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APPARATUS FOR DETECTING AND HANDLING DEFECTIVE BOX BLANKS

Filed Sept. 24, 1964

3 Sheets-Sheet 1

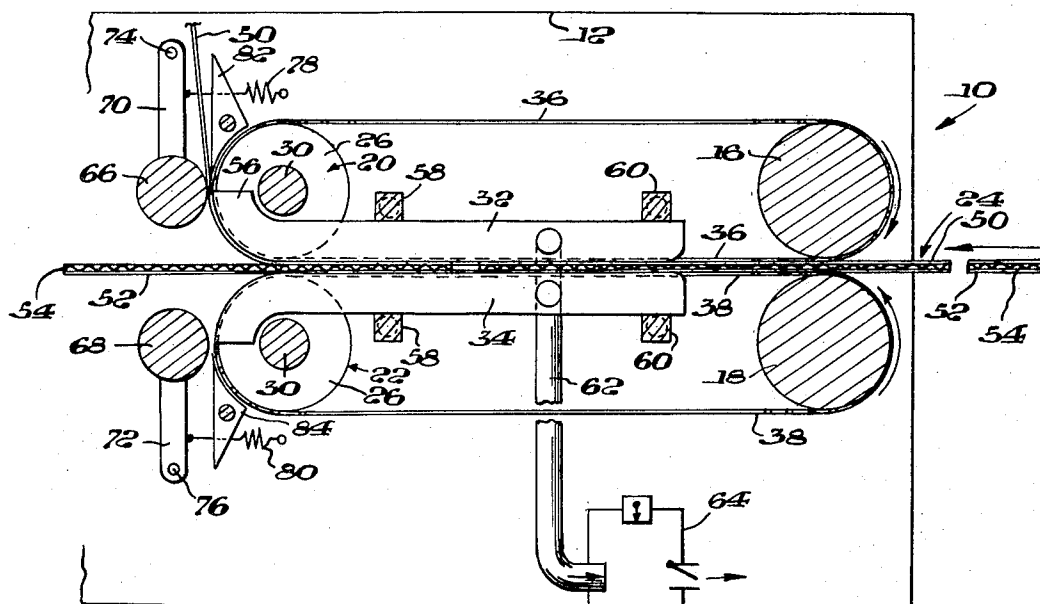


Fig. 1

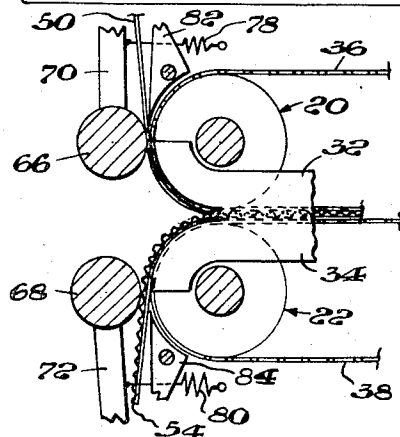


Fig. 3

Fig. 4

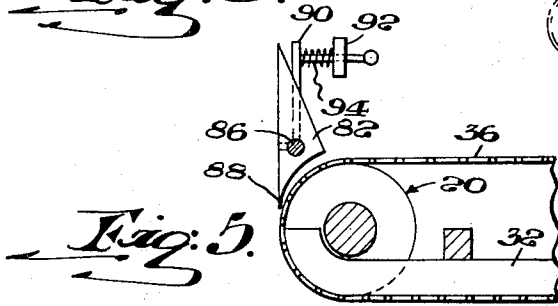
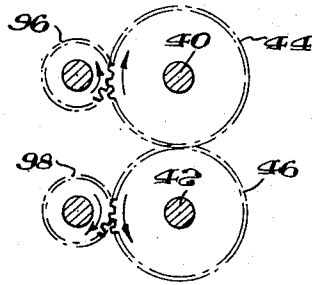


