The invention relates to carton blank forming machines and more particularly to the treatment of the blanked out web after it leaves the blanking press.

One of the objects of the invention is to provide an improved means for separating the blanked out pieces of stock from the advancing web by providing a cyclically timed means for firmly tractive gripping the back end of a blanked out section of the web so that this section may be separated from that portion of the web in the press as that portion is blanked out by the press. Each blanked out section may be a single carton blank or a multiple carton blank, in which case after the multiple blank has been separated from the web as above described, the blanks themselves are separated from each other, one at a time, by the interaction of two sets of feed rolls with the advancing feed rolls running at a higher speed than those of the other set. The arrangement hereinafter described produces a better separation of the blanks than heretofore.

A further object of the invention is to provide an improved means including an impaling pin or pins for separating the waste, especially waste which is located in the interior of the blank. The use of impaling pins for waste separation is not broadly new, but so far as I am aware, the prior art pins have been plain cylindrical pins with more or less pointed ends, and these do not always have the desired gripping action on the waste so as to hold it after it has been torn from the blank. Furthermore, it has been the practice to remove the separated waste from the pins by passing it by a comb with the ends of the pins running between the teeth with the result that definite limitations are set up for the location of the teeth of the comb relative to the pins and because the width of the teeth is a factor which can prevent the best location of the pin or pins relative to the waste section to be removed. According to the present invention, the chance of the waste slipping off the impaling pin has been prevented by forming the pin with what may be termed a "beveled" head so that during the impaling step the waste is forced downward over the enlarged end or web of the head, and as a consequence, is firmly gripped until it is stripped off. Also instead of using the usual comb for removing the waste from its carrying pin or pins, a flexible brush (preferably metal) is brought into engagement with the waste to remove it, the pin preferably being designed to engage the combing point for the waste on the pin to facilitate its removal. Since the brush is composed of a great number of flexible filaments of a diameter smaller than and actually several times smaller than any practical comb tooth width, the positioning of the waste remover relative to the pins is no longer a problem so that the pin or pins may be placed on their movable support to engage the waste in the blank at the point or points best suited for this purpose.

A further object is to provide improved means for supporting the blank during waste removal and also an improved means for removably mounting the pin carrier in the apparatus.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a side elevation view of that portion of a carton blank forming apparatus embodying the invention;

Fig. 2 is a plan view of the apparatus with the blank supporting means in the waste stripping section omitted;

Fig. 3 is a vertical sectional view through the waste stripping section;

Fig. 4 is an enlarged horizontal sectional view through the waste stripping section with parts omitted;

Fig. 5 is a detailed vertical sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a detailed vertical sectional view taken on the line 6—6 of Fig. 3;

Fig. 7 is a detailed vertical sectional view taken on the line 7—7 of Fig. 3;

Fig. 8 is a diagrammatic view of the drives;

Figs. 9 and 10 are diagrammatic views showing different stages of the feed of the blank through the apparatus embodying the invention;

Fig. 11 is a progressive view of the blanks at their different stages of treatment;

Fig. 12 is a vertical sectional view through a portion of the stripper mechanism;

Fig. 13 is a view similar to Fig. 12 showing the waste removal step;

Fig. 14 is an enlarged view of parts shown in Fig. 13;

Fig. 15 is an enlarged side elevation view of an impaling pin;

Fig. 16 is a plan view of an impaling pin.

Referring to Fig. 1 of the drawing, the letter P designates generally a blanking press having a fixed platen Pa and a movable platen Pb, and for a more detailed showing of the press, reference is made to my prior U.S. Patent No. 2,616,689, of November 4, 1952.

The letters S and D designate, respectively, the separator and stripper section and the delivery section.

