Aug. 18, 1959 F. G. AUER 2,899,871

STRIPPER MECHANISM

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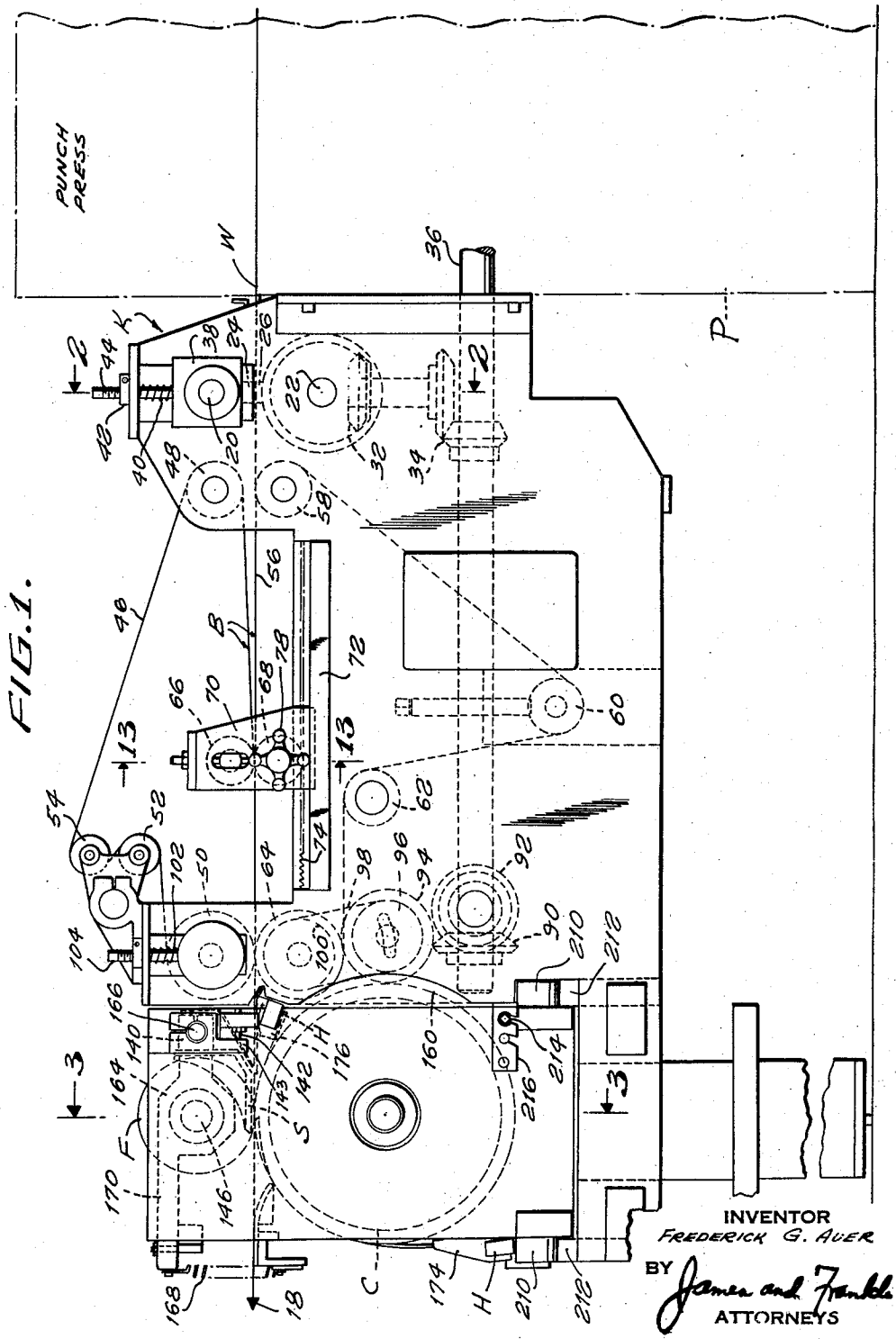

FIG. 1.

INVENTOR
FREDERICK G. AUER
BY James and Franklin
ATTORNEYS

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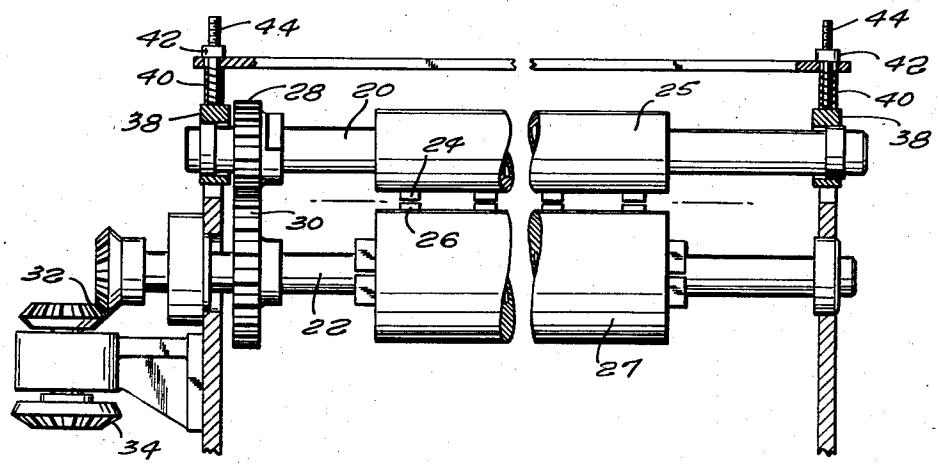
FIG. 2.



