United States Patent

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[54] DE-STACKING DEVICE FOR SHEET METAL BLANKS

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[52] **U.S. Cl.** **271/26,** 271/18

[51] **Int. Cl.** **B65h 3/08**

[58] **Field of Search** 271/18, 26, 20, 74

[56] **References Cited**

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[57] **ABSTRACT**

A de-stacking device for a stack of sheet metal blanks having a vertically movable head adapted to engage the top of the stack of blanks and a saw-tooth blade on the head adapted to engage the edge of the topmost blank and upwardly movable for peeling the topmost blank from the stack.

6 Claims, 10 Drawing Figures

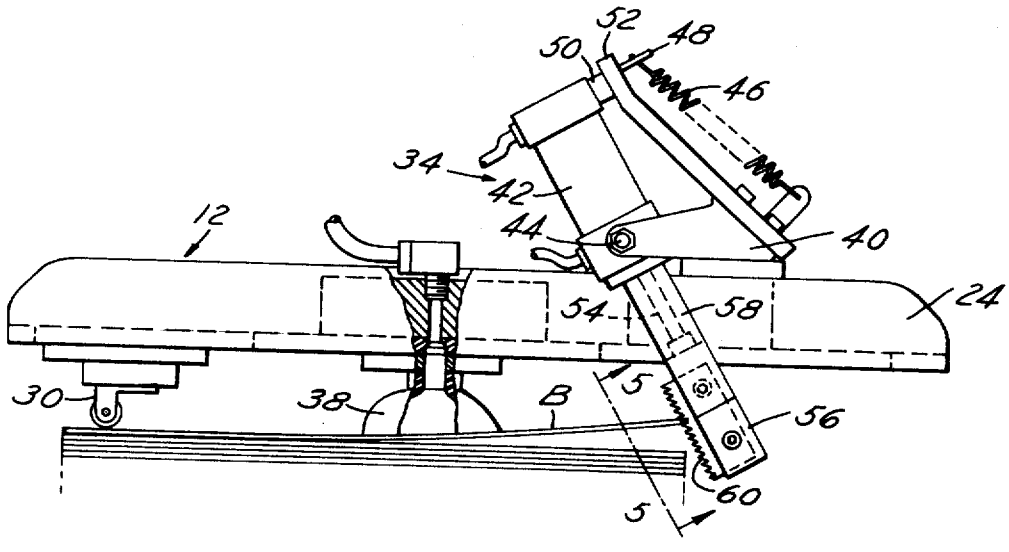


FIG. 1

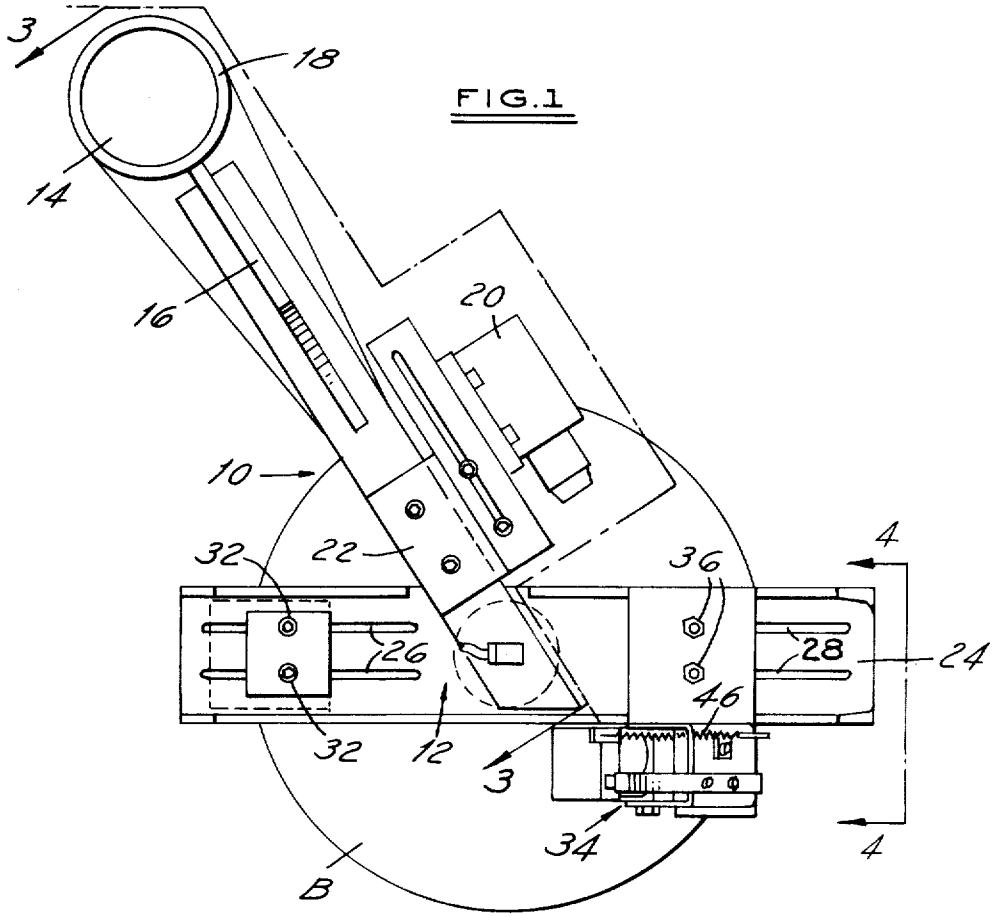
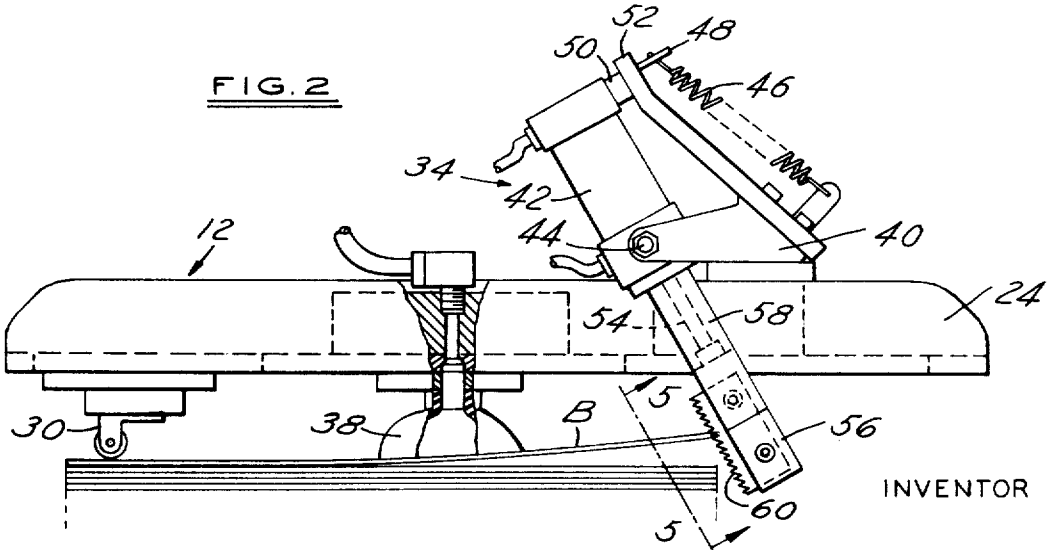


