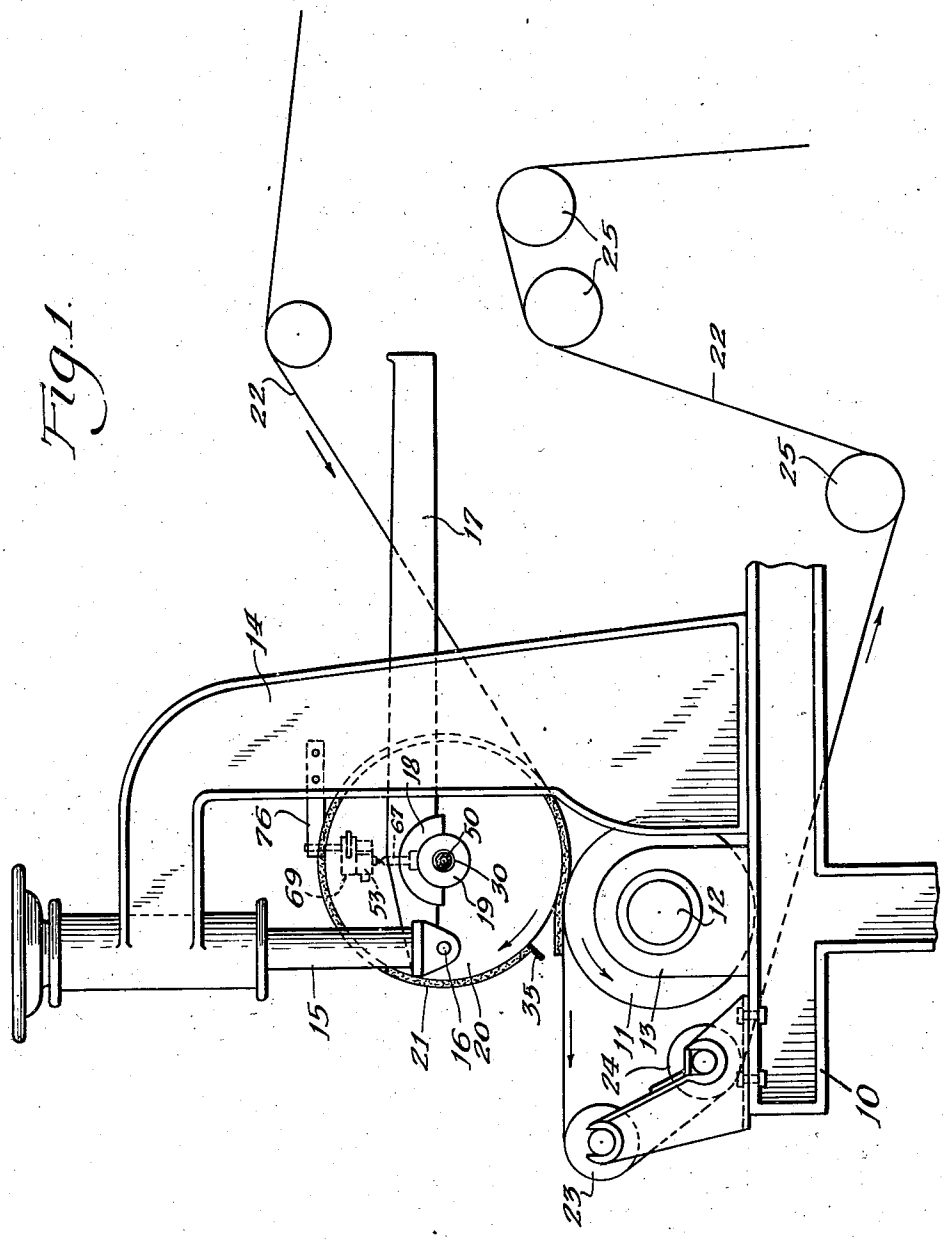
March 5, 1946. G. F. KINGMAN 2,396,104

AUTOMATIC CUT-OFF ROLL

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Fig. 1.



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AUTOMATIC CUT-OFF ROLL

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Fig. 2.