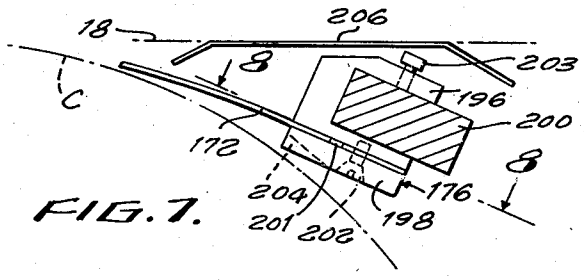
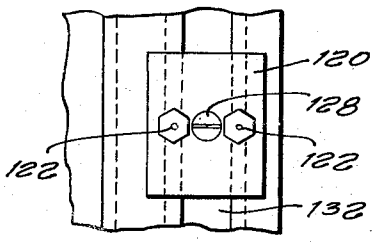


FIG. 7.

FIG. 5.



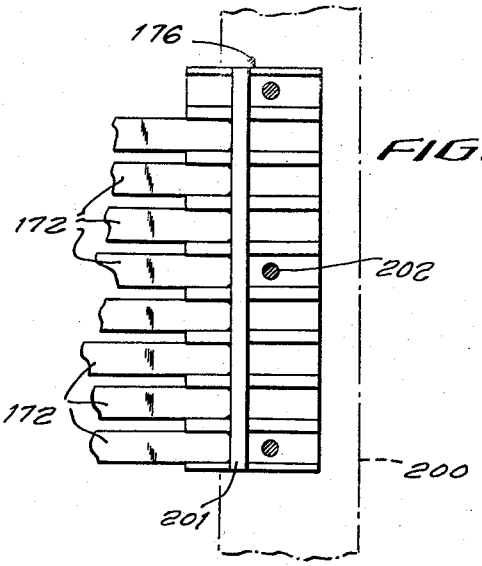


FIG. 8.

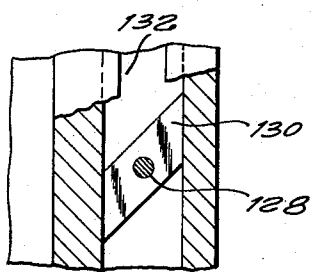


FIG. 6.

INVENTOR
FREDERICK G. AUER
BY James and Franklin
ATTORNEYS

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STRIPPER MECHANISM

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FIG. 14.

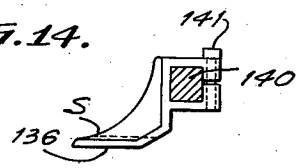
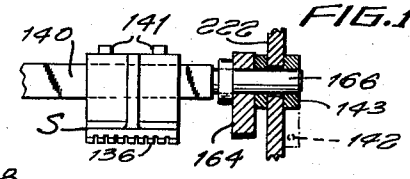


FIG. 15.



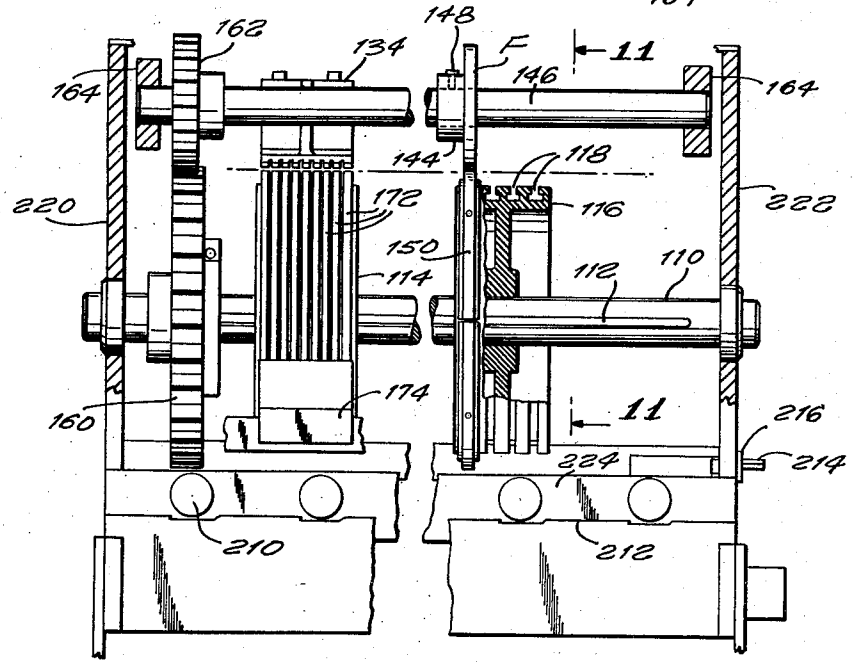


FIG. 3.

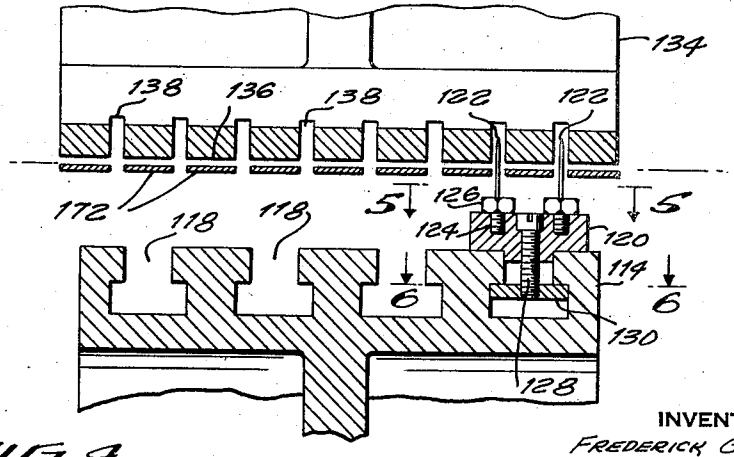


FIG. 4.

