

March 13, 1962

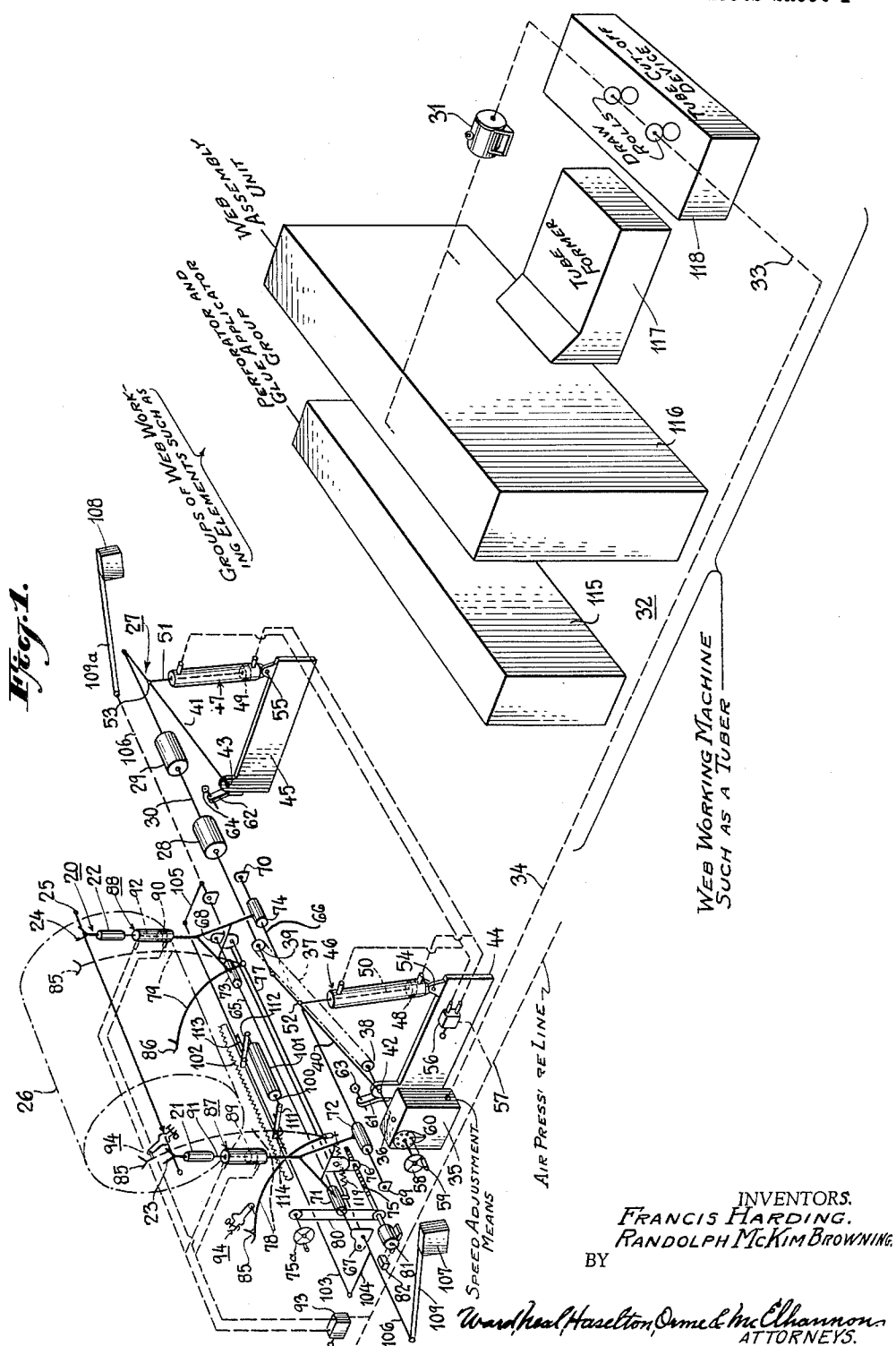
F. HARDING ET AL

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APPARATUS FOR CONTROLLING PAPER ROLLS

Filed Feb. 18, 1957

8 Sheets-Sheet 1



March 13, 1962

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3,025,013

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Fig. 3.

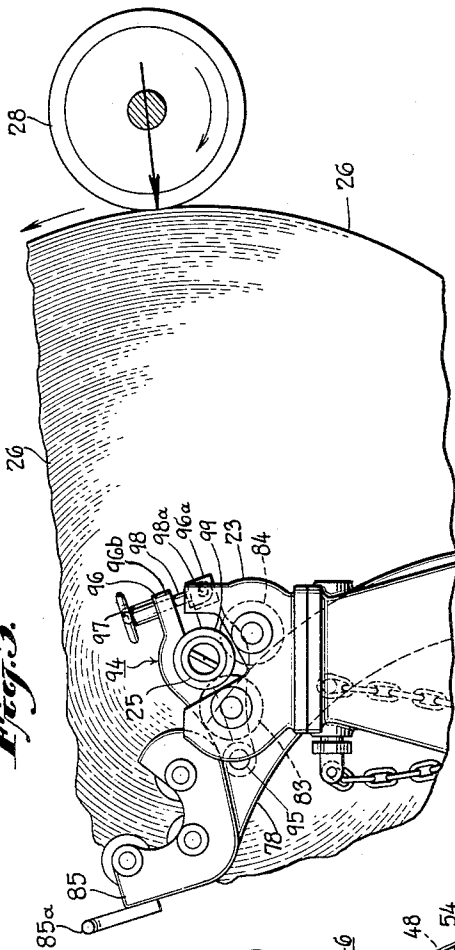


Fig. 4.

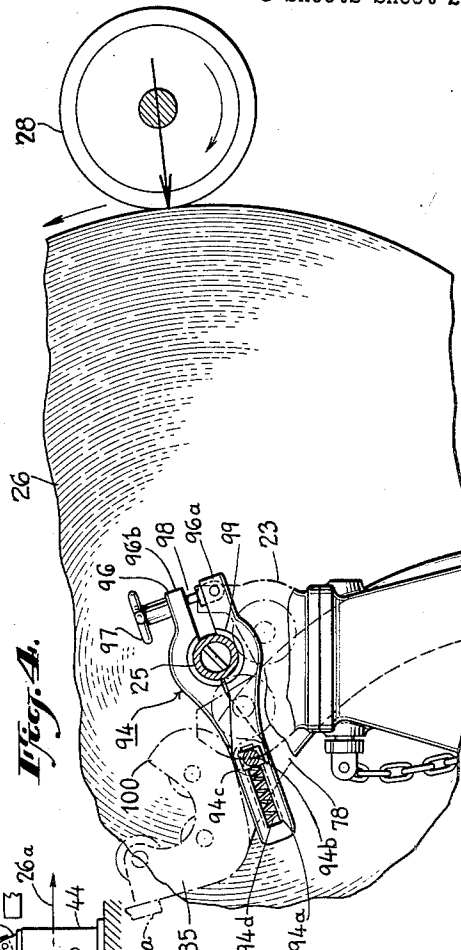
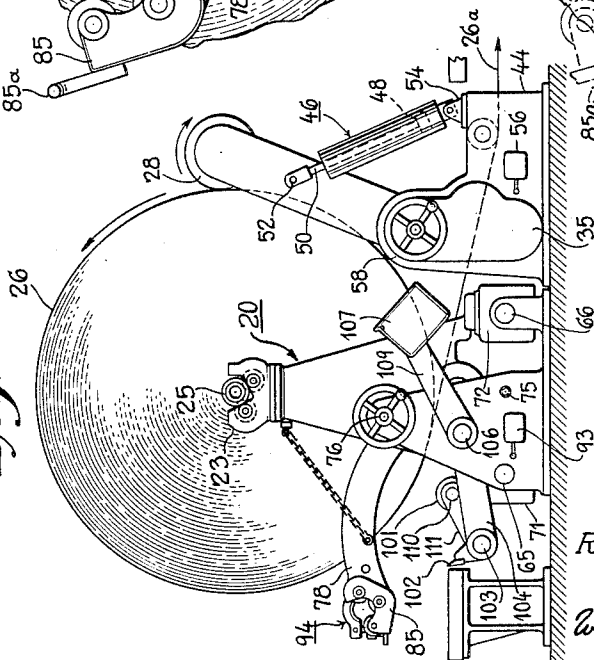


Fig. 2.