FIG. 2



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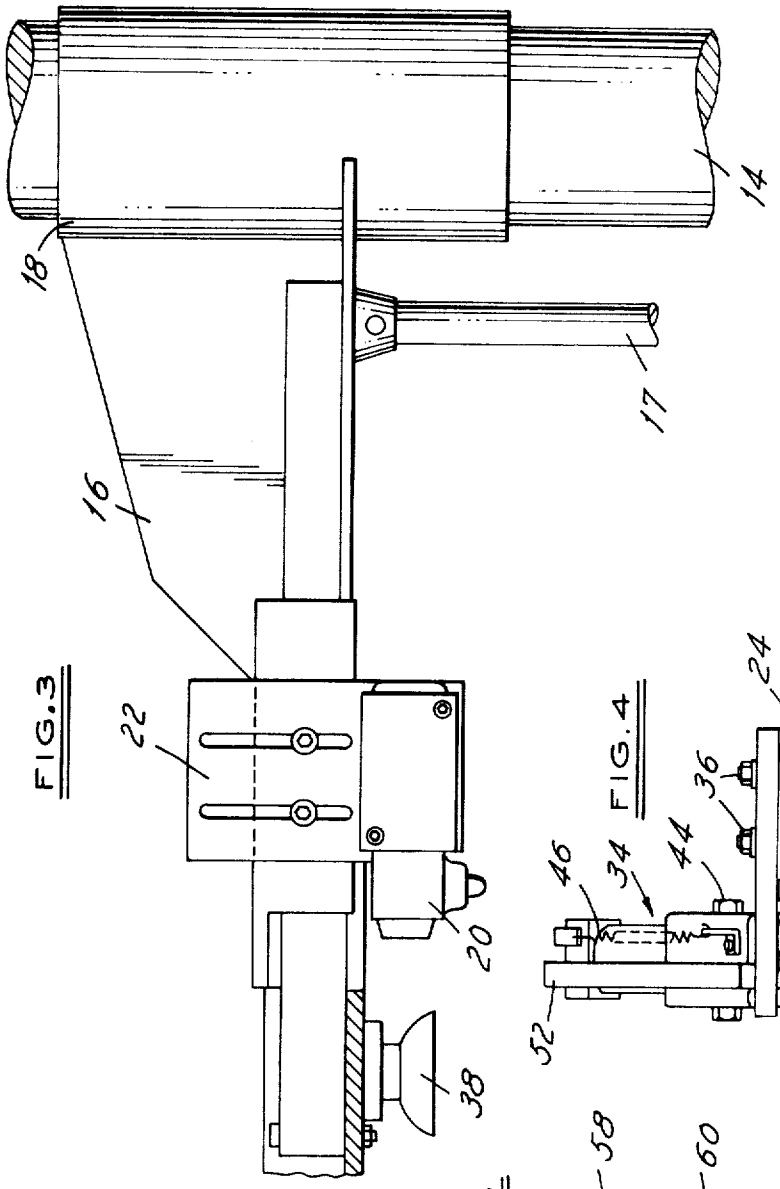