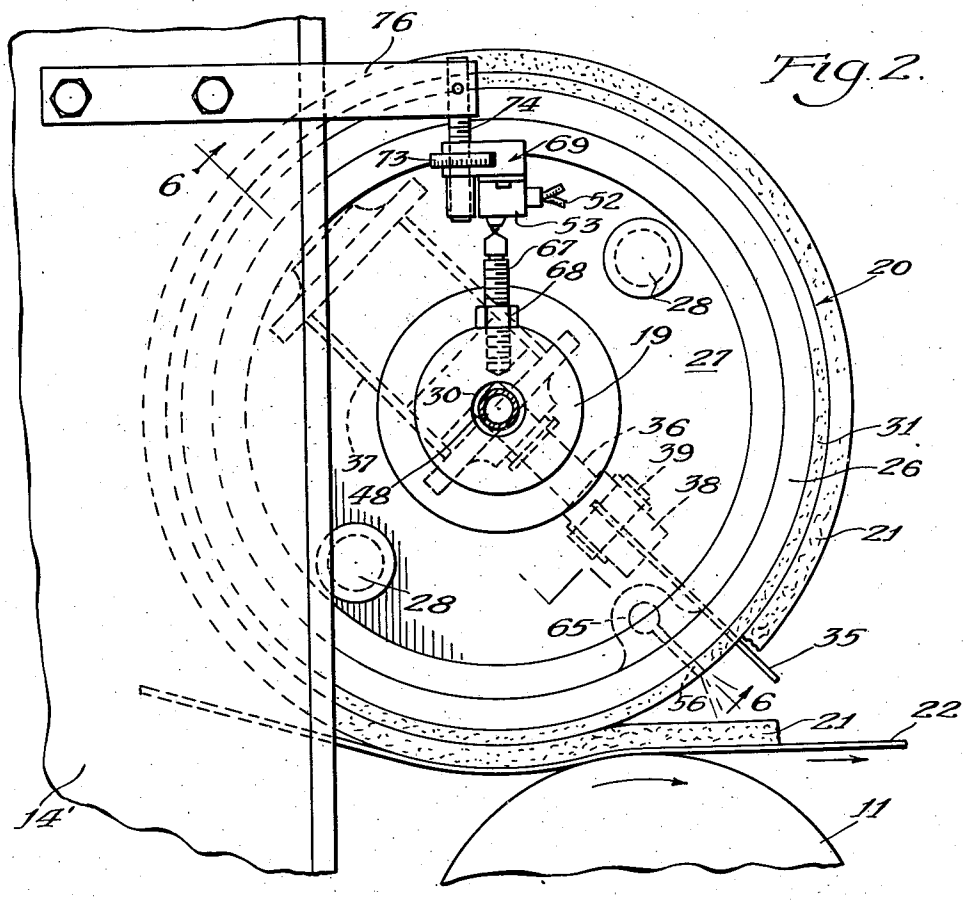


Fig. 3.

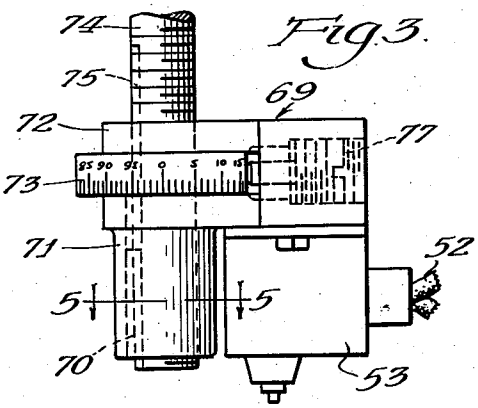


Fig. 4.

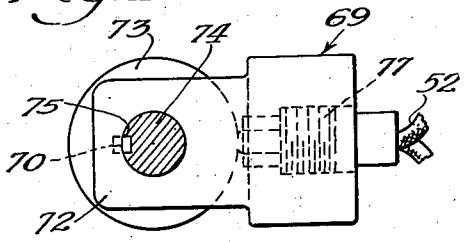
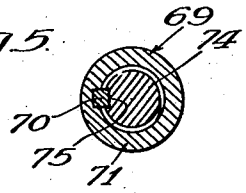


Fig. 5.