The section S of the apparatus includes a pair of sets of feed belts 17 and 18, each suitably supported by a series of transversely disposed rollers R in cooperative relation to feed the web W from the press, see Figs. 9 and 10. One of the rollers R of each set of belts is positively driven from the press drive shaft as hereinafter described, and as in my prior U.S. Patent No. 2,655,842, of October 20, 1953, one of the rollers for each set of belts is shiftable to tension the belt. Unlike the patent, however, in this invention the front roller R for the lower sets of belts is mounted on arms 18a for vertical swinging movement toward and away from the web and is moved into tractive gripping engagement with the web by the turning of its supporting shaft 19 in timed relation with the movement of the platen Pb. For this purpose, the platen has a bracket arm 20 in which a shaft 21 is suitably supported, said shaft carrying a cylinder 22 having a spring 23 and the lower end of a plunger 24, bearing on the spring, mounted therein, see Figs. 1 and 2. The upper Shank end of the plunger 24 is pivotally connected to the free end of a crank arm 25 on the shaft 21 so that as the platen Pb moves upwardly, it will through the spring 23 and plunger 24 swing the arm 25 upwardly and consequently turn the shaft 19 and swing the arms 18a with the associated roller R thereon upwardly so that as the last part of a previously cut blank is moving out of the press, this part will be firmly engaged as the blank is advanced forwardly between the belts 17 and 18 so that this blank will be separated from the web at the press as the press platens come together to impress the next blank section on the web. Fig. 9 shows the web before its separation and Fig. 10 shows the web just after separation at the press. Thus the carton or cartons blanked out by a single
operation of the blanking press as, for instance, the first showing Be in Fig. 11 is cut off from the web and fed along with the opposed sets of rolls 26 and 27 which carry the blank relieved of its waste to another set of feed rolls 28 and 29 which rotate at a higher speed than the rolls 26 and 27 so that if the previously cut blank is a multiple blank, the blanks will term along their transverse division lines into single blanks as indicated in Fig. 10 and the second and third showings in Fig. 11. As the separated blank section passes between the rollers 28 and 29, since the rollers 28 are actually two rollers that are set at a slight angle relative to each other, as the two part blank shown in the third showing of Fig. 11 passes between the last set of feed rolls, it will by the action of multiple rollers 28 be torn apart transversely into the two separate carton blanks shown in the fourth showing in Fig. 11, and these blanks B will be delivered onto the conveyor belt 30 indicated in Figs. 1, 9, and 10.

Referring now to the stripper portion of the section S, as the separated blank or multiple blank passes from the feed belts 17 and 18 to the feed rolls 26 and 27, the waste is stripped therefrom while the remainder of the blank is supported on a series of riders 31 in the form of tensioned steel wires, each anchored at one end by a pin projection 32 in a head block 33 and connected at the other end to a threaded anchor member 34 slidably mounted in an opening in a head block 35. A wing nut 36, in threaded engagement with member 34 and bearing against the head block or a washer 37 abutting the same, is turned up to tension its associated wire. Referring to Fig. 4, each of the head blocks 33 and 35 have a series of spaced wire anchoring holes 38 so that the riders 31 may be arranged in blank supporting position in those of the areas not to be stripped of waste, leaving the other areas open. The lower feed roll 27 may, as indicated in Fig. 6, be provided with a series of annular grooves 39 to allow free passage of the wires or riders 31. A segmental rider supporting plate 40 provided with spaced wire engaging grooves 41 is mounted adjacent the delivery end of the belts 17 and 18 so that the wires may be deflected downwardly to their points of anchorage in block 35.

