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Smith et al.

[11] **3,877,353**

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[54] **STRIPPING DEVICE**

[75] Inventors: **Walter S. Smith,** Naperville; **Joseph E. Mazur,** Chicago, both of Ill.

[73] Assignee: **Rockwell International Corporation,** Pittsburgh, Pa.

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[51] **Int. Cl.** **B31b 1/74**

[58] **Field of Search** ..... 83/103, 115, 116; 225/97; 93/36 A, 58 P, 58.5, 59 ES

[56] **References Cited**

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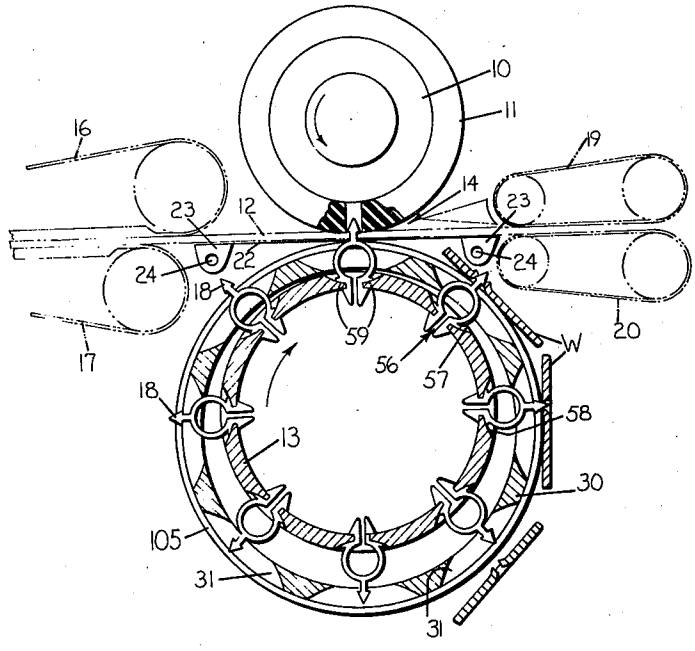
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Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan

[57] **ABSTRACT**

A rotatable pin cylinder and a coacting backing or anvil roller define a nip through which die cut and creased sheet material is fed to have intervening waste pieces removed. A hollow cylinder or combing drum is telescoped over the pin cylinder for rotation about an axis which is eccentric with respect to the pin cylinder axis. The drum and cylinder and driven in unison and as they rotate through a complete cycle, radially projecting stripper pins carried by the pin cylinder are caused to project through apertures in the combing drum to impale and separate waste pieces from the sheet material in the area of the stripping nip. Thereafter the pins are progressively retracted within the periphery of the combing drum to positively eject the waste pieces in an area approximately opposite the stripping nip.