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AUTOMATIC CUT-OFF ROLL

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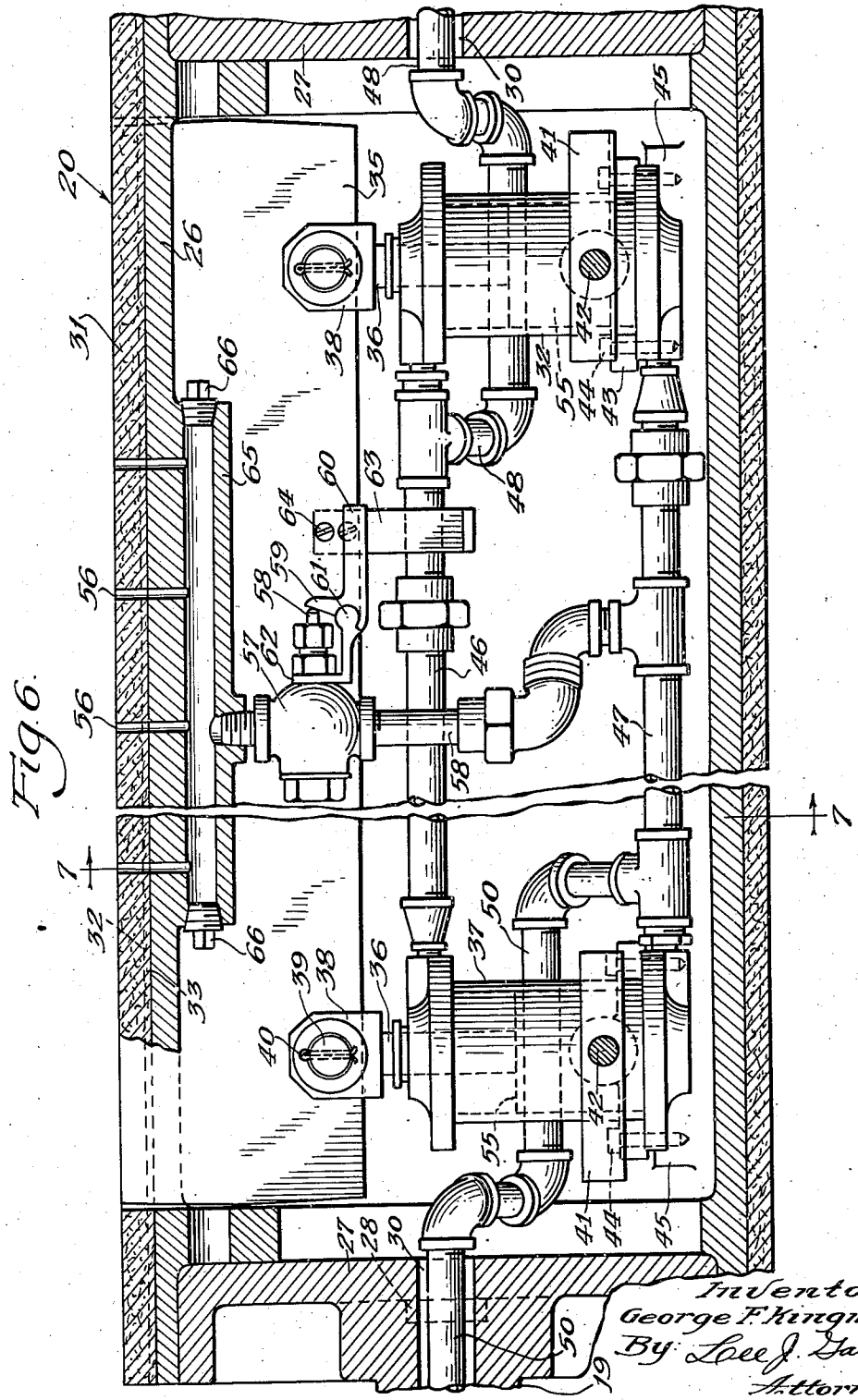


Fig. 6.

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AUTOMATIC CUT-OFF ROLL

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Fig. 7.