Fig. 5

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3 Sheets-Sheet 2

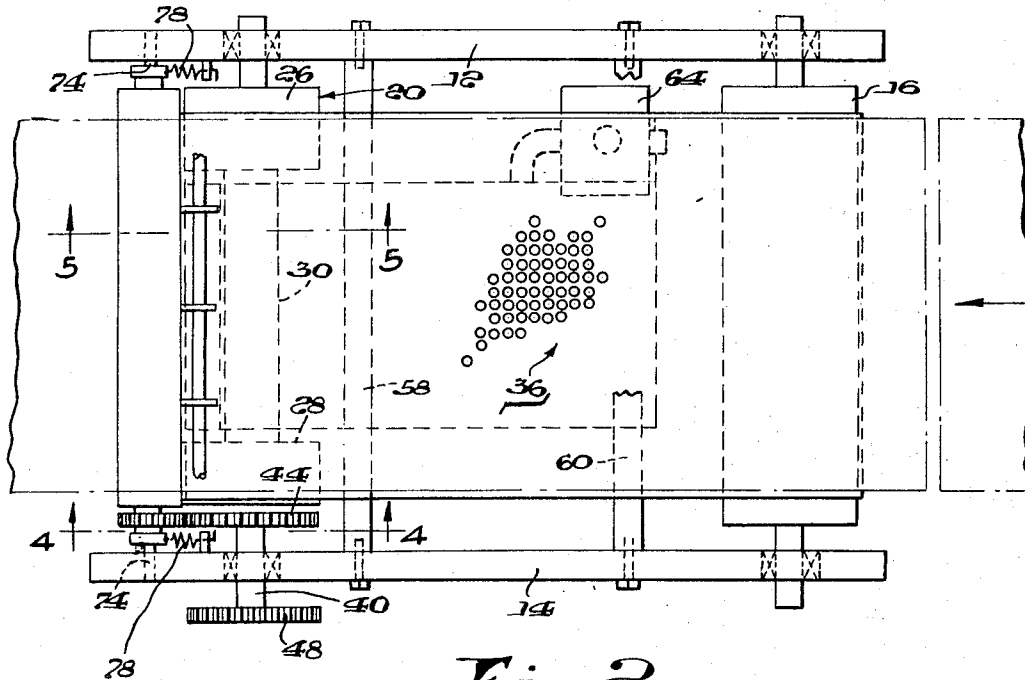


Fig. 2.

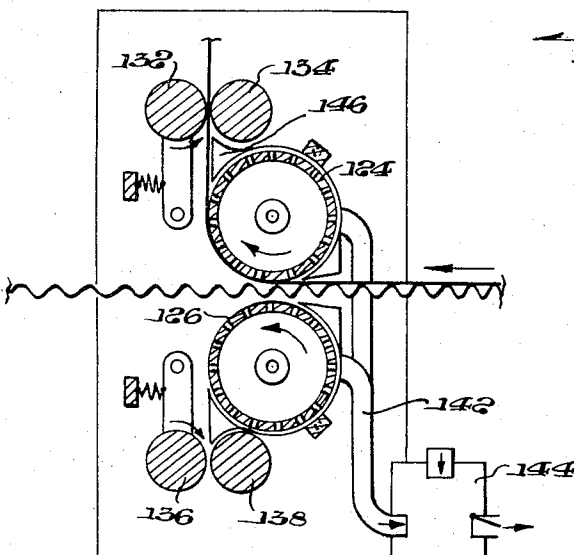
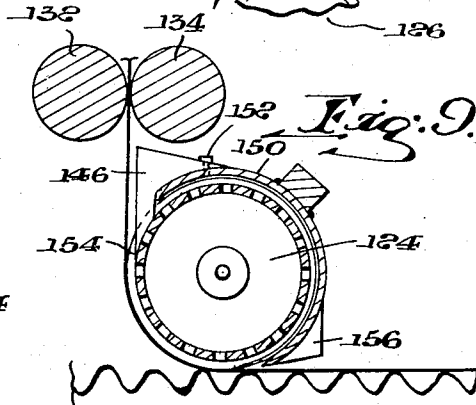
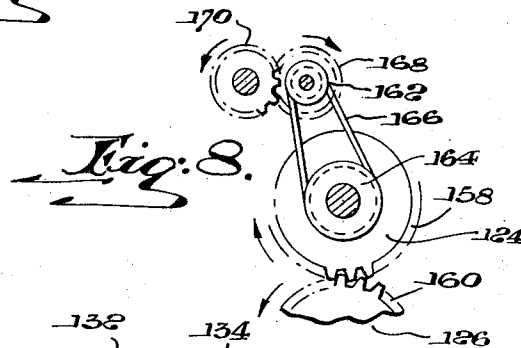


Fig. 6.



