SINGLE FACER MACHINE

Henry W. Moser, Haddonfield, and Hans Meister, Cherry Hill, N.J., assignors, by mesne assignments, to The Langston Company, Camden, N.J., a corporation of New Jersey
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ABSTRACT OF THE DISCLOSURE

A single facer machine having a pivotally supported glue mechanism and having easily accessible limit stops for limiting pivoting of the glue mechanism. The glue mechanism has free floating self-adjusting clean-out fingers which are partially received within grooves in the glue applicator roll.

This invention relates to a single facer machine structurally interrelated in a novel manner for ease of efficient operation, ease of maintenance, and ease of manufacture, while permitting construction of the machine at minimum cost. In a single facer machine, there is generally provided first and second corrugating rolls and a pressure roll all supported by side frames for rotation about a horizontal axis. The axes of rotation for said rolls lie in a plane inclined with the horizontal. The second corrugating roll and the pressure roll are pivotally mounted for movement toward and away from the first corrugating roll and are disposed on opposite sides of the first corrugating roll. Motors are provided in a plane for selectively causing said pivotable movement of the second corrugating roll and the pressure roll.

The plane containing said axes of rotation lies between and is substantially parallel to the plane of the motors and the plane containing the pivoting axes. The motors are supported on a common structural member which when removed exposes the bearing journal for said first roll. This arrangement permits ease of construction and maintenance. Thus, it is possible to change corrugating and/or pressure rolls in considerably less time than has been customary on conventional machines.

In a single facer, there are provided a plurality of clean-out fingers extending into grooves on an applicator roll. A metering roll is provided for the applicator roll and disposed alongside thereof. Heretofore, it has been conventional to place clean-out fingers partly in the glue pan and/or support the fingers on a shaft to one side of the applicator roll. The prior art devices have required that the glue pan be removed, the fingers be inserted from the bottom, and spread apart and bolted if they are the two piece type or threaded on a rod if they are the one piece type. The location of the fingers in the pan interferes with the shifting of partitions or dams which are used to exclude glue from the applicator roll except for that portion of its length which is needed to cover the width of the corrugated sheet being formed. Such conventional mounting for the clean-out fingers renders them difficult to adjust for speed changes and interferes with shifting of dams when the width of the medium being processed is changed. Also, it is difficult to observe the fingers during operation.

The clean-out fingers of the single facer machine of the present invention are free floating and therefore are self-adjusting with speed changes. The clean-out fingers are entirely disposed between vertical planes containing the axes of rotation of the applicator and metering rolls. Also, the clean-out fingers are substantially above a horizontal plane containing said axes of rotation. Hence, the clean-out fingers are readily capable of being observed and cannot interfere with adjustment of dams. The clean-out fingers are preferably provided with a toe extending downwardly below said horizontal plane between the applicator and metering rolls to act as a plow which removes part of the adhesive from the grooves of the applicator roll.

Heretofore, adjustment of the applicator roll toward and away from the corrugating rolls by moving the glue mechanism which supports the applicator roll has been difficult to accomplish and observe. In the single facer machine of the present invention, the glue mechanism is mounted for pivotable movement by means of a motor in a manner whereby the adjustment is mounted on the outside surface of the side frames for ease of manipulation and observation. Ease of access to the clean-out fingers, crescent fingers and other components is accomplished by mounting the pivot shaft for the glue mechanism within a hollow cylindrical brace extending between the side frames.

It is an object of the present invention to provide a novel simplified single facer machine which is easier to construct and maintain while costing less than other single facer machines proposed heretofore.

It is another object of the present invention to provide a novel mounting for a glue mechanism having novel clean-out fingers.

It is another object of the present invention to provide a single facer machine which overcomes disadvantages of adhesive regulation and adjustment structure on prior art machines.

It is another object of the present invention to provide a single facer machine structurally interrelated in a novel manner.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIGURE 1 is a perspective view of a single facer machine in accordance with the present invention.