FIG. 3

FIG. 4

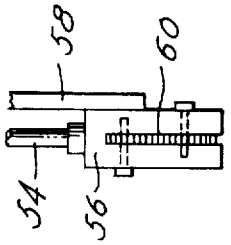


FIG. 5

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FIG. 6

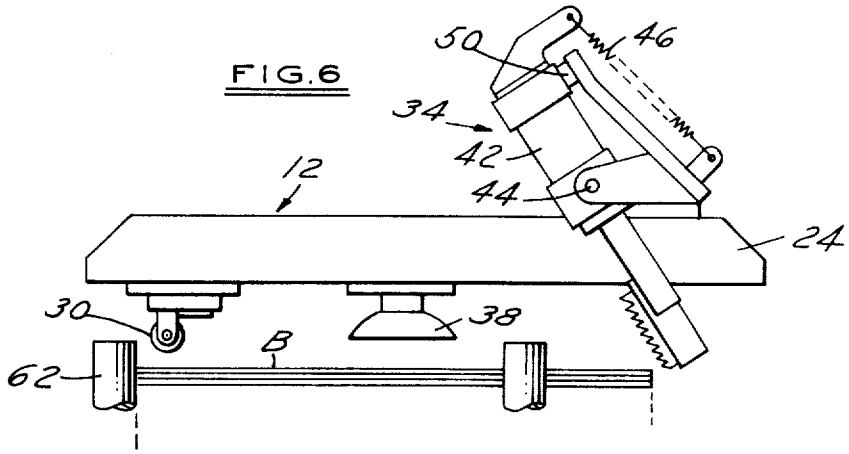


FIG. 7

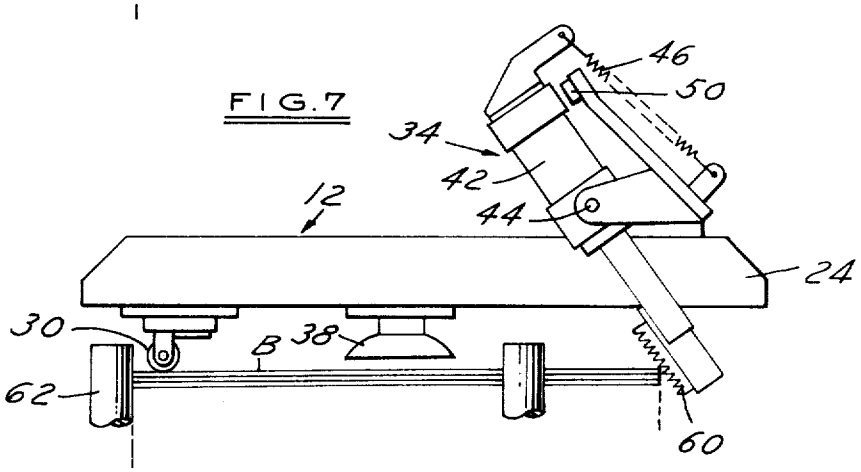
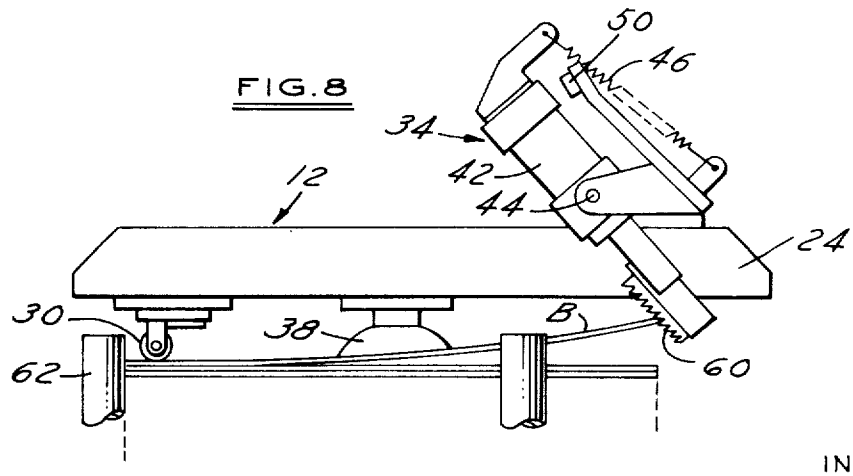


