

April 8, 1958

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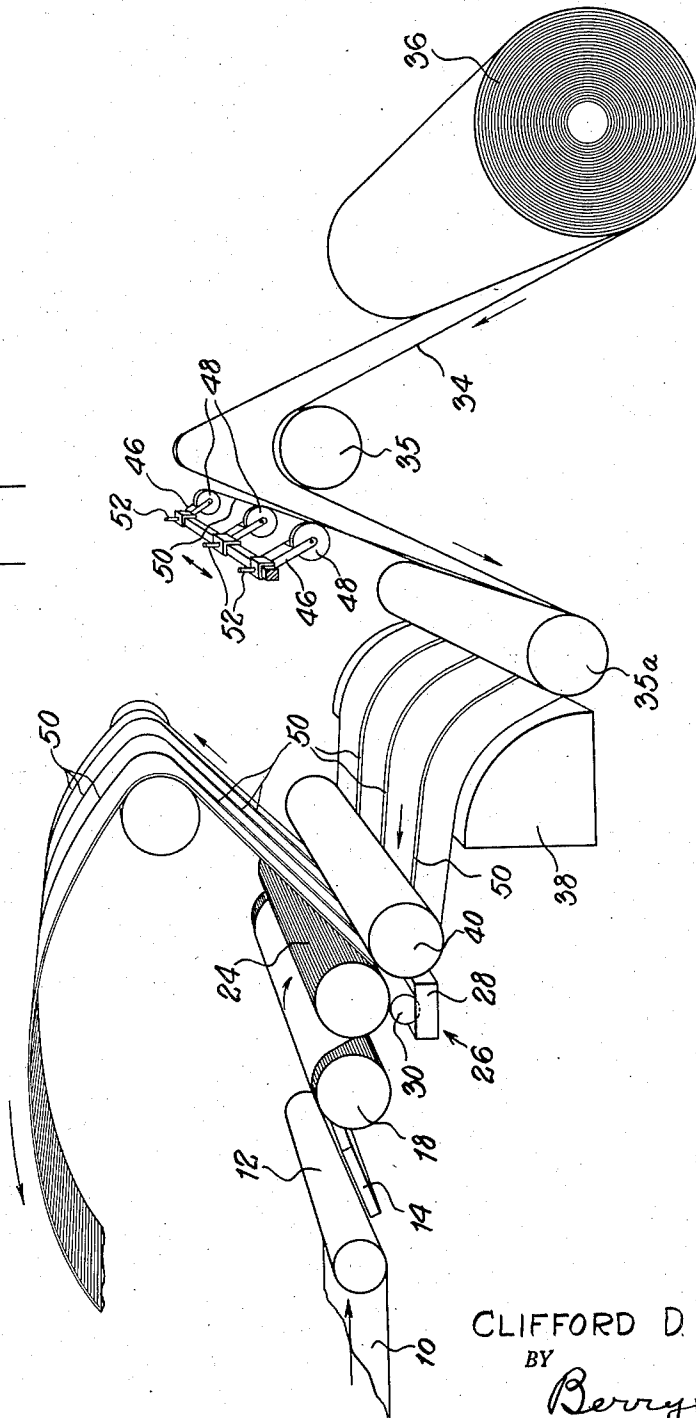
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MANUFACTURE OF CORRUGATED BOARD HAVING TEAR STRIPS

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2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 2.

