DOUBLE DECK SINGLE FACER MACHINE
Hans Meister, Cherry Hill, N.J., assignor to Samuel M.
Langston Company, Camden, N.J., a corporation of
New Jersey
Filed Aug. 17, 1965, Ser. No. 480,453
Int. Cl. B32b 31/12, 3/28
U.S. Cl. 156—470
9 Claims

ABSTRACT OF THE DISCLOSURE
A double deck single facer machine for making single
face corrugated board is disclosed having upper and lower
machines. The upper single facer machine is staggered
with respect to the lower single facer machine. The front
end of the upper single facer machine is supported by the
rear end of the lower single facer machine. The rear end
of the upper single facer machine is provided with a
separate support. Each machine has the same frame so
that they are interchangeable.

This invention relates to a double deck single facer
machine, and more particularly to such a machine struc-
turally interrelated in a novel manner.
In accordance with the present invention, two single
facer machines having identical frames are disposed at
different elevations in a staggered fashion whereby only
the front end of the upper machine is supported by the
lower machine. A discrete support means is provided to
cooperate with the lower machine for supporting the
upper machine. Since the frames on each of the machines
are identical, only one production line is required for the
frames and either machine could be an upper or a lower.
The components of each machine are identical and there-
fore there is no need for manufacturing or storing com-
ponents which are usable only on one of the machines.
Also, the upper and lower machines are structurally inter-
related in a manner so that the corrugating rolls and other
components of the lower machine may be removed with-
out interfering with the upper machine.
The staggered arrangement of the machines has other
advantages. Thus, maintenance and observation of com-
ponents such as doctor rolls, adhesive flow patterns,
clean-out fingers, adjustment of crestline fingers, etc. are
capable of being accomplished on either machine as if
the other machine were not present. The individual ma-
chines are structurally interrelated in a manner whereby
a paperboard manufacturer may install only the lower
machine and at some later date, add the upper machine
thereof. This event could occur when a manufacturer
does not have a sufficiently large business so as to justify
a double deck arrangement. By adding an upper deck at
some later date, the manufacturer has the advantage
that additional floor space is not required.
Quite often, manufacturers move from one location
to another, such as during an expansion program. In the
event that such changes do not facilitate the use of double
deck machines and adequate space is available, the upper
deck may be removed and mounted on a bed plate where-
ever desired. Thus, it will be noted that maximum ver-
satility is one of the main advantages of the present inven-
tion in conjunction with the other advantages discussed
above.
A single motor may be used to drive rotating compo-
nents of the upper and lower deck. The drive system pref-
erably includes provisions for declutching the corrug-
ating and pressure rolls of either machine independently
of the other. At the same time, this system may include
components for declutching the drive with respect to the
glue mechanism independently of each other and in-
dependent of the driving connection to the corrugating
and pressure rolls. The driving system of the present inven-
tion permits the accomplishment of these features while
being simple, rugged, and inexpensive.
It is an object of the present invention to provide a
novel double deck single facer machine.
It is another object of the present invention to provide
a double deck single facer machine having identical upper
and lower modules structurally interrelated in a staggered
fashion.
It is another object of the present invention to provide
a double deck single facer machine structurally inter-
related in a manner to facilitate ease of maintenance and
observation of components.
It is another object of the present invention to provide
a double deck single facer machine having upper and
lower modules each provided with identical frames so
that either one could be an upper or a lower deck.
It is another object of the present invention to provide
a double deck single facer machine comprised of upper
and lower decks structurally interrelated in a manner
whereby the upper deck may be added after the lower
deck has been installed and operated.
Other objects will appear hereinafter.
For the purpose of illustrating the invention, there is
shown in the drawings a form which is presently pre-
tered; it being understood, however, that this invention
is not limited to the precise arrangements and instrument-
ations shown.
FIGURE 1 is a side elevational view of the machine at
the present invention.
FIGURE 2 is a sectional view taken along the line
2—2 in FIGURE 1.
FIGURE 3 is a sectional view taken along the line
3—3 in FIGURE 2.
FIGURE 4 is a slightly enlarged detailed view of the
structure within the circle designated as A in FIGURE 2.
FIGURE 5 is a transverse sectional view of the lower
single facer machine.
Referring to the drawings in detail, wherein like nu-
merals indicate like elements, there is shown in FIGURE
1 a double deck single facer machine in accordance with
the present invention designated generally as 9. The ma-
chine 9 includes a lower single facer machine 10 and an
upper single facer machine 11. The machines 10 and 11
are identical modules having identical frames.
The single facer machines 10 and 11 are each pref-
erably of the type disclosed in copending application Ser.
No. 480,415 entitled "Single Facer Machine" and filed
The disclosure in said application is incorporated herein
by reference. Since the structure of the machines 10 and
11 is identical, only the details of machine 10 will be de-
scribed in detail hereinafter.
The machine 10 includes a pair of parallel spaced side
frames which may be designated as a right side frame 12
in FIGURE 3 and a left side frame 14. The side frames
12 and 14 support the rotating components and are
mounted on a bed plate 16. The frames 12 and 14 are
connected to the bed plate 16 by front and rear pairs of
bolts disposed on the inner surfaces of the frames. The
distance between the bolts of each pair is identical. The
side frames are preferably solid cast iron and the bed
plate 16 is preferably sound-deadened to eliminate vibra-
tion problems.
A first or lower corrugating roll 18 is rotatably sup-
ported by the side frames 12 and 14. A second or upper
coring roll 20 is rotatably supported by a pair of lever arms 22 (only one of which is shown). The arms 22 are mounted on the side frames 12 and 14 for pivotal movement about the longitudinal axis of stud 24. The arms 22 are each connected to a rod extending from separate pneumatic motors 28 (only one shown). The motors 28 are adapted to operate in unison to move the ends of the upper corrugating roll 20 toward the lower corrugating roll 18 by pivoting the arms about the longitudinal axis of stud 24.