FIG. 8



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FIG.9

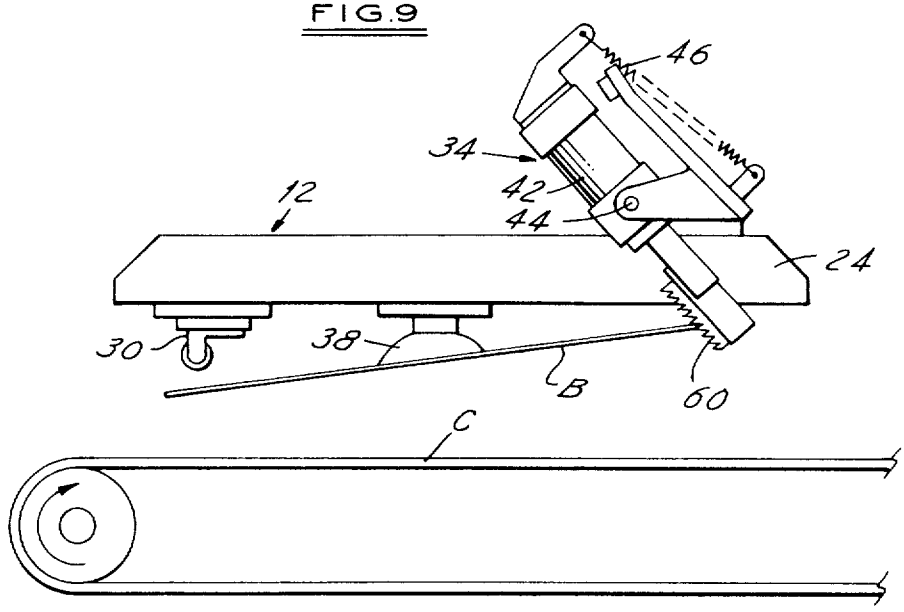
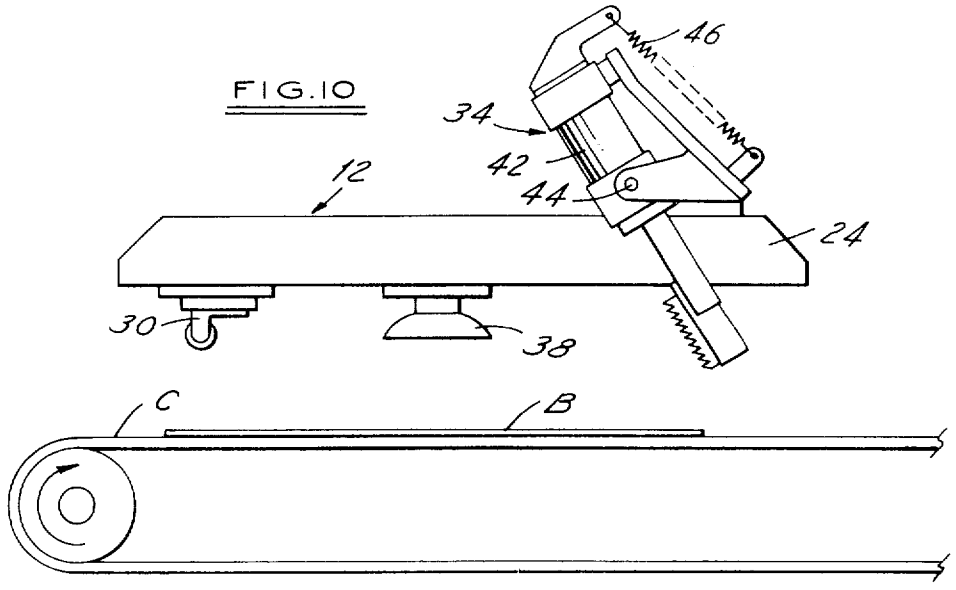


FIG.10



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DE-STACKING DEVICE FOR SHEET METAL BLANKS

This invention relates to a de-stacking device for removing the topmost blank from a stack of sheet metal blanks. More particularly, the invention is concerned with novel means for peeling the topmost blank from the stack so as to prevent the removal of more than one blank at a time from the stack.

The de-stacking device has particular utility in connection with a stamping operation where it is desired to feed blanks one at a time into a press. Since the blanks forming the stack are usually coated with a substance such as oil or the like they have a tendency to stick together. Thus, when a blank is removed from the top of the stack a second blank is often adhered to the bottom side of the first. Should this "double blank" be used in the press, the press would be dangerously overloaded to the point where either it or the die could be damaged.

It is an object of this invention to provide a de-stacking device for removing the topmost blank from a stack of sheet metal blanks which eliminates the possibility of having a "double blank."

It is another object of this invention to provide a de-stacking device for removing a single blank from the top of a stack of blanks which can readily accommodate a wide variety of blank sizes and shapes.

In the drawings:

FIG. 1 is a plan view of the de-stacking device of the present invention.

FIG. 2 is a front elevational view of a portion of the device in FIG. 1 having a portion broken away.

FIG. 3 is a view taken along line 3—3 in FIG. 1. 1. FIG. 4 is a view taken along line 4–4 in FIG. -.

FIG. 5 is a view taken along line 5—5 in FIG. 2.

FIG. 6 is a front elevational view showing a first operating position of the de-stacker.

FIG. 7 is a front elevational view showing a second operating position of the de-stacker.

FIG. 8 is a front elevational view showing a third operating position of the de-stacker.

FIG. 9 is a front elevational view showing a fourth operating position of the de-stacker.

FIG. 10 is a front elevational view showing a fifth operating position of the de-stacker.

Referring to FIGS. 1, 2 and 3, the de-stacking device of the present invention is shown generally at 10. It comprises a head 12 supported from a column 14 by means of a jib 16. Jib 16 comprises a tubular portion 18 which guides the jib and the head for vertical reciprocation on as well as for rotation about column 14. The vertical drive is supplied by a piston rod 17 of a power cylinder (not shown). A limit switch 20 for stopping the downward movement of head 12 is mounted on jib 16 by means of a bracket structure 22 and is adapted to be tripped by contact with the stack of blanks.