INVENTOR
FREDERICK G. AUER
BY James and Franklin
ATTORNEYS

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STRIPPER MECHANISM

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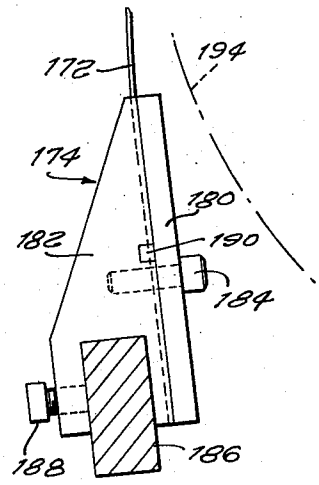

FIG. 9.

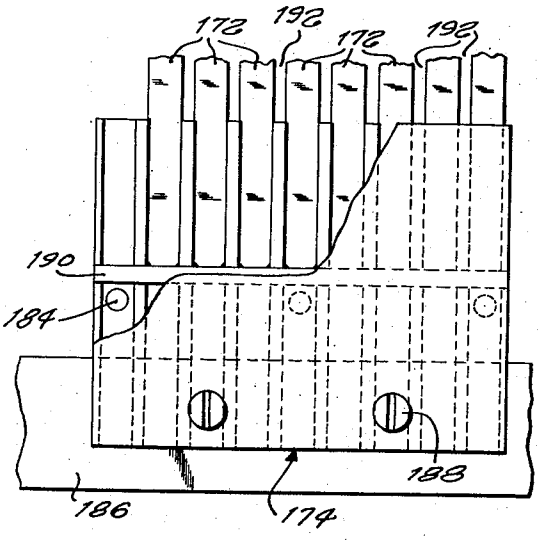

FIG. 10.

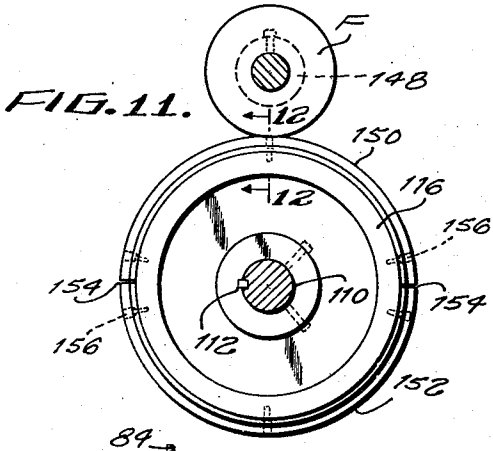

FIG. 11.

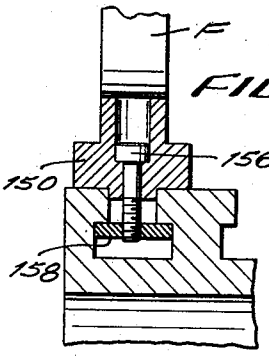

FIG. 12.

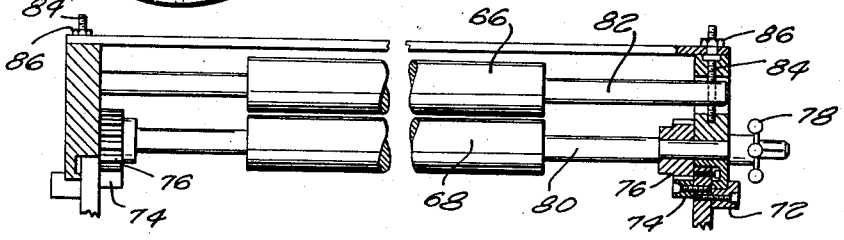

FIG. 13.

INVENTOR
FREDERICK G. AUER
BY James and Franklin
ATTORNEYS

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STRIPPER MECHANISM

Frederick G. Auer, Teaneck, N.J., assignor to Champlain Company, Inc., Bloomfield, N.J., a corporation of New York

Application August 28, 1953, Serial No. 377,020

8 Claims. (Cl. 93—36)

This invention relates to apparatus for die cutting paperboard blanks, for example, for milk cartons and the like, and more particularly to apparatus for stripping the pieces of scrap or waste from the blank after the cutting operation.

In the manufacture of milk cartons, boxes or the like the usual practice is to feed a continuous web through one or more printing presses, and then to a press for die cutting or punching the web to outline the box or carton blank. However, the press does not actually remove the piece of scrap or waste. To do this the web, or sheets cut from the web, may be fed to a stripper mechanism which is designed to remove the scrap from the blank. The primary object of the present invention is to generally improve stripper mechanism of the specified character.

One important object of the invention is to provide a stripper mechanism which is almost universal in character, that is, which may be adjusted readily to fit any one of a number of different blanks in which the scrap may be differently located. For this purpose I provide a cylinder large enough to take care of the widest and longest sheet contemplated to be used, as limited by the printing apparatus and the punch press preceding the stripper. Stripper pins may be located as desired in circumferential direction, and may be located axially in small increments.

In accordance with a further feature and object of the invention, a large number of short cylinders is provided, all carried on a single shaft. The cylinders are so constructed that they may be fitted end-to-end to provide a single long drum or cylinder, and yet the use of separate cylinders affords greater flexibility in the location of the stripper pins because if a spacing is required which differs from the normal uniform amount, the modified spacing may be provided by shifting one cylinder relative to another along the shaft which carries the cylinders.