A stripper pin carrying cylinder 42 is rotatably mounted in the frame of the machine so that the pins 43 thereon will be effective to remove waste W from the blank or blanks while these blanks are passing over the horizontal support provided by the riders 31. The cylinder or drum 42 is preferably a sleeve or shell of light weight metal, such as aluminum so that it may be readily tipped or threaded to take the threaded ends 44 of the stripper pins in the exact spot or spots best suited to accomplish waste removal. As shown in Figs. 14 to 16, each pin 43 has a barred head formed by providing a conical point 45 and conical shank 46 tapering inwardly from the point to a relatively large flat base 47 which is preferably rounded and extends down to the reduced diameter threaded end 44 which is screwed into the tapped hole 49 in the drum by the use of a rod insertable in a diametrically disposed hole 50 in the base portion of the pin, the mounting as above described bringing the head of the pin to a position directly under the cylinder 42 with the waste area portion of the blank so that as the drum 42 revolves and the pins move beneath the waste portion, the waste areas of the blank can be pressed down onto the heads of the pins and be impaled thereon by any suitable means as, for example, the dense wire brush 51 revolutely mounted in an axial line with that of the drum 42 and whose outer portion has a bearing engagement with the opposite side of the blank as shown in Fig. 12. After the pin gets an impaling hold on the waste, its continued movement with the drum tears the waste W away from the blank and carries it downwardly away from the body of the blank, which advances to the feed rolls 26 and 27 while the waste W is carried along with the drum to a point where it is stripped therefrom. Preferably if one pin is used or the first pin of a series of pins is used, such pin should be so located on the cylinder 42 that it will impale the waste thereon within a distance not materially greater than the diameter of the pin to provide a short projecting lip portion L as indicated in Fig. 14 so that as the blank past a less dense but flexible revolving wire brush 52, the wires of this brush will first contact this lip L and bend it down while flexing the portion on the opposite side of the pin down into a fulcruming contact at F with the base of the pin so that by the leverage action thus induced the waste is pierced off the pin, and in the case of a single pin drops off of the drum, or if more than one pin, the already loosened section of the waste being in contact with the brush acts to tear the rest of the waste from the other pins. It will be noted that the waste remover brush 52 is spaced so that at one point it is almost in contact with the drum so that as the drum revolves, the pins actually have to move through the peripheral portions of this brush, and this is more readily accomplished and with less wear and tear by forming the bases of the pins circular since such a section moving through the brush more readily deflects the elements thereof. The brush 52 is driven at a higher speed than the blanks as shown in Figs. 1 and 8, its supporting shaft carries a pulley 53 connected by a belt 54 with a pulley 55 on the shaft 56 of an electric motor 57.

Referring to Figs. 8 and 5, the numeral 58 designates one of the power shafts of the blanking press which carries a sprocket 59 connected by a chain 60 with a sprocket 61 on a drum drive shaft 62, which shaft is splined to a sleeve shaft 63 carrying a large gear 64 meshing with a smaller gear 65 on the shaft 66 for the brush 51. For driving the belts 17 and 18, gears 67 and 68 on the driven rollers R mesh together and are operatively connected to the gear 65 by an idler gear 69. The feed rolls 26 and 27 carry intermeshing gears 70 and 71 that are operatively connected by an idler gear 72 with the gear 64. As each form of carton that may be blanked out by the machine may differ from other forms of cartons that may be required, it is desirable to provide means for readily attaching and detaching the pin carrying cylinder 42 from its drive mounting, and one form of means for this purpose is shown in Fig. 5 and includes a driving head 73 and a clamping and supporting head 74. The head 73 includes a disk 73a with a conical periphery 73b and secured to a splined shaft 73c slidably mounted in the splined sleeve 63. The disk is clamped to the other head by a spring 75, this movement being limited by a pin 76 working in a key slot 77.

The head 74 includes a disk 74a with a conical periphery 74b and mounted on a ball bearing 74c carried by a stub shaft 74d which is slidably mounted in a housing 78 but restrained from rotary movement by a pin 79 in the shaft working in an elongated slot 80 in the housing. A hand-operated feed screw 81 is journaled in the housing 78 and has threaded engagement with a threaded bore 82 in the shaft 74d so that the head 74 may be moved in or out relative to the frame F of the machine and so that the cylinder 42 engaging the coned peripheries of the disks 73a and 74a may be clamped therebetween, and if desired, may be keyed in place by a pin 83 on one of the disks engaging a notch in the edge of the cylinder, at which time the tension of the spring 75 acting on the head 73 and through the cylinder on the head 74 holds the parts together. To remove the feed screw 81 is turned to carry the head 74 toward the left as viewed in Fig. 5 until the pin 76 strikes the end of the slot 77 and arrests movement of the head 73 and thereafter continued movement of the head 74 disengages it from the cylinder 42 so that the cylinder can be taken out of the machine and replaced by another cylinder having a different pin arrangement.
It is to be noted that since the waste removing brush 52 imposes no limitations on the disposition of the pin or pins transversely of the blank, the placing of such pin or pins for waste removal from any particular form of carton blank is greatly facilitated, and a considerable amount of time in setting up the machine for a run of stock is saved.