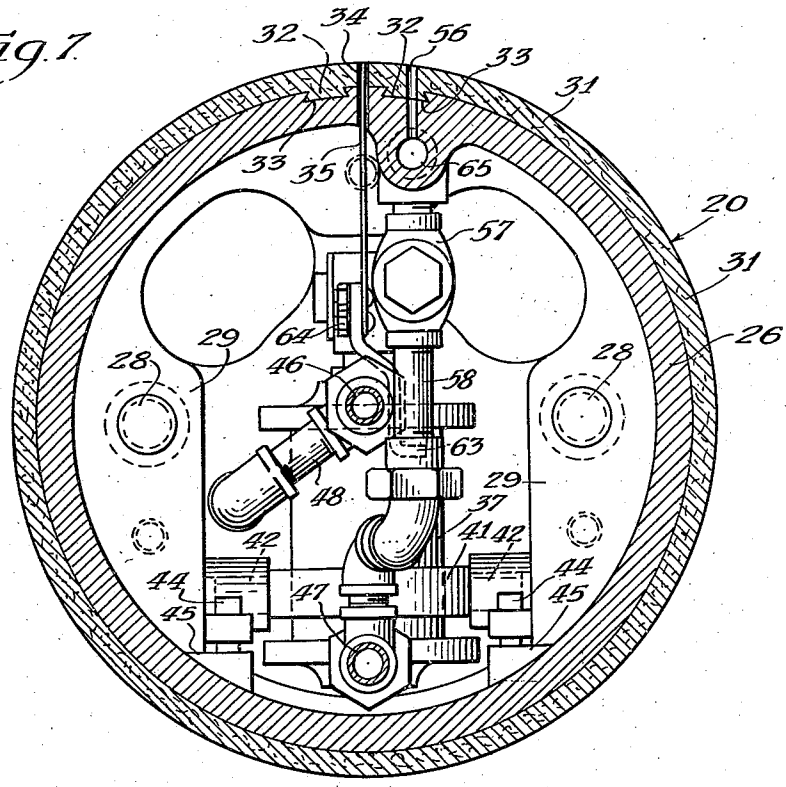
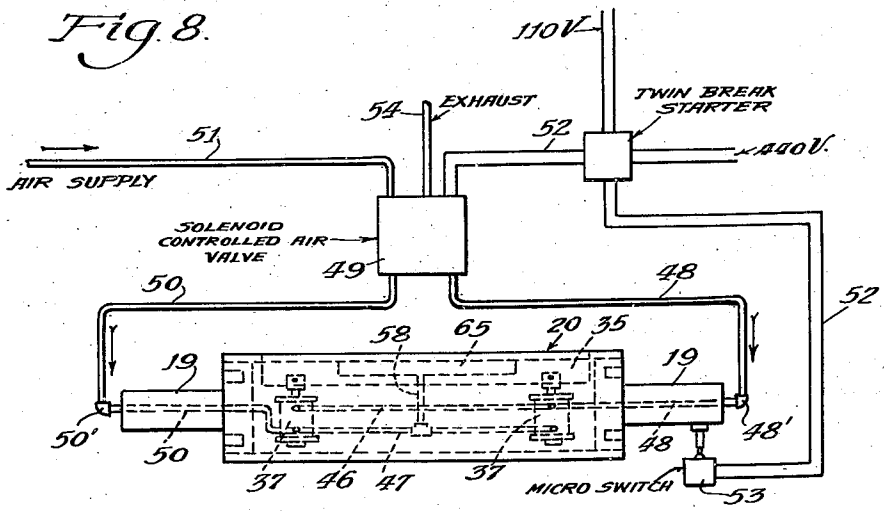


Fig. 8.



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UNITED STATES PATENT OFFICE

2,396,104

AUTOMATIC CUTOFF ROLL

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Application October 1, 1943, Serial No. 504,635

10 Claims. (Cl. 92—67)

This invention relates to improvements in wet board machines of the type wherein a web of pulp or slurry is picked up by a felt, presented to a make-up roll and thereon accumulated to form a multi-ply sheet or board of desired thickness, the accumulated material being thereafter cut off and removed in sheet form. More particularly, the invention relates to novel means in combination with a make-up roll for a wet board machine, for automatically cutting and removing therefrom accumulated thicknesses of web material.

In conventional practice, after a predetermined thickness of wet web has been built up on the make-up roll of a machine of the class described, the operator who stands facing the make-up roll cuts the sheet across longitudinally of the roll by inserting a cut-off stick, which he holds in his hand, into a slot in the make-up roll and runs it quickly across the face of the roll, then grasps the lower edge of the cut sheet and removes it from the roll placing it onto a pile of similar sheets. In the formation of sheets which are relatively narrow or thin, while the operation of the machine may be continuous, the speed of the machine is limited by the time it takes the operator to go through the motions of cutting and "taking." For sheets which are relatively wide or thick, or both, the machine must be stopped in making this cut, and either one or two men are necessary in taking the sheet from the roll and laying it out on a table. As a result of the stopping of the machine, the formation of the web is interrupted and results in poor sheet formation. In such manual operations a considerable amount of dexterity is necessary, and the operations present a continuous hazard to both the operator and to the various portions of the machine including the felt and make-up roll portions.

By providing means for automatically cutting and removing the accumulated thicknesses of wet web from the make-up roll in accordance with the present invention, the operation of cutting is practically instantaneous, and thick and heavy sheets may be handled with as great facility as thin or narrow sheets, the machine may be kept in constant operation and at relatively higher speeds, the necessity for skilled operators and the numbers thereof sharply reduced, potential hazards to the operator and portions of apparatus substantially eliminated, and with a gain in rate of production, and therefore with considerable over-all attendant economy.

It is recognized that various automatic or mechanical cut-off means have been heretofore proposed, including cutting means actuated longitudinally, radially, diagonally, and controlled by various mechanical devices and linkages. However, all such known devices are of complicated construction, frequently get out of order, and as a whole, have heretofore been found unsatisfactory and as a result have not found commercial acceptance.