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3 Sheets-Sheet 3

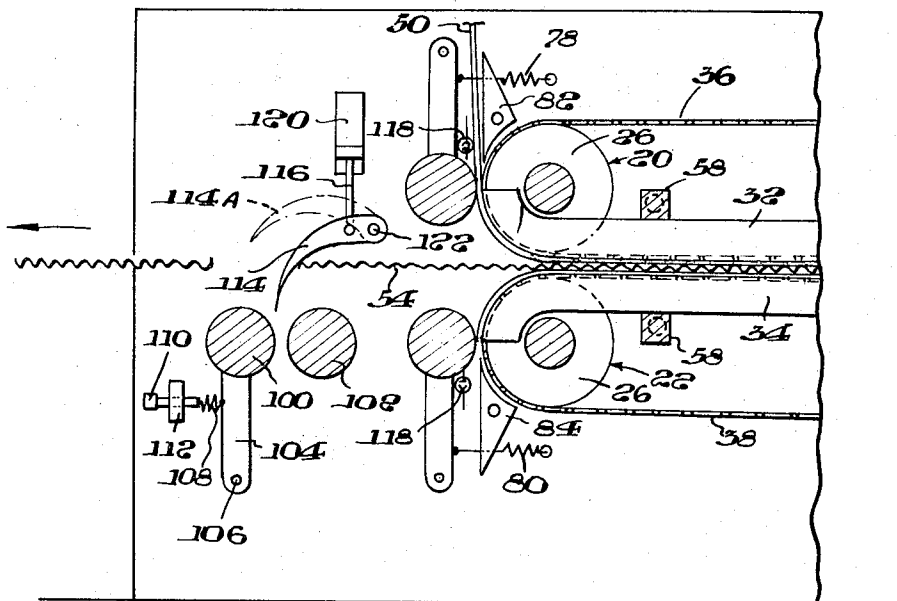
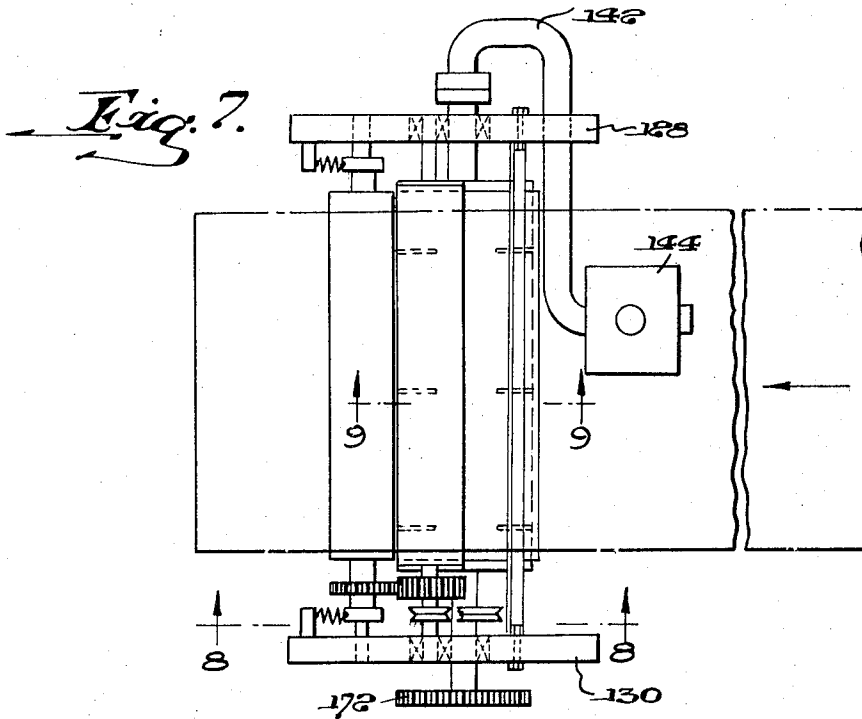


Fig. 10.

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3,352,736

APPARATUS FOR DETECTING AND HANDLING DEFECTIVE BOX BLANKS

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ABSTRACT OF THE DISCLOSURE

The corrugated box blanks produced, for example, by automatic machinery are passed through a pair of roller members having perforated peripheral surfaces to which suction is applied. When an outer liner has not been suitably bonded to the corrugated interliner, the outer liner will, because of this suction, adhere to one of the rollers and be stripped from the corrugated interliner. Then the remaining portion of the blank is flexible enough that it will follow the other roller. Thus, the entire defective box blank is removed from the line of travel of the other box blanks.

This invention relates generally to apparatus for making and handling paperboard blanks, and more particularly to apparatus for detecting a box blank wherein one or more of the liners are not suitably bonded to the corrugated medium, and removing the defective box blank from the processing apparatus.

In the past, defective box blanks were detected by sight alone at the delivery end of the combiner where the liners were bonded to the corrugated medium. If the defective box blanks were not visually detected, or if automatic conveying means were used, the defective box blanks were comingled with the acceptable blanks and were not usually detected until subsequent operations were performed on the blanks. Operating difficulties caused by the separation of the liners from the corrugated medium would then be encountered in subsequent processing equipment and result in a substantial loss in productivity until the defective box blanks could be removed and the remaining blanks properly repositioned for subsequent processing.

It has been proposed to utilize electronic apparatus for detecting defective sheets having a single thickness. Such apparatus is limited, however, to detecting defects such as non-uniform thickness, unsatisfactory printing, and the like. Electronic apparatus is not suitable for detecting an unsatisfactory bond between the paper liner and the corrugated medium.