A pressure roll 30 is supported for rotation about its longitudinal axis by the side frames 12 and 14. A conventional means not shown may be provided for heating the rolls 18, 20 and 30. The pressure roll 30 is supported at its ends by arms 32 (only one of which is shown). The arms 32 are mounted for pivotal movement about the longitudinal axis of stud 34. The arms 32 are each likewise connected to a separate rod extending from a pneumatic motor 38 (only one of which is shown). The motors 38 are adapted for simultaneous actuation to move the ends of the pressure rolls 20 and 30. The lower corrugating roll 18 is pivoted by the arms 32 about the longitudinal axis of stud 34.

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 and 34 lie in a plane which is substantially parallel to the mentioned plane. The motors 28 and 38 all lie in a plane inclined with the horizontal and parallel to the last-mentioned planes.

The pneumatic motors 28 and 38 on one side of the machine are mounted on a support member 56. The motors 28 and 38 on the other side of the machine 10 are likewise supported by corresponding support members. The support members 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. It has been found that this construction will aid in removal or replacement of the lower corrugating roll with a period of several hours instead of several days.

The medium 46 to be corrugated passes over a spreader bar 39 and is adjusted by the side frames 12 and 14. The spreader bar 39 assures smooth entry of the medium 46 as will be readily understood by those skilled in the art. From the spreader bar 39, the medium 46 may pass over one or more idler rollers and beneath a shower designated generally as 40. The desirability of providing a shower for preheating and conditioning the medium 46 will be readily understood by those skilled in the art. If desired, a slitter knife may be provided between the shower 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 whereby flutes are formed under heat and pressure. The newly formed flutes are gently stripped from the nip by one-piece crescent fingers 54 at spaced points therealong and guided around the corrugating roll 18. A liner 48 extends around the preheater roll 42, around 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 single faced board 50 which exits in the direction of arrow 52.

Crescent fingers 54 are disposed at spaced points along the corrugating rolls. The upper corrugating roll 20 is provided at spaced points therealong to facilitate receiving the 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 corrugated 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 in the area between rolls 18 and 62. The adhesive or glue applicator roll 62 is provided with a peripheral adhesive applicating surface interrupted at spaced points therealong by grooves 64. A metering roll 66 is provided to meter the thickness of adhesive on the surface of roll 62. As the medium 46 fluffs out into the relief section on the crescent fingers 54, an even film of adhesive is applied on the flute tips by the outer peripheral surface of roll 62.