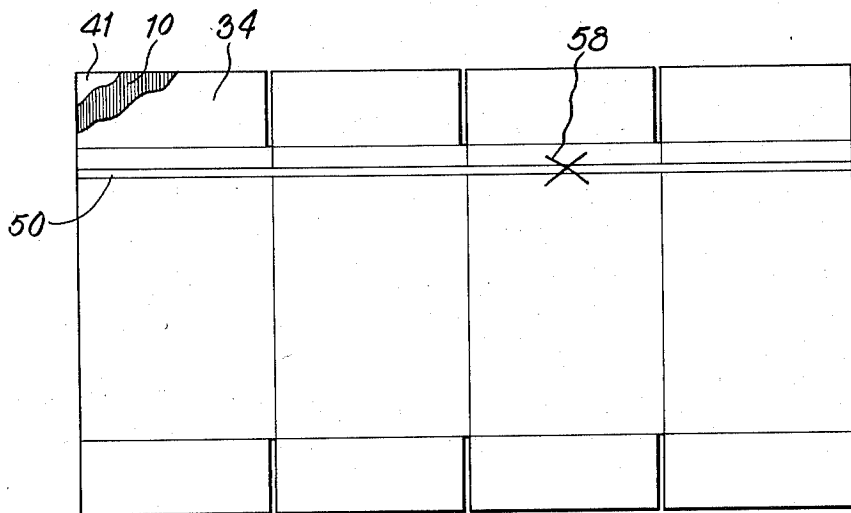
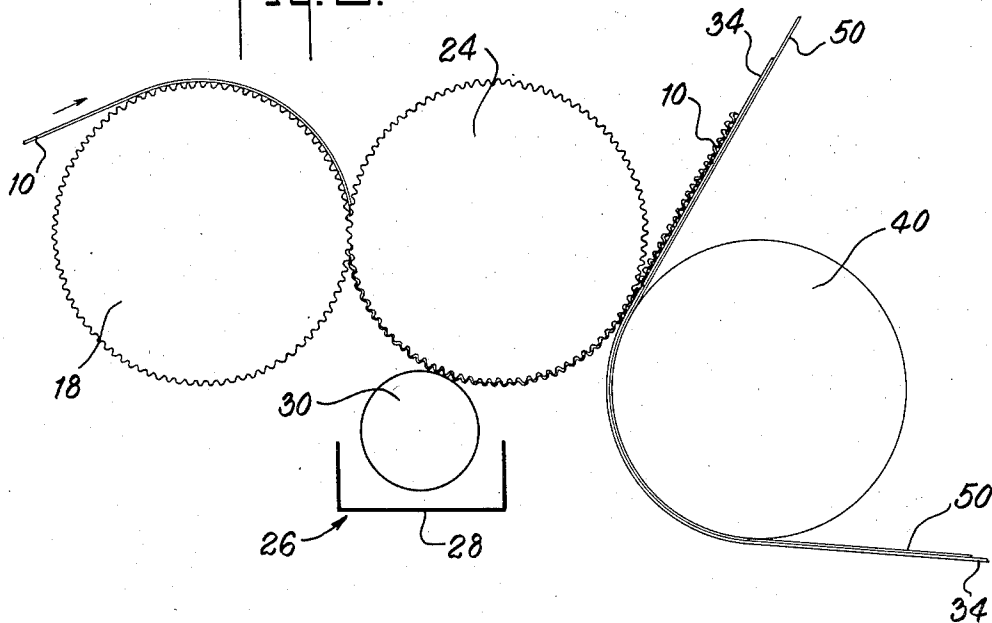


Fig. 3.

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MANUFACTURE OF CORRUGATED BOARD HAVING TEAR STRIPS

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7 Claims. (Cl. 154—31)

This invention relates to the manufacture of corrugated paper board, either the single faced type or the double faced type commonly used in cartons, provided with one or more continuous tear strips, such that when blanks are cut and formed into containers such as cartons or wrappers, the container will have an internal tear strip permitting a narrow zone of the paper board to be conveniently, effectively and continuously torn from the container walls for opening the container.

It is a primary object of the present invention to provide an improved means and method of tear strip application which will enable a dependable tear strip to be provided at comparatively low cost, and of minimum added thickness.

The invention is adapted for incorporation in a single facer or in any other mechanism embodying an equivalent combination of elements; i. e., means for feeding a web toward a point at which an operation is to be performed upon it which requires that it be in a dry, hot condition, and means for heating the web enroute to that point, the heating means being adapted to supply heat at a temperature low enough to avoid damage to the material but high enough to activate the thermoplastic adhesive of a heat sensitive tear strip or reinforcing strip.