Head 12 is formed of a channel section 24 extending horizontally and attached midway between its ends to the end of jib 16 opposite column 14. Two pairs of slots 26, 28 extend longitudinally in channel section 24. A roller 30 is adjustably attached to the underside of channel 24 by bolts 32 extending through slots 26 and is adapted to engage the top of the stack as head 12 moves downward. Also mounted beneath channel 24 but spaced above the level of roller 30 is a suction cup 38 to which a source of vacuum is adapted to be conducted.

A peeler mechanism shown generally at 34 is adjustably attached to channel 24 by bolts 36 extending through slots 28 and is adapted to engage the edge of the topmost blank in the stack. Peeler mechanism 34 comprises a bracket structure 40 on which a power cylinder 42 is pivoted about a horizontal axis as at 44. A spring 46 extending between bracket structure 40 and a bracket 48 mounted on the head end of cylinder 42 biases cylinder 42 in a clockwise direction as viewed in FIG. 2. The action of spring 46 urges the head end of cylinder 42 against a bumper 50 affixed to the end of a stop bracket 52 which extends upwardly from bracket 40. Cylinder 42 comprises a piston rod 54 adapted to reciprocate within the cylinder in response to the introduction of pressure fluid into opposite ends of the cylinder. A blade retainer 56 is attached to the external end of rod 54. Retainer 56 is prevented from rotating about the axis of the cylinder by a guide 58 (FIG. 5). A blade 60 having a saw-tooth edge is inserted within a slot in blade retainer 56 and is adapted to engage the edge of a sheet metal blank B as is shown in FIG. 2. Blade 60 is preferably formed from a strip of saw blade material.

The operation of the de-stacker is best described with reference to FIGS. 6 through 10. Head 12 is lowered on column 14 toward the top of a stack of blanks until roller 30 engages the topmost blank B. To ensure that roller 30 engages the top of the stack, limit switch 20 is so adjusted that it is actuated by engagement with the topmost blank shortly after roller 30 has contacted the top of the stack. Since the blanks in the stack are not all uniformly flat, the action of roller 30 slightly compresses the stack before the downward travel of the head ceases. Blade 60 is located so as to strike the edge of the topmost blank prior to the engagement of roller 30 with the top of the stack. As the head descends the teeth of blade 60 progressively ratchet downwardly over the edge of the blank. Thus, with the head positioned as shown in FIG. 7 cylinder 42 is pivoted away from bumper 50 by the ratcheting engagement of blade 60 with the top of the stack. The blanks are prevented from shifting horizontally by upright guides 62. The inclination of the blade and the size of the teeth are selected such that when descent of the head is arrested one of the teeth is in gripping engagement with the edge of only the top blank. The device operates very successfully when the toothed edge of blade 60 engages the top of the stack of blanks at an angle of about 60° to the plane of the top blank. In order to ensure engagement of the blade with the edge of only the top blank the spacing of the teeth should not be substantially greater than the thickness of the metal blanks. It will be appreciated that blade 60 is mounted on retainer 56 with the teeth inclined upwardly to provide the necessary blank gripping and retention action.

Next, piston rod 54 is retracted by admitting pressure fluid to the lower end of cylinder 42. This causes the saw-tooth edge of blade 60 to be moved upwardly in an arcuate path relative to the plane of the top blank so that the tooth engaged with the edge of the top blank causes the top blank to peel upwardly from the stack and assume an arcuate contour. Continued retraction of rod 54 causes the top blank to be flexed upwardly throughout a major portion of its extent away from the stack regardless of the presence of any oil on the blanks. This peeling action is facilitated by the fact that roller 30 bears down on the blank adjacent the edge portion thereof and blade 60 engages the blank at the diametrically opposite edge thereof. As the center portion of the blank is urged against suction cup 38, vacuum is applied to cup 38 to grip the blank to the head (FIG. 8).