When the carton blank first reaches the stripper the pins must penetrate the scrap, and the scrap should be supported against upward movement when the pins press from beneath. The present apparatus supports the blank well back of the center line as the pins first approach the blank, and to accomplish this I provide so-called "shoes" which are grooved to pass the pins. On rare occasions special narrow shoes may be used, but for most purposes standard shoes are used, and these shoes correspond to the cylinders, and preferably are mounted for axial movement so that they may be aligned with the cylinders.

The carton is fed through the stripper by means of narrow feed wheels located at places on the blank where no stripper pins are needed. For this purpose a feed wheel shaft is mounted above the cylinder and carries the narrow feed wheels, which may be shifted axially along the shaft. Beneath the web line I may provide mating narrow feed wheels located between cylinders. However, in accordance with a further feature and object of the present invention, I provide narrow rings so dimensioned that they may be secured outside a cylinder, thereby providing a feed wheel at any desired point along the feed drum.

The pieces of scrap impaled on the pins must be stripped therefrom. For this purpose a comb-like element may be provided which comes between the scrap and the cylinder, and the slots of which receive the pins, thus stripping the scrap from the pins. Another object of the present invention is to improve the mechanism for stripping the scrap from the pins, and for this purpose I have found that relatively inexpensive steel strip of uniform section may be bent to arcuate configuration and held at its ends to provide the desired stripping action. More specifically, I provide holders at the rear and front of the drum, with the steel strips bent around the cylinder between said holders. The bottom holder is spaced from the cylinder so that the radius of the strips increases to an amount greater than the length of the pins, thus stripping the scrap from the pins. The holders preferably correspond to the cylinders and have an appropriate number of spring bands for each cylinder. The holders are preferably carried on cross-bars and are adjustable to one side or the other so that they can be mated with the cylinders when the latter are adjusted to one side or the other on the cylinder shaft.

When the web passes through the press it may be cut into sheets each made up of a suitable number of cartons, depending on the size of the individual carton. These sheets must be fed ahead to the stripper mechanism in proper time relation, and another object of the invention is to provide a suitable "kicker" device to kick the sheets ahead somewhat faster than the normal web speed, thereby insuring proper timing, and separation of the individual sheets from one another. Inasmuch as this kicking action is to be applied only once for each sheet, and inasmuch as the stripper may have to handle large sheets, say up to 36" wide and 34" long in the illustrated machine, the kicker cylinders might have to be quite large in diameter.

An object of the present invention is to make it possible to use small diameter kicker cylinders, and this is done by giving them different diameters and rotating them at commensurately related different rotative speeds for equal linear speed. The difference in rotative speeds is made such that the projecting parts of the kicker which engage the sheet miss one another during certain revolutions, and come into contact only once in several revolutions. In this way kicker elements of small radius may be made to function as though of very large radius.

Still another object is to provide suitable means to feed the detached sheets from the kicker to the stripper, and to make the said means adjustable over a wide range to accommodate sheets of greatly different dimension. A further object is to provide easy access to the cylinder for placement of the pins.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the stripper elements, and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings, in which:

Fig. 1 is a side elevation of stripper apparatus embodying features of my invention;

Fig. 2 is a section through the kicker taken approximately in the plane of the line 2—2 of Fig. 1;

Fig. 3 is a partial section through the stripper cylinder taken approximately in the plane of the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section drawn to enlarged scale and also taken approximately in the plane of the line 3—3 of Fig. 1;

Fig. 5 is a fragmentary plan view taken approximately in the plane of the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary section taken approximately in the plane of the line 6—6 of Fig. 4;

Fig. 7 is a fragmentary section through the support bar for the upper bandholders;

Fig. 8 is a view of the lower part of a bandholder, taken approximately in the plane of the line 8—8 of Fig. 7;

Fig. 9 is a transverse section through the support bar for the lower bandholders;

Fig. 10 is a front elevation of one of the lower bandholders with a part of the same cut away;

Fig. 11 shows the feed wheel and feed ring portion of the stripper cylinder, and is taken approximately in the plane of the line 11—11 of Fig. 3;

Fig. 12 is a fragmentary section drawn to enlarged scale, and taken approximately in the plane of the line 12—12 of Fig. 11;

Fig. 13 is a partially sectioned view through the pinch rollers for the feed belts, and is taken approximately in the plane of the line 13—13 of Fig. 1;

Fig. 14 is an end elevation of one of the shoes; and

Fig. 15 is a view of one end of the bar which carries the shoes and the bearing arms for the top feed wheels.

Referring to the drawing, and more particularly to Fig. 1, the complete apparatus receives a web W leaving a suitable punch press generally designated P, which in turn may receive the web directly from one or more printing units, not shown in the drawing. From the press P the web is fed to a so-called "kicker" generally designated K, which is so timed as to accelerate each sheet, thus insuring breakage apart or separation of the sheets after they leave the press. The kicker K advances the sheets in proper timing between feed belts generally designated B, which in turn feed the sheets to stripper mechanism comprising a stripper cylinder C cooperating with shoes S and feed wheels F. The stripped sheets continue along the horizontal paper line 18 to suitable tab breaker means to break each sheet into its component cartons, while the pieces of scrap are carried downward by the cylinder C, and are stripped from the cylinder by suitable comb-like bent bands held around the upper left quadrant of the cylinder by upper and lower bandholders H.

Considering the arrangement in greater detail, the kicker K may be described with reference to Figs. 1 and 2 of the drawing. It comprises superposed shafts 20 and 22, the shaft 20 being above the web line W, and the shaft 22 below the web line. There is an axial line of projections 24 (Fig. 2) carried by shaft 20, and an axial line of projections 26 carried by shaft 22. The projections may be mounted on cylinders 25 and 27. It will be noted that the projections on one shaft are of different overall radius than the projections on the other shaft. In Fig. 2 it will be seen that the shafts are geared together by gears 28 and 30 which come to the pitch line of the projections, so that the shafts turn at different rotative speeds in inverse proportion to their radii. In other words, the projections 24 and 26 have the same linear speed when they come together.