It is apparent that with automated machinery for processing box blanks, apparatus for detecting and rapidly removing defective box blanks from the production line is highly desirable for increased production in the manufacture of box blanks wherein product quality is an essential element. The invention herein disclosed provides apparatus that positively detects defective box blanks that have either one or both of the liners improperly bonded to the corrugated medium and removes the defective box blanks from the production line.

Briefly, the invention herein disclosed is directed to apparatus for detecting box blanks that includes an endless belt means in juxtaposition with the paper liner portions of the box blanks as they are conveyed along the production line. The endless belts have perforations or apertures therein and apparatus is positioned adjacent portions of said belts to subject the liners, through said belts, to a controlled suction so that paper liners that are not properly bonded to the corrugated medium between the liners adhere to the perforate belt and are stripped from

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the corrugated medium. Other means are provided to remove the corrugated medium with the other liner bonded thereto from the production line.

Another embodiment of this invention provides a pair of roller members having perforate peripheral surfaces. A suction means is provided to evacuate the perforate rollers so that a corrugated paperboard passing therebetween has the exterior liner portions subjected to a controlled suction. Unsuitably bonded liners will, because of this suction, adhere to the perforate rollers and are stripped from the corrugated medium. Means is thereafter provided to remove the corrugated medium with the single liner bonded thereto.

Accordingly, the primary feature of this invention is to provide apparatus for detecting the presence of defective box blanks wherein either one or both of the imperforate liners are unsatisfactorily bonded to the corrugated medium therebetween.

Another feature of this invention is to provide apparatus for removing the defective box blanks from the processing line.

Another feature of this invention is to provide perforate means in juxtaposition with the imperforate liners of the box blanks and subject the imperforate liners to a suction through vacuum means to strip from the corrugated paper imperforate liners that are not satisfactorily bonded to the corrugated medium.

This invention comprises the new and improved construction and combination of parts and their operating relation to each other will be described more fully hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the drawings:

FIGURE 1 is a semi-schematic view in elevation and in section illustrating one form of the invention wherein an improperly bonded liner is removed from the corrugated medium.

FIGURE 2 is a semi-schematic plan view of the apparatus illustrated in FIGURE 1 illustrating the general arrangement of the component parts.

FIGURE 3 is a view in side elevation of a portion of the apparatus illustrated in FIGURE 1 showing the manner in which both the liner and the corrugated medium with the other liner bonded thereto are removed from the processing apparatus.

FIGURE 4 is a view in section taken along the line 4—4 in FIGURE 2 illustrating the gearing for driving the pairs of rollers.

FIGURE 5 is a view in section taken along the line 5—5 in FIGURE 2 illustrating the position of the stripping fingers and the manner in which the stripping fingers are maintained in abutting relation with the endless belt.

FIGURE 6 is a semi-schematic view in side elevation of another embodiment of apparatus for detecting and removing defective box blanks.

FIGURE 7 is a top plan view of the apparatus illustrated in FIGURE 6 showing the general arrangement of the components for detecting and removing the defective box blanks.

FIGURE 8 is a view in section taken along the line 8—8 of FIGURE 7 illustrating the manner in which the rollers are driven.

FIGURE 9 is a view in section taken along the line 9—9 of FIGURE 7 illustrating the position of the stripping fingers relative to one of the rollers.

FIGURE 10 is a view in side elevation illustrating apparatus for removing the corrugated medium with one of the liners secured thereto. The apparatus of FIGURE 10 can be utilized with either of the embodiments illustrated in FIGURES 1 and 6.

Referring to the embodiment illustrated in FIGURES 1—5, there is illustrated apparatus for removing defective

box blanks generally indicated by the numeral 10 that includes side frames 12 and 14 for suitably supporting pairs of rollers designated 16, 18, 20 and 22. The rollers 16, 18, 20 and 22 are suitably journaled in bearings or the like in side frames 12 and 14 in a manner that the peripheral surfaces of the pairs of rollers 16 and 18 are spaced from each other a suitable distance to permit a box blank generally designated by the numeral 24 to pass therebetween. One pair of the rollers 16, 18 or 20, 22 may be adjustably journaled in the side frames 12 and 14 to vary the distance therebetween so that the space for the box blanks can be varied to accommodate varying thicknesses of box blanks.