Power cylinders 72 (see FIGURE 5) are supported by the frames below the horizontal plane of the glue pan 66 for retracting the glue mechanism which includes the glue pan 66, applicator roll 62 and metering roll 66. The cylinders 72 may be identical in size with the power cylinders 28 and 38 for simplification of maintenance and storage of spare parts. The cylinders 72 are pneumatic and have a rod 74 extending upwardly for connection to the glue pan 68.

A bracket 76 is provided at each end of the glue pan 68. The glue pan 68 and the rolls 62, 66 are supported by the brackets for pivotable movement about a horizontal axis corresponding to the 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.

Free-floating fingers 82 are provided. Each clean-out finger 82 extends into one of the grooves 64 on roll 62. The clean-out fingers maintain the proper amount of adhesive in the grooves 64. The entirety of the clean-out fingers lies between vertical planes containing the axes of the rolls 62 and 66. Back-up structure in the form of a shaft 84 may be provided to limit the upward extent of the clean-out fingers 82. Since the clean-out fingers 82 are free-floating, they are self-adjusting with speed changes and mounted for removal from a position above the glue pan 68 and do not interfere with the adjustment of dam or will enable within the glue pan 68.

In order to facilitate adjustment in the gap between the applicator roll 62 and the corrugating roll 18, arms 96 are fixedly secured to the ends of shaft 78 on the outer surface of the side frames 12 and 14. A limit stop 98 is provided on each side frame for cooperation with an adjustable screw member 100 which is threadedly coupled to the terminal end of each arm 96.

The frames 12 and 14 terminate at their upper ends in a horizontal surface 102. Surface 102 is provided with a pair of tapped holes spaced apart by a distance corresponding to the distance between the bolts of each pair connecting the frames to the bed plate 16. In this manner, bolts 104 may be utilized to connect the front end 106 of machine 11 to the surface 102 on the rear end of the machine 10 as shown more clearly in FIGURE 3. A discrete support means such as posts 108 and 110 are provided to cooperate with the machine 10 in supporting the upper single face machine 11. The upper end of posts 108 and 110 are provided with apertures spaced apart by a distance corresponding to the distance between the bolts of the pair of bolts securing the rear end of machine 10 to the bed plate 16. Hence, the same bolts and apertures which could be used to bolt the rear end of machine 11 to a bed plate are utilized to bolt the rear end of machine 11 to the support posts 108 and 110.

The bed plate 16 is provided with apertures adjacent each thereof for receiving bolts 112. Bolts 112 secure an extension 114 thereto at ground level. Each of the extensions 114 support the lower end of one of the posts 108 and 110. The tapped holes in surface 102 at the upper end of machine 11 (see upper left-hand corner of FIGURE 1) are not used and may be filled with a dummy bolt if desired. Such dummy bolts would prevent these tapped holes from becoming filled with dirt or other impurities and thereby interfere with the ability of machine 11 being used at some subsequent time as the lower deck of a double deck machine.
To facilitate access to the front of the machine 11, the lower machine 10 may be provided with a catwalk platform 116. Platform 116 may be removable bolted to the support 36 which are spaced apart further than the greatest width of paperboard which can be processed so as to avoid interference with the exit of single faced board. The use of discrete support means for the rear end of machine 11 of the upper deck facilitates ease of maintenance and operation of both machines without interfering with either machine. Access to the rear side of machine 11 may be had by way of an elevated platform. The machines 10 and 11 are capable of being operated independently of one another and are adapted to function as if the other did not exist.

The double deck machine 9 is provided with a single driving system which provides for selective or simultaneous operation of the machines 10 and 11. The driving system includes a motor 118 mounted on a base 120. Base 120 may be separate from or connected to extension 122 of the bed plate 16.

The motor 118 is provided with a V-belt pulley 126. Belts 128 extend around the pulleys 124 and 130 and in engagement with idler pulley 132.