The shaft 22 is driven through bevel gearing 32 and 34, and it will be understood that this in turn is driven by a suitable main or line shaft 36 (Fig. 1) which runs along the line of machines in order to synchronize the operation of all of the units such as the printing presses (not shown), the punch press P, and the parts of the stripper apparatus here disclosed. Now the linear speed of the projections 24 and 26 is made somewhat higher than the regular web speed of the web W in order to kick the severed sheet ahead slightly. This insures breakage of any fibres left uncut between successive sheets.

At the same time the difference in speed of rotation of the shafts 20 and 22 causes the projections 24 and 26 to come together only once in a number of revolutions. As a consequence of this the radii of the projections 24 and 26 may be only a fraction of what they would have to be if they were equal, and thus the kicker K may be made rather compact in dimension. In the specific case here shown the speed ratio of the shafts 20 and 22 is three to two, and the projections come together once in three revolutions of the projections 24, and once in two revolutions of the projections 26.

In the drawings it will be seen that the bearings for the shaft 22 are fixed in the frame of the machine, and that the bearing holders 38 for the shaft 20 are vertically slidable in the machine frame and are normally urged downward by means of compression springs 40, the downward movement, however, being limited by appropriate stop nuts 42 on threaded posts 44. Thus the position of the shaft 20 may be adjusted until the projections 24 and 26 come together with a desired squeeze pressure on the sheet.

The feed belt arrangement B for feeding the detached sheets from the kicker K to the stripper cylinder may be described in greater detail with reference to Figs. 1 and 13 of the drawing. In Fig. 1 it will be seen that there is an upper belt 46 which is guided around pulleys 48, 50, 52 and 54, and which is driven by a desired one of these pulleys, in this case the pulley 50. The tension of the belt may be adjusted and maintained by adjusting the angular position of the brackets carrying the shafts of the pulleys 52 and 54. Belt 46 in reality is a series of collateral narrow belts.

There is a lower belt 56 which passes around rollers 58, 60, 62 and 64. The bottom belt is preferably a wide continuous belt having a width large enough to receive the widest web or sheet to be handled, in this case 36". It is preferred not to use a series of parallel narrow belts at the bottom because it is better to support the sheet against curl, and against sagging or falling out of any of the scrap or waste, which in turn might interfere with proper operation of parts of the apparatus.

It will be noted that the belts 46 and 56 have converging approach portions at the letter B which come together or "pinch" at suitable pinch rollers 66 and 68. In order to handle sheets of different length, in this case up to 34", the pinch point is preferably adjusted forward or back, and this is done by shifting the location of the pinch rollers 66, 68. For this purpose the rollers are carried in a frame 70 which is slidable on rails 72. The machine frame is provided with gear racks 74 on each side, and the frame 70 is provided with pinions which may be rotated by means of a suitable handle. In Fig. 13 it will be seen that in the present machine the pinions 76 are concentric with the lower pinch roller 68. More specifically, there is a control handle 78 which is secured to a shaft 80, which in turn carries the pinions 76. Rotation of handle 78 thus causes movement relative to the stationary gear racks 74. The pinch roller 68 rotates freely on shaft 80. Similarly the upper pinch roller 66 rotates freely on shaft 82. The position of the latter may be adjusted by means of appropriate adjusting screws 84 locked by nuts 86. Compression springs may be used, if desired. It will be evident that when dealing with a short sheet the pinch rollers are moved to the right, as viewed in Fig. 1, and when dealing with a long sheet the pinch rollers are moved to the left, and that in any case they are so located as to receive and adequately grip a sheet when kicked ahead by the action of the kicker K, in proper time relation.

The feed belts are driven by a train of gearing which includes bevel gears 90 (Fig. 1) driving a gear 92 meshing with a gear 94, which in turn drives a sprocket wheel 96 driving a chain 98 meshing with a sprocket wheel 100, which in turn drives the roller for the lower belt 56. There are also gears connecting the upper and lower rollers 50 and 64, in order to drive the upper belts. It will be noted in Fig. 1 that the roller 50 for the upper belts is urged downward by suitable compression springs

102, with a pressure which may be adjusted by means of threaded posts 104.

The pin-carrying or stripper cylinders are shown at C in Fig. 1, but may be described in greater detail with reference to Figs. 3 and 4 of the drawing. The stripper cylinder is carried on a shaft 110 which is splined or has a long continuous keyway 112. The cylinder is preferably made up of a series of smaller cylinders, only two of which are here schematically indicated at 114 and 116. In the specific case shown each cylinder is only 4" wide in axial direction, and enough cylinders may be provided to make up a continuous drum as wide as the widest web to be handled, which in this case is 36". When appropriate the cylinders may be spaced apart, and may be shifted axially of the shaft 110, and secured in any desired position by means of suitable set screws. The diameter of the cylinders is the same, and is selected to provide a circumference substantially greater than the length of the longest sheet to be handled. In the present case the circumference is 42" to readily handle sheets up to 34" in length.

Each cylinder is provided with a series of preferably parallel, uniformly spaced slots which are undercut or T-shaped. These T slots are shown at 118 in Figs. 3 and 4. In the present case there are four such slots for each cylinder, the slots being spaced 1" apart. The slots are designed to receive pinholders, one of which is indicated at 120 in Fig. 4, and each pinholder may carry two pins 122, so that the spacing apart of the pins is ½". The pins are carried by screws 124 having nuts 126 by means of which the screws may be detachably secured in mating threaded holes in the pinholder 120. The pinholder in turn is detachably secured on the cylinder 116 by means of a screw 128 threadedly received in a preferably lozenge-shaped nut 130.

