United States Patent

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[73] Assignee **Honshu Seishi Kabushiki Kaisha, Tokyo, Japan**

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[54] **APPARATUS FOR APPLYING A FILLING AGENT TO A CORRUGATED BOARD**
4 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **93/1**, 93/36, 118/223
[51] **Int. Cl.** **B05c 1/08**
[50] **Field of Search** ..... 93/1H, 1R, 36MM, (Inquired); 118/44, 217, 223, 224, (Inquired)

[56] **References Cited**

UNITED STATES PATENTS

2,226,709	12/1940	Colbert	118/223X
2,229,620	1/1941	Bradner	118/223UX
3,058,868	10/1962	Schroeder	93/36MMUX

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ABSTRACT: An apparatus for applying a filling agent or filler to the edge portions of a corrugated board having a corrugated medium forming a number of flutes, more particularly to the edge portions which extend transversely in relation to said flutes comprising a transfer means for holding a corrugated board upright so that one of said edge portions is positioned lowermost and for transferring the corrugated board in a horizontal direction; at least a pair of rolls provided in facing relation to the path of travel of the corrugated board transferred by said transfer means. At least one side surface of said lower edge portion of the corrugated board is compressed between said rolls. A plurality of rolls each contacting at one portion thereof with a filling agent stored in a reservoir are provided at a position next to said pair of rolls and beneath the path of travel of the corrugated board and extend crosswise of the direction of travel of the corrugated board. The corrugated board is compressed and crushed at the lower edge portion thereof by said pair of rolls, and the filling agent is applied to the compressed edge portion by reverse coating rolls in contact with the filling agent stored in the reservoir to give high water or moisture resistance to the edge portion of the corrugated board. The amount of the filling agent applied is kept uniform and adequate by other coating rolls, excluding the stationary roll located at the most forward position in the direction of travel of the corrugated board, since these rolls rotate in a reverse direction in relation to the direction of travel of the corrugated board and are arranged in spaced relation to each other, and each of openings between adjacent rolls has a different width which decrease in the direction of travel of the corrugated board.