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8 Sheets-Sheet 3

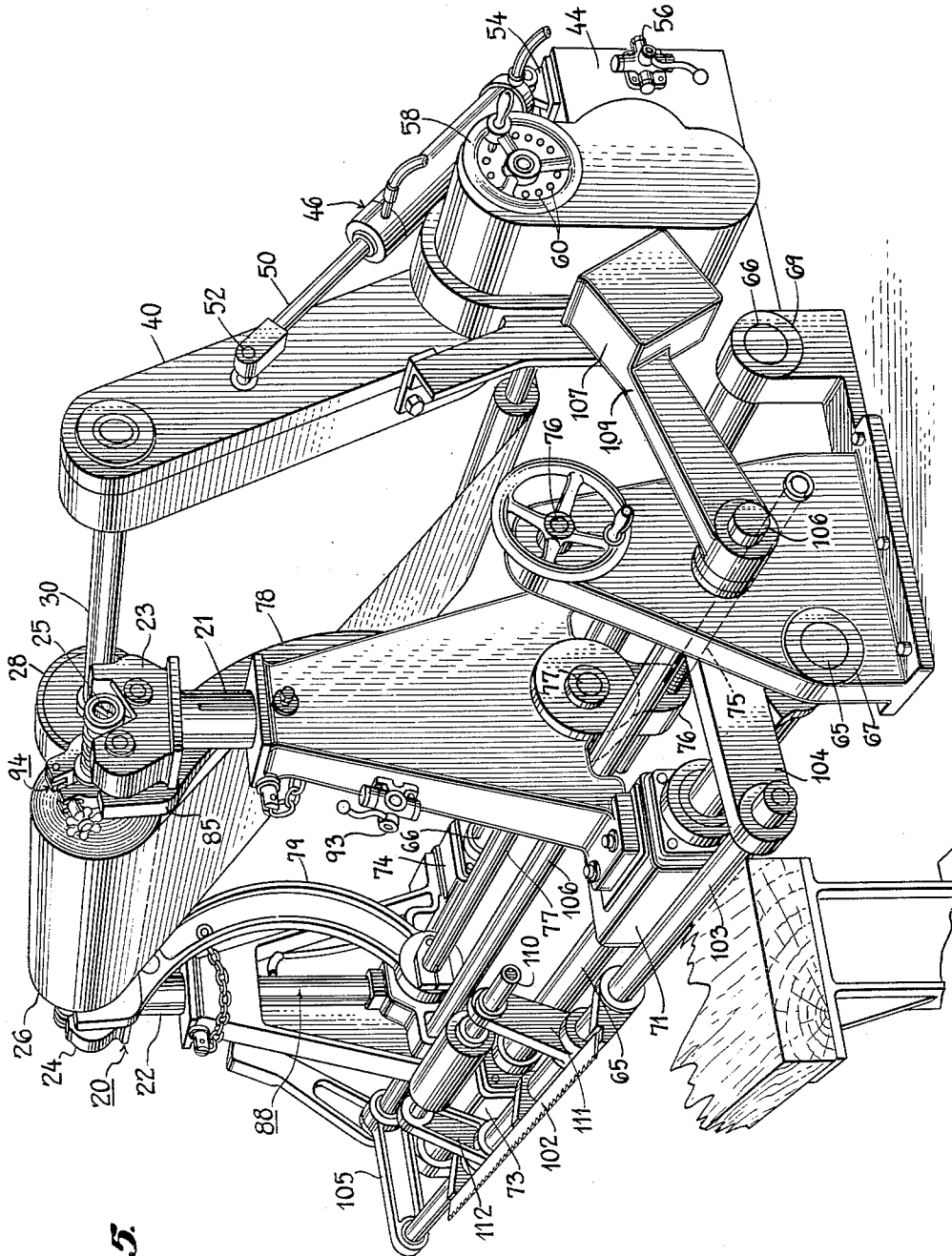


Fig. 5.

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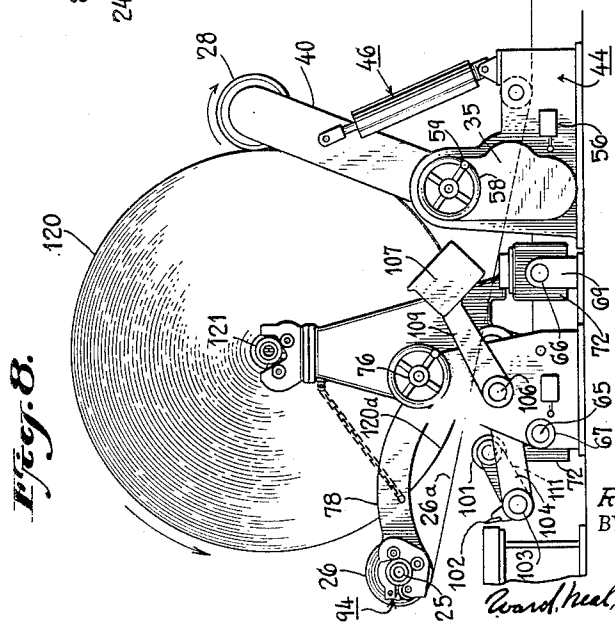
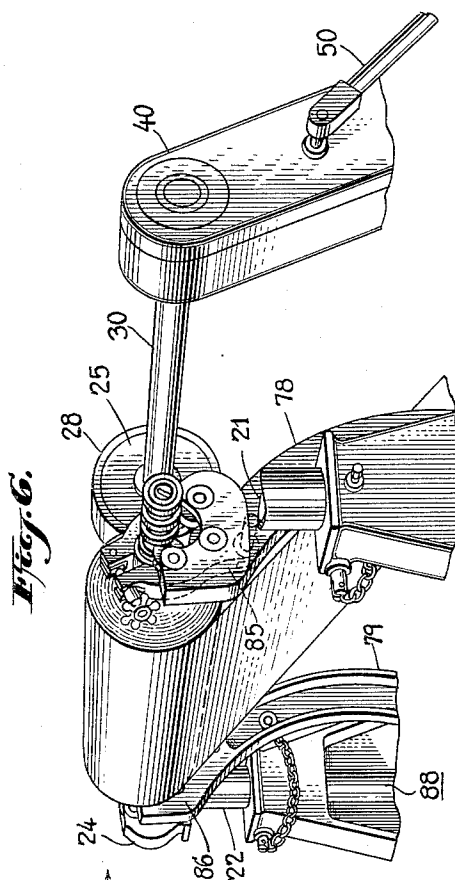
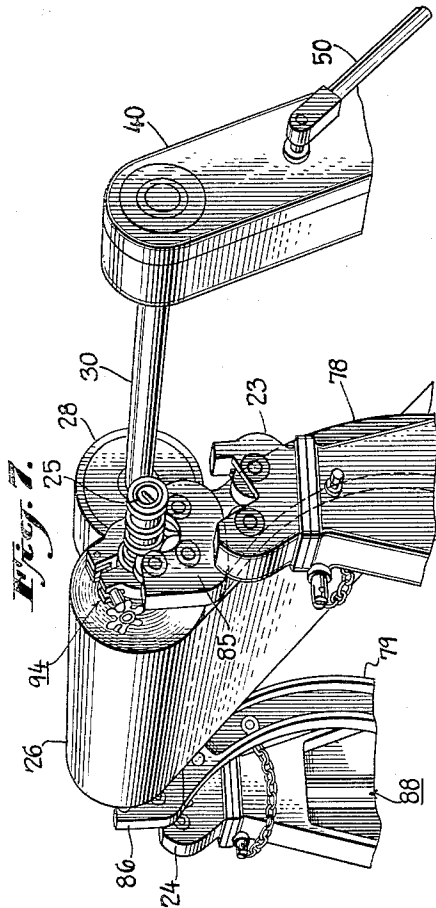
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8 Sheets-Sheet 4