6 Claims, 3 Drawing Figures



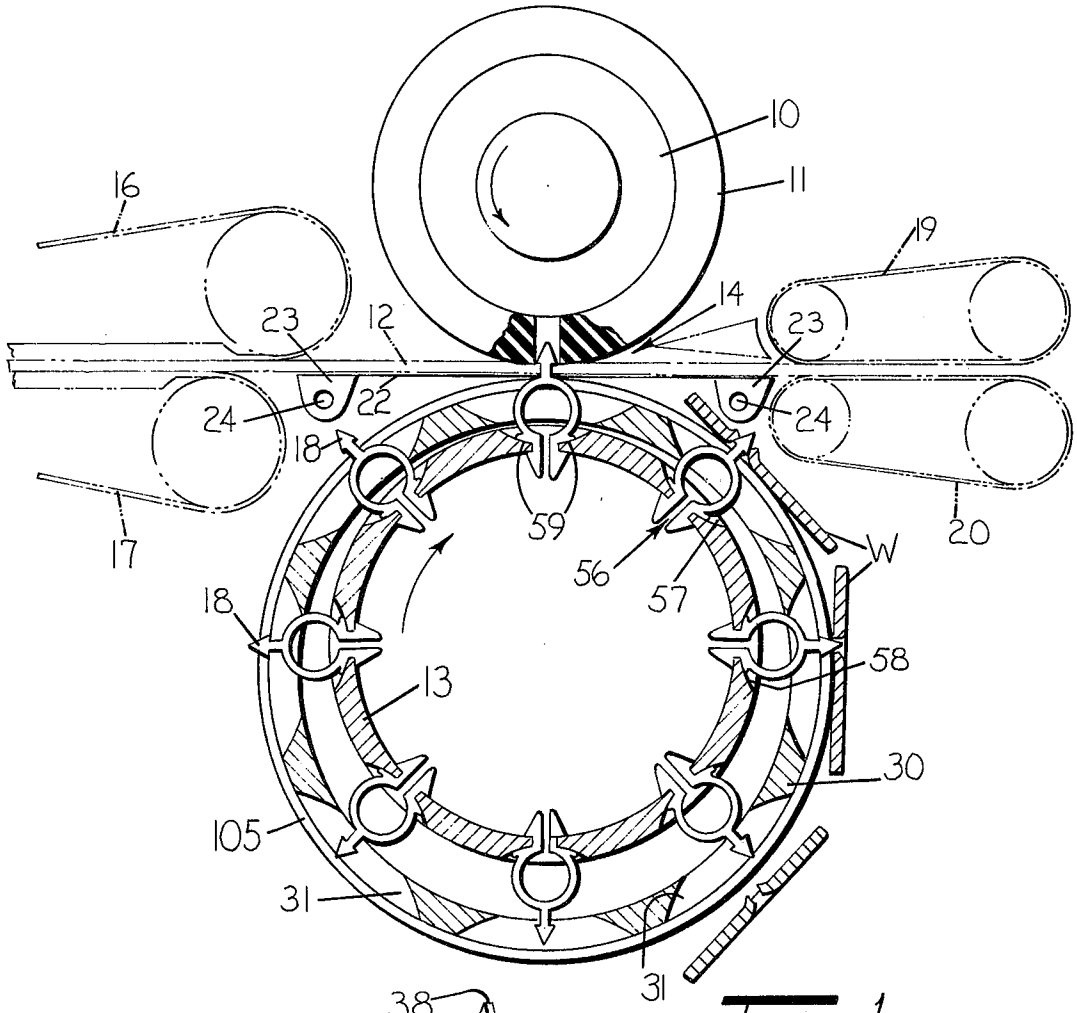

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Fig. 1

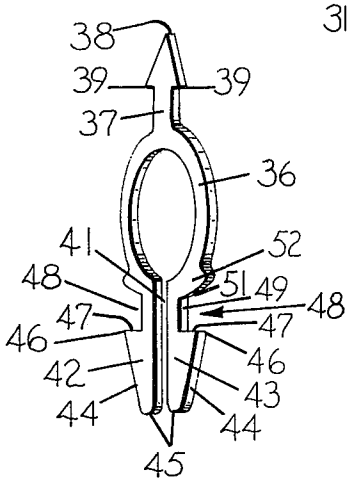

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Fig. 2

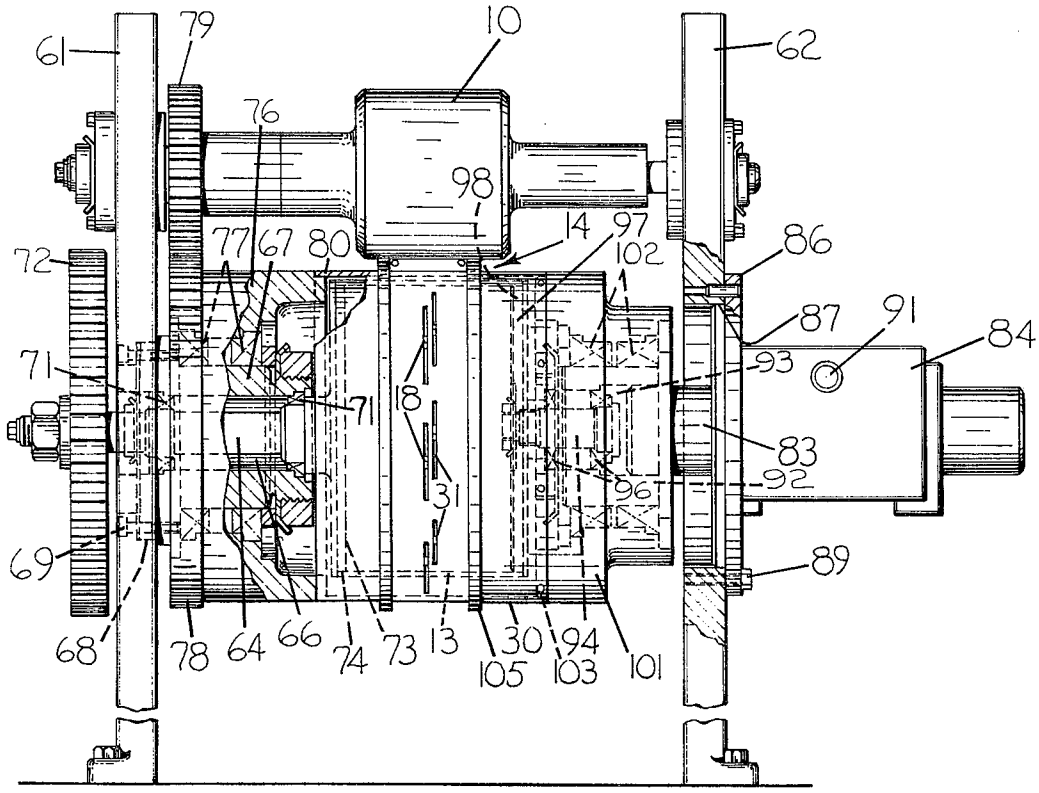

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94
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105
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Fig. 3

STRIPPING DEVICE

SUMMARY

The invention pertains to a stripping device for removing waste pieces from die cut and creased sheets or webs of carton material and which comprises spaced side frames for rotatably supporting an anvil roller and a coacting pin cylinder. The anvil roller and pin cylinder are positioned on opposite sides of the sheet path and define a stripping nip through which the die cut sheets are fed. Endless combining means, preferably in the form of a hollow cylinder or combing drum having a diameter greater than that of the pin cylinder, is telescoped over the pin cylinder for rotation about an axis eccentric with respect to the pin cylinder axis and in a manner that its surface is closely adjacent the periphery of the pin cylinder in the region of the stripping nip and is spaced at a maximum distance from the pin cylinder in the region diametrically opposite the stripping nip. A plurality of stripper pins carried by the pin cylinder are adapted to project radially through apertures in the combining drum to impale and separate waste pieces from the sheets as they travel in unison through the stripping nip whereupon the stripper pins are progressively retracted within