FIGURE 2 is a transverse sectional view of the single facer machine illustrated in FIGURE 1.

FIGURE 3 is a sectional view of that portion enclosed in FIGURE 2 and labeled A, but on an enlarged scale.

FIGURE 4 is a sectional view taken along the line 4—4 in FIGURE 3.

FIGURE 5 is a sectional view taken along the line 5—5 in FIGURE 2.

FIGURE 6 is a sectional view taken along the line 6—6 in FIGURE 2.

FIGURE 7 is an enlarged view of the clean-out finger.

Referring to the drawings in detail, wherein like numerals indicate like elements, there is illustrated a single facer machine designated generally as 10. Many of the components of the single facer machine 10 are conventional, will be readily understood by those skilled in the art, and need not be discussed in detail.

The machine 10 includes a pair of parallel spaced side frames which may be designated as a right side frame 12 and a left side frame 14. The side frames 12 and 14 support the rotating components and are mounted on a bed plate 16 and connected thereto in any convenient manner. The side frames are preferably solid cast iron and removably bolted to the bed plate 16 which is preferably sound-deadened to eliminate vibration problems. A first or lower corrugating roll 18 is rotatably supported by the side frames 12 and 14. A second or upper corrugating roll 20 is rotatably supported by a pair of lever arms 22 and 22'.

The arms 22 and 22' are mounted on the side frames for pivotable movement about the longitudinal axis of studs 24 and 24'. The arms 22 and 22' are each connected...
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to a rod extending from a pneumatic motor. Thus, arm 22 is connected to rod 26 on motor 28. The motor for arm 22 is designated as 28.

The pressure roll 30 is supported for rotation about its longitudinal axis by the side frames 12 and 14. A conventional means not shown is provided for heating the rolls 18, 20 and 30. The pressure roll 30 is supported at its ends by arms 32 and 32', which are mounted for pivotal movement about the longitudinal axis of studs 34 and 34'. The arms 32 and 32' are likewise connected to a rod extending from a motor. Thus, arm 32 is connected to rod 36 extending from the pneumatic motor 38.

The motors 28 and 28' are adapted to cause the arms 22 and 22' to move the upper corrugating roll 20 toward the corrugating roll 18. The motors 38 and 38' are adapted to move the pressure roll 30 toward the corrugating roll 18. It will be noted that the axes of the rolls 18, 20 and 30 lie substantially in a plane which is inclined with the horizontal. The axes of studs 24, 24', 34 and 34' lie in a plane which is substantially parallel to the last-mentioned planes. The motors 28, 28', 38 and 38' lie in a plane on the opposite side of the plane of the corrugating rolls from the plane containing the axes of studs 24, 24', 34 and 34'.

The pneumatic motors 28 and 38 are mounted on a support member 36. The motors 28' and 38' are mounted on a support member 36'. The support members 36 and 36' are bolted to the side frames 12 and 14 in a manner whereby their removal exposes the bearings for the roll 18. In this manner, access for maintenance or removal of these rolls is readily facilitated.

The medium 46 to be corrugated passes over a spreader bar 39 supported by the side frames 12 and 14. The spreader bar 39 is adjustable and assures smooth entry of the medium as well as being readily comprehended by those skilled in the art. From the spreader bar 39, the medium 46 may pass over idler rollers and beneath a shower designated generally as 40. The desirability of providing this shower for preconditioning the medium 46 will be readily understood by those skilled in the art. If desired, a slitter knife may be provided between the shower 40 and the spreader bar 39 to trim side edges of the medium 46.

After preconditioning, the web of medium 46 passes over the upper corrugating roll 20 and into the nip between the corrugating rolls 18 and 20 where flutes are formed under heat and pressure. The newly formed flutes are stripped from the medium 46 by the one-piece fingers 54 at spaced points therealong and guided around the corrugating roll 18. A liner 48 extends around the preheater roll 42, around the idler roller 44, passes between the nip of rolls 18 and 30 and is adhesively bonded to the corrugated medium 46 by the heated pressure roll 30 to thereby form a single face board 50 which exils in the direction of arrow 52.