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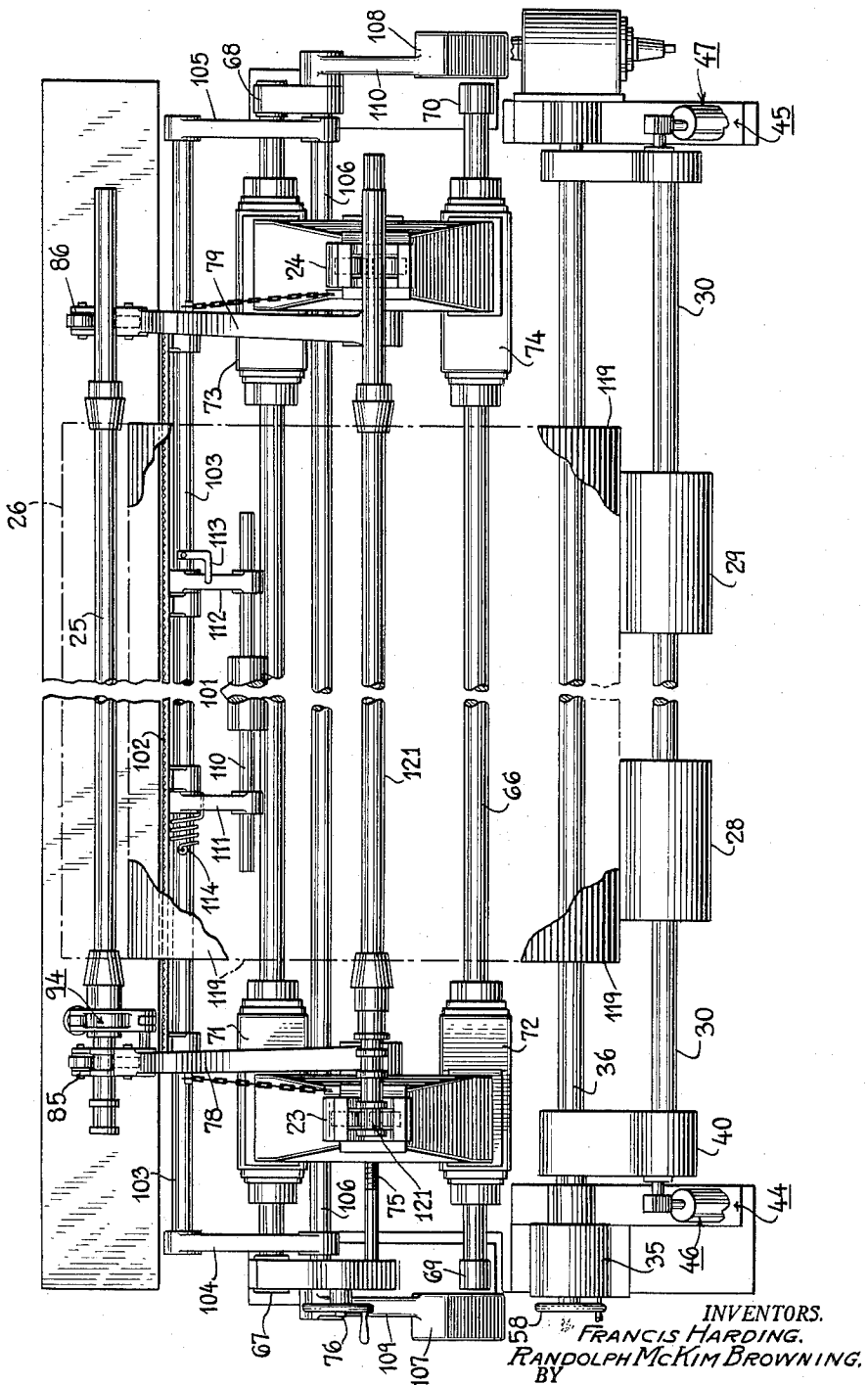
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Filed Feb. 18, 1957

8 Sheets-Sheet 5

Fig. 9.



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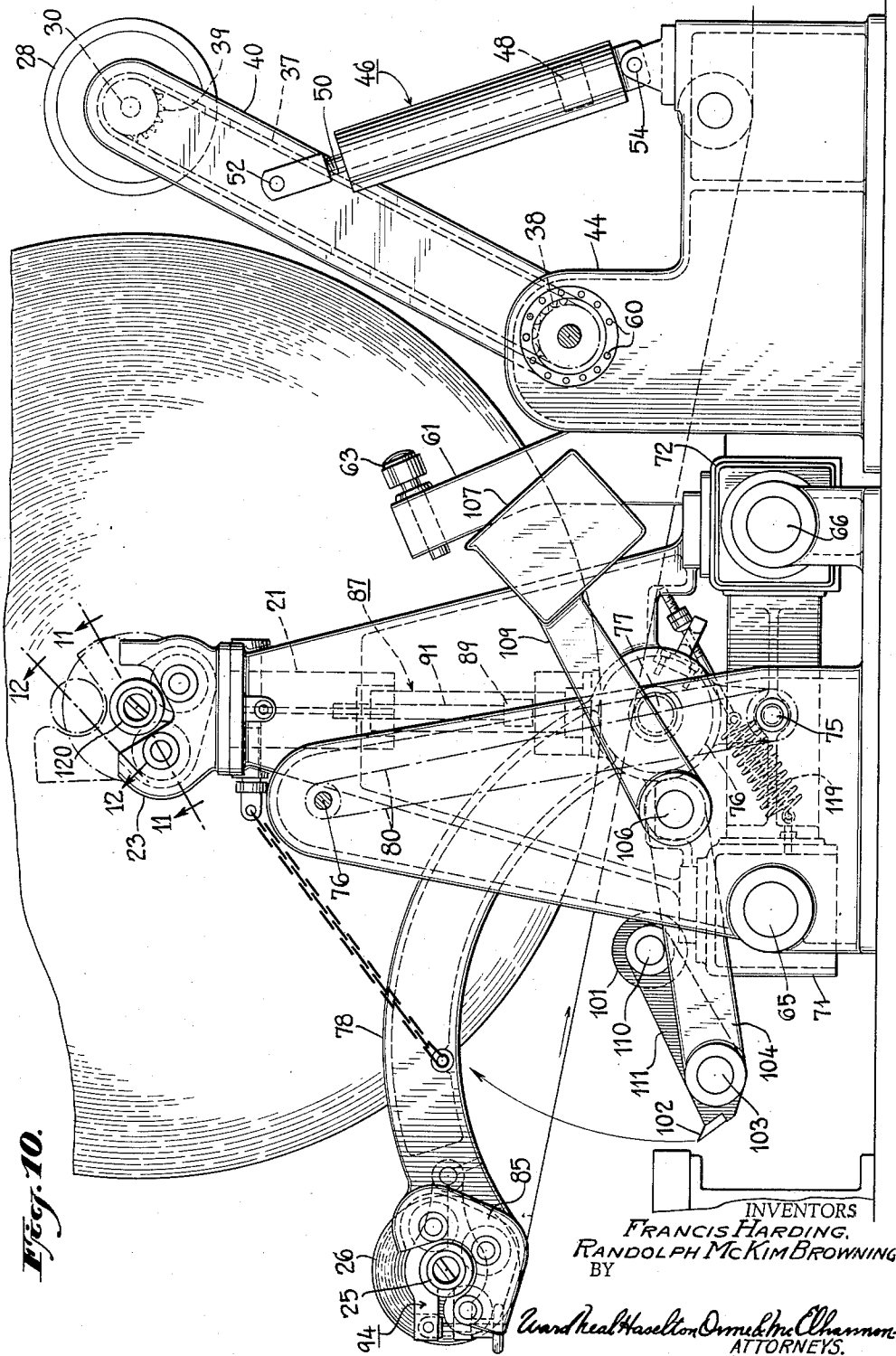
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3,025,013