The rollers 16 and 18 are cylindrical in shape and have substantially the same diameter throughout their length. The rollers 20 and 22, however, each have end sections 26 and 28 of a diameter substantially equal to the diameter of rollers 16 and 18 and an intermediate portion 30 of reduced diameter, as is illustrated in FIGURES 1 and 2, to accommodate chambers 32 and 34, later described. Endless perforate belts 36 and 38 are positioned around the respective rollers 16, 20 and 18, 22 and convey the box blanks 24 through the apparatus 10 in the direction indicated by the arrow in FIGURES 1 and 2. The rollers 20 and 22 have shafts 40 and 42 with gears 44 and 46 secured thereto for rotation therewith. The gears 44 and 46 are in meshing relation with each other so that the rollers 20 and 22 are driven in opposite directions, as is illustrated in FIGURE 4. The shaft 40 extends beyond the frame 14 and has a drive gear 48 secured thereto. Suitable drive means (not shown) is associated with gear 48 and is arranged to drive, through gears 44 and 46, both rollers 20 and 22. With this arrangement the drive means through gear 48 propels the endless belts 36 and 38 in the directions illustrated by the arrows in FIGURE 1, and to convey box blanks 24 therebetween in the direction indicated.

The box blanks 24 are cut to desired lengths and have imperforate paper liners 50 and 52 bonded to a corrugated medium 54. The liners 50 and 52 are bonded to the corrugated medium 54 in an adhesive applicator apparatus and combines as is well known in the art. The bonding of the liners 50 and 52 to the corrugated medium at times is unsatisfactorily accomplished in the adhesive applicator apparatus so that the box blank is defective. A satisfactory bond between the corrugated medium 54 and liners 50 and 52 should be such that the corrugated liners 50 and 52 can be subjected to a pulling force as by a controlled suction on their exterior surface, and yet remain bonded to the corrugated medium. Where the bond is unsatisfactory and the liners 50 and 52 are subjected to the pulling force, away from the corrugated medium, the defective or unsatisfactorily bonded liners will part from the corrugated medium 54 and break the defective bond therebetween. The liners 50 and 52 are relatively imperforate so that one surface of the liner may be subjected to a controlled suction without a substantial amount of air passing through the relatively imperforate liner. Stated otherwise, the liners 50 and 52 are sufficiently imperforate to provide a seal when one of the surfaces is subjected to a vacuum.

A shroud or chamber 32 is positioned above the belt 36 between the enlarged portions 26 and 28 of roller 20. The chamber 32 has an upwardly extending curved end portion 56 that extends around the portion 30 of roller 20. The chamber 32 has walls on all sides and an open bottom portion that is contiguous with the belt 36. Suitable transverse members 58 and 60 are connected to the frames 12 and 14 and support the chamber 32 in the desired position adjacent the belt 36. A similar chamber 34 is positioned adjacent the belt 38 and has a similar curved end portion extending around the intermediate portion of roller 22. Similar transverse supports 58 and 60 are secured to the frames 12 and 14 and maintain the chamber 34 in the desired position. The chambers 32 and 34

are connected to a common conduit 62 which, in turn, is connected to a vacuum pump generally designated by the numeral 64. Any suitable vacuum pump may be utilized to evacuate the chambers 32 and 34 and subject the perforate belt to a controlled suction pressure. For example, a type L "axi-compressor," positive displacement, helical type, axial flow rotary compressor manufactured by the Ingersoll-Rand Corporation and described in their form 11003, is suitable to provide the desired vacuum in the chambers 32 and 34.

Rollers 66 and 68 are pivotally mounted adjacent the rollers 20 and 22 by means of pivot arms 70 and 72 secured to the frames 12 and 14 by pins 74 and 76. The pivotal mounting of rollers 66 and 68 provides a means for permitting paper of various thicknesses to pass between the respective rollers 66, 20 and 68, 22. Springs 78 and 80 are secured to the pivot arms 70 and 72 and the frames 12 and 14, and urge the rollers 66 and 68 against the belts 36 and 38 as the belts orbit around the rollers 20 and 22.

There are also provided stripping fingers 82 and 84 that remove a paperboard liner that adheres to the belt as the belt passes around the respective rollers 20 and 22. The manner in which the stripping fingers are mounted is illustrated in FIGURE 5. The stripping fingers 82 are secured to a horizontal bar 86 so that the tips 88 of stripping fingers 82 are urged against the respective belt, as, in FIGURE 5, belt 36. The bar 86 has an upwardly extending lug 90 secured thereto and the frames 12, 14 have lugs 92 secured thereto, with a resilient adjusting means 94 extending therefrom and into abutting relation with the lugs 90. The adjusting means 94 urges the lug 90 in a counterclockwise direction to thereby urge the finger tips 88 against the belt 36.

The rollers 66 and 68 have gears 96 and 98 secured to their shafts adjacent the frame 14. The gears 96 and 98 mesh with gears 44 and 46 associated with rollers 20 and 22 so that rollers 66 and 68 are driven by the same means that drives rollers 20 and 22.