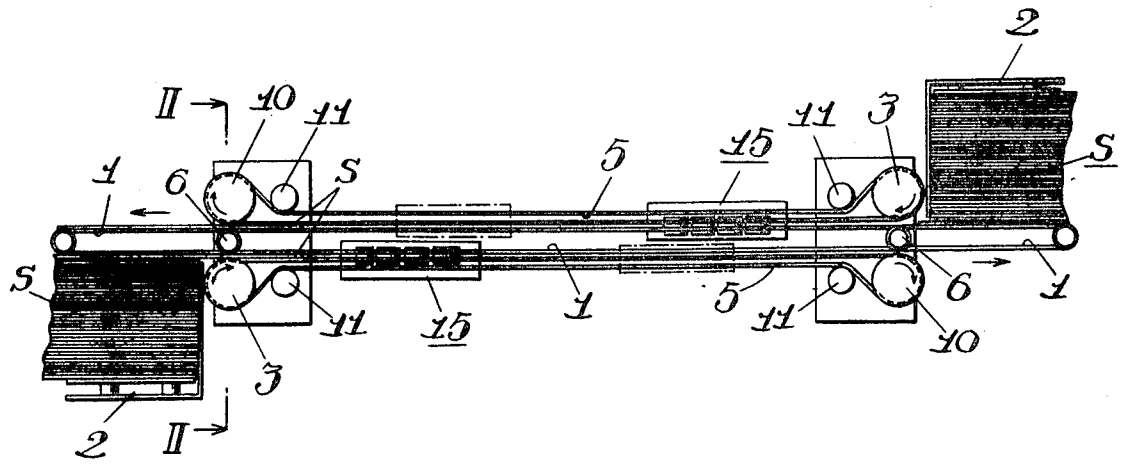


Fig. 1

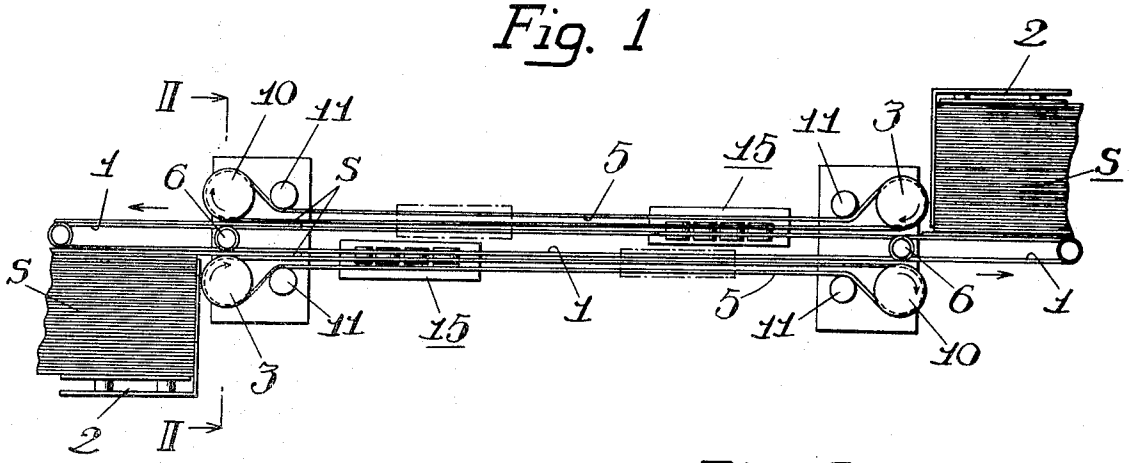


Fig. 2

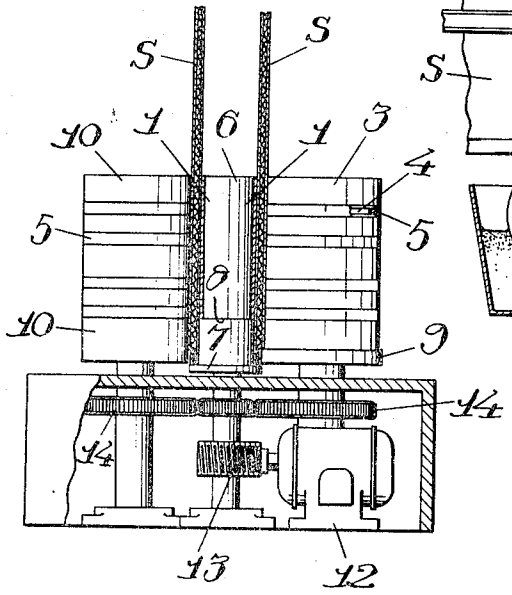


Fig. 3

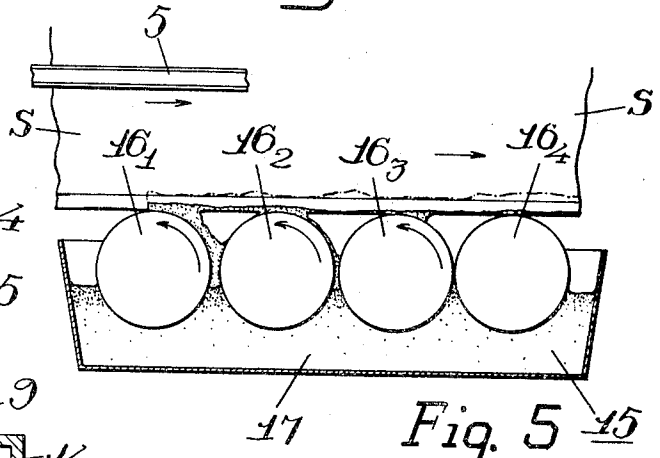


Fig. 5

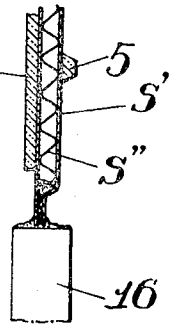
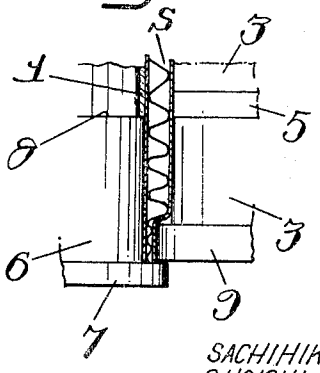


Fig. 4



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APPARATUS FOR APPLYING A FILLING AGENT TO A CORRUGATED BOARD

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for applying a filling agent to the edge portions of a corrugated board, having a corrugating medium forming a number of flutes, in order to increase the water or water vapor resistance at said edge portions.

Corrugated board, which has been improved remarkably in recent years is used in place of wooden cartons as a wrapping material.

The inherent low resistance to water or water vapor of paper can be improved by applying to the web surface a water repellent agent such as paraffin or other plastic coating. However, there remains unsolved the problem of preventing penetration or permeation of water or water vapor into a corrugated board through the edge portions thereof, especially through the flutes which open at the sectional area which extends transversely in relation to the flutes of a corrugated medium sandwiched between two liners and extending in the same direction. Accordingly, after the corrugated board has been subjected to penetration of water or water vapor through the open ends of these flutes the strength of the board is extremely weakened. Because of such disadvantageous permeability of water through the open-end portions of flutes, the corrugated board cannot be used as a wrapping material for fresh fruits and vegetables which contain water.