Referring now to Fig. 6, the lozenge-shaped nut 130 is dimensioned to pass freely through the narrow part 132 of the T slot. When the screw 128 is tightened the nut 130 turns clockwise to the angular position shown in Fig. 6, at which time it cannot turn any further, and thus the screw 128 may be tightened home. This in turn locks the block 120 in position, and rotation of the latter may be prevented by a suitable projection on bottom received in the narrow part 132 of the T slot, as is best shown in Fig. 4. Fig. 5 also shows the location of the pins 122, and it will be understood that either pin may be used alone. It will also be understood that the relative location of the pins around the cylinder is readily varied by suitably locating the pinholder 120. The axial location of the pins is determined at ½" intervals for any one cylinder, and the intervals may differ in other increments, as between one cylinder and another, by varying the location of the cylinders along the shaft 110 (Fig. 3).

As will be seen in Fig. 4, the pins 122 are rather substantial in length, and are preferably cylindrical except at the point, in order to better frictionally hold a piece of scrap once it has been impaled on the pin. The sheet should be supported from above as the pins enter the scrap, for otherwise the pins may simply dislodge the scrap upwardly out of the sheet. For this purpose I provide shoes S, the location of which is shown in Fig. 1, and the construction of which may be better described with reference to Figs. 3 and 4. In those figures it will be seen that the shoe 134 corresponds to the cylinder 114. It has a main bottom bearing surface 136 (Fig. 4) which bears against the top of the sheet as the sheet rides over the stripper cylinder. The shoe is provided with a series of parallel slots or grooves 138 into which the pins 122 pass as the cylinder 114 rotates. In the case here illustrated the shoes are approximately 4" in width, and the grooves 138 are ½" apart.

The shape of the shoe in profile is best shown in Fig. 14 in which it will be seen that there is a flat bottom surface 136 which extends rearwardly far enough to support the sheet at the point where the pins of the stripper cylinder first bear against the sheet. Fig. 14 also shows how the shoes are releasably carried on a square or rectangular rod 140, and thus may be adjusted from side to side. The position may be locked by screws 141. Ordinarily they will be moved to positions matching with the stripper cylinders, except, however, that they may be displaced in staggered or offset relation when it is desired to accommodate certain narrow feed wheels which are described later.

Reverting to Fig. 1, it will be seen that the shoes S may be slightly raised or lowered by adjustment of an appropriate screw 142 which, when moved forward, raises the shoes, and when moved rearward lowers the shoes. The screw 142 bears against a depending arm of a split block 143, which is fixed on the end of the rounded journal portion 166 of square bar 140. In Fig. 15 it will be seen that the round portion 166 is journaled in the machine frame 222, while the block 143 is disposed outside the machine frame. Thus by means of the screw 142 and the block 143 a suitable adjustment may be made for any substantial change in thickness of the material being handled.

To insure continued feeding of the sheet through the stripper to the tab breaker, and without reliance on the stripper pins which meanwhile move downward with the scrap and thus lose control of the sheet, I provide appropriate feed wheels. These are preferably narrow, and are adjustable axially so that they may be located at appropriate parts of the sheet where there is no scrap, and consequently where dependable feed may be obtained, and without interference by stripper pins which, of course, come to a higher elevation than the paper line. In Fig. 1 a top feed wheel is indicated at F, and is located directly above the stripper cylinder. Referring now to Fig. 3, the feed wheel F is formed with a hub 144, and may be moved axially of its shaft 146, it being secured in desired location by a suitable set screw 148. It will be understood that a number of feed wheels F may be provided along the shaft 146.

Lower mating feed wheels may be provided mounted directly on the cylinder shaft 110, and in such case the upper and lower feed wheels may be located between cylinders at points where the latter may be spaced apart because there is no scrap. However, while I have made the apparatus in that form, I believe it preferable to provide lower feed wheels directly on the cylinders, and for this purpose I provide split rings which may be screwed directly on a cylinder at one of the T slots of the cylinder. The top feed wheels F are preferably rubber covered, to accommodate variations in thickness of the box material. It is thus possible to use metal for the split rings.

Such a ring is shown at 150 on cylinder 116 in Fig. 3. Referring now to Figs. 11 and 12 of the drawing, it will be seen that the ring comprises semi-circular halves 150 and 152, the ends of which abut at 154. Each half is provided with a plurality of screws 156, the heads of which are suitably countersunk, as is best shown in Fig. 12. The threaded shank of the screw 156 is received in a lonzenge-shaped nut 158 similar to those previously described. It will be understood that the ring is applied to the cylinder with the screws and nuts already in position, and that upon tightening the screws the nuts tend to turn into holding position, thus permitting the screws to secure the split ring in position. The thickness of the ring is such as to come up to the paper line and to bear against one of the upper feed wheels F previously referred to.

In normal practice the cylinder which carries a feed ring is not needed for scrap removal, and thus one entire shoe may be omitted above the cylinder to make room for an upper feed wheel. In other cases an equal number of shoes and cylinders may be retained on their supports, but there anyway is preferably some idle space for axial adjustment, and the position of a shoe simply may be offset somewhat from the position of a cylinder, to make

room for a top feed wheel. In such case a single cylinder may carry both a feed ring and one or more stripper pins, in which case the pins cooperate with the offset shoe. In extremely rare occurrences, not encountered to date, the configuration of the box blank and the location of scrap therein may be so complex as not to permit the offset relationship described, and for such emergencies one or more modified widths of shoe may be provided, typically a 2" shoe, in addition to the regular 4" shoe, for the particular machine here shown. In such case a feed wheel and a narrow shoe may be used with one (or more) of the cylinders, while regular width shoes may be used in cooperation with the other cylinders.

