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WEB STORAGE MEANS

Filed July 25, 1966

FIG. 1.

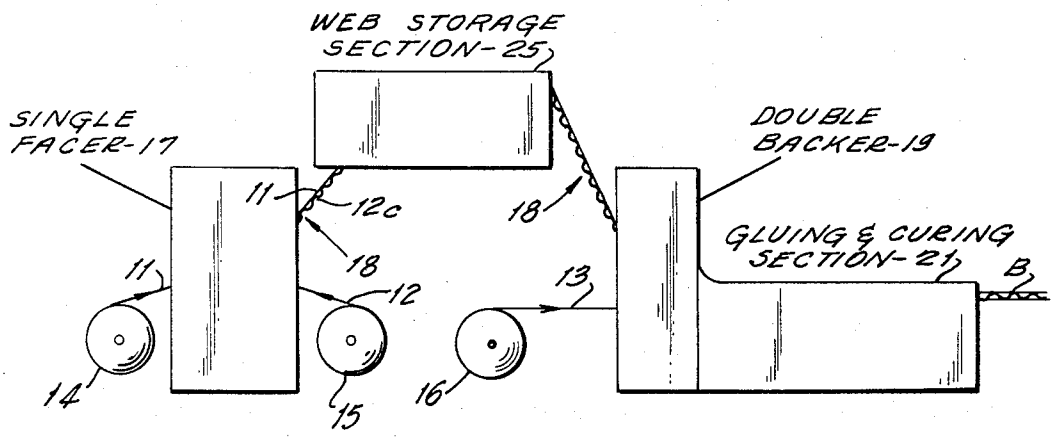


FIG. 2.

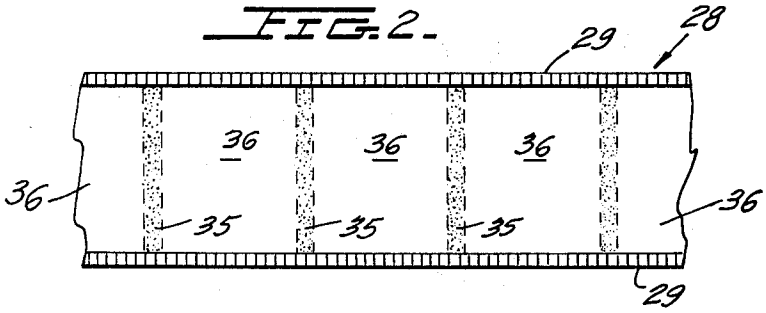


FIG. 3.

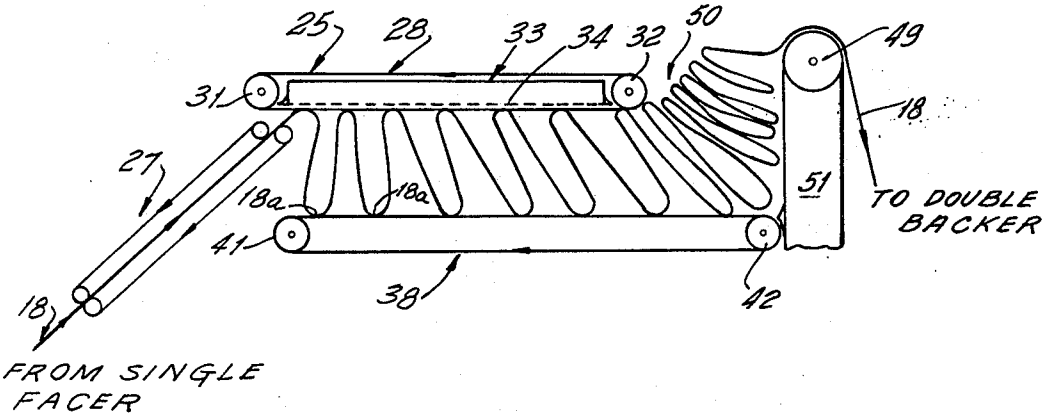
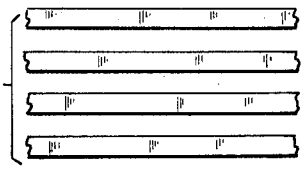


FIG. 4.



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WEB STORAGE MEANS

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The instant invention relates to apparatus for the production of double faced corrugated board and in particular relates to the section of such apparatus between the single facer and double backer where single faced web material is stored prior to having the second liner applied.

Double faced corrugated board is manufactured by corrugating a web and uniting same with a first liner in a single facer to produce single face board. Thereafter, the single face board is united with a second liner in a double backer to produce double faced board. While operations of the single facer and double backer are coordinated to a great extent, for practical reasons the single facer should not be stopped or operated at very slow speeds when it becomes necessary to stop the double backer or operate same at very slow speeds as during order changeovers. Conversely, it is often desirable to operate the double backer faster than the single facer.

Thus, corrugating apparatus of this type is provided with a bridge between the single facer and double backer for the storage of single face material during those intervals when the double backer must be slowed down. Single face boards accumulated in the storage device is also available during those intervals when the double backer demands material at a faster rate than it is being produced by the single facer.