It is an object of the present invention to provide a make-up roll having in combination therewith novel automatic cut-off mechanism of simple but efficient and sturdy construction and wherein the operation of the knife means for severing web accumulations on the roll is pneumatically controlled and is positive both in projection and retraction of the knife or similar cutting means.

Other objects relate to the inclusion of automatic timing means for controlling the actuation of the knife when a predetermined thickness of the web is built up on the make-up roll, and to the provision of air jets to aid in stripping the severed sheet from the make-up roll.

Further objects relate to various details of construction, arrangement of parts and economies thereof which will be apparent from a consideration of the following specification and drawings wherein:

Fig. 1 is a diagrammatic elevation of a portion of a wet machine illustrating my invention.

Fig. 2 is a fragmentary elevation of a portion of the wet machine illustrating particularly one end of the make-up roll and automatic timing means for initiating action of the automatic cut-off mechanism.

Fig. 3 is a fragmentary detail showing a side elevation of the automatic timing control mechanism.

Fig. 4 is a detailed plan view of the mechanism shown in Fig. 3.

Fig. 5 is a section on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary longitudinal section through the make-up roll on the line 6—6 of Fig. 2, with parts broken away, and interior details shown in full, illustrating the novel details of my improved make-up roll.

Fig. 7 is a transverse section through the make-up roll on the line 7—7 of Fig. 6.

Fig. 8 is a schematic diagram of my novel make-up roll and associated cut-off mechanism and control means therefor.

Referring to the drawings, particularly Fig. 1, which illustrates the make-up roll end portion

of a wet machine, the reference numeral 10 indicates the bed of the machine having a roll 11, the shaft 12 of which is journalled on each end in a bearing 13. A standard 14 on one side, and a similar standard 14' on the other side, rises from the bed 10 supporting a conventional hand wheel and adjustable vertical rod 15 to which there is pivoted at 16 the floating weighted arm 17. The arm 17 comprises a semi-cylindrical bearing 18 which embraces the shaft 19 of the make-up roll 20, and the make-up roll 20 is supported on the roll 11 and is maintained in engagement therewith by means of the lever arm 17 in a manner whereby a make-up roll may move in respect to its supporting roll 11 as the thickness of the web 21 becomes built up on the make-up roll. It will be understood that this portion of the apparatus is conventional, and my invention may be embodied in the make-up roll of similarly constructed and arranged wet machines.

In the operation of the wet machine a web of fibrous asbestos or other pulp is picked up from the paper-making portion of the machine, not illustrated, by means of the felt 22 and presented to the make-up roll 20. The composition of this make-up roll is such that the adhesion between the web and the roll is greater than the adhesion between the web and the felt, and the pulp will therefore pick-up on the make-up roll. After the first revolution of the make-up roll the cohesion between the web and ply already applied to the roll is greater than the adhesion between the web and the felt, and the sheet continues to build up on the make-up roll to a predetermined thickness. The felt thereafter passes over the roll 11 in a horizontal direction over the roll 23 to facilitate transfer of the cut sheet to a conveyor in front of the machine, not illustrated, and thereafter downwardly over a similar roll 24 and returns in the indicated direction over a plurality of rolls 25 to the web-forming apparatus to pick up additional web in conventional manner.

The make-up roll generally indicated by the reference numeral 20 comprises a hollow cylindrical metallic shell 26 closed endwise by the heads 27, the latter comprising shafts 19. The heads 27 are secured by means of bolts at 28 to transversely extending web portions 29 integral with the inner surface of shell 26. The heads 27 and their shaft extensions are each formed with axial bores 30. The shell 26 is provided with a conventional composition surface covering 31 for causing adhesion of the web thereto from the conveyor felt 22, the covering 31 being split and anchored to the shell portion 26 by means of the dovetail portions 32 extending into grooves 33 adjacent to the longitudinal defining edges of the elongated slot 34 which extends through the entire thickness of the make-up roll 20, that is, through the thicknesses 26 and 31 thereof, and in a direction radially of the roll so as to receive and permit passage therethrough of the edge of the knife 35.

The knife 35, which may have a blunt, beveled or saw-toothed edge, is supported within the roll 20 by means of the piston rods 36 extending from the air cylinders 37, and is engaged at its lower edge by means of the slotted or bifurcated members 38 which are each secured to the outer end portions of pistons 36. Association between the knife 35 and the slotted members 38 is affected through pins 39 which are passed through apertures in the members 38 and the knife 35 and locked in place by suitable means such as cotter pins 40 extending through transverse apertures in the pins 39.