In order to eliminate such defects, many attempts have been made; for example, by crushing the open ends of the flutes to thereby prevent penetration of water through flute openings. Such attempts, however, were not effective to seal together continually and completely the sectional area of the flutes of the corrugated board.

For attaining the above object, the present invention provides an apparatus for sealing the edge portions of a corrugated board in which a corrugating medium forming flutes is crushed and compressed at its edge portions including the open ends of the flutes, and then a filling agent or filler, such as a hot molten plastic, is applied to said crushed end portions to seal them completely.

The present invention relates to an apparatus for applying a filling agent or filler to a cross-sectional area including the open ends of the flutes of a corrugated board wherein the corrugated board having a corrugating medium is crushed at the cross-sectional areas including the open ends of flutes of the corrugating medium by a vertical crushing roll which roll is provided at one end with a flange, so as to prevent exposure of the corrugating medium. Then, the corrugated board is transferred by a vertical conveyor belt horizontally toward a reverse roll coater. The crushed sectional area of the corrugated board is then filled with a hot molten plastic by a multistage reverse roll coater provided under the conveyor belt, as the corrugated board travels thereby.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings show a preferred embodiment of an apparatus for applying a filling agent or filler to the edge portions of a corrugated board, wherein;

FIG. 1 is a top plan view showing the apparatus of the present invention;

FIG. 2 is a view substantially as taken along the line II–II of FIG. 1;

FIG. 3 is an enlarged side view of the reverse roll coating device in FIG. 1;

FIG. 4 is an enlarged view showing a part of the crushed edge portion; and

FIG. 5 is an enlarged front view showing a part of said reverse roll coating device.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 there is shown a vertical endless conveyor belt for transferring corrugated boards S, one after another. Each corrugated board S is comprised of a corrugating medium S'' sandwiched between liners S' and forming flutes therewith. Corrugated board supply stands **2, 2** are provided on opposite sides of the conveyor belt **1** at the respective ends thereof.

The corrugated boards on said supply stands **2, 2** are arranged so that the flutes of the corrugated medium extend vertically and said boards are transferred with their inner surfaces in frictional contact with one side surface of said conveyor belt **1**.

Provided at a position adjacent to each of the supply stands **2, 2** is a drum type of crushing roll **3**. The roll **3** has a comparatively large diameter and serves also as a belt pulley, as seen in FIG. **2**.

Each of the crushing rolls **3** is provided on the peripheral surface thereof with a plurality of grooves. A plurality of V-shaped endless conveyor belts **5** are respectively received in the grooves so as to be moved by rotation of the crushing rolls.

The V-shaped endless conveyor belts **5** run in the same direction as said conveyor belt **1** and are horizontally spaced slightly therefrom to transfer the corrugated board received therebetween. Therefore, the corrugated board is sandwiched between the two endless conveyor belts **1** and **5** and is moved thereby.

Provided in a radial opposing relationship to each of the crushing rolls **3** is a vertical backing roll **6**. The lower edge of each backing roll has a flange **7** so as to prevent slipping down of the corrugated board. Each vertical backing roll **6** is also provided with a shoulder **8** having a width corresponding to the thickness of the conveyor belt **1**, for receiving the lower edge of said conveyor belt **1** thereon, so that said backing roll **6** can drive smoothly the conveyor belt **1**. The crushing roll **3** is provided at its lower edge with a flange **9** for flat crushing the corrugated board. The flange **9** is positioned immediately above the flange **7** of the backing roll **6**.

The corrugated board transferred from the supply stand **2** by the conveyor belt **1**, is fed between the crushing roll **3** and the backing roll **6**, and is crushed compressedly at the lower edge portion thereof by and between the lower flanged portions **7** and **9** of said crushing roll **3** and the backing roll **6**, as shown in FIG. **4**.

Numerals **10** indicate belt pulleys for the return traveling portion of the V-shaped conveyor belts **5** and **11** indicates guide rolls. The crushing rolls **3**, the backing rolls **6**, and the belt pulleys **10** are driven by an electric motor **12**, through a worm **13** and a gear mechanism **14** provided en bloc under these rolls.

The corrugated board having the crushed lower edge portion is transferred automatically through a roll-coating device **15** by the conveyor belt **1** and the V-shaped conveyor belts **5**. The roll-coating device **15** is arranged at a position adjacent to the crushing roll **3** and beneath the conveyor belt **1**, as shown in FIGS. **1** and **3**. Said roll-coating device **15** includes coating rolls 16_1, 16_2, 16_3, 16_4, each arranged in horizontally spaced relation to each other inside a reservoir or vat **17**. The space or opening between the two adjacent rolls 16_1, and 16_2 is the largest, and the openings between adjacent other rolls have widths which decrease in the direction of travel of the corrugated board. The most rightward roll 16_4 in FIG **3** is stationary, while the other rolls 16_1, 16_2 and 16_3 rotate in a reverse direction in relation to the traveling direction of the corrugated board.