The crescent fingers 54 are disposed at spaced points along the corrugating rolls. The upper corrugating roll 20 is provided with grooves at spaced points therealong to facilitate receiving upper end of the crescent fingers 54. The crescent fingers 54 are adjustably supported by a rigid finger bar 56 extending between and connected to the side frames 12 and 14. The fingers 54 confine the corrugating medium 46 to the teeth of the roll 18, but permit it to fluff out very slightly while adhesive is applied to the flute tips by an adhesive applicator roll 62. To facilitate such slight fluffing out, the fingers 54 are provided with a depression or notch 58 as shown more clearly in FIGURE 3.

The applicator roll 62 is provided with a peripheral adhesive applying surface 60 interrupted at spaced points therealong by grooves 64. The surface 60 cooperates with the outer peripheral surface of a metering roll 66 to meter the thickness of the adhesive on surface 60. Thus, when adhesive is picked up from the glue pan by the applicator roll 62, the thickness of the film thereon is controlled by the metering roll 66. A rigid doctor blade may be provided against the full width of the metering roll 66 to keep it clean and return any excess adhesive to the glue pan. As the medium 46 flips out into the relief section 58 on the crescent fingers 54, an even film of adhesive is applied on the flute tips by the applicator roll 62.

The rolls 62 and 66 are rotatably supported at their ends by brackets 76 and 76'. As rolls 62 and 66 are provided with openings 70 and 70', respectively, into which the offset brackets 76 and 76' extend. Power cylinders 72 and 72' are supported by the side frames 12 and 14, respectively, below the horizontal plane of the brackets 76 and 76'. The cylinders 72 and 72' may be identical in size with the power cylinders 28, 28', 38 and 38' for simplification of maintenance and storage of spare parts. The cylinders 72 and 72' are pneumatic and have rods 74 and 74', respectively, extending upwardly for connection to the brackets.

The glue pan is supported by brackets 76 and 76', the whole assembly pivoting about a horizontal axis corresponding to longitudinal axis of shaft 78. Shaft 78 is longer than the distance between the side frames 12 and 14. The side frames 12 and 14 are rigidly interconnected by a cylindrical brace 80. To conserve space and provide for ease of access to the components of the single facer machine 10, the shaft 78 is coaxial with the binder 89.

The art to which the present invention pertains has always been plagued with the problem of dry streaks or wet streaks. Dry streaks are caused by insufficient amount of adhesive in the grooves 64 on the applicator roll 62. Wet streaks are due to excessive adhesive. As roll 62 rotates, the grooves 64 fill up with adhesive. Centrifugal force tends to sly this adhesive out of the grooves. In addition, a hydrodynamic action takes place at the nip of the applicator roll 62 and the metering roll 66 which forces an excess of adhesive through the grooves 64. The effect of both of these factors varies with speed as well as the type of adhesive used.

Free floating clean-out fingers 82 are provided. Each clean-out finger extends into one of the grooves 64. The clean-out fingers maintain the proper amount of adhesive in the grooves 64 on the applicator roll 62. The amount of adhesive that is displaced from the grooves 64 can be exactly controlled so that the top of the grooves and the crescent fingers 54 is bridged by adhesive to prevent dry and wet streaks, with no spraying. At the same time, the clean-out fingers are disposed in a manner so that a minimum amount of adhesive passes between the bottom of the grooves 64 to lubricate the crescent fingers 54 and prevent excess of wear.

As shown more clearly in FIGURE 7, the clean-out finger 82 includes a toe 86 and a heel 87 interconnected by an arcuate surface 88. The arcuate surface 88 is of sufficient extent so that it may overlap the upper left quadrant of the metering roll 66 to a circular extent of at least sixty degrees and preferably seventy-five to eighty degrees.