The air cylinders 37, a pair of which are employed in the preferred illustrated embodiment of my invention, are mounted in longitudinally aligned and spaced relationship within the shell 26 of make-up roll 20 by means of embracing collars 41 provided with trunnions 42 which are received within brackets 43. The brackets 43 are secured by means of bolts 44, which extend through apertures on the end portions of the brackets, into threaded engagement with the ledges 45 formed integral with and rising from the inner periphery of the roll shell portion 26. Thus, while the air cylinders 37 and the knife 35, which is supported from their piston rods, are all securely mounted in position within the interior of the make-up roll, some slight flexibility of construction is provided and freedom from possible binding obviated through employment of pivoted mountings including the trunnions 42 through which the cylinders are engaged and the pins 39 through which the blade 35 is engaged to the slotted members 38.

The cylinders 37 are of the double acting type and the heads of both of the cylinders are connected together by the line 46. The bases of the cylinders are similarly connected together by means of the line 47. A line 48 extending from the solenoid controlled air valve 49 and through the axial recess 30 of one of the heads 27 and integral shaft 19, is connected into line 46. When air under pressure is admitted into line 46 through line 48 the pistons 55 in each of the cylinders simultaneously move downwardly and their piston rods 36 are drawn inwardly to retract the outer edge of the knife 35 inwardly of the outermost periphery of the roll 20. In a similar manner, line 50 extends from the solenoid controlled air valve 49, through the axial opening 30 in the opposed head 27, into line 47. Upon introduction of air under pressure through lines 50 and 47 to the bases of both of the cylinders 37, the pistons of both of the cylinders will be caused to move simultaneously upwards carrying the supported blade 35 outwardly of the periphery of the roll 20, and thereby cut accumulations of web thereon.

The lines 48 and 50 are provided with flexible rotatable ball joints 48' and 50' respectively adjacent the outer ends of the shafts 28, as illustrated in Fig. 8, to provide flexible rotatable connections between the make-up roll and the external portions of the air pressure supply lines.

Air for actuation of the cylinders 37 is supplied under pressure from the line 51 and enters the solenoid controlled air valve 49, this valve being a selective multiple passage valve such as a Ross four-way air valve, controlled by solenoid, the solenoid being connected into the electric circuit 52 which includes a switch such as the micro switch 53, as illustrated in Fig. 8.

In normal operation of the make-up roll, that is, during the period when the web is being accumulated thereon, the switch 53 remains, or is maintained open, and the solenoid consequently de-energized. Under such condition the valve 49 permits air to be introduced from line 51 into lines 48 and 46, and to the heads of the cylinders 37 so as to hold the blade 35 retracted within the roll in a positive manner by means of air pressure, lines 47 and 50 being connected through the valve 49 to the exhaust therefrom 54. When switch 53 is closed the solenoid in valve 49 is energized and moves the valve to a position

whereby line 48 is connected to the exhaust 54 and the air supply line 51 becomes connected to line 50 to admit air under pressure to the bases of the cylinders 37 and thereby cause the cutting edge of knife 35 to be projected outwardly of the periphery of the roll for cutting purposes.

To aid in stripping the severed web from the roll 20, the roll 20 may be further provided with a plurality of apertures 56 extending through the thickness thereof, longitudinally spaced adjacent to the slot 34. These apertures 56 are embraced within the inner periphery of the roll portion 26 by means of a tubular enclosure 65 having end closure and access plugs 66, the chamber 65 being supplied with air through valve 57 and line 58 which is connected into line 47. Valve 57 is a self-closing globe valve type, the valve stem 58 thereof being depressible by means of the arm 59 of the bell crank lever 60 which is pivoted at 61 to the bracket 62. The valve 57 is actuated by means of the tripper 63, which is secured to and extends from the lower edge of the knife 35 as at 64. Thus as air under pressure is introduced to the base of the cylinders 37 through lines 50 and 47 and the knife 35 caused to project outwardly, in its outward passage the lower angularly bent portion of valve tripper 63 engages the lever arm 60 to actuate valve 57 and to admit air to the chamber 65 and outwardly therefrom through the orifices 56 against the underside of the leading edge of the severed sheet 21 on the make-up roll as indicated in Fig. 2. In this connection it will be noted that the outer angularly bent portion of the valve tripper 63, in the retracted position of the knife 35, is spaced a substantial distance from the horizontally extending arm of the bell crank lever 60. As a result of the lost-motion connection which is thus provided, the knife 35 will be operative to open the valve 57 only when the knife is approaching the extended limit of its stroke, in other words, after severing of the material on the roll 20 is completed, or is substantially completed. Air is thus permitted to act upon the material on the roll 20 only at a time when it will not impair the cutting action of the knife.