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Filed Feb. 18, 1957

8 Sheets-Sheet 6



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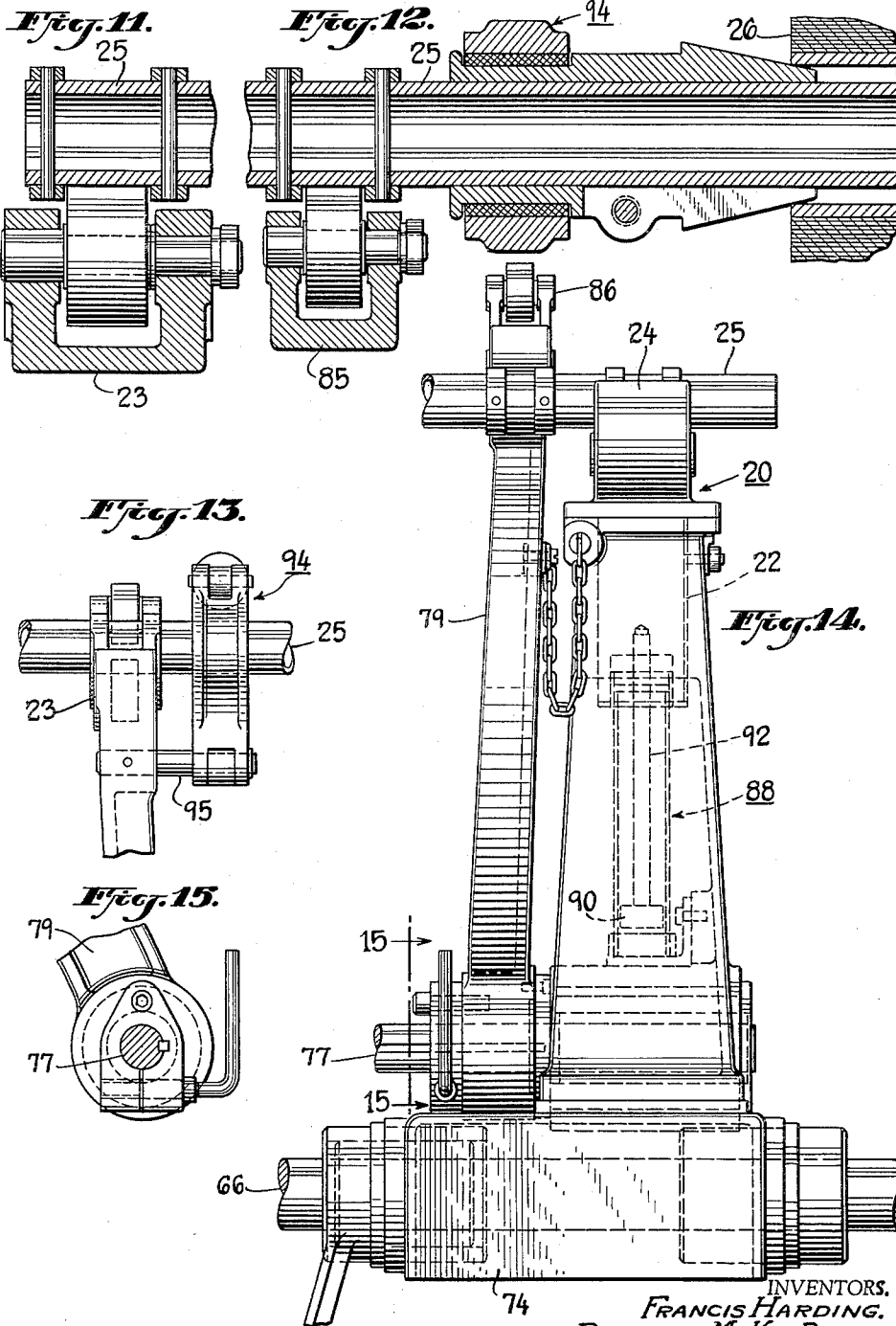
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8 Sheets-Sheet 7



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APPARATUS FOR CONTROLLING PAPER ROLLS

Filed Feb. 18, 1957

8 Sheets-Sheet 8

Fig. 16.

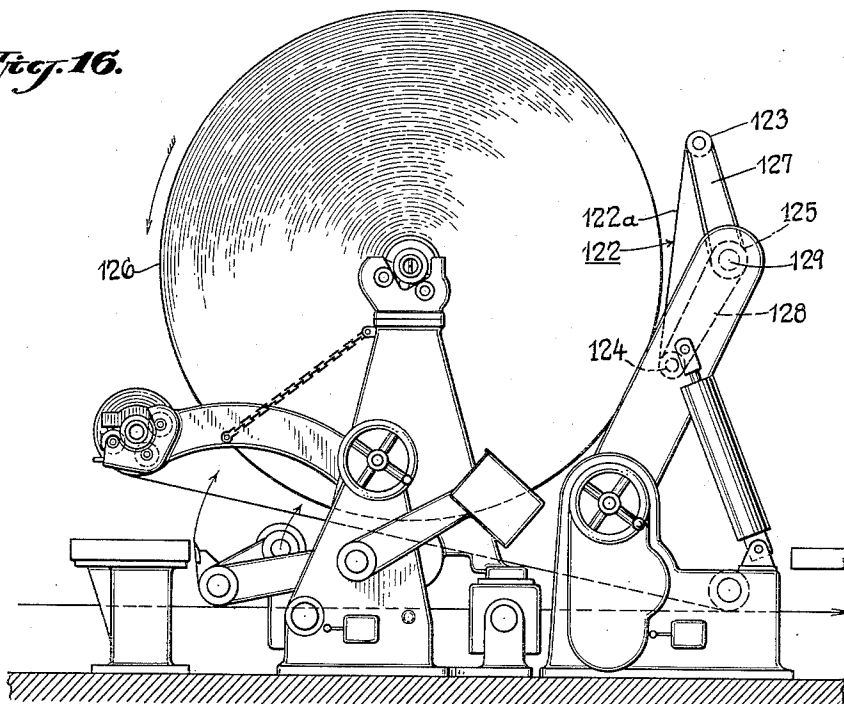
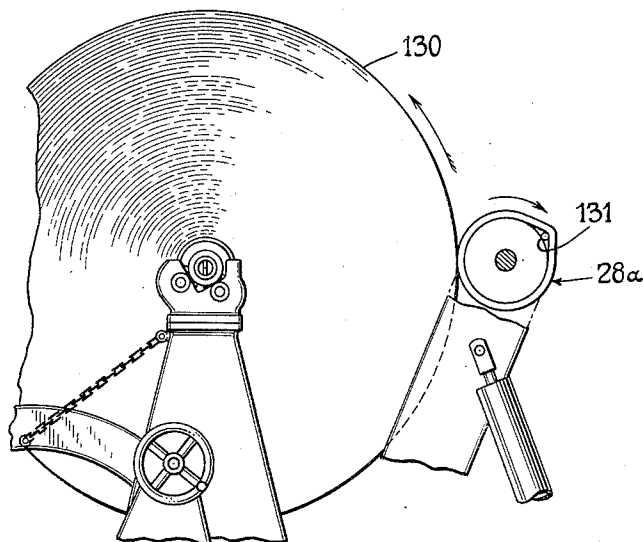


Fig. 17.



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1

3,025,013

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Filed Feb. 18, 1957, Ser. No. 640,668
5 Claims. (Cl. 242—58.3)

This invention relates to roll stand apparatus for supporting rolls of sheet material while being unrolled as a continuous web or sheet and drawn into a web or sheet material working machine. More particularly, the invention relates to improvements in such apparatus for the purpose of controlling the tension of such web, and for facilitating the splicing of a fresh roll to the web of a nearly expired roll, such improvements maintaining a control of such tension at all times, including the time of such splicing.

Apparatus embodying the present invention is well adapted for use with web working machines, such as that shown and described in copending U.S. patent application Serial No. 545,363, now Patent No. 2,897,730, such application describing a multiwall bag tuber.

Most types of web working machines, and in particular tube making machinery, is to a large extent dependent for efficient operation upon carefully controlled web or sheet tension. Prior art means for controlling such web or sheet tension has not proved entirely satisfactory as exemplified by the results obtained by the use of weighted belts which are hung over rolls of sheet material, such as paper, and also as exemplified by the results obtained by auxiliary draw rolls, also referred to as "S" rolls. These prior expedients have proved extremely uncertain.

A further serious problem that exists in prior art apparatus of this general type is found in its inability to control tension and weaving of the sheet or web during the time that a splice is being made, such splice, of course, being made while the apparatus is in operation, usually at high speed, and being referred to as a flying splice. Often, control of the web is lost during the time of the making of such flying splice and excessive weaving takes place which causes a high percentage of scrap and rejected end product of the web working machine, for example, an excessive amount of rejected bag tubes in the case of a tubing machine.

Thus the use of the aforementioned weighted belts, while being of some help, is not adequate and is subject to a still further disadvantage in that it does not prevent overrunning of the rolls of sheet material when the web working machine is stopped quickly. For example, should a tuber be suddenly stopped, the momentum of the heavy paper rolls is so great that the weighted belts are incapable of stopping them promptly, resulting in the rolls paying out large quantities of paper which cannot profitably be rewound thereupon and which often must be scrapped.

Furthermore, in order to make a flying splice with apparatus of the prior art, it has heretofore been necessary for two persons to be occupied in this task, namely, the operator who must be diverted from his normal duties and who must absent himself from his control station and appear at the rear of the machine to assist the so-called "shafter" man to complete the flying splice. In view of the absence in apparatus of the prior art for making a successful flying splice by substantially automatic means, the successful completion of the task of making the splice is dependent upon the skill and experience of the personnel involved and despite the employment of skilled and experienced personnel there are many defective and uncompleted splices which occur, thereby causing machine shutdowns of substantial length and expensive lost production. The percentage of such uncom-

2

pleted splices has been found to increase in proportion to the width of the web or sheet.