Said coating rolls 16_1 to 16_4 are positioned so that the lower portions thereof extend into a hot molten plastic stored inside the reservoir **17**, so as to apply readily the hot molten plastic to the sectional area or lower edge portion of the corrugated board. In the thus constructed reverse roll-coating device, the hot molten plastic can be applied effectively and sufficiently only to the sectional area at the lower edge including the open-end portions of the flutes of the corrugated board, in the manner as shown in FIG. **5**, with no probability of wasteful application onto each surface of two liner boards, as shown by a broken line in FIG. **3**, which would damage the appearance of the board.

Excessive plastic or filler applied to the corrugated board by the roll 16_1 is scraped by the roll 16_2, and is completely scraped off by the roll 16_3 which latter roll rotates in light contact with the stationary roll 16_4 in the reverse direction in relation to the traveling direction of the board. Thus, the necessary and minimum amount of plastic is applied to and retained inside the sectional area of the crushed edge portion of the corrugated board, as illustrated in FIG. 5.

The filling agent or filler-applying apparatus of the present invention permits the use of comparatively expensive filling agents or fillers in an economical manner, because the amount of filling agent applied is small.

The filler-applying apparatus of the present invention also provides another advantage in that the film thickness of the filling agent or filler is easily adjustable to be the thinnest amount necessary for adequate sealing. This is important for the practical application of the filler to a corrugated board. Most of the corrugated boards supplied to the filler-applying apparatus of the present invention are usually nearly finished sheets which have already undergone slitting, printing and slotting operations, and therefore, staining and the presence of dirt on the liner surfaces as shown with the broken line in FIG. 3 should be absolutely avoided. The problem of staining the liner surfaces by an excessive application of a filling agent is completely solved by the filling agent applying apparatus of the present invention, since a thin film or thickness of applied filling agent can be attained by the use of this apparatus.

The filling agent applying apparatus of the present invention provides the further advantage that the uneven sectional area including the open-end portions of the flutes of the corrugated board can be filled uniformly and sufficiently with a filling agent. The corrugated board does not always have an even, smooth and straight sectional area; for example, a dull slitter can cause tearing on the surface of the back liner, which is encountered very often in a double-strength corrugated board or double-wall corrugated board; and corrugated boards treated with waterproof agents have slippery surfaces and are hard to trim straight.

The application of a filling agent to such uneven and warped sectional area including the open-end portions of the flutes is ensured effectively by the filling agent applying apparatus of the present invention which includes such means as a device for holding the corrugated board upright on the drum surfaces of the rolls and for tightening and compressing the lower edge of the corrugated board, and multistage coating rolls arranged in the space between adjacent rolls, and rotating in the reverse direction to the traveling direction of the corrugated board. The space or opening between adjacent rolls in the reverse roll coater is respectively different and is the smallest between the stationary roll and the roll adjacent thereto, and has a width which decreases is the direction of travel of the corrugated board.

The filling agent applying apparatus provides the further advantage that the amount of filling agent applied is small so that the liner surfaces are not stained with an excess of the filling agent.

We claim:

1. An apparatus for applying a filling agent to at least one edge portion of a corrugated board having a corrugating medium forming a number of substantially parallel flutes, particularly to the edge portions of said board which extend transversely to said flutes, comprising:

transfer means for holding the corrugated board in an upright position with one of said edge portions being lowermost and for moving said corrugated board in a substantially horizontal direction;

at least a pair of crushing rolls positioned in confronting relation to and on opposite sides of the path of travel of the corrugated board for compressing said lowermost edge portion of the corrugated board;

a reservoir positioned adjacent to said rolls and below the path of travel of the corrugated board and adapted for receiving a filling agent therein; and

a plurality of filling agent applying rolls positioned in horizontally spaced relation and extending crosswise of and positioned below the path of travel of the corrugated board, the lower portions of said filling agent applying rolls being adapted to be submerged in the filling agent in said reservoir, the upper portions of said filling agent applying rolls being adapted to contact the lowermost edge portions of the corrugated boards moving therepast in order to apply the filling agent thereto.

2. An apparatus according to claim 1, in which the spacing between adjacent filling agent applying rolls progressively decreases in the direction of travel of the corrugated board therepast.

3. An apparatus according to claim 2, in which the filling agent applying rolls comprises a plurality of rotatable rollers whose upper portions move in a direction opposite to the direction of travel of the corrugated board, and a stationary roller located downstream of said rotatable rollers in the direction of travel of the corrugated board.

4. An apparatus according to claim 1, in which said crushing rolls comprise a vertical crushing roll and a vertical backing roll, said crushing roll having a flange at its lower edge projecting toward said backing roll.