereto through a speed reducing gear 52 and a clutch 53 similar to the clutch 46. The clutch 53 comprises a flanged drum 54 keyed to the chuck 28 and an inner element 55 secured to a shaft 56 extending from the speed reducer 52. Both of the motors 44 and 51 are mounted on the stand 12, and thus are always in proper position relative to the chucks 27, 28 and 29. Each of the motors 44 and 51 is disconnected from the chuck it is driving, by disengagement of the clutches 46 and 53, before the web from the supply roll is completely exhausted.

The disengagement of the clutches 46 and 53 permits the support members 26 and 33 to be rotated to shift each roll to an adjacent position. The shifting operation, hereinafter described, moves the expiring supply roll 41 into the normal take-up position, the take-up roll 42 into the reserve position of the replenishment roll, and the replenishment roll into the normal supply position. The chuck 29 is also provided with a flanged drum (not shown) similar to the drums 47 and 54. Thus, the inner elements 48 and 55 of the clutches 46 and 53 may be engaged with one of the drums after each shift, regardless of which roll is in the supply position and which core is in the take-up position.

The shifting of the various rolls from their initial positions to their new positions is effected by the simultaneous rotation of both support members 26 and 33 about a common axis through 120° in the same direction. The shift mechanism is shown in FIG. 2. A motor 57, mounted on the stand 12, is coupled to a vertical shaft 58 through a speed reducing gear 59. The upper end of the shaft 58 is coupled through suitable gearing 60 to the shaft 25 for rotating the support member 26.

The lower end of the shaft 58 is coupled through suitable gearing 61 to a horizontal shaft 62 supported in a pillow block bearing 63. The shaft 62 is coupled to a similar shaft 64 at the front end of the apparatus by a tubular shaft 65 to which both shafts 62 and 64 are keyed. The shaft 64 is also supported in a bearing 66. The tubular shaft 65 permits either shaft 62 or 64 to move axially therein, whereby either stand 12 or 13 may be moved laterally relative to the other. Nuts 67 and 68, threaded on shafts 62 and 64, are engageable respectively with the outer ends of the bearings 63 and 66 to hold each of the shafts 62 and 64 against axial movement relative to the other. When each nut is engaged with the adjacent bearing neither of the stands 12 or 13 can be moved laterally from its adjusted position.

The shaft 64 is connected to a vertical shaft 69 that is connected, by suitable gearing 70, to the shaft 32. The gearing at each end of the machine insures simultaneous rotation of both support members 26 and 33 in the same direction at the same rotational speed.

Two guide rollers 71, 72 are mounted in fixed position forwardly of the take-up roll to permit shifting of the take-up roll without interfering with rewinding the web on the take-up roll in either the normal take-up position,

or in the reserve position of the replenishment roll, to which the take-up roll is shifted when the web from the supply roll approaches its end.

During the shift period both motors 44 and 51 are disconnected from the chucks they drive during the normal operation of the apparatus. The tension on the web being fed from the supply roll 41 is released immediately by disconnection of the motor 44, and the desired web tension is maintained during the shift period by an auxiliary mechanical brake 73 that is secured to the chuck 27. The speed of rotation of the supply roll is reduced when the motor 44 is disconnected, and consequently the brake 73 is smaller because less braking power is required. When the chuck 27 is shifted from one position to an adjacent position the brake 73 is moved with it, and is always available to exert the desired web tension when the clutch 46 is disengaged. Each of the chucks 28 and 28 are also provided with an auxiliary mechanical brake 73 so that the desired web tension may be maintained during the shift period regardless which chuck is in the supply position. No auxiliary take-up motor is required during the shift period because the momentum of the take-up roll causes it to rotate for a short period while after the motor 51 is disconnected from the take-up chuck.

The splicing operation, which takes place during the shift period, will now be described. The mechanism for effecting the splice between the leading end of the web from the roll 43 to the trailing end of the web from the roll 41 is shown diagrammatically in FIGS. 5, 6 and 7. During the normal operation of the web feeding apparatus, the web from the supply roll 41 passes under a pasteur roller 75 below which is pivotally mounted a pressure roller 76. The supply roll 41 continues to feed its web as it is being shifted into the take-up position. A web carrier 77 picks up the leading end of the web from the roll 43 and carries it between the web of the roll 41 and the pasteur roller 75.

The pressure roller 76 is moved upwardly into substantial engagement with the roller 75 to press the web from the roll 43, to which adhesive has been applied, and the web from the roll 41 together to splice them. The web from the roll 41 may be fed until it reaches its end, but preferably is served after the splice has been effected. The remnant of the web is removed from the core 37 after it is served to make the core ready to receive and rewind the web from the new supply roll 43 after it has been processed.