To this end it is a feature that a continuous strip of heat-sensitive tape is provided having a body of high tensile strength, such as nylon, and a thermoplastic coating of comparatively low melting point, such as polyethylene. The tape is initially tacked to the outer face of a continuous web of liner board and is continuously drawn forward in the combiner by and with the liner board to the point of union of the liner board with a web of corrugated sheet material. The liner board web is subjected to heating on one or both of its faces while en route to the point of union with the corrugated sheet, being conducted under tension over a heated, convex surface while in a dry condition. The heat activates the heat-sensitive adhesive, and causes the tear strip to become firmly united with the liner board web before the latter meets the web of corrugated sheet material.

The web which is destined to form the corrugated sheet is steamed and corrugated prior to union with the liner board, and has adhesive applied on the ridges or crowns of the corrugations, being then delivered to the point of web union between a corrugating roll and an opposed pressure roller. The liner board is there pressed against the ridges of the corrugated web by the positively acting pressure roller while the ridges have the benefit of positive support from the teeth of the corrugating wheel.

Regardless of the side from which the heat is applied, it is a point that the heater is regulated to maintain a temperature high enough to activate the heat-sensitive coating of the tape but low enough to avoid injury to the tape body. When Mylar or nylon tape, coated with polyethylene, is employed, the temperature is maintained between 300° F. and 350° F. A nice temperature control

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can be maintained by adjusting the pressure at which steam is maintained within the heater.

The result is that a very effective tear strip is provided at no extra expense other than the mere cost of the material of the tear strip and the added mechanism for feeding the tear strip to the board.

The heat-sensitive tape employing nylon and polyethylene may be considerably thinner than the conventional pressure-sensitive tape or gummed tear tape. This is advantageous both from the standpoint of economy, and from the standpoint of stability of stacking of the taped blanks. It is also advantageous because the tape can, without injury to itself or to the corrugated board components, pass the point at which the liner board and the corrugated sheet are positively pressed together on the teeth of the corrugating wheel. If conventional pressure-sensitive tape were applied to the liner board in place of the heat-sensitive tape of this invention, the increased thickness of the tape would cause intense pressure to be applied in the tape zone or zones by the teeth of the corrugating wheel, and this would be apt to cause serious injury to the tape itself, and/or to one or both of the webs intended to be united at that point.

Another advantage of the thin tear tape resides in the fact that when the blanks are fed from a hopper pile by the kicker of a printer slotter the tape offers less cross drag than would be offered by blanks which have the thicker pressure-sensitive or moisture-sensitive tapes applied to them.

Other objects and advantages will hereinafter appear. In the drawing forming part of this specification

Figure 1 is a perspective view showing the mechanism of a single facer whereby the corrugated sheet and the liner board are prepared for union with one another and are united, and whereby a tear strip (or plurality of same) according to the present invention is made a unitary part of the corrugated board through union with the liner board.

Figure 2 is a fragmentary view in sectional elevation showing the corrugating rolls and associated parts; and

Figure 3 is a plan view of the lining side of a finished box blank with one corner broken away.

In the single facer chosen for illustration, an intermediate web of corrugating medium board 10 is drawn from a roll (not shown), being drawn beneath an idler roller 12 and onto a toothed corrugating roll 18. Between the roller 12 and the roll 18 the web is usually exposed to jets of live steam which are projected from a steaming head 14. The steaming prepares the web for shaping by and between the roll 18 and a complementary toothed corrugating roll 24. The roll 18 presses the web against the corrugating roll 24 and into conformity with the meshed teeth of the rolls 18 and 24. The corrugating medium which has been shaped in this manner is carried by the roll 24 past a dauber unit 26 which consists of a pot 28 for adhesive, usually of the sodium silicate or starch variety, and a bath roll and a doctor roll for applying adhesive, herein represented simply by a roller 30. The roller 30 stands just a little clear of the path of the teeth of the corrugating wheel 24, so that it will not apply adhesive to the bare teeth when there is no web present. The web, however, is thrown outward slightly by centrifugal force and gravity, so that it travels with the tips of its ridges contacting the applying roll 30. The roll 24 carries the web to a point of web union.