the combing drum to positively eject the waste pieces as they travel through the region opposite the stripping nip. The stripper pins are designed so as to be quickly installed on or removed from the pin cylinder and the pin cylinder and combining drum, in turn, are supported for rapid removal and replacement in the stripping unit to facilitate off-press make-ready and thereby minimize down time between jobs.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side elevational view of a stripping device embodying the invention with parts being shown in section for clarity,

FIG. 2 is an enlarged view of a stripper pin, and;

FIG. 3 is a front elevational view, partly in section and illustrating the mounting arrangement for the respective members.

DETAILED DESCRIPTION

With reference now to the drawings and particularly FIG. 1 thereof, a stripping device embodying the present invention is illustrated as comprising a backing or anvil roller **10** having a resilient covering **11** thereon. The roller **10** is mounted for rotation about an axis located above the path of the sheets **12.** A pin cylinder **13,** having coaction with the anvil roller **10,** is mounted for rotation about an axis located below the path of the sheets and said pin cylinder and anvil roller together define a stripping nip **14** through which the die cut and creased paper board sheets **12** or other flat material are adapted to be fed. The sheets may be die cut and/or creased and/or perforated at points along a predetermined line. Reference hereinafter to "pre-creased" sheets is meant to include any of the aforementioned means of cutting or scoring.