The switch 53 may, if desired, be manually actuated by the operator when the accumulated sheet or wet board 21 has reached a desired or predetermined thickness. On the other hand I also provide automatic switch actuation means in combination with the make-up roll whereby the switch is contacted when the roll 20 has been elevated by reason of accumulation thereon of a predetermined thickness of web material. This is accomplished by providing a switch actuation member on one of the shafts 19 of roll 20, such as the stud 67 provided with a tapered contact head at one end and threadably engaged at the other end into a shaft 19, and fixed in position by means of the lock nut 68. The switch 53 is mounted on a carriage generally indicated as 69 provided with a smooth bore having a longitudinally extending key 70 in the tubular portion 71 thereof. The carriage is further provided with a transversely slotted portion 72 which receives the internally threaded gauge wheel 73. Extending through the bore in the carriage is the threaded member 74 which is engaged by the wheel 73, the member 74 being provided with a groove or keyway 75 to slidably receive the key 70 but to otherwise prevent rotation of the carriage as a unit. Thus by manipulation of the gauge wheel 73 the carriage may be moved with respect to the member 74.

The carriage 69 is mounted as a unit by fixedly securing one end of the member 74 to an arm 76, which in turn is secured to the machine vertical frame portion 14'. The mounting of the carriage 69 is further in relationship to the stud 67 so that the depressible portion of switch 53 is in the same plane as the tapered tip of stud 67 and may be actuated thereby when brought into contact. The angular spacing of the stud 67 from the knife 35 is such that actuation of the switch 53 by means of stud 67 will be effected at a point of rotation where the knife 35 can be freely projected without danger of cutting the felt 22 and substantially immediately after the felt assumes its horizontal run after leaving the lower roll 11, as illustrated in Figs. 1 and 2.

At the commencement of the accumulation of the web on the make-up roll, the roll 20 rests on the roll 11, over the felt 22, and the end of stud 67 is in spaced relation to the switch 53. The switch 53 at the commencement of the operation is adjusted by means of the wheel 73 to a spacing from the end of stud 67 equal to the desired thickness of the sheet or board to be accumulated on the make-up roll. This may be conveniently accomplished by means of the gauged periphery of the wheel 73, the wheel being then locked against further accidental rotation by means of the set screw 77. In operation, when the predetermined amount of web has accumulated at the make-up roll, its shafts become elevated and the stud 67 in its rotation eventually momentarily contacts micro-switch 53 to initiate successive outward projection of the knife 35 to cut the accumulated wet board 21 therefrom, and to retract the knife inwardly, both in a positive manner heretofore described.

I claim as my invention:

1. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed with a longitudinal slot, a knife, means for supporting said knife within said roll, means for projecting said knife through said slot to cause it to sever the material which has accumulated upon said roll, means within said make-up roll for directing jets of air against the under surface of said material adjacent said slot, and a valve controlled by the movement of said knife for admitting air to said last named means when the knife is caused to move outwardly through said slot and thereby assist said knife in stripping said material from said make-up roll.

2. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed with a longitudinal slot, a knife, means for supporting said knife within said roll, means for projecting said knife through said slot to cause it to sever the material which has accumulated upon said roll, a source of fluid under pressure, means within said make-up roll for directing jets of said fluid against the under surface of the said material adjacent said slot, a normally closed valve, and a lost-motion connection between said valve and said knife, whereby when the latter is moved outwardly through said slot, it actuates said valve only as it approaches the limit of its movement to admit said fluid to said last mentioned means and in so doing assist said knife in stripping said material from said make-up roll.

3. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed

with a longitudinal slot, a knife, double-acting, fluid cylinders mounted within said make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, and means which is automatically operative when the material accumulating on said make-up roll reaches a predetermined thickness for actuating said valve to admit said fluid to said cylinders to extend said knife through said slot to cause it to sever said material so that it may be stripped from said make-up roll.

4. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed with a longitudinal slot, a knife, double-acting fluid cylinders mounted within said make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, electric circuit means including a switch for actuating said valve, and means which is automatically operative when the material accumulating on said make-up roll reaches a predetermined thickness for actuating said switch, whereby to operate said valve to admit said fluid to said cylinders to extend said knife through said slot to cause it to sever said material so that the latter may be stripped from said make-up roll.

5. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed with a longitudinal slot, a knife, double-acting fluid cylinders mounted within said make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, means which is automatically operative when the material accumulating on said make-up roll attains a predetermined thickness for actuating said valve to admit said fluid to said cylinders to extend said knife through said slot to cause it to sever said material, means within said make-up roll for directing jets of air against the under surface of said material adjacent said slot, a second, normally-closed valve to which a supply of air is controlled by said first mentioned valve, and means controlled by the movement of said knife, as the latter is extended, for opening said second valve to admit air to said second mentioned means and in so doing assist said knife in stripping said material from said make-up roll.

6. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll being formed with a longitudinal slot, a knife, double-acting fluid cylinders mounted within said make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, means which is automatically operative when the material accumulating on said make-up roll attains a predetermined thickness for actuating said valve to admit said fluid to said cylinders to extend said knife through said slot to cause it to sever said material, means within said make-up roll for directing jets of air against the under surface of said material adjacent said slot, a second, normally-closed valve to which a supply of air is controlled by said first mentioned valve, and a lost-motion connection between said second valve and said knife, whereby when the latter is moved outwardly through said slot, it actuates said second valve only as it approaches the limit of such movement to admit air to said last mentioned means and in so doing assist said knife in stripping said material from said make-up roll.

7. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll having a hollow shaft and being formed with a longitudinal slot, a knife which is movable in said slot to extended and retracted positions and which normally occupies the latter position, fluid-actuated means within said make-up roll connected to said blade, a source of fluid under pressure, a line leading from said source of fluid through said shaft to said fluid actuated means, a valve included in said line, electric circuit means including a switch which is mounted in fixed relation with respect to said shaft, for actuating said valve, and means which is automatically operative when the material accumulating on said make-up roll reaches a predetermined thickness for actuating said switch, whereby to operate said valve to admit fluid to said supply line to move said knife to its extended position to cause it to sever said material so that the latter may be stripped from said make-up roll, said last mentioned means including a radially extending element which is carried by said hollow shaft and which turns with the latter, the angular relation of said element and knife being such that said switch may be actuated only at a time when said knife has just moved past the position at which said make-up roll and pressure roll act upon said material.

8. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll having a hollow shaft and being formed with a longitudinal slot, a knife which is movable in said slot to extended and retracted positions and which normally occupies the latter position, fluid actuated means within said make-up roll connected to said blade, a source of fluid under pressure, a line leading from source through said shaft to said fluid actuated means, a valve included in said line, electric circuit means, including a switch, for actuating said valve, means, including a gauging element, for adjustably supporting said switch in fixed relation with respect to said make-up roll, and an element which is carried by said shaft and which turns with the latter for automatically actuating said switch when the material accumulating on said make-up roll attains a predetermined thickness, whereby to operate said valve to admit fluid to said supply line to move said knife to its extended position to cause it to sever said material so that the latter may be stripped from said make-up roll, the angular relation of said element and knife being such that said switch may be actuated only at a time when said knife has just passed beyond the position at which said make-up roll and pressure roll act upon said material.

9. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll having a hollow shaft and being formed with a longitudinal slot, a knife, double-acting fluid cylinders mounted within said

make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, electric circuit means including a switch which is mounted in fixed relation with respect to said shaft for actuating said valve, and means which is automatically operative when the material accumulating on said make-up roll attains a predetermined thickness for actuating said switch, whereby to operate said valve to admit fluid to said cylinders to extend said knife through said slot to cause it to sever said material so that the latter may be stripped from said make-up roll, said last mentioned means including a radially extending element which is carried by said shaft and which turns with the latter, the angular relation of said element and knife being such that said switch may be actuated only at a time when said knife has just moved past the position at which said make-up roll and pressure roll act upon said material.

10. A wet board machine of the type having a hollow make-up roll which cooperates with a pressure roll, said make-up roll having a hollow shaft and being formed with a longitudinal slot, a knife, double-acting fluid cylinders mounted within said make-up roll and having pistons connected to said blade adjacent the opposite ends thereof, a source of fluid under pressure, a line leading from said source through said shaft to said cylinders, a valve which is normally operative to admit said fluid to said cylinders to hold said knife in a retracted position, electric circuit means, including a switch which is mounted in fixed relation with respect to said shaft, for actuating said valve, a radially extending element carried by said shaft and turning with the latter and being automatically operative to actuate said switch when the material accumulating on said make-up roll attains a predetermined thickness, whereby to operate said valve to admit fluid to said cylinders to extend said knife through said slot to cause it to sever said material, the angular relation of said element and knife being such that said switch may be actuated only at a time when said knife has just moved past the position at which said make-up roll and pressure roll act upon said material, means within said make-up roll for directing jets of air against the under surfaces of said material adjacent said slot, a second, normally closed valve to which a supply of air is controlled by said first mentioned valve, and means actuated by said knife for opening said second valve, whereby to direct air against said material and in so doing assist said knife in stripping said material from said make-up roll.

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