The apparatus previously described operates as follows to detect and remove defective box blanks. The drive through gear 48 is actuated to rotate rollers 20, 22 and 66, 68. The perforate belts 36 and 38 are driven by rollers 20 and 22 to orbit around the respective pairs of rollers 16, 18 and 20, 22. The vacuum pump 64 is actuated to evacuate chambers 32 and 34 so that air is drawn through perforate belts 36 and 38 into the respective chambers 32 and 34. The box blanks 24 are fed from adjacent processing equipment to the apparatus for detecting defective box blanks, and pass between rollers 16 and 18, as is illustrated in FIGURE 1. The rollers 16 and 18 are so positioned that the belts 36 and 38 frictionally engage the box blank 24 and convey the box blank in the direction indicated. As the box blank passes between the chambers 32 and 34 the relatively imperforate liners 50 and 52 are subjected to a suction by the evacuated chambers 32 and 34. The imperforate liners 50 and 52 have a pulling force exerted thereon by the vacuum in chambers 32 and 34. If the imperforate liners 50 and 52 are suitably bonded to the corrugated medium 54, the box blank is conveyed through the apparatus 10 and fed to other processing machinery. If the imperforate liners 50 or 52 are not suitably bonded to the corrugated medium 54, the suction created on the exterior surface of the imperforate liner will cause the liner to part from the corrugated medium 54 and adhere to the belt, as is illustrated in FIGURE 3. The imperforate liner will follow the belt in its orbiting path around the roller, for example, in FIGURE 3 the imperforate liner 52 follows the belt 36 in its path around the roller 20. The driven auxiliary rollers 66 or 68 contact the imperforate liner 50 as it follows the perforate belt around the respective roller and frictionally assists in conveying the defective box blank away from the processing machinery. The stripping finger 82 separates the liner 50 from the belt 36 and guides the

liner between rollers 20 and 66 and conveys the separated liner 50 into an adjacent space away from the other processing machinery.

The remaining imperforate liner and corrugated medium 54 is usually sufficiently flexible after the other liner 50 has been removed therefrom to adhere to the perforate belt, as, for example, belt 38 in FIGURE 3 in its path around the roller 22, so that the liner 52 and corrugated medium 54 is deflected from its normal path of travel and is disposed of in a similar manner as the separated liner 50.

Although in FIGURE 3 the separation of liner 50 from the corrugated medium is illustrated, it should be understood the apparatus illustrated in FIGURES 1-5 will separate an unsatisfactorily bonded lower liner 52 in the same manner. The apparatus illustrated may also separate both of the imperforate liners 50 and 52 from the corrugated medium 54 and dispose of the imperforate liners 50 and 52 in the manner previously described. The corrugated medium 54 alone may continue in the normal path of travel and be readily observed and removed from the production line. Similarly, if one of the liners remains bonded to the corrugated medium and the corrugated medium with the one liner bonded thereto is not flexible enough to be deflected from the normal path of travel, it may be readily observed and removed from the production line.

If desired, a further feature may be used to dispose of the liners and the corrugated medium 54, or the corrugated medium 54 alone, if it is not deflected from the normal path of travel and disposed in the manner provided. The apparatus for removing the liner and/or corrugated medium is illustrated in FIGURE 10 wherein a pair of rollers 100 and 102 are suitably journaled in the side frames 12 and 14 in parallel spaced relation to each other and at a preselected distance to frictionally engage the defective liner and convey the defective liner away from the normal path of travel. If desired, one of the rollers, such as roller 100, may be pivotally mounted so that a varying thickness of box blanks may be accommodated. As is illustrated in FIGURE 10, the roller 100 is journaled in pivot arms 104 that are pivotally mounted to the side frames 12 and 14 by means of studs 106. The arms are adjustably tensioned to urge the roller 100 toward the roller 102 by means of a compression spring 108 between the arm 104 and an adjustable screw 110 that is suitably supported in the side frames 12 and 14 by studs 112.

A plurality of guides 114 are provided to deflect the liners 52 and corrugated medium 54 from its normal path of travel into frictional engagement with the rollers 100 and 102. The guides 114 are supported by shafts 116 that are suitably journaled in side frames 12 and 14. The guides are normally in the phantom position indicated by the numeral 114A to enable satisfactory or acceptable box blanks to continue their normal path of travel. When the guides 114 are actuated they assume the position illustrated in FIGURE 10 and block the normal path of travel for the box blanks and deflect the defective blank between the rollers 100 and 102 from which the defective blanks are conveyed away from the apparatus 10 and do not interfere with the further processing of the acceptable box blanks.