The clean-out finger 82 includes a curved surface 90 which is to be juxtaposed to a portion of the periphery of the applicator roll 62 within the grooves 64. The clean-out finger 82 is also provided with a horizontally disposed top surface 92 terminating at the right end in FIGURE 7 and a vertical surface 94. As shown more clearly in FIGURE 2, an adjustable and/or removable back-up member 96 is provided for the shaft 84 is provided to limit the upward extent of the clean-out fingers. Shaft 84 extends between and is supported by brackets 76 and 76' in contact with the surface 94 on the fingers. The uppermost position of the fingers will result in contact between the periphery of shaft 84 and surface 92. The length of the toe 66 is preferably sufficient so that its tip is below the intersection of the clean-out fingers and the peripheral surface 60.
when the same are superimposed over one another as shown in FIGURE 2. In this manner, the tip of the toe 86 will act as a plow which removes part of the adhesive from the grooves of the applicator roll. Also, it will be noted that the entirety of the clean-out fingers is disposed between the vertical planes containing the axes of rolls 62 and 66 for ease of access, adjustment and observation while at the same time not interfering with adjustment of partitions or dams within the glue pan 68. Since the clean-out fingers 82 are free floating, they are self-adjusting with speed changes. Further, the clean-out fingers may be removed without in any way interfering with the disposition of the glue pan.

In order to facilitate adjustment of the gap between the applicator roll surface 60 and the corrugating roll 20, arms 96 and 96' are fixedly secured to the ends of the shaft 78. A limit stop 98 is provided on the side frame 14. A corresponding limit stop 98' is provided on the side frame 12. An adjustable screw 100 is threadedly coupled to the terminal end of the arm 96 for cooperation with the limit stop 98. A corresponding screw 100' is provided on the arm 96'. Since the glue mechanism is fixedly connected to the shaft 78 and the arms 96 and 96' are fixedly connected to the shaft 78, adjustment of the screws 100 and 100' can be readily accomplished in a manner which is simple and easy. Thus, minimum skill and operator attention is required to produce top quality board at maximum rates with minimum waste.

To assure that the liner 48 and medium 46 are always moving at exactly the same speed, the pressure roll 50 is geared to the drive for the lower corrugating roll 18. Such a positive drive facilitates tighter nip pressures between said rolls. Conventional micrometer adjustments may be provided for the individual crescent fingers 54 which are readily accessible. As will be apparent to those skilled in the art, the metering roll 66 rotates at a slower speed than the speed of rotation of the applicator roll 62. Both of these rolls revolve in the same direction to produce an opposing shear on the adhesive at the nip. As shown more clearly in FIGURE 4, the crescent fingers 54 are spaced from the side walls in the bottom wall of the grooves 64. As shown more clearly in FIGURE 5, the same relationship is provided between the grooves 64 and the floating clean-out fingers 82.

The applicator roll 62 may have an etched finish on the surface 60 to facilitate pick-up of adhesive at slow or idle rolls. The metering roll 66 may be equipped to give it a smooth surface and extend the life of the scraper blade which cleans the roll. If desired, the entire glue mechanism may be automatically retracted by the pneumatic motors connected thereto when the rotation of the corrugating rolls ceases as per conventional practice.

In view of the above remarks, a description of operation is not deemed necessary. That structure illustrated and not specifically described may be entirely conventional and will be understood by those skilled in the art to which the present invention pertains.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

1. Claim 1:
1. In a single face machine comprising upright side frames, a glue mechanism supported by said frames for pivotable movement about a horizontal axis, adjustable limit stop means upon said frames for each of the glue mechanism, said frames being between the adjustable limit stop means in the horizontal planes containing the axes of said horizontal axis, a grooved applicator roll supported by said glue mechanism, a metering roll supported by said glue mechanism alongside said applicator roll, and a plurality of free-floating clean-out fingers, each finger being partially disposed in one of the grooves on the applicator roll, said fingers lying entirely between the vertical planes containing the axes of rotation of the applicator and metering rolls.