In the prior art the storage section between the double backer and single facer was constructed in such a manner that the single face board was formed into folds or loops which accumulated in a stack. Folds of single face board were added to the top of the stack and board being fed to the double backer was drawn away from the bottom of the stack. It was found that the weight of the stack resulted in excessive resistance to removal of single face material from the storage device causing damage to the material and/or interference with operation of the double backer.

In order to overcome this disadvantage of the prior art the instant invention provides a storage device in which the web of single face board is formed into a stack fed from the bottom and material is drawn off the top of the stack and fed to the double backer. This is accomplished by providing a suction belt conveyor positioned above and confronting a lower conveyor operated at a slightly greater speed than the suction conveyor. Single face boards fed into the storage device is directed toward the suction conveyor which operates at a much slower speed than the input conveyor so that the first portion of the web material to engage the suction conveyor remains in engagement therewith but material following is directed downward to form a loop tip supported by the lower conveyor. Material following is again supported by the suction conveyor so that a series of loops are formed with the upper tips thereof held by suction against the suction conveyor and the lower tips thereof supported by the lower conveyor. Since the lower conveyor is operated at a faster speed than the suction conveyor, the lower loop tips move toward the double backer faster than the upper loop tips. In this manner, at the forward end of the storage device the loops are formed into a stack fed from below. Single face web material fed to the double backer is drawn from the stack at the top thereof and as a result this withdrawal is not resisted by the weight of the stack.

Accordingly, a primary object of the instant invention is to provide novel storage means for web material where

material is simultaneously fed in and removed from the storage means simultaneously even at different rates.

Still another object is to provide a storage means of this type in which the web material is formed into loops fed to the bottom of a stack with material being drawn from the top of the stack.

Still another object is to provide a storage means of this type including a suction conveyor positioned above and spaced from a lower conveyor with the suction conveyor engaging the upper loop tips and the lower loop tips being supported by the lower conveyor.

A further object is to provide a storage means of this type in which the lower conveyor is operated at a faster speed than the upper conveyor to facilitate feeding of loops to the bottom of the stack.

These as well as other objects of the instant invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 is schematic representation of apparatus for the production of double face board.

FIGURE 2 is a side elevation in schematic form of the storage means of FIGURE 1 constructed in accordance with the teachings of the instant invention.

FIGURE 3 is a plan view of a portion of the suction conveyor belt.

FIGURE 4 is a fragmentary plan view of the grid forming bars at the bottom of the suction chamber.

Now referring to the figures and more particularly to FIGURE 1 which illustrates, in block diagram form, apparatus for producing double face board B from webs of paper **11**, **12**, **13** supplied by rolls **14**, **15**, **16**, respectively. Web **12**, as it leaves roll **15**, is fed into the rear of single facer **17** where the flat web **12** is transformed into corrugated web **12***c*. Single facer **17** also unites corrugated web **12***c* with liner **11** to produce web **18** of single face board fed into the rear of web storage section **25**. Construction of section **25** will hereinafter be described in detail with particular reference to FIGURE 2.

Web **18** leaves storage section **25** at the front thereof (at the right with respect to FIGURE 3) and is fed into double backer **19** together with liner **13**. Web **18** and liner **13** are combined by double backer **19** with the combination after feeding through curing section **21** issuing as double face board B fed to additional apparatus including a cut-off (not shown) which cuts web B transversely transforming the latter into sheets.

Now referring more particularly to FIGURE 2 which shows details of web storage section **25**. For the sake of simplicity, in FIGURE 3 web **18** of single face board is illustrated by a single line. Upon entering section **25**, web **18** is carried upward between the belts of sandwich-type input conveyor **27** which delivers web **18** to the lower flight of suction conveyor belt **28** at the rear end thereof (at the left with respect to FIGURE 3).

Suction belt **28** is a closed loop member passing over sprockets **31**, **32**. Each of the sprockets **31**, **32** consists of two sections spaced on opposite sides of the web feed path in driving engagement with the teeth **29** along the longitudinal edges of belt **28** (see FIGURE 3). Suction chamber **33** is disposed between the upper and lower flights of belt **28** extending substantially from sprocket **31** to sprocket **32**. The lower flight of conveyor **27** is adjacent to grill **34** constituting the bottom wall of chamber **33**. Belt **28** is provided with transverse sections **35** having a plurality of perforations through which suction is applied through belt **28** to hold portions of single face web **18** against the lower or working flight of belt **28**.

It is noted that in FIGURE 3 grill **34** is shown merely in schematic form. In its physical embodiment grill **34** consists of a plurality of longitudinally extending bars spaced transversely across storage section **25**. The cor-

rugations of web **12***c*, being transverse to the bars of grill **34**, provide sufficient strength for web **18** to withstand the effects of suction holding forces tending to draw web into chamber **33**.