After the blank is gripped to the head by cup 38 and blade 60, head 12 is elevated on column 14 and rotated horizontally about the axis of the column to carry the gripped blank to a position overlying a conveyor belt C by means of which the blank can be transported to a work station for subsequent processing as shown in FIGS. 9 and 10. In order to deposit the blank on conveyor belt C, rod 54 is extended and suction cup 38 is opened to atmospheric pressure. Once the blank has been dropped on conveyor belt C head 12 may be returned to pick up the next blank from the stack.

While the prime mover and control system for the de-stacker have not been fully described, it will be appreciated that one skilled in the art can readily utilize any of several suitable arrangements for accomplishing the desired sequence of operation with conventional devices such as electric motors, limit switches, etc.

It will be appreciated that slots 26, 28 enable adjustment of roller 30 and mechanism 34 toward and away from the axial center of head 12. This enables the de-stacking device to accommodate blanks which differ widely in size.

I claim:

1. In a de-stacking device for removing the topmost blank from a stack of sheet metal blanks the combination comprising, a vertically movable head, means for raising and lowering the head over the stack of blanks, abutment means on said head interengageable with the topmost blank when the head is lowered, means for stopping descent of the head in response to interengagement of said abutment means with the topmost blank, a blade on said head extending in a generally vertical plane and having a saw-tooth lower edge, said edge extending at an acute angle relative to the plane of the blank in a direction upward and inward of an edge portion of the blank, said blade being spaced laterally from said abutment means so that said edge engages said edge portion of the topmost blank when said abutment means interengages the top face of the topmost blank at a point remote from said edge portion, means for movably mounting said blade on said head comprising pivot means on said head for pivoting said blade about a generally horizontal axis and guide means on said head for guiding said blade for bodily movement relative to said head in said upward and inward direction, means biasing said blade about its pivotal axis such that said edge is urged downwardly and inwardly of said edge portion of the blank whereby, when said head is lowered to interengage said abutment means with the topmost blank, said teeth ratchet downwardly over said edge portion as the abutment means descends into interengagement with the topmost blank, and actuating means for bodily moving said blade along said guide means relative to said head in said upward and inward direction while said abutment means is interengaged with the topmost blank whereby said blade moves in an arcuate path so that the tooth engaged with said edge portion of the blank flexes the blank upwardly about said abutment means thereby peeling the blank from the stack.

2. The combination called for in claim 1 including blank gripping means on said head, said actuating means being arranged to flex said topmost blank into engagement with said gripping means, said gripping means being arranged to retain said blank for movement with said head.

3. The combination called for in claim 1 wherein said guide means is pivoted on said pivot means to thereby pivotally mount said blade on said head.

4. The combination called for in claim 3 wherein said guide means guides said blade for rectilinear movement lengthwise thereof.

5. In a de-stacking device for removing the topmost blank from a stack of sheet metal blanks the combination comprising, a vertically movable head, means for raising and lowering the head over the stack of blanks, abutment means on said head interengageable with the topmost blank when the head is lowered, means for stopping descent of the head in response to interengagement of said abutment means with the topmost blank, a blade on said head extending in a generally vertical plane and having a saw-tooth lower edge, said edge extending upwardly at an acute angle relative to the plane of the blank in a direction inwardly of an edge portion of the blank, said blade being disposed on said head so that said edge engages said edge portion of the topmost blank when said abutment means interengages the topmost blank, said blade being supported on said head for pivotal movement about a generally horizontal axis, means biasing said blade about its pivotal axis such that said edge is urged downwardly and inwardly of said edge portion of the blank whereby, when said head is lowered to interengage said abutment means with the topmost blank, said teeth ratchet downwardly over said edge portion as the abutment means descends into interengagement with the topmost blank, and means for shifting said blade bodily upwardly relative to said head while said abutment means is interengaged with the topmost blank whereby the tooth engaged with said edge portion of the blank flexes the blank upwardly about said abutment means, said means for shifting said blade comprising a power cylinder having a reciprocating piston, said piston being operatively connected with said blade, said cylinder being pivotally mounted on said head about said horizontal axis.

6. The combination called for in claim 5 including means forming a stop on said head, and abutment means pivotable with said blade and adapted to engage said stop, said biasing means being adapted to retain said abutment means in engagement with said stop during that portion of the descent of said head prior to the engagement of said blade with said stack.

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