Feed means in the form of coacting endless conveyor belts **16** and **17** are adapted to receive the pre-creased sheets as they are delivered from a cutting and creasing press, not shown, and then advance them in regular order to the stripping nip **14.** As they pass through the stripping nip **14,** the anvil roller **10** provides a backing for the sheets so that a multiplicity of stripper pins **18**

carried by the pin cylinder **13** can impale the waste pieces W thereon and separate them from the portions of said sheets constituting the carton blanks. Upon leaving the stripping nip, the carton blanks are directed between coacting endless delivery conveyor belts **19** and **20** for delivery to a suitable stacking mechanism, not shown.

The number of stripper pins **18** carried by the pin cylinder **13** is dictated by the number of waste pieces to be removed from the sheets and it will be understood that the pins are located in selected positions both circumferentially and axially of the pin cylinder so that at least one such pin is adapted to coincide with and impale each waste piece W as the pins and sheets move in unison through the stripping nip **14.**

To facilitate the separation of the waste pieces W from the sheets, the latter are supported as they pass through the nip **14,** by a series of spaced riders or wires **22.** These wires extend through the nip **14** and are fastened at each end thereof to brackets **23** which are, in turn, mounted on transverse rods **24** extending between the side frames of the stripping unit. The brackets **23** are adjustable axially of the rods **24** so that the wires **22** can be positioned at spaced intervals to support the carton blank portions of the sheets and thereby provide space for the waste pieces to pass therebetween.

The structure thus far described is relatively conventional. Stripping units having comparable coacting elements are old and well known. Such devices have proved effective for separating the waste pieces from the sheets of carton blanks but, after bieng separated from the sheets, the waste pieces tend to cling tenaciously on the stripper pins and the provision of reliable means capable of consistently and positively removing the waste pieces from the pins after they leave the stripping nip has heretofore presented a critical problem.

As will now be described, the present invention is directed to relatively simple, but highly effective means for ejecting the waste pieces from the stripper pins which is positive in its function and yet does not involve an excessive number of moving parts which would be subject to wear and possible jamming.

The apparatus essentially consists of an endless pin combing means, preferably in the form of a hollow cylinder or drum **30** which may be fabricated from relatively thin walled metal tubing having a diameter greater than that of the pin cylinder **13.** The combing drum is axially coextensive with the pin cylinder **13** and is mounted for independent rotation about an axis which is eccentric with respect to the axis of the pin cylinder. As will be evident from FIG. **1,** the axis of the combing drum is coincident with a plane extending through the axes of the anvil roller **10** and pin cylinder **13** but is spaced farther from the anvil roller axis than is the pin cylinder. The degree of eccentricity of the pin cylinder and combing drum is such that, in the zone of area of the stripping nip **14,** the wall or peripheral surface of the combing drum will travel in a path that is intermediate the surface of the pin cylinder **13** and the projecting tips of the stripper pins **18** whereas in the zone or area opposite the stripping nip the peripheral surface of the combing drum will be spaced radially behond the tips of the stripper pins.

It will thus be evident that as the pin cylinder and combing drum rotate about their respective axes at the same angular velocity, the tips of the stripper pins **18**

will project through and beyond the peripheral surface of the combing drum **30** to thereby impale and separate the waste pieces W from the sheets as they travel in unison through the stripping nip. Upon leaving the stripping nip, however, the stripper fingers will be progressively withdrawn within the peripheral surface of the combing drum which surface will thus function to positively eject the waste pieces from the stripper pins in a continuous manner as they travel through a zone or area opposite the stripping nip.