A web of liner board 34 is drawn under tension from a reel 36, being guided around successive guide rolls 35 and 35a, which may be heated, and over a convex upper face of a steam heater 38 which is maintained at a temperature higher than that required to melt the heat-sensitive adhesive of the tear strip. A temperature of more than 300° F. is desirable when polyethylene is

employed. The heater 38 is desirably stationary, as shown, but may take other forms, such as a rotary type with adjustable wrap around. After passing the heater 38, the web is delivered onto a pressure roll 40 which bears against the corrugating roll 24 through the webs 34 and 10. The roller 40 presses the liner against the ridges of the web 10 which are at this point positively supported by the teeth of the wheel 24. From the point of web union where the roller 40 bears against the wheel 24 the combined webs are carried forward and an outer liner 41 is subsequently adhered to the opposite face of the corrugated web. Since this is a step conventionally performed on the combiner when double faced board is produced, and since it has no direct bearing upon the present invention, it has not been illustrated.

The description up to this point is of mechanism which is conventional in the type of mechanism, known as the "pressure roll single facer."

At a point above the path of the liner board 34 provision is made of stationary bearing brackets 46 in which spools 48 are revolvably mounted. Each spool 48 carries a reel of heat-sensitive tape 50. Each bracket 46 is adapted to be fixed in any selected position longitudinally of a cross-bar 51 and can be adapted for lateral adjustability by a hand knob set screw 52 which passes through the bracket. Any spool 48 may be rendered inactive by the simple expedient of snipping the tape near the spool. Two or more of the spools would be rendered active when a wide web is being acted upon which is intended to be slit into comparatively narrow blanks, so that two or more blanks are derived from the width of the web. In this way each blank which emerges from the machine may be provided with a tear strip, or each blank which is intended to be later subdivided may be provided with a plurality of tear strips.

Each tape 50 desirably includes a thin, narrow body of nylon which has one of its faces coated with a thermoplastic material such as polyethylene. The tape or tapes 50 are guided beneath the guide roller 35a (which, as previously noted, may be a heated roller) into contact with the lining web 34. Initially the leading end of each tape which is to be active is stuck to the outer face of the web 34 by a small piece of pressure-sensitive or gummed tape so that it is drawn forward by and with the web 34. The tapes 50 travel under tension with their adhesive coated faces in contact with the web 34 as the web travels around the roller 35a and across the heater 38 and onto the pressure or combining roller 40. As the tapes travel around the roller 35a and/or over the heater 38, the thermoplastic material is activated by heat transmitted from the roller 35a and/or the heater 38 and causes the tape or tapes to be firmly adhered to the web 34. As the web and tapes pass from the heating means to the point of web union, the sensitized adhesive is cooled somewhat and is caused to become at least partially set. Soon after the liner web meets the wet corrugated web the heat-sensitive adhesive is cooled to a temperature below the boiling point of water.

The pressure exerted by the roller 40 against the wheel 24 is positively applied through the tape or tapes 50, causing them to be pressed positively against the crowns of the teeth of the wheel 24 whenever the teeth come into position positively to support the web 34 and the tape 50. Since the tape zones are zones of greater than normal thickness the tape and/or the corrugated board materials would be likely to be damaged by this pressure if conventional pressure-sensitive tape, or tape of equal thickness were employed. This liability of damage is avoided because of the extreme thinness of the tape 50.

It will be apparent that the heat-sensitive tape 50 is applied by the normal mechanism of a single facer operating in substantially the normal way, the only added mechanism being the reels for carrying the heat-sensitive tape and the means for supporting said reels.