It will, of course, be understood that the impaling pins can be mounted on a movable support other than a cylinder if such an arrangement is desirable without departing from the invention.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In a blank forming apparatus, the combination with feeding means for advancing a blank having a waste portion therein, a frame having a series of sets of openings, a plurality of riders interchangeably mounted in said openings to support the full portions of the blank and leave an exposed opening for that portion of the blank having the waste portion, a cylinder rotatably mounted adjacent said riders, an impaling pin mounted on said cylinder to contact the waste portion of the blank, means to exert pressure on the advancing blank while in contact with said pin to impale the waste portion thereon, said riders extending from the infeed side of said cylinder, past said pressure exerting means and to the discharge side of said cylinder, so that continued rotation of said cylinder strips the waste from the blank as the latter is supported on said riders, and means for removing the stripped waste from said pin.

2. The blank forming apparatus as defined in claim 1 wherein the riders are steel wires removably anchored at one end to one of the members of the frame and adjustably tensioned at the other end.

3. In a blank forming apparatus, an impaling pin-carrying hollow cylinder, heads for clamping said cylinder between them, each of said heads having a stud shaft, means for driving one of said shafts, springs means for urging said heads toward each other to clamp the cylinder between said heads, and manually operable means for moving the other of said shafts lengthwise to separate said heads to permit removal of said cylinder.

4. In a blank forming apparatus, the combination with feeding means for advancing a blank having a waste portion therein, a frame having a pair of spaced-apart blocks, a plurality of riders adjacent to said blocks secured at their ends to said blocks for supporting the full portions of said blank and leaving an exposed opening for said waste portion, a cylinder rotatably mounted adjacent thereto, an impaling pin mounted on said cylinder to contact said waste portion, and means to exert pressure on the advancing blank while the latter is in contact with said pin to thereby impale the waste portion thereon and cause the latter to be stripped from said rider-supported blank as the cylinder continues to rotate.

5. In a blank forming apparatus, the combination with feeding means for advancing a blank having a waste portion therein, a frame having a pair of spaced-apart blocks, a plurality of riders adjustably secured at their ends to said blocks for supporting the full portions of said blank and leaving an exposed opening for said waste portion, a cylinder rotatably mounted intermediate the length of said riders and adjacent one side thereof, an impaling pin mounted on said cylinder to contact said waste portion, and means on the other side of said riders to exert pressure on the advancing blank while the latter is in contact with said pin to thereby impale the waste portion thereon and cause the latter to be stripped from said rider-supported blank as the cylinder continues to rotate.

6. In a blank-forming apparatus, the combination with feeding means for advancing a blank having a waste portion therein, a frame having a pair of spaced-apart blocks, a plurality of generally horizontally disposed wire riders secured at their ends to said blocks for supporting the full portions of said blank and leaving an exposed opening for said waste portion, attaching means for detachably and adjustably securing said riders to said blocks, a cylinder rotatably mounted intermediate the length of said riders and adjacent the lower side thereof, an impaling pin mounted on said cylinder to contact said waste portion, and means located on the upper side of said riders to exert pressure on the advancing blank while the latter is in contact with said pin to thereby impale the waste portion thereon and cause the latter to be stripped from said rider-supported blank as the cylinder continues to rotate.

7. The combination set forth in claim 6 further characterized in that said attaching means for attaching one end of said wires to one of said blocks comprises a threaded member carried by said wires whereby the tension of the latter may be varied.

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