Also, web working machines, such as tubers, which employ roll stand apparatus heretofore suggested, have been subject to the disadvantage of slippage of the web or sheet material at the main draw rolls of the web working machine during the start-up of the machine, thereby causing loss of registration of any preprinted matter on the web or sheet material, thereby often causing undesirable rejection of, for example, finished bag tubes by virtue of lack of registration of the colors printed thereupon or by virtue of lack of registration of printed matter even though not of a multicolor variety. The latter disadvantage is particularly frequent when large and heavy rolls of paper or other sheet material are fed during start-up of the web working machine. Also, more frequent rupturing of the web in such prior art apparatus has occurred during the start-up of the machine when employing large diameter rolls of paper.

One of the objects of the present invention is to overcome the above difficulties or to reduce same to insignificance.

The invention, in one aspect thereof, is constituted by the combination with a web working machine of a roll stand apparatus which is constituted by primary and secondary support means for a core shaft of a roll of sheet material, such as paper, which in web form is unrolled from such roll and drawn by such machine into same for working. Drive means for such roll are provided which frictionally engages its periphery to rotate same. The drive means comprise a power driven drive roll. For the purpose of controlling the tension of such web, means are provided for adjusting the speed of such roll drive means, it being understood, of course, that if the surface speed of the paper roll is reduced below the surface speed of the web in the web working machine, the tension will be increased and vice versa. The roll of sheet material when nearly expired is removed from the primary to the secondary support means to make way for a fresh full roll. Accordingly, means are provided for transferring such core shaft from said primary to said secondary support means while maintaining frictional peripheral engagement of said roll and roll drive means thereby to maintain suitable tension control during the transfer of the roll, such transfer, of course, being effected after the roll has become reduced in diameter to a selected degree and is near or approaching expiration. The primary support means are thereby cleared for the support, as aforementioned, of a fresh roll, the web from the now reduced roll, of course, being continually fed to the web working machine and caused to pass near to the periphery of the new and full roll substantially parallel to the axis of the latter. Brake means are provided for applying a braking force to the reduced roll after such transfer and before and after separation of the reduced roll and the aforementioned roll drive means, such brake means thus maintaining a desired tension upon the web of the now expiring roll. The roll drive means, after disengagement from the reduced roll, of course, are applied to the periphery of the new full roll supported now by the primary support means and thus prior to splicing can bring the surface speed of the new roll up to speed as required by the web working machine. Splice roll means are also provided for urging the web of the expiring roll against the periphery of the now rotating new roll during the actuation of such brake means to the expiring roll, and also during engagement of said roll drive means with such new roll. Knife means are operatively associated with such splice roll means for cutting the web of the expiring roll while concurrently applying said brake and drive means to the old and new rolls respectively. That is, means are provided for urging the web from the ex-

piring roll against the periphery of the new roll (to which adhesive has been applied) and, after adhesion therebetween, cutting the web of the expiring roll while so concurrently applying said brake and drive means. Thus tension is maintained in both webs or sheets during the making of the flying splice.

The above and further objects and novel features will more clearly appear from the detailed description given below when the same is read in connection with the accompanying drawings. It is expressly understood, however, that the drawings are for purposes of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being had to the appended claims.

In the drawings:

FIG. 1 is a perspective schematic view of roll stand apparatus embodying one form of the invention shown in combination with a web working machine;

FIG. 2 is a side elevation of the roll stand apparatus schematically shown in FIG. 1 and illustrating the means for supporting a roll of sheet material which is to be threaded into a web working machine;

FIG. 3 is a side elevation of a fragment of the apparatus shown in FIG. 2 but in a different operating position, such apparatus being shown partly in section and with parts broken away;

FIG. 4 is a further fragmentary view of the parts shown in FIG. 3 with certain parts eliminated for purposes of clarity and for illustrating the braking means employed in the present invention, such braking means of FIG. 4 being modified as compared to FIG. 3;

FIG. 5 is a perspective view of the apparatus shown in FIG. 1 but from a different angle and in a different operating position, the roll of sheet material shown in FIG. 5 being substantially reduced in diameter as compared to its initial size and being prepared for removal to make way for a fresh or full roll of sheet material which is to be spliced to the web of the first-mentioned roll;

FIG. 6 is a perspective view of portions of the apparatus shown in FIG. 5 in the same operating position, but partly in section and with parts broken away to illustrate the position of the core shaft of a paper roll slightly above the bearings of the transfer arms (secondary support means);

FIG. 7 is a perspective view of the parts of the apparatus shown in FIG. 6 but in another operating position, the distinction over FIG. 6 being that the core shaft of the paper roll is shown lowered into engagement with the bearings of such secondary supporting means;

FIG. 8 is a side elevation of the roll stand apparatus shown in the previous figures but in a still further and different operating position, the expiring roll of sheet material having been moved away from its initial position and the fresh or full roll placed upon the primary roll support means preparatory to bringing the latter to required surface speed for splicing into the web of the expiring roll;

FIG. 9 is a plan view of the parts shown in FIG. 8;

FIG. 10 is a further side elevation, partly in section and with parts broken away, somewhat similar to FIG. 8 but showing additional details;

FIG. 11 is a sectional view taken substantially along line 11—11 of FIG. 10;

FIG. 12 is a sectional view taken substantially along line 12—12 of FIG. 10;

FIG. 13 is a fragmentary view, in top plan, of the extremity of a transfer arm in the position shown in FIG. 10, and illustrating the association of one form of brake means with the extremity of such transfer arm;

FIG. 14 is a front view, partly in section and with parts broken away, of a pedestal comprising one of a pair thereof comprising the main stand of the present invention;

FIG. 15 is a sectional view taken substantially along line 15—15 of FIG. 14;

FIG. 16 is a side elevation of a modification of the apparatus embodying the present invention, and in particular illustrating an alternative form of drive means for driving the roll of sheet material resting upon the main stand; and

FIG. 17 is a fragmentary view in side elevation of a portion of the apparatus shown in FIGS. 1 and 8 illustrating another form of such roll drive means.

Referring to the drawings in greater detail, with particular reference to FIGS. 1 and 2, the novel apparatus embodying the present invention is constituted by a main stand 20 consisting of two main pedestals 21 and 22, each being surmounted by its respective core shaft cradle 23 and 24 respectively, a core shaft 25 for a roll of sheet material 26, such as paper, being shown resting in such cradles.

For purposes of starting up the roll 26 and for maintaining same at a desired speed, and also for purposes of maintaining a selected tension upon the web unrolled from such roll 26, a novel drive means 27 is employed which is constructed and arranged for engaging the periphery of the roll 26 and rotating same as is well shown in FIG. 2. Such drive means, in the form shown in FIG. 1, comprises two separate drive rolls 28 and 29 mounted upon a common drive shaft 30 which is driven by suitable power means, for example, by a main motor 31 comprising the main source of torque or power of a web working machine 32, such as a tuber, with which, in one form of the invention, the novel roll stand is employed in combination. The operative interconnection between the motor 31 and the rolls 28, 29 may, if desired, include a group of elements comprising a part of the tuber, the latter being a multiwall or multi-ply tuber having means for drawing therethrough a plurality of webs which are to be formed into a multi-ply tube.

Although only one roll stand apparatus is shown in FIG. 1, it is understood that any desired number of such apparatus can be employed to feed webs to the web working machine.

The use of the power driven rolls 28 and 29 eliminates the need for a separate group of auxiliary draw rolls which ordinarily would be employed. Usually such a group of auxiliary draw rolls precedes a perforator and glue applicator group in a tuber machine. One of the main objects of the invention thus is achieved by the elimination of such an auxiliary draw roll group thereby simplifying the apparatus and reducing its cost.

Shaft 30, which supports the drive rolls 28 and 29 derives its torque from motor 31 by an operative interconnection including:

Torque or power shafts 33 and 34, a speed adjustment means 35, and intermediate shaft 36, and a belt 37 which passes respectively over pulleys 38 and 39 upon the shafts 36 and 30. Thus referring to FIG. 1 it is seen that such operative interconnection is preferably but not mandatorily via the draw rolls of the tube cutoff device.

The function of the speed adjustment means, as aforementioned, is to control the speed of the drive rolls 28 and 29 for the purpose of slowing down or speeding up the surface speed of the roll 26 relative to web speed in the tuber, thereby to increase or decrease the tension upon the web being payed out therefrom to the web working machine. The speed of the roll 26 thus can be adjusted to achieve any desired tension upon the web, it being understood, of course, that the drive rolls 28 and 29 may not travel at precisely the same surface speed as that of the roll 26 by virtue of the action of draw roll means (FIG. 1) in the web working machine. Such draw roll means pull the web at one speed comprising the aforementioned web speed (or paper speed) in the tuber and this may differ from the surface speed of such drive rolls 28 and 29. Thus there may be a slight slippage between the drive rolls 28 and 29, that is, between the peripheries of the

5

drive rolls 28 and 29 and the paper roll 26, such slippage, of course, occurring when the speed of the drive rolls is below paper speed.