To accommodate the stripper pins **18**, the combing drum **30** is provided with apertures or slots **31** in its peripheral surface which are located so as to coincide with the stripper pins and which are of sufficient length circumferentially to accommodate the small angular changes of the stripper pins relative to the combing drum, due to the eccentricity of said drum and pin cylinder, and to provide adequate clearance for the installation and removal of the pins from the pin cylinder. The width of the slots, however, is maintained at a minimum such that the stripper pins **18** can pass freely therethrough with minimum clearance and whereby the peripheral surface of the combing drum will provide a maximum shearing effect upon the waste pieces and positively remove them from the pins.

The stripper pins **18** are designed so as to be securely interlocked in their operative positions on the pin cylinder **13**, but in a manner whereby they can be quickly removed and replaced if they become worn or damaged. As illustrated in FIG. **2**, the stripper pins are preferably fabricated from sheet metal of the required thickness and they comprise an annular body portion **36** having a radially projecting finger **37** formed integral therewith which is provided at its extremity with a sharpened tip **38** to impale the waste pieces, and barbs **39** for interlocking with and positively removing the waste pieces from the sheets.

On the side thereof opposite the finger **37**, the body portion is slotted as at **41** and is provided with spaced, radially projecting legs **42** and **43** resembling a split arrowhead. Both of said legs have an upwardly diverging edge **44** which extends from the tip **45** thereof to a point **46** where said edge intersects the wall **47** of a groove **48** formed in each leg **42** and **43** and which is further defined by the base **49** and the opposite wall **51** that is provided by an enlarged part **52** of the body portion **36.**

The stripper pins **18** are adapted to be mounted in interlocking seats provided therefor on the pin cylinder **13** and which comrpise a circular aperture or radially disposed hole **56** which extends completely through the wall of the pin cylinder. A slot **57** having an arcuate base **58** is formed in the surface of the pin cylinder, said slot being centered with respect to the axis of the hole **56** and being of a depth such that oppositely disposed shoulders **59** are formed at the base of the slot and which have a cross sectional width substantially equal to the width of the groove **48** in the legs of the stripper pins **18.** Accordingly, when a stripper pin is mounted on the pin cylinder, as illustrated in FIG. **1**, the shoulders **59** will interlock with the grooves **48** in the stripper pin legs and the side walls **47** and **51** coact with said shoulders to prevent any relative radial movement of the stripper pins. In this respect, it will be noted that the wall **51** of the groove **48** is curved on a radius corresponding to the radius of curvature of the base **58** of the slot **57** to provide maximum contact area between the respective surfaces. This serves to stabilize the pin against relative movement circumferentially of the drum and the side walls of the slot **57** preclude any pivoting or twisting of the pins in the aperture **56.**

To mount a stripper pin **18** in position on the pin cylinder it is merely necessary to insert the tips **45** of the legs **42–43** through the appropriate slot **31** in the combing drum **30** and into the hole **56** of the pin cylinder. By exerting pressure on the pin in a radial direction the diverging walls **44** coact to press the legs **42–43** together until the points **46** slip through the hole **56** whereupon the tension in the legs causes them to spring apart thereby positively interlocking the grooves **48** onto the shoulders **59.** To remove the pins, a special plier type tool is used to compress the body portion **36** of the pin until the legs **42–43** contact each other. In this position the points **46** will clear the sides of the hole **56** and the stripper pin can readily be removed.

As was previously mentioned, the pin cylinder **13** and combing drum **30** are removably mounted in the stripping unit so that they can be drilled, slotted, assembled and made ready off press to thereby minimize down time between jobs. The mounting arrangement for these members will now be described with reference to FIG. **3**, wherein the stripping unit is shown as comprising spaced side frames **61** and **62** for supporting the anvil roller **10**, the pin cylinder **13** and the combing drum **30** for cooperative action.

The journalling means for the anvil roller **10** have not been illustrated in detail in the drawing since they are not critical to the invention. It will be understood, however, that the respective ends of said roller are suitably journalled for rotation in the side frames by means of anti-friction bearings.