The cylinder shaft **110** is driven by a gear **160** (Fig. 3), and this in turn meshes with and is driven by a gear **94** (Fig. 1) previously referred to in connection with the drive of the feed belts B. Reverting now to Fig. 3, it will be seen that the gear **160** meshes with a gear **162** on the feed wheel shaft **146**. The gears **160** and **162** have pitch diameters corresponding to the diameters of the feed wheels, and thus provide equal linear speeds for the feed wheels.

It is convenient to be able to swing the feed wheel shaft **146** with its feed wheels F upwardly out of the way when adjusting the positions of the shoes from side to side. In Fig. 3 it will be noted that the feed wheel shaft **146** is carried by bearings formed on arms **164**, and in Fig. 1 it will be seen that the arms **164** are themselves rotatably carried at their rear ends by round or cylindrical portions **166** of the square bar **140** previously referred to as carrying the shoes. The arms **164** are normally pulled downward by pull springs **168**, the lower ends of which are secured to the machine frame outside the web, and the upper ends of which are secured to forward extensions **170** of the arms **164**. Thus by releasing the springs **168** the arms may be swung upwardly about the axis **166**, thereby throwing the wheels F upward out of the way of the shoes. The arms **164** are not fixedly secured to the rounded ends **166** (Fig. 15) of the bar **140**.

A very important feature of the present invention is the provision of improved means for clearing the removed scrap from the stripper pins after the pins have served their purpose of pulling the scrap from the sheet. In Fig. 3 it will be seen that there are a series of strips or bands **172** which are disposed parallel to one another and form comb-like slots therebetween which are so disposed as to receive the stripper pins. The lower ends of these bands are secured in a lower holder **174**, while the upper ends are secured in an upper holder which is not visible in Fig. 3, but which is located at **176** in Fig. 1. In accordance with a feature of the invention the bands are made inexpensively out of uniform strip, preferably of steel, and it is merely necessary to cut the steel into pieces of desired uniform length.

Referring now to Figs. 9 and 10, the lower holder **174** comprises a rear portion **180** and a forward portion **182** which are secured together by suitable screws **184**. The forward portion **182** is deeply slotted to receive a rectangular support bar **186**, and the holder may be secured in any desired location along the support bar **186** by means of appropriate screws **188**. Either part **180** or **182**, and in the present case the forward part **182**, is provided with a series of parallel slots dimensioned to receive the lower ends of the spring bands **172**. The insertion of the spring band is limited by means of a suitable cross-bar **190**. Thus the bands **172** are readily inserted in position as shown in Figs. 9 and 10, and need not be and preferably are not clamped between the parts **180** and **182**, for it is found that they remain firmly and accurately in desired position without need for clamping the same, which in turn makes it possible to use a lesser or greater number of bands, as needed or desired. It will be understood that the slots **192** formed between the bands **172** are spaced appropriately to register with the stripper pins, and in this case are spaced ½" apart, the bands themselves having a width of less than ½".

It will also be understood by reference to Fig. 9 of the drawing that the curvature caused to be assumed by the holder **182** is a spiral, in which the bands are gradually spaced further from the cylinder (indicated by a broken line **194**) thus forcing the scrap outward and off the stripper pins (not shown) carried by the cylinder **194**. The bands are resilient and automatically self-contouring, when once inserted in the bandholders. It will also be understood that the spacing between the bands **172** and the cylinder, just above the holder **174**, exceeds the length or projection of the pins from the cylinder. The removed scrap then falls downward into a suitable receptacle, or into a conduit and suction system for continuous removal of the scrap (not shown).

Referring now to Figs. 7 and 8, the upper holder is generally designated **176**, and somewhat resembles the lower holder, except for changes necessitated by space limitations. Specifically, the upper holder is made of an upper part **196** and a lower part **198** which are secured together by screws **202**, and which form slots therebetween for the reception of the upper ends of the bands **172**. Insertion of the bands is limited, as at **201**. The holder is secured on a rectangular bar **200** which extends entirely across the machine, so that the holders may be slidably adjusted to one side or the other, with the adjustment secured, as by screws **203**.

The lower part **198** of the holder may be cut to form grooves **204** to afford clearance and passage of the tips of the pins as the cylinder rotates. The cylinder is suggested in broken lines at C. The pins after leaving the grooves **204** enter the spaces between the bands **172**, and, of course, the bands are located below the paper line, which is indicated at **18**. If desired the sheet, after leaving the feed belts (B in Fig. 1), may be supported by a suitable table or support guard **206** (Fig. 7). It will be understood that the spacing of the bands **172** in the upper holder **176** (Fig. 8) is identical with the spacing of the bands in the lower holder **174** (Fig. 10), and that in setting up the machine for a particular operation the holders are aligned with one another, and in registration with the stripper pins of the cylinder.

The stripper is followed by a tab breaker to break each sheet into its component blanks, for each sheet may consist of from two to sixteen blanks, depending on their size.

In order to provide full access to the cylinder and associated parts for ease in properly locating the cylinders, pins, rings, bands, and shoes, the cylinder unit is preferably so mounted that it may be slid axially out of the machine, for the machine as shown in Fig. 1 usually is immediately followed by additional apparatus for tab breaking and separation and stacking of the carton blanks. Referring to Fig. 3, it will be seen that the cylinder shaft **110** is mounted in a sub-frame having sides **220**, **222** and a base **224**. The sub-frame is provided with a series of rollers **210** (Figs. 1 and 3) on each side which run on rails **212**. The rails may be very slightly cut away beneath the rollers in rest position, but after a small initial movement in axial direction the rollers are slightly raised by the rails, and the sub-frame may be pulled axially out of the machine, and with it the cylinders, bands, bandholders, shoes, and upper feed wheels. When the sub-frame is pushed back into working position it may be locked by additional means such as screws or bolts, not shown. However, before locking the sub-frame, its precise side-to-side registration may be slightly varied by suitable means, such as an adjusting screw **214** having a squared end to receive a crank, and a bracket **216** which cooperates with the screw.