The drive rolls 28 and 29 are also sometimes referred to as the driven rolls.

Such rolls 28 and 29 are mounted for movement toward and away from the main stand 20 and any roll of sheet material mounted thereupon. Power means are provided for urging the rolls 28 and 29 toward and away from such main stand, and particularly toward and away from the core shaft 25 which mounts roll 26.

Accordingly, we have found it desirable to mount the shaft 30 upon parallel movable roll support arms 40 and 41 which are pivotally mounted respectively at 42 and 43 upon fixed frame members 44 and 45, respectively, the latter frame members being positioned at the maximum width expected for a web or sheet of the material to be unrolled, the same being true of the parallel arms 40 and 41.

The aforementioned power means for so moving the driven rolls 28 and 29, and hence for effecting the angular movement of the arms 40 and 41, in the form shown, comprise pneumatic power cylinders 46 and 47 having pistons 48 and 49, respectively, to which are attached piston rods 50 and 51, respectively. Such piston rods in turn protrude from the power cylinders and are pivotally connected to their respective parallel arms 40 and 41 at 52 and 53. The lower extremity of each power cylinder is pivotally associated with its respective frame member 44 and 45 at 54 and 55.

The power cylinders 46 and 47 are actuated by a fluid medium such as air under pressure which is controlled by means of a control valve 56 which receives the pressure medium from an air pressure line 57 and is capable, in a well known manner, of directing same to the chambers below the pistons 48 and 49 or alternatively to the chambers thereabove.

The speed adjustment means 35 above mentioned can be of any suitable variety which, in the form shown, is provided with a manual adjustment wheel 58 having an axially shiftable handle 59 thereupon which is provided at its inner extremity with a finger for engaging any one of a plurality of spaced recesses 60. The latter are positioned in a circular path for engagement selectively by the aforementioned finger of the handle 59.

For the purpose of controlling the extent of angular movement of the parallel arms 40 and 41 toward the main stand 20, suitable limit-stops 61 and 62 are provided having respectively adjustment screws 63 and 64 for controlling to a selected and accurate extent the distance to which the driven rolls 28 and 29 can approach the core shaft resting upon the main stand 20.

Reverting to the aforementioned main stand 20, the means for mounting same and its associated parts will now be described. The pedestals 21 and 22 of the main stand 20 are mounted for lateral adjustment, as will appear hereinafter, and are also mounted for movement together transversely of the path of the webs. That is, such pedestals 21 and 22 may be positioned at any selected interval from one another for the purpose principally of being placed closely adjacent to the opposite ends of a roll of sheet material thereby to gain a more positive support of the core shaft of such roll and to prevent deflection of the roll which might occur if such pedestals were widely separated and the core shaft were permitted to sag or bounce under the influence of the rotation of the great weight of such roll.

In the form shown, the means for mounting the pedestals 21 and 22 for lateral adjustment of the interval therebetween comprises a pair of main support bars 65 and 66 which are mounted parallel to one another extending transversely of the path of the web or webs which are unrolled from such stand. Preferably the opposite extremities of such bars 65 and 66 are rigidly secured to suitable fixed frame members, such as 67, 68 for the bar 65

6

and 69, 70 for the bar 66. The bars 65 and 66 are associated with the pedestals 21 and 22 by means of two pairs of foot members, namely, 71, 72 and 73, 74. Such foot members in the form shown comprise tubular elements which respectively embrace the bars 65 and 66 and are provided with suitable bearings for supporting the weight upon such bars and at the same time providing for easy lateral adjustment of the pedestals and, when desired, easy edge alignment of a roll supported thereby by means of movement of the pedestals together laterally.

In the form shown the means for moving the pedestals 21 and 22 together laterally of the path of the webs, thereby to make an adjustment of the edge alignment of the webs, comprises a threaded shaft 75 which engages a threaded bore in a lug 76 which is rigidly secured to one of the pedestals, such as 21, said shaft 75 being restrained from axial movement by any conventional means and being angularly shiftable by means of a handwheel 75a thereby to shift the pedestal 21 and hence the pedestal 22, such pedestals being rigidly secured together by means of a cross-shaft 77 secured to both, said cross-shaft 77 also serving the purpose of a pivot shaft for a pair of transfer arms 78, 79 to be described more fully herebelow.

The handwheel 75a, in the form shown, is operatively connected to the threaded shaft 75 for effecting the aforementioned edge lateral adjustment by any suitable means, for example, by means of a belt or sprocket chain 80 interconnecting suitable pulleys or sprocket wheels upon the shaft mounting the wheel 75a and upon the threaded shaft 75.

Furthermore, if desired, a motorized lateral adjustment of such pedestals to effect such edge alignment may be made by means of a motor 81 having a control device 82, said motor being operatively connected to said threaded shaft 75. The motor 81 and its control 82, if desired, may be operatively connected to suitable photoelectric means (not shown) for observing the edge of a web and for introducing a suitable lateral edge aligning adjustment to the pedestals 21 and 22 where indicated by such photoelectric means.

When a roll of sheet material has diminished in diameter to a selected degree, it is, of course, desirable to prepare the apparatus for the introduction of a fresh or full roll of large diameter. Means for accomplishing this will now be described.

In general, means are provided for transferring the roll of sheet material which is of diminished diameter to a location removed from the main stand 20, and to the opposite side thereof with respect to the drive rolls 28 and 29, whereby the first roll of diminished diameter is made ready for being cut off and for being spliced to such fresh roll of large diameter placed on the main stand 20. The latter and its pedestals 21 and 22 comprise primary support means for the core shaft of the roll of sheet material, and the aforementioned transfer arms 78 and 79 comprise secondary support means for such core shaft. Means are provided for transferring the core shaft, for example, the shaft 25, from such pedestals to the transfer arms 78 and 79, as will appear herebelow.

The transfer arms 78 and 79 are mounted for movement toward and away from the pedestals 21 and 22 and hence toward and away from a shaft supported thereby. Preferably the means for so mounting the transfer arms comprises a pivot means for pivotally supporting the lower extremities thereof thereby to permit said arms to move together angularly about a selected axis, which, in the form shown, comprises the axis of the shaft 77 to which the support arms 78 and 79 are rigidly secured for angular movement together.

As aforementioned, each of the pedestals 21 and 22 is provided with a bearing cradle 23 and 24, each containing a pair of self-aligning roller bearings for supporting its respective extremity of the core shaft, said self-aligning

bearings being shown for the cradle 23 at 83 and 84 (FIG. 3).

The means for effecting the transfer of a core shaft, such as 25, from the main stand 20 to the transfer arms 78, 79, that is, from the primary to the secondary core shaft support means, comprises, in the form shown, power means for raising the core shaft 25 to a point where it can be lowered into cradles 85 and 86 respectively mounted upon the extremities of the transfer arms 78, 79.

Such power means, in the form shown, comprises power cylinders 87 and 88 (FIG. 1) respectively associated with the pedestals 21 and 22 and provided respectively with pistons 89 and 90 having piston rods 91 and 92 which are operatively connected to suitable column or post means which respectively support the cradles 23 and 24.

The power cylinders 87 and 88 are preferably actuated by air under pressure which is under the control of a valve 93 which also draws its supply of fluid medium from the main pressure line 57.

As is well shown in FIGS. 2 and 3, the cradles 23 and 24 are normally in their depressed condition, the pistons 89 and 90 of the power cylinders 87 and 88 thus being in their lowermost positions. In this condition, a paper roll core shaft 25 is at the elevation shown in said FIGS. 2 and 3 and also in FIG. 4.

It will be observed in FIG. 3 that the transfer arms can be moved to a position adjacent to the pedestals and to the core shaft 25 after the installation of a paper roll, such as 26. The purpose for so moving the transfer arms 78, 79 to a position adjacent the core shaft is to apply a brake 94 which is pivotally mounted by means of a pin 95 (FIGS. 3 and 13) upon one of the transfer arms, such as 78.

The brake 94 is of the bifurcated variety having two halves 96, 96a which are hingedly associated with one another upon pin 95. Brake halves 96, 96a can be tightened or loosened by controlling a handwheel 97 which threadedly engages a shaft 98 pivoted by means of pin 98a upon brake half 96a. Handwheel 97 in turn releasably engages a bifurcated portion 96b of brake half 96.