At the drive end therof, to the left as viewed in FIG. **3**, the pin cylinder **13** is arranged to be supported for rotation in the side frame **61** by a shaft **64** which extends axially through a bore **66** that is provided therefor in an axially projecting sleeve **67.** The sleeve is mounted in an opening **68** in the side frame **61** and is secured in fixed position therein by means such as bolts **69.** Anti-friction bearings **71** mounted within the bore **66** journal the shaft **64** for rotation therein and at the end thereof which projects outwardly beyond the sleeve **67**, said shaft is provided with a gear **72** by means of which the shaft **64** and therewith the pin cylinder **13** are driven.

At its opposite or inner end the shaft **64** is provided with a disc **73** which is fixed to said shaft for rotation therewith and which is adapted to support the adjacent end of the pin cylinder **13.** A reduced diameter shoulder **74** is provided about the periphery of the disc **73** on the side thereof facing the pin cylinder, and this shoulder has a radius such that it will fit snuggly into and thus support the adjacent end of the pin cylinder when the latter is inserted in its operative position.

In order to transmit the drive torque from the shaft **64** to the pin cylinder **13** without slippage, the edge of said cylinder is provided with one or more axially disposed slots, not shown, which are adapted to fit over a corresponding number of pins, also not shown, which project radially from the shoulder **74** when the pin cylinder is installed. The interlocking pins and slots assure a positive drive connection between the shaft **64** and the pin cylinder **13** during operation of the stripper unit and still permit quick removal and replacement of the cylinders for job changes.

The corresponding end of the combing drum **30** is supported for rotation independently of, but in unison with the pin cylinder **13**, by means of a housing **76**. This housing is mounted on bearings **77** for rotation about the axis of the sleeve **67** and it is provided with a gear **78** at one end thereof by means of which the housing and therewith the combing drum are driven. The gear **78** also meshes with a gear **79** on the shaft of the anvil roller **10** and thus drives said roller in unison with the combing drum.

As in the case of the pin cylinder, the housing **76** is provided with a reduced diameter shoulder **80** which is adapted to telescope into and thereby support the adjacent end of the combing drum **30** and similar slots and pins, not shown, are provided in the drum and shoulder, respectively, to positively transmit the drive torque from the housing to the drum.

It will be noted that the bore **66** in the sleeve **67** has its axis located eccentric with respect to the axis of said sleeve. The location of the respective axes is such that the surface of the pin cylinder is closely adjacent the combing drum **30** in the zone of the stripping nip **14** and is spaced substantially farther away from said drum in the region opposite said nip.

At the opposite ends thereof, to the right in FIG. **3**, the pin cylinder and combing drum are similarly supported by an assembly which, however, is axially retractable as a unit to thereby facilitate installation and removal of said members. This assembly essentially comprises a main supporting shaft or arbor **83** which extends through a housing **84** that is mounted on the side frame **62**. A flange **86**, formed integral with the housing, has a reduced diameter shoulder **87** which fits into an opening in the side frame **62** and it is secured in fixed position on the side frame by means such as bolts **89**.

The arbor **83** is non-rotatably mounted in the housing **84** by means such as a key and coating keyway, not shown, but it is adapted to be slidable axially therein between supporting and retracted positions relative to the pin cylinder and combing drum. The means for effecting axial movement of the arbor have not been shown but they consist essentially of an elongated rack attached to the arbor and which meshes with a pinion located within the housing **84** and which is adapted to be actuated by a control shaft indicated at **91**.

At the end thereof projecting inside the side frame **62**, the arbor **83** is provided with an axially projecting sleeve **92** having an eccentric bore **93** formed therein. One end of said sleeve is telescoped over and fixedly secured to the projecting end of the arbor whereas at its opposite end the sleeve provides support for a stub shaft **94** which is journalled for rotation within the bore **93** by bearings **96**. A disc **97**, which is essentially the same as the disc **73**, is fixed to the projecting end of the stub shaft **94** and it has a reduced diameter shoulder **98** formed thereon to fit into and thus support the end of the pin cylinder **13**.

The adjacent end of the combing drum, in turn, is supported by a housing **101** which is mounted on bearings **102** for free rotation about the axis of the sleeve **92**. The housing has a reduced diameter shoulder **103** adapted to fit into and thus support the end of the drum.