The heating means normally furnishes the necessary

heat to raise the temperature of the polyethylene above the temperature of 300° F. which is required for activation, but not to raise the temperature of the nylon above 350° F., which would be damaging to the nylon. If, in a given instance, the heating means is not normally maintained in the required temperature range, adjustment can be readily effected to bring about controlled operation in that range.

The fact that the tape body is composed of a high tensile strength material such as nylon means that a very thin and narrow tape 50 will suffice. This is advantageous both for the reason that damage at the combining wheel is avoided, as already pointed out, and because an economy of material is realized. Stacking stability of the resulting blanks is also promoted by the thinness of the tape.

In order that access may be had to the tear strip within a carton, provision is made for forming conventional crossed cuts in each tear strip zone at blank length intervals as indicated at 58.

I have described what I believe to be the best embodiment of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A corrugated paper board single facer comprising in combination, means for supplying a web of corrugating medium, means for moistening the web, means for corrugating the web, means for applying moisture sensitive adhesive to the corrugated web, means for supplying and feeding a web of liner board into meeting relation with the web of corrugating medium, heating means disposed to act on the liner board enroute to meeting relation with the corrugating medium to assure more dryness of the liner board so that the liner board will be in a condition to absorb rapidly the moisture sensitive adhesive applied to the corrugating medium, means for paying out to the liner board a continuous strip of heat sensitive tape with the heat sensitive face thereof disposed toward the liner board and for directing said strip onto a predetermined zone of the face of the liner board which is to be faced away from the corrugating medium, for travel with the liner board past the heating means, the heating means being adapted to be maintained at a sufficiently high temperature to activate said heat sensitive tape, so that the heat sensitive tape is caused to be activated and adhered to the hot, dry liner board as an incident of the supplying of heat to the liner board for promoting and accelerating the subsequent union of the liner board with the corrugating medium.

2. In a single facer for making corrugated paper board which includes means for steaming, corrugating and gumming an intermediate web and feeding it to a point of web union, means for feeding a web of liner board to the point of web union, and a heater having a convex surface across which the liner board face destined for contact with the corrugated web is drawn for assuring complete dryness of the liner board, the improvement which consists in providing a means for supporting and paying out to a predetermined zone of the exposed face of the liner board a continuous strip of heat-sensitive material, so that the strip, carried forward by and with the liner board, is heated to sensitization by heat which is furnished for drying the liner board and is firmly pressed into securely adhered relation to the liner board by pressure exerted by the strip against the heater-supported liner board.

3. In the method of manufacturing corrugated paper-board having a heat-sensitive tear strip strongly adhered to an exposed face thereof, the procedure which comprises steaming, corrugating and gumming a first web while feeding it to a point of web union, heating to a temperature substantially above the boiling temperature of water a second web composed of liner board while feeding it toward the point of web union, and causing a heat-

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sensitive tear strip to be drawn forward with the liner web on the face thereof remote from the first web so that the strip will be activated while enroute to the point of web union, and causing the activated tear strip to be firmly pressed against, and securely adhered to, the liner web in advance of the point of web union.

4. The method as set forth in claim 3 in which the heat-sensitive strip consists of a narrow, thin body composed of nylon and a thermoplastic coating of polyethylene.

5. The method as set forth in claim 4 in which the heating of the liner board and of the strip are effected under such temperature control that the thermoplastic coating is effectively activated while leaving the nylon body of the strip unaffected.

6. The method as set forth in claim 3 in which the heat is applied exclusively to the side of the liner board destined for contact with the intermediate web, the heat-sensitive strip being activated by heat which bleeds through the liner board.

7. A corrugated paper board single facer as set forth in claim 1 in which the heating means comprises a steam box

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and means maintaining the steam in the box at sufficient pressure and temperature to assure the evaporation of moisture from the liner board and the activation of the heat sensitive tape coating while leaving the body of the heat sensitive tape unaffected.

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