The continuity of the web feeding to the processing machine is assured by allowing the doubled portion of the web to pass through the processing machine and then severing the web forwardly of the splice before any of the doubled portion of the web is wound on the take-up roll 42, which is now in the reserve position of the replenishment roll. The doubled portion of the web is then served from the following single thickness of web and is removed. The single thickness of web rearwardly of the splice is attached to the empty core 37 that formerly carried the supply roll 41, and is now the core for the new take-up roll.

When the support members have been rotated through 120° and the rolls are in their new positions, the clutches 46 and 53 are engaged pneumatically to resume the normal operation of the web supply apparatus. The old take-up roll 42 is removed from the reserve position of the replenishment roll, and a new replenishment is mounted in that position ready to replace the new supply roll 43 in the next shift.

While the invention has been described above with particular reference to feeding a web of paper through a supercalender, it is clear that the web supply apparatus may be used with other devices and that the web may be of material other than paper.

A preferred embodiment of the invention has been described in considerable detail, but it will be understood

that the description thereof is intended to be illustrative, rather than restrictive, as many details of construction may be modified or changed without departing from the spirit or scope of the invention. Accordingly, it is not intended that the invention be restricted to the exact structure described.

What is claimed is:

1. Apparatus for feeding a continuous supply of web material from a supply roll and a replenishment roll and for rewinding on a take-up roll web material returning to the apparatus comprising a pair of stands, a support member mounted on each stand for rotation about a common axis, means on each of said support members for supporting between said support members in equally spaced radial relationship one roll in a normal supply position, one roll in a normal take-up position and one roll in a normal replenishment position, means for laterally moving each of said stands independently of the other stand to support therebetween rolls of different lengths, means for laterally moving said stands as a unit to adjust the lateral position of rolls supported between said stands, and means for simultaneously rotating said support members about said common axis to shift the radial positions of said roll support means relative to said common axis, whereby web material being supplied from a supply roll may be spliced to web material to be supplied from a replenishment roll.

2. Apparatus as recited in claim 1, in which said means for moving said stands laterally as a unit comprises a shaft, means for moving said shaft axially, and means connecting said shaft to each of said stands.

3. Apparatus as recited in claim 1, in which said means for moving said stands laterally independently of each other comprises a threaded shaft, a pair of nuts rotatably threaded on said shaft, means connecting each of said nuts to one of said stands, and means for independently rotating each of said nuts on said shaft whereby each said stands are independently moved laterally relative to said shaft.

4. Apparatus as recited in claim 3, in which said means for moving said support members laterally as a unit includes said threaded shaft, said nuts secured to each of said stands, and means coupled to said shaft for moving said shaft axially whereby both of said support members are moved laterally as a unit.

5. Apparatus as recited in claim 1 including a brake motor supported in fixed axial alignment with the normal supply position and disengageably connected successively to the roll support means of one support member when rotated into said normal supply position for maintaining web tension on a web being supplied from a roll supported in said normal supply position.

6. Apparatus as recited in claim 5 including auxiliary brake means coupled to each roll support means on one support member for maintaining web tension on the web being supplied from a roll when said support members are rotated about said common axis to position the roll from which web is being supplied away from said normal supply position.

7. Apparatus as recited in claim 1 including drive means mounted on one of said stands in fixed axial alignment with the normal take-up position and connected successively to each roll support means of one support member when in said normal take-up position for taking up web material on a roll supported in said normal take-up position.

8. Apparatus for feeding a continuous supply of web material from a supply roll and a replenishment roll for rewinding on a take-up roll web material returning to the apparatus comprising a pair of stands, a rotatable support member mounted on each stand, means on each of said support members in equally spaced radial relationship for supporting therebetween one roll of web material in a normal supply position, one roll of web material in a normal replenishment position, and one roll of web material in a normal take-up position, means for rotating said

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support members about a common axis to index said roll support means, respectively, from normal supply position to normal take-up position from normal take-up position to normal replenishment position and from normal replenishment position to normal supply position, primary brake means aligned with said normal supply position and disengageably connected to the roll support means in the normal supply position for maintaining tension on a web being supplied from a roll supported in said normal supply position and disengageably connected to the roll support means in the normal take-up position for rewinding a web returning to the apparatus on a roll in normal take-up position, auxiliary brake means coupled to each roll support means on one support member for maintaining tension on a web being supplied from a roll indexed from normal supply position, and means for splicing to a web being supplied

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from a roll in the normal take-up position a web to be supplied from a roll in the normal supply position, whereby a continuous web of material is supplied.

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242—64