Normally such brake will not be applied while the drive rolls 28, 29 are able to contact the periphery of the roll 26 for the purpose of controlling the tension of the web which is being payed out from such roll. However, after the transfer of the shaft 25 from the main stand 20 to the transfer arms 78, 79 has been made, and before disengagement of the drive rolls 28, 29, the handwheel 97 is set up to a desired degree thereby to apply the brake 94 for the purpose of maintaining a selected tension upon the web of the reduced roll after such transfer as will appear more fully hereinafter.

Alternatively, the brake 94 may be associated with the arm 78 for resilient relative movement, as is shown in FIG. 4, for purposes of insuring that the transfer arms 78 and 79 can be drawn up under the core shaft 25 in response to the actuation of the power cylinders 87 and 88 and the raising of said shaft 25, and also for the purpose of providing a cushioned action in so moving the cradles of the transfer arms beneath the core shaft 25. Furthermore, such resilient mounting of the brake 94 may be necessary to insure that an adjacent lip 100 of the transfer shaft cradle 85 clears the shaft 25 in response to the raising of the latter. Thus, the brake 94 can be adapted to move with respect to arm 78 in the direction of a slot 94a formed in the brake into which extends a brake pivot pin 94b surrounded by a sleeve 94c, such pin being fixed to arm 78. A spring 94d urges the pin 94b toward one end of such slot. When it is desired to make the aforementioned transfer of the core shaft 25 from the main stand 20 to the transfer arms 78, 79 (FIG. 5), the valve 93 is actuated to raise the cradles 23, 24 thereby drawing the transfer shaft cradles 85 and 86 under the shaft 25 whereupon the valve 93 can be

actuated to lower the cradles 23, 24 and hence to lower the shaft 25 into such cradles of the transfer arms (FIGS. 6 and 7), in the former figure the core shaft being raised to its maximum level and not yet lowered into the cradle of the transfer arms. If the conformation of the brake 94 and of the transfer arm cradle 85 does not permit the drawing under the shaft 25 of the cradles 85, 86 in response to such raising of such shaft, i.e. (if the spring construction 94d of FIG. 4 is not provided, the brake 94 may be disengaged and the transfer arms 78, 79 merely pushed (as by a handle 85a) against the shaft 25 and hence therebeneath in response to the raising thereof by the power means 87, 88. Then the core shaft may be lowered into the cradles 85, 86 of the transfer arms and the brake 94 thereafter applied prior to the disengagement of the drive rolls 28, 29 from the reduced paper roll. Alternatively straight pin 95 can be replaced by a conventional crank pin (not shown) making unnecessary spring 94d in slot 94a. Thus for the straight pin 95 there may be substituted such crank pin comprising two parallel subpins held in such parallel attitude by a conventional crank lever which, if desired, may be rigidly connected to such separate subpins. Referring to the relative attitude of the parts shown in FIG. 13 and to such substituted crank pin, one of such subpins thereof may be mounted for angular movement in the cradle member 23, the other being mounted in the brake 94 in the same recesses as the pin 95. By virtue of the motion of hand brake 94 thus permitted by such crank pin, such brake is allowed to move sufficiently whereby a roll of paper can be raised to the transfer position without disconnecting such hand brake.

Referring now to FIGS. 1 and 8, the splicing means will now be described. A pressure roll 101 is positioned for urging the web 26a of the nearly expired roll 26 against the periphery 120a of the new roll 120 supported by the main stand thereby to cause adhesion therebetween as a result of glue or suitable adhesive placed on such periphery. Knife means 102 are associated with the pressure roll 101 for engaging and cutting off the web of the expiring roll shortly after the pressure roll has forced such web against the periphery of the new roll.

The means for mounting the pressure roll 101 for movement toward and away from the aforementioned web and roll periphery comprise a counterbalanced support shaft 103 which is rigidly secured by means of arms 104 and 105 to a pivot shaft 106 having counterweights 107 and 108 rigidly secured thereto and spaced therefrom respectively by counterweight arms 109 and 109a. The shaft 106 preferably extends completely across the path of the webs and therebeneath. The aforementioned cutoff knife 102 is rigidly secured by suitable support means to the aforementioned support shaft 103.

For the purpose of permitting further angular movement of the cutoff knife 102 after engagement of the pressure roll 101 with the aforementioned web and periphery, such pressure roll is spaced from and resiliently associated with the main support shaft 103 in the following manner:

Roll 101 is mounted upon a shaft 110 which is associated with the support shaft 103 by a pair of spacer arms 111 and 112 which are mounted for angular movement about the shaft 103. The pressure roll shaft 110 and pressure roll 101 are resiliently maintained in the position shown in FIG. 1, arm 112 being resiliently urged against a limit-stop 113 by means of a spring 114 which embraces the shaft 103 and at one extremity is rigidly secured thereto, the other extremity being secured to and so urging the arm 111, shaft 110 and arm 112. Thus the pressure roll 101 may be shifted in a clockwise direction (FIG. 1) against the force of the spring 114 and in response to the angular shifting of the counterweights 107 and 108 also in a clockwise direction to enforce engagement between the pressure roll, the web of

the expiring roll, and the periphery of the new paper roll.

In operation, when initiating the operation of the apparatus, a new paper roll, such as 26, is set in the main stand 20 and threaded in the usual manner through the web working machine 32, such as the tuber, that is, it is threaded through a perforator and glue applicator group 115, a web assembly unit 116, a tube former 117 and suitable draw rolls of a tube cutoff device 118. It is to be understood, however, that the invention is not limited to the combination or the novel roll stand with a tuber. The parts of the roll stand are then in the position shown in FIG. 2. Now the lever of the air valve 56 is shifted into the "up" position thereby actuating the power cylinders 46 and 47 and thus angularly shifting the arms 40, 41 and the drive rolls 28, 29 into positive contact with the paper roll 26. Such power cylinders 46 and 47, for example, may be capable of urging the drive rolls against the paper roll with a force at the contact point of approximately 100 lbs. The drive rolls 28 and 29, if desired, can be brought to a selected surface speed as determined by the web speed in the web working machine prior to engaging roll 26. On the other hand, the drive rolls 28 and 29 can be urged with such force against the paper roll 26 when the web working machine and the drive rolls are started, and the drive rolls will drive the paper roll at a desired speed with a desired sheet or web tension. Such tension may be refined by adjusting the drive roll speed by means of the handwheel 58 and the speed adjustment means 35.

In view of the fact that the braking means 94 above described has been found to be satisfactory for braking rolls up to, for example, 11 inches in diameter, we have found it desirable to make the transfer of the core shaft from the main pedestal 20 to the transfer arms when the diameter of the roll has been reduced to about 11 inches. Prior to such transfer, the transfer arms 78, 79 may be raised to the position shown in FIGS. 3 and 4 and the brake 94 applied lightly to the core shaft, dependence then being had on the drive rolls 28, 29 for proper sheet tension.

The transfer of the core shaft 25 to the transfer arms may be made as aforementioned or it can be effected as follows: by firmly urging the transfer arms against the core shaft 25, raising the lever of air valve 93 to the "up" position, thereby actuating the power means 87 and 88 to raise the paper roll, as shown in FIGS. 5 and 6, whereupon the cradles 85, 86 of the transfer arms 78, 79 can be pushed into position under the core shaft. The core shaft then being at its maximum height, as shown in FIG. 6, is not yet supported by the cradles of the transfer arms. Thereupon the lever of the air valve 93 can be moved to its "down" position which lowers the cradles of the pedestals 21 and 22 and thus lowers the core shaft 25 into the cradles of the transfer arms, as shown in FIG. 7. Note that the drive rolls 28, 29 are still in engagement with the periphery of the paper roll 26. The brake 94 heretofore disengaged now can be applied and adjusted to produce the required sheet tension and the transfer arms 78, 79 can be lowered to the position shown in FIG. 8, the lowering of such arms being counterbalanced by a counterbalance spring 119 which is associated with the frame of the apparatus and with an extremity of the arm 78, as schematically shown in FIG. 1. The parallel arms 40, 41 of the drive rolls 28, 29 at this point will be in engagement with the limit-stops 61, 62, respectively, and now can be moved to an inoperative position by actuation of the lever of the air valve 56 into the "down" position which will move arms 40, 41 to the position shown in FIG. 1.