As seen in FIGURE 3, transversely extending perforated sections **35** are spaced along the longitudinal axis of belt **28**. Sections **36** of belt **28** between perforated sections **35** are not porous so that the suction applied through web **34** acts on web **18** only at perforated sections **35**. Belt **25** is driven at a slower speed than conveyor **27**. Thus, those sections of web **18** issuing from conveyor **25** which do not engage perforated belt sections **35** are much greater in length than the solid sections **36** adjacent to perforated sections **35**. Because of this web **18** is formed into loops whose lower tips **18***a* extend downward to engage and be supported by the upper flight of lower conveyor belt **38** extending around sprockets **41**, **42**. The upper loop tips **18***b* are maintained in engagement with belt **28** at spaced perforated areas **35** by means of suction provided through chamber **33**.

Lower belt **38** operates at a faster speed than upper belt **28** so that lower loop tips **18***a* move along at a faster speed than upper loop tips **18***b*. Thus, the loops closest to the rear (left of FIGURE 2) of belt **28** appear to have vertical sides and as each loop moves forward its sides assume a lesser angle of inclination with respect to the horizontal.

The suction force is essentially non-existant in the region of forward sprocket **32** so that as upper loop tips **18***b* reach this region they are released. However, lower belt **38** extends more forwardly than upper belt **28** so that lower loop tips **18***a* continue to move forward further reducing the angle of inclination for the loop sides. Forward movement of lower loop tips **18***a* is arrested by vertical barrier **51** extending upward at the forward end of conveyor **38**. This results in the formation of a stack of loops **50** consisting of single face web **18** with the stack **50** being supplied from the bottom. In being drawn from the top of stack **50** single face web passes over forward idler **49** and is fed to double backer **19** without being impeded by the weight of stack **50**.

It should now be apparent to those skilled in the art that the speeds of conveyors **27**, **28**, **38** are coordinated and are in time relationship with respect to single facer **17**. Naturally, the number of loops in stack **50** increases during those periods of operation when single facer **17** produces single face web **18** at a rate faster than that demanded by double backer **19**. Conversely the number of loops in stack **50** decreases during those periods of operation when the demand by double backer **19** exceeds the supply of single face web **18** being produced by single facer **17**.

Thus, it is seen that the instant invention provides a novel web storage section in which web material is being fed in on a substantially continuous basis with the input and output rates not necessarily being equal. In particular, the web storage section of the instant invention provides means whereby web material entering the storage section is formed into loops which enter a vertical stack from below thereby enabling material to be drawn from the top of the stack without being impeded by the weight of the stack.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. Storage apparatus for material in the form of a moving web including a first conveyor, a second conveyor positioned below said first conveyor, said first and second conveyors including respective first and second

web engaging sections, said sections being generally horizontal and disposed in spaced confronting relationship, an input conveyor at the rear of said apparatus, said input conveyor delivering a web entering said apparatus to said first section, suction means acting through said first section to support a web after delivery thereof by said input conveyor to said first section, driving means moving said first section forward at a speed sufficiently slower than the speed of said input conveyor whereby a web leaving said input conveyor forms loops moving toward the front of said apparatus with lower tips of said loops supported by said second section and upper tips of said loops supported by suction applied through said first section.

2. Storage apparatus as set forth in claim **1** in which said first conveyor includes means for limiting application of suction through said first section to a plurality of selected areas of said first conveyor, said areas extending transverse to the line of movement of said first section and spaced along said line of movement whereby upper tips of said loops are held against said first section only at said selected areas.

3. Storage apparatus as set forth in claim **1** in which said second conveyor operates at a speed intermediate the respective speeds of said first and said input conveyors whereby said lower tips move faster than said upper tips with the result that as each of said loops moves forward its angle of inclination with respect to the horizontal decreases.

4. Storage apparatus as set forth in claim **3** in which as each of the upper loops reach the forward end of said first section the application of suction force holding such loop to said first section is removed from such loop thereby permitting such loop to move upward in a vertical stack of loops positioned at the forward end of said second section.

5. Storage apparatus as set forth in claim **4** in which there is a barrier at the forward end of said first section, said barrier limiting forward movement of loop entering said stack.

6. Storage apparatus as set forth in claim **5** also including means above said barrier defining an exit at which material is drawn from said stack at the top thereof.

7. Storage apparatus as set forth in claim **6** in which said first conveyor includes a continuous belt having a lower generally horizontal flight constituting said first section, said belt having alternate first and second type transversely extending areas, said second areas being essentially non-porous, said first areas being porous to permit suction to be applied through said belt to hold upper tips of said loops against said first section only at said first areas.

8. Storage apparatus as set forth in claim **7** in which said second conveyor includes another continuous belt having an upper generally horizontal flight constituting said second section.

9. Storage apparatus as set forth in claim **7** in which said first section also includes a porous stationary support means positioned above said lower generally horizontal flight with the latter in contact therewith.

10. Storage apparatus as set forth in claim **9** in which said stationary support means includes a plurality of spaced longitudinally extending generally parallel bars.

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