It is believed that the construction and operation of my improved stripper mechanism, as well as the advantages of the same, will be apparent from the foregoing detailed description. It will also be apparent that

while I have shown and described the apparatus in a preferred form, changes may be made in the structure shown without departing from the scope of the invention, as sought to be defined in the following claims.

I claim:

1. Stripper apparatus comprising a kicker for accelerating a sheet, a stripper, and a belt feed means between said kicker and stripper, said belt feed means comprising an upper belt, a lower belt, said belts being vertically spaced apart at one end and converging into contact at the other end, and pinch rollers for bringing said belts together at a desired point intermediate the ends of the belts and between the kicker and the stripper, there being upper and lower pinch rollers carried by a normally stationary frame, and said pinch roller frame being adjustable toward or away from the kicker in order to change the point at which the belts are brought together in order to compensate for changes in the length of the sheet.

2. Stripper apparatus comprising a kicker for accelerating a sheet, a stripper, and a belt feed means between said kicker and stripper, said belt feed means comprising an upper belt, a lower belt, said belts being vertically spaced apart at one end and converging into contact at the other end, and pinch rollers for bringing said belts together at a desired point intermediate the ends of the belts and between the kicker and the stripper, there being upper and lower pinch rollers carried by a normally stationary frame, together with gear and rack mechanism for moving said pinch roller frame toward or away from the kicker in order to change the point at which the belts are brought together to compensate for changes in the length of the sheet.

3. A stripper comprising a cylinder having means for detachably holding stripper pins, a plurality of stripper bands cooperating with said cylinder, said bands being flat in section and disposed in closely spaced edge to edge relation and providing narrow slots between said bands for receiving the pins, an upper band holder located ahead of the cylinder beneath the paper line for receiving and holding the upper ends of the bands, a lower band holder located beyond the cylinder for receiving and holding the lower ends of the bands, said holders being so disposed as to hold the bands around the cylinder with the lower holder so positioned that the bands are there spaced radially further from the cylinder than the length of the pins, in order to strip scrap from the pins.

4. A stripper comprising a cylinder having means for detachably holding stripper pins, a plurality of stripper bands cooperating with said cylinder, said bands being flat in section and disposed in closely spaced edge to edge relation and providing narrow slots between said bands for receiving the pins, an upper band holder located ahead of the cylinder beneath the paper line for receiving and holding the upper ends of the bands, a lower band holder located beyond the cylinder for receiving and holding the lower ends of the bands, said holders being so disposed as to bend the bands around the cylinder, with the lower holder so positioned that the bands are there spaced further from the cylinder than the length of the pins, in order to strip scrap from the pins, said bands being equal lengths of strips having a uniform cross-section and made of resilient material.

5. A stripper comprising a plurality of cylinders each having stripper pins, said cylinders being mounted on a common shaft and being axially adjustable along said shaft, a plurality of upper band holders as defined in claim 3, mounted on a support bar and axially adjustable along said support bar, a plurality of lower band holders as defined in claim 3 mounted on a support bar and axially adjustable along said support bar, and bands bent and held around the cylinders by said holders as defined in claim 3, whereby said holders and cylinders may be similarly relatively adjusted from side to side.

6. A stripper comprising a cylinder mounted on a shaft, a plurality of parallel T slots around said cylinder, a plurality of stripper pins, and means to feed a sheet through the stripper, said feed means including split metal feed rings having a diameter larger than the diameter of the cylinder, said stripper pins and said feed rings being detachably secured along the cylinder by means of said T slots, and said feed rings being secured to T slots having no stripper pins.

7. A stripper comprising a cylinder having means for detachably holding stripper pins, a plurality of stripper bands cooperating with said cylinder, said bands being flat in section and disposed in closely spaced edge to edge relation and providing narrow slots between said bands for receiving the pins, said bands being strips of uniform length and section and made of resilient material, and upper holder located on the leading side of the cylinder below the paper line for receiving and holding the upper ends of the bands, a lower holder located on the trailing side of the cylinder below the axis for receiving and holding the lower ends of the bands in generally upright position, said holders being so disposed as to bend the bands around the cylinder, with the lower holder so positioned that the bands are there spaced further from the cylinder than the length of the pins, in order to strip scrap from the pins.

8. A stripper for removing pieces of scrap from a sheet, said stripper comprising a plurality of stripper cylinders mounted on and axially adjustable along a common shaft, a plurality of top band holders corresponding to said cylinders and located on the leading side of the cylinders below the paper line, a plurality of bottom band holders corresponding to said cylinders and located on the trailing side of the cylinders below their axis, means affording adjustment from side to side of said holders to correspond to adjustment of the cylinders, said cylinders having means to detachably carry stripper pins and feed rings, said holders receiving bands which are bent thereby around the cylinder, said bands being flat in section and disposed in closely spaced edge to edge relation, said bands being spaced apart to form narrow slots corresponding to the stripper pins, said bands at the lower ends being spaced from the cylinder by the bottom holders an amount greater than the length of the stripper pins, and means disposed on the side of the sheet opposite the cylinders for backing and supporting the sheet for cooperation with the feed rings and the stripper pins.

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