A new roll of sheet material 120 (FIG. 8) having a core shaft 121 now is lowered into the main stand 20 and glue is applied thereto in such a way as to clear the drive rolls 28, 29, that is, to pass therebetween.

When the diminished roll 26 has reached a somewhat smaller size, for example, about 4 inches in diameter, the lever of the air valve 56 is again moved to the "up" position and the new paper roll 120 is accelerated to approximate paper speed. This requires normally about two turns of the new paper roll. This may be determined, for example, by making a mark upon the side of the new paper roll in line with the area bearing the glue. After such mark has passed the pressure roll 101 on its first revolution, the pressure roll is gently brought into contact with the new paper roll 120 by depressing the counterweight arm 109 thereby urging the web 26a of the diminished roll 26 against the periphery 120a of the new roll 120. When such mark has passed the pressure roll on the second revolution, the flying splice has automatically been made and thereupon the counterweight arm 109 is sharply and forcefully depressed to the full extent of its angular movement, thus bringing the cutoff knife 102 into the cutting position to sever the web 26a from the expiring roll 26.

Referring now to FIG. 16, an alternative form of drive means for peripherally engaging and rotating the paper roll resting on the main stand will now be described. Such means comprises the substitution of a movable belt 122 for the aforementioned drive rolls 28 and 29, such movable belt 122 being of the endless band type and passing over upper and lower pulleys or rolls 123, 124 and over an intermediate pulley or roll 125, the inner run or stretch 122a of the endless belt, of course, being the portion which peripherally engages the paper roll, for example, 126, and rotates same. The pulleys or rolls 123, 124 are mounted respectively at the outer extremities of arms 127 and 128 which are pivotally mounted at their inner extremities upon a shaft 129, the belt 122 being moved by virtue of rotation of the aforementioned intermediate pulley 125 and, if desired, also by forceful rotation of the pulleys or rolls 123, 124.

The alternative drive means of FIG. 16 provides improved sheet tension control due to the flexibility of a spring (not shown) which tends to separate the arms 127 and 128, such spring tending to urge said arms into alignment with one another. Furthermore, the tensioned belting of FIG. 16 provides an increased contact area with the paper roll 126. Also the drive means 122 of FIG. 16 is especially desirable when the paper roll is out of round and must be run at high speed or when such paper roll has one or more flat spots.

Referring now to FIG. 17, some rolls 130 of paper or other sheet material are loosely wound and the pressure required by the drive roll means to drive same would ordinarily produce wrinkles and creases in such roll. This is prevented by the expedient shown in FIG. 17, namely, by suitable means to make the drive rolls somewhat out of round, in the form exemplified by the modified roll 28a which otherwise is analogous to its counterpart 28 above described. This may be accomplished by inserting a small rod 131, for example, of 1/8 inch diameter, under the resilient or rubber-like drive roll covering. This construction causes a slight bumping action in rotating against the roll 130 which momentarily releases the pressures caused by the contact therewith and thus eliminates the possibility of wrinkles and creases in the sheet.

There is thus provided a novel apparatus providing improved means for achieving sheet tension control. Furthermore, the making of the aforementioned flying splice between the expiring web and the new roll can be done by one man instead of two as has been heretofore required. The novel apparatus also provides for improved braking of the paper roll upon the main stand and also upon the transfer arms. The braking action of the drive rolls 28 and 29 upon the paper roll on the main stand prevents overrunning should the web working machine suddenly stop. The apparatus is capable of accommodating rolls of sheet material of substantial size, for exam-

ple, up to 50 inches in diameter and up to 65 inches in width. By virtue of the ability to locate the main pedestals 21, 22 closely adjacent the opposite ends of the paper rolls, there is a reduced maintenance on the roll stands and on roll shafts because of reduction in shaft deflection. Also it has been found by tests that once the tension has been properly adjusted by the apparatus herein described, such tension need not be further adjusted while running the balance of the paper rolls required for a given order. Furthermore, novel and improved means are provided for maintaining a selected tension in the web while it is being transferred from the primary to the secondary support means for the core shaft.

Furthermore, a desired tension is maintained in the sheets of both rolls, that is, the rolls upon both the primary and secondary supporting means while splicing, this being accomplished, of course, by virtue of the engagement of the drive rolls 28, 29 with the roll upon the main stand and by the brake means 94 acting upon the roll upon the secondary support means. Furthermore, the extent of the force exerted by the drive roll against the paper roll upon the main stand enables the paper roll to be effectively brought to a stop quickly when the machine is stopped, for example, when the bag tuber is suddenly stopped.

The apparatus operates in the manner described above and is applicable to all paper sheets and other sheet material of similar strength and qualities regardless of the width thereof. Both sides of the stand are mounted upon suitable ball bushings and it may be adjusted to accommodate rolls, for example, from 35 inches in width to the aforementioned 65 inches, and up to 50 inches in diameter with a minimum amount of shaft deflection. The large and heavy rolls of paper or other sheet material are accelerated to approximate paper speed by means of the drive rolls, thus eliminating slippage at the draw rolls and preventing sheet rupture during "start-up."

What is claimed is:

1. In apparatus of the class described, primary and secondary support means for a core shaft of a first roll of sheet material which in web form can be unrolled by drawing same from such roll; drive means for frictionally engaging the periphery of such roll and rotating same; means for controlling the speed of such drive means; means for transferring such core shaft from said primary to said secondary support means while maintaining the aforementioned frictional engagement; brake means for applying a braking force to such roll; and pressure roll means for urging such web against the periphery of a second roll of sheet material supported by said primary support means, such brake means and drive means being concurrently applied to said first and second rolls of sheet material, respectively.

2. In apparatus of the class described, primary support means for a core shaft of a roll of sheet material; drive means for frictionally engaging the periphery of such roll and for rotating same; means for controlling the speed of such drive means; secondary support means for such core shaft; means for transferring such core shaft from said primary to said secondary support means while maintaining such frictional engagement; brake means upon said secondary support means for applying a braking force to such a roll after such transfer and intended for operation after disengagement of such drive means and roll; means for urging a web from such roll against the periphery of a second roll supported by said primary support means; and cutting means for cutting such web while concurrently applying said brake and drive means respectively to said first and second rolls.

3. In apparatus of the class described, a roll stand comprising a main stand including two pedestals for supporting a core shaft of a web supply roll from which a

web is drawn, drive roll means, means for urging such drive roll means against a web supply roll, the core shaft of which is supported on such pedestals thereby to rotate said roll, transfer arms situated adjacent said main stand, means for mounting such transfer arms for movement to a position for supporting such core shaft concurrently with the support of the latter by said pedestals to relinquish support of said shaft to said transfer arms, said transfer arms being shiftable to move said core shaft away from said pedestals, means for adjusting the surface speed of said drive roll means thereby to adjust the tension of such web, and means for effecting a flying splice between said web and the surface of the fresh roll resting on said pedestals, said means including a pressure roll and knife means, said means for mounting said pressure roll and knife means for movement towards and away from a selected position comprising a cut-off station past which moves the web from a roll supported on such transfer arms and also the surface of the fresh roll to urge the pressure roll against the periphery of the fresh roll to effect the flying splice in response to a first movement of such pressure roll and knife mounting means and thereafter to move said knife means into such cut-off station to sever the expiring web in response to a further and second movement of such pressure roll and knife mounting means.

4. In apparatus of the class described, a roll stand comprising a main stand including two pedestals for supporting a core shaft of a web supply roll from which a web is drawn by draw rolls, drive roll means, means for urging said drive roll means against a web supply, the core shaft of which is supported on such pedestals thereby to rotate said roll, transfer arms situated adjacent said main stand, means for mounting such transfer arms for movement to a position for supporting such core shaft concurrently with the support of the latter by said pedestals, means for moving at least part of said pedestals to relinquish support of said core shaft to said transfer arms while said drive roll means is continuously urged against said web supply, said transfer arms being shiftable to move said core shaft away from said pedestals, braking means carried by said transfer arms for applying a braking force to said core shaft supported by said pedestals and for maintaining said braking force during and after transfer of such shaft to said transfer arms to cooperate with said draw rolls to maintain a desired tension in said web, and while said drive roll means is urged against the surface of a fresh roll resting on said pedestals, whereby said web and fresh roll are brought to a desired speed relationship to enable the effecting of a flying splice therebetween.

5. Apparatus according to claim 4, wherein the speed of the drive roll means is adjustable to control the tension of the web drawn therefrom, said braking means on the transfer arms being adjustable to maintain a braking force upon such roll to continue the tension upon the web after the transfer arms have been shifted to remove such roll from the pedestals of the main stand.

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