Although the housing **101** and stub shaft **94** are freely rotatable relative to the supporting sleeve **92**, they are secured against relative movement axially thereon. Consequently,, when the arbor **83** is moved axially in the housing **84** from the operative position illustrated in FIG. **3** to a retracted position, to the right as viewed in said Figure, the housing **101** and disc **97** will move therewith to release the ends of the pin cylinder and combing drum. Said cylinder and drum can then be slipped off the disc **73** and housing **76**, respectively, for removal from the stripping unit and be replaced by a different cylinder and drum which have previously been prepared for the next job to be stripped.

To control and drive the pre-creased sheets as they pass through the stripping nip **14** a plurality of endless, resilient bands or tires **105** preferably are mounted at spaced intervals about the periphery of the combing drum **30**. These tires function to press the sheets against the anvil roller **10** and prevent them from being skewed or otherwise displaced by the impaling action of the stripper pins as they pass through the stripping nip. The tires obviously are located so as to contact the carton blanks in the sheets and thus not interfere with the impaling and removal of the waste pieces therefrom.

Although the means for driving the pin cylinder and combing drum have not been illustrated, it will be understood that the respective gears **72** and **78** are driven by separate drive gears mounted on a common drive shaft to drive the cylinder and drum at precisely the same angular velocity. Moreover, although the anvil roller, pin cylinder and combing drum illustrated in FIG. **3** are relatively short, it will be appreciated that these members may be of any practical length depending upon the width of the material to be processed and that the stripper pins **18** and clearance slots **31** can be located in any position about the peripheries of the pin cylinder and combing drum respectively to engage and remove waste pieces at any positions in the sheets.

From the foregoing description it will be apparent that a novel apparatus has been provided for stripping waste pieces from pre-creased sheets of carton blanks which includes simple, economical and highly efficient means for positively ejecting the waste pieces from the stripper pins after they have been separated from the sheets. No auxiliary elements or relatively moving parts that are subject to wear and/or jamming are involved and thus the apparatus is capable of continuous operation for extended periods.

We claim:

1. Stripping apparatus for separating waste pieces from pre-creased material comprising, a rotatable cylinder, stripper means mounted on said cylinder and having tips projecting radially beyond the surface of said cylinder, roller means mounted adjacent said cylinder and defining therewith a stripping nip, said roller means being adapted to coact with said stripper means to impale the waste pieces on the tips thereof as the sheet material moves through said stripping nip, a hollow drum telescoped over said cylinder, said hollow drum being coextensive axially with said cylinder and having apertures in the surface thereof in selected positions coinciding with the location of the stripper means on said cylinder, and means mounting said drum for independent rotation in unison with said cylinder about a fixed axis eccentric with respect to the cylinder axis whereby said drum surface is located intermediate the cylinder surface and the tips of said stripper means in the area of the stripping nip and is spaced radially out-

wardly beyond the tips of said stripper means in an area spaced from said stripping nip.

2. Stripping apparatus as set forth in claim **1** wherein said stripper means includes a plurality of individual releasable stripper pins having respective barbed waste-engaging tips for impaling the waste pieces.

3. Stripping apparatus as set forth in claim **1** further including drive means for independently rotating said cylinder and drum in unison about their respective axes and at the same angular velocity.

4. Stripping apparatus as set forth in claim **1,** wherein said hollow drum is releasably supported on a disc at each end thereof, and said mounting means support said discs for rotation about an axis eccentric with respect to the axis of said cylinder.

5. Stripping apparatus as set forth in claim **4,** wherein at least one of said discs is supported whereby it is axially retractable to facilitate installation and removal of said hollow drum.

6. Stripping apparatus as set forth in claim **2,** wherein each of said stripper pins comprises an annular body portion having spaced apart radially projecting legs thereon, a groove formed in each said leg, and said cylinder having shoulder means for coaction with said grooves to releasably retain the stripper pins on said cylinder.

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