The guides 114 are moved from the phantomly illustrated position 114A to the position 114 where they deflect the defective box blanks in the following manner. Photoelectric cells 118 or an equivalent thereof are positioned adjacent the stripping fingers 82 and 84 so that they detect a defective liner that is separated from a box blank. The cells 118 actuate a valve (not shown) to fill cylinder 120 with suitable hydraulic fluid to thereby urge shaft 116 downwardly and cause the guides 114 to pivot about connection 122. The actuation of the hydraulic cylinder 120 moves the guides 114 to a position to deflect the defective liner and corrugated medium in the manner previously described. When the defective liner that has

been stripped from the corrugated medium 54 passes the cells 118 the valve mechanism causes the hydraulic cylinder 120 to retract the shafts 116 and return the guides to their normal position out of the path of travel of the box blanks. With this arrangement whether the top liner 50 or the bottom liner 52 is stripped from the corrugated medium 54 the guides 114 are moved to a position that the corrugated medium 54, with or without a liner 50 or 52 bonded thereto, is deflected out of the normal path of travel by the guides 114.

The second embodiment of the invention is illustrated in FIGURES 6-9 and includes a pair of perforate rollers 124 that are suitably journaled in side frames 128 and 130. Another pair of rollers 132 and 134 are journaled in the side frames 128 and 130 adjacent to the roller 124. If desired, either the roller 132 or 134 can be pivotally mounted similar to the roller 100 illustrated in FIGURE 10. A similar pair of rollers 136 and 138 are positioned adjacent roller 126 and may also be pivotally arranged to accommodate different thicknesses of paper. The rollers 124 and 126 are perforate in that they have a plurality of radially extending apertures 140 therethrough which provide for the passage of air from the external portion of the roller to the internal portion. The internal portions of the rollers 124 and 126 are suitably connected to a conduit 142 that is, in turn, connected to a suitable vacuum pump 144. With this arrangement the internal portions of rollers 124 and 126 are evacuated so that air is drawn through the radial apertures 140 in both rollers 124 and 126. An imperforate surface in contact with rollers 124 and 126 will cause a suction on that portion of the roller so that the imperforate member will adhere thereto. A plurality of stripping fingers 146 and 148 are provided for both rollers 124 and 126 to separate the imperforate liner from the rollers and guide the liner between the adjacent pair of rollers as, for example, rollers 132 and 134. As is illustrated in FIGURE 9, the stripping fingers 124 are secured to a shield 150 by means of screw 152. The tips 154 of fingers 146 about the periphery of the roller 124 to separate the liner from the roller. If desired, the rollers 124 and 126 may have portions of reduced diameter in which the tips 154 of fingers 146 and 148 extend. With this arrangement the tips 154 are between the external peripheral surface of the roller and the defective liner.

The shield 150 prevents foreign objects from being sucked into the rollers 124 and 126. Guides 156 are secured to the lower portion of the shields 150 and assist in guiding the box blanks 24 between the rollers 124 and 126.

FIGURES 7 and 8 illustrate the manner in which the rollers 124 and 126 are driven. Gears 158 and 160 are secured to rollers 124 and 126 in meshing relation with each other. The pair of rollers 132 and 134 are driven by a pulley 162 secured to roller 134 and a pulley 164 secured to roller 124. An endless belt 166, properly tensioned, transmits rotation from roller 124 to roller 134 through a pulley and belt arrangement. Roller 134 has an externally toothed gear 168 secured thereto that meshes with another externally toothed gear 170 secured to roller 132. With this arrangement a common drive through gear 172 rotates the rollers 124 and 126 through meshing gears 158 and 160. The rollers 132 and 134 are driven by roller 124 through a belt and pulley arrangement previously discussed. A similar pulley belt and gear arrangement is provided for rollers 136 and 138.

The perforate rollers 124 and 126 remove the defective box blanks from the normal path of travel in a manner similar to the embodiment illustrated in FIGURES 1-5. The evacuation of the internal portions of rollers 124 and 126 is sufficient to provide a suction on the external surface of the liners passing therebetween. If the liner is not suitably bonded to the corrugated medium, the liner is separated from the corrugated medium and adheres to the perforate roller. The liner is separated from the perforate roller by the stripping fingers 146 or 148 and is frictionally

engaged by the rollers 132 and 134 or 136 and 138 depending on the liner removed from the corrugated medium. The corrugated medium with the single liner bonded thereto is usually flexible enough to adhere to the perforate roller and be deflected from the normal path of travel and between the gripping rollers positioned adjacent the perforate rollers. If desired, the apparatus illustrated in FIGURE 10 may be used to deflect the corrugated medium of defective box blanks from the normal path of travel.

Suitable control means may be provided for regulating the pressure of the vacuum pumps 64 and 144 to thereby control the quality of the box blanks. With this arrangement, an acceptable box blank can be categorized as one that has been subjected to a given vacuum pressure or suction without the separation of the liner from the corrugated medium. The adjustable control mechanism can regulate the vacuum pressure that the liners will be separated from the corrugated medium when they fail to meet the categorized standard. The apparatus of the herein described invention may also, therefore, be utilized as a quality control device.