2. In a machine in accordance with claim 1 wherein said free-floating fingers have a toe projecting downwardly below the plane containing the axes of rotation of said rolls, a curved portion on said clean-out fingers juxtaposed to at least sixty arcuate degrees of the metering roll above and beginning at said plane containing the axes of rotation of said rolls.

3. In a machine in accordance with claim 1 wherein said clean-out fingers means includes an arm pivotably mounted on the outer surface of each frame for rotation about said horizontal axis with the glue mechanism, each arm being fixedly connected to the adjacent end of the glue mechanism, whereby the disposition of the arms is indicative of the disposition of the glue mechanism and readily observable on the outer surface of the frames.

4. In a machine in accordance with claim 1 including a cylindrical brace extending between and fixed to said frames, said horizontal axis of the glue mechanism coinciding with the interior of said brace so that the axis substantially coincides with the longitudinal axis of said brace.

5. In a machine in accordance with claim 1 including back-up structure disposed above said fingers for limiting the extent of upward movement of the fingers, whereby the fingers are accessible and removable from the glue mechanism.

6. In a machine in accordance with claim 1 including pneumatic motors connected directly to the glue mechanism for moving the glue mechanism about said horizontal axis, said motors being supported by said frames.

7. In a machine in accordance with claim 1 including a corrugating roll supported by said frames for rotation about its longitudinal axis, crescent fingers, each finger being partially disposed in one of the grooves on the applicator roll, a plurality of free-floating clean-out fingers, a finger bar extending between said frames for supporting said crescent fingers, and motor means for moving the applicator roll toward and away from the periphery of the corrugating roll by pivoting the glue mechanism about said horizontal axis.

8. In a machine in accordance with claim 7 wherein said clean-out fingers have a curved portion juxtaposed to at least sixty arcuate degrees of the metering roll above and beginning at a plane containing the axes of rotation of said applicator and metering rolls, and said clean-out fingers being removable from a position above said last-mentioned plane.

9. A machine in accordance with claim 1 including a lower rotatable corrugating roll supported by said frames, a pivotably mounted rotatable pressure roll supported by said frames, a rotatable pivotably mounted upper corrugating roll supported by said frames, a separate motor means connected to each of the pressure roll and the upper corrugating roll for pivoting the same toward the lower corrugating roll, the plane containing the axes of rotation of said corrugating and pressure rolls being between the plane containing the motor means and the plane containing the pivoting axes for the pivotably mounted rolls.

10. In a single face machine comprising upright side frames, a glue mechanism supported by said frames for pivotable movement about a horizontal axis, a grooved applicator roll rotatably supported by said frames, a metering roll rotatably supported by said frames, a pivotable movement about a horizontal axis, a grooved applicator roll rotatably supported by said frames, a metering roll rotatably supported by said frames, a pivotable movement about a horizontal axis, a groove along said applicator roll, a plurality of free-floating clean-out fingers, each finger for disposal in one of the grooves on the applicator roll.
Applicator roll, said clean-out fingers lying entirely between the vertical planes containing the axes of rotation of the applicator and metering rolls, each clean-out finger having a curved portion juxtaposed to at least sixty arcute degrees of the metering roll above and beginning at the plane containing the axes of rotation of said applicator and metering rolls, and means above said last-mentioned plane for limiting the upward movement of said clean-out fingers.

11. In a machine in accordance with claim 10 wherein said clean-out fingers have a toe portion extending down between the applicator and metering rolls to a position where they may act as a plow on the adhesive therebelow, said clean-out fingers being mounted for removal from a position above said last-mentioned plane, and said clean-out fingers having a generally vertical guide surface for contact with said limiting means.

12. A machine in accordance with claim 11 wherein said limiting means is a shaft supported at its ends by the glue mechanism.

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EARL M. BERGERT, Primary Examiner.

H. F. EPSTEIN, Assistant Examiner.