A vertical plate 134 is bolted at its lower end to the extension 122 spaced from and parallel to the side frames of the machines 10 and 11. Plate 134 is provided with a horizontal surface 136 at its upper end and a horizontal surface 138 between its upper and lower ends. A shaft 140 is supported on surface 136 by bearing 142. The hub 144 of pulley 130 is rotatably supported on shaft 140 and connected to one side of a pneumatic selectively operable clutch 146. The rotary motion of hub 144 may be selectively transmitted to the shaft 140 by way of clutch 146. Clutch 146 may be conventional.

The hub 144 remote from clutch 146 is rotatably supported by side frame 150 on the machine 11. Side frame 150 on machine 11 corresponds to side frame 14 on machine 10 and are disposed one above the other, but staggered with respect to each other as shown more clearly in FIGURE 3. The side frame of machine 11 opposite to side frame 150 is designated as 152. Side frame 152 corresponds to side frame 12 on machine 10.

Shaft 140 is provided with a gear 145 adapted to be coupled to drive the lower corrugating roll on machine 11. The upper corrugating roll on machine 11 is designated at 155. Figure 2 is a sectional view, wherein the distance between the locations where the lower single facer machine frame is connected to said bed plate corresponds to the distance between adjacent bolts 104 connecting the front end of machine 11 to the rear end of machine 10 at surface 102. Said distance also corresponds to the distance between the bolts connecting the rear end of machine 11 to the end of support posts 108 and 110. These relationships facilitate using either machine 10 or 11 as an upper or a lower or by themselves without requiring any additional adaptors or machines thereby lending versatility to the single facer machine 11.

If machine 11 is not present, machine 10 will be operating with a smaller version of plate 134 and a belt shorter than belt 128 and of sufficient length to couple pulley 124 to pulley 126. When machine 11 is superimposed on a machine 10, the only change of components involved in the conversion to the double deck machine of the present invention is to remove the old belt together with the smaller version of plate 134 and substitute belt 128 and plate 124 therefor.

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.

I claim:

1. Apparatus comprising a double deck single facer having upper and lower single facer machines, each single facer machine having the same frame, the single facer machines being disposed at different elevations so that the upper single facer machine is connected to and only partially supported by the lower single facer machine, the upper single facer machine being staggered with respect to the lower single facer machine so that corrugating rolls of the lower machine are offset with respect to corrugating rolls of the upper machine while having parallel axes of rotation, a discrete upright support means adjacent ends of the upper single facer machine and spaced from said lower single facer machine, said upper single facer machine being connected to said support means, said support means cooperating with said lower single facer machine to support said upper single facer machine.

2. Apparatus in accordance with claim 1 including a bed plate, said lower single facer machine frame and said support means being mounted on and connected to a portion of said bed plate.

3. Apparatus in accordance with claim 2 including a removable extension on said bed plate, said support means being connected to said extension.

4. Apparatus in accordance with claim 1 wherein the distance between the locations where the lower single facer machine frame is connected to said bed plate cor-
responds to the distance between connections of the upper single facer machine to the lower single facer machine and the upper single facer machine to the support means.

5. A single facer machine in accordance with claim 1 including a drive system for each machine coupled to a single motor, said system including means for selectively and independently disconnecting a glue applicator roll and corrugating roll of either machine with respect to the driving system.

6. An apparatus in accordance with claim 5 including an upright plate disposed alongside and spaced from a portion of the frame of each machine, and at least a portion of said driving system being supported by said plate.

7. An apparatus in accordance with claim 5 wherein said driving system includes an air clutch for coupling the driving system to the lower corrugating roll of each machine and a selectively disengageable gear train for connecting the driving system to each applicator roll of the machine.

8. Apparatus comprising a double deck single facer having upper and lower single facer machines, each single facer machine having the same frame, the single facer machines being disposed at different elevations so that the front end of the upper single facer machine is connected to and supported by the rear end of the lower single facer machine, a discrete upright support means spaced from the rear end of the lower single facer machine, the rear end of said upper single facer machine being connected to said support means and supported thereby, and each machine frame having identical connecting means thereon whereby the machines are interchangeable with one another.

9. Apparatus in accordance with claim 1 wherein said corrugating rolls on the lower machine are offset with respect to the corrugating rolls in the upper machine so as to be located on opposite sides of a vertical plane.

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EARL M. BERGERT, Primary Examiner
H. F. EPSTEIN, Assistant Examiner

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