According to the provisions of the patent statutes, the principle, preferred construction, and mode of operation of the invention have been explained, and what is now considered to represent its best embodiments has been illustrated and described. However, it should be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for detecting defective paperboard box blanks having one or more liners unsuitably bonded to the corrugated medium therebetween comprising,
 - a receiver for said box blanks,
 - means within said receiver for applying a controlled pulling force on at least one of said liners in a direction away from said corrugated medium so that liners unsuitably bonded to said corrugated medium are separated therefrom,
 - sensing means to detect the separation of said liner from said corrugated medium, and
 - means to convey said separated liner away from said corrugated medium.
2. Apparatus for detecting defective paperboard box blanks having one or more liners unsuitably bonded to the corrugated medium therebetween comprising,
 - a receiver for said box blanks,
 - means within said receiver for applying a controlled pulling force on at least one of said liners in a direction away from said corrugated medium so that liners unsuitably bonded to said corrugated medium are separated therefrom,
 - sensing means to detect the separation of said liner from said corrugated medium,
 - means to convey said liner away from said corrugated medium, and
 - means responsive to said sensing means operable to change the direction of travel of said corrugated medium in said receiver.
3. Apparatus for detecting defective paperboard box blanks having one or more liners unsuitably bonded to the corrugated medium therebetween and separating said unsuitably bonded liner from said corrugated medium comprising,
 - pairs of rollers arranged in parallel spaced relation to each other,
 - endless perforate belts positioned around said pairs of rollers,
 - drive means for said rollers arranged to orbit said perforate belts around said rollers,
 - said perforate belts having portions spaced from each other a preselected distance to convey paperboard box blanks therebetween,
 - chambers positioned in overlying relation with portions

- of said endless belts adjacent to said paperboard box blanks and having openings adjacent to said belts,
 - means to evacuate said chambers and cause a controlled suction through said belts on the outer surface of said relatively imperforate liners of said paperboard box blanks conveyed therebetween so that liners unsuitably bonded to said corrugated medium are separated therefrom and adhere to said belts adjacent said chambers,
 - said chambers having end portions extending around said rollers and arranged to convey said separated imperforate liners around said rollers, and
 - other means to convey said separated liners in a path away from said corrugated medium.
4. Apparatus for detecting defective paperboard box blanks as set forth in claim 3 which includes sensing means to detect the separation of said liner from said corrugated medium, and
 - means responsive to said sensing means operable to change the direction of travel of said corrugated medium after the separation of a liner therefrom.
 5. Apparatus for detecting defective paperboard box blanks as set forth in claim 3 in which said means to convey said separated liners in a path away from said corrugated medium includes fingers abutting said rollers and arranged to deflect said separated liner away from said roller,
 - other roller means abutting said belts and arranged to frictionally engage and convey said separated liners away from said corrugated medium.
 6. Apparatus for detecting defective paperboard box blanks having one or more liners unsuitably bonded to the corrugated medium therebetween and separating said unsuitably bonded liner from said corrugated medium comprising,
 - a pair of cylindrical rollers rotatably supported in spaced parallel relation to each other,
 - said pair of cylindrical rollers having perforate peripheral surfaces,
 - said rollers spaced to frictionally engage and convey a paperboard box blank therebetween,
 - drive means to rotate said rollers in opposite directions,
 - means to evacuate the inner portions of said rollers and cause a controlled suction through said rollers on the outer surfaces of the relatively imperforate liners of said paperboard box blanks conveyed therebetween so that liners unsuitably bonded to said corrugated medium are separated therefrom and adhere to said roller,
 - means to disengage said separated imperforate liner from said roller, and
 - other means to convey said separated liner in a path away from said corrugated medium.
 7. Apparatus for detecting defective paperboard box blanks as set forth in claim 6 which includes sensing means to detect the separation of said liner from said corrugated medium, and
 - means responsive to said sensing means operable to change the direction of travel of said corrugated medium after the separation of a liner therefrom.
 8. Apparatus for detecting defective paperboard box blanks as set forth in claim 6 in which said other means to disengage said separated imperforate liner from said roller includes fingers abutting said rollers and arranged to deflect said separated liner away from said roller, and
 - pairs of rollers positioned adjacent to each of said first named pair of cylindrical rollers, said last named pairs of rollers constructed and arranged to frictionally engage said imperforate liner separated from said corrugated medium.
 9. Apparatus for removing a defective box blank having one or more liners separated therefrom from a predetermined path of travel comprising,
 - sensing means to detect a box blank having one or more liners separated therefrom,

deflector means pivotally supported above said blank
predetermined path and having a downwardly ex-
tending end portion, and
means responsive to said sensing means operable upon
actuation by said sensing means to pivot said deflec-
tor means downwardly and deflect said corrugated
medium with one or more liners separated therefrom
downwardly away from the predetermined path of
said box blanks.

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