DE-STACKING DEVICE FOR SHEET METAL BLANKS

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ABSTRACT OF THE DISCLOSURE

A de-stacking device for sheet metal blanks in the form of a vertically reciprocating head on which a lever is pivotally supported between its ends for rotation about a generally horizontal axis, the lever having suction cups at opposite ends and an intermediate stop member for engaging the topmost blank on a stack of sheet metal blanks for peeling the topmost blank from the stack.

This invention relates to a de-stacking device for sheet metal blanks and more particularly to a de-stacking device of the suction cup type.

De-stacking devices for sheet metal blanks are commonly used in connection with feed mechanisms for stamping presses. One of the problems encountered with such devices has to do with the tendency of a plurality of such blanks to stick together when lifted from a stack. This problem arises because normally such blanks have oil or other coating material on the faces thereof.

The object of the present invention is to provide a de-stacking device of the type described which eliminates the problem of picking up more than one blank at a time.

The present invention generally comprises a vertically reciprocal head on which a pair of lever-supported suction cups are mounted. A stop is affixed to the lever such that when the head is lowered toward the stack of blanks, if one of the suction cups is caused to engage and grip a portion of the topmost sheet metal blank and then, upon further descent of the head, the stop engages the blank and finally the other suction cup is brought into contact with the blank. The stop causes the lever to rock so that the cup gripping the blank flexes the gripped portion of the blank upwardly and thereby "peels" it from the next lower blank in the stack. As an added feature, the device of this invention also includes a generally upright lever having a serrated edge positioned to be engaged by the edges of the blanks as they are elevated by the head so that if two blanks are stuck together the lower blank will be caused to separate from the gripped blank as the edges of the two blanks move upwardly while engaged by the serrated edge of the lever.

Other objects and advantages of the present invention will become apparent from the accompanying drawings in which:

FIGURE 1 is a side elevational view of a de-stacking device constructed in accordance with the present invention.

FIGURE 2 is a fragmentary view partly in section showing the suction cup arrangement as the head descends to engage one of the suction cups with the topmost sheet metal blank in a stack.

FIGURE 3 is a view similar to FIGURE 2 and showing the head in a further lowered position for engaging the other suction cup with the topmost blank.

FIGURE 4 is a fragmentary view showing a modification of the invention utilizing an air nozzle for assisting separation of the blanks.

FIGURE 5 is a fragmentary sectional view showing the air nozzle illustrated in FIGURE 4.

FIGURE 6 is a fragmentary view showing the operation of the lever with the serrated edge.

Referring to the drawings, there is illustrated in FIGURE 1 a support 10 having a pair of upright columns 12 mounted thereon. A pair of vertically spaced guide rails 14 are supported at the upper ends of columns 12. Guide rails 14 support a carriage 16 which is adapted to be shifted lengthwise along rails 14 by a piston cylinder assembly 18. A second cylinder 20 is supported on carriage 16 with its axis extending vertically. The lower end of piston 22 within cylinder 20 supports a cross-head 24. Cross-head 24 is guided for vertical movement on carriage 16 by a pair of vertical guide rods 26 slidably arranged in guide bushings 28 mounted on a cross bar 30 fixedly attached to the lower end of cylinder 20.

On base 10 there is arranged a plurality of upright guide posts 32 for retaining a stack 34 of sheet metal blanks directly below cross-head 24. On the underside of cross-head 24 there is mounted a yoke 36 which pivotally supports a lever 38 as by a pin 40 (FIG. 2). There is mounted adjacent opposite ends of lever 38 a pair of suction cups 42, 44. It will be observed that suction cup 44 is located substantially closer to pivot pin 40 than is suction cup 42. Suction cups 42, 44 are interconnected by a fluid passageway 46 which extends to a port 48 at one end of lever 38 for connection with a vacuum conduit 50. Passageway 46 is restricted as at 51 where it connects with suction cups 42, 44, the bight portion of yoke 36 is formed with a stop surface 52 adapted to engage the top face of lever 38 when the lever is pivoted in a clockwise direction as viewed in FIG. 2. Lever 38 is biased to a position wherein the top face thereof is engaged by stop surface 52 by a spring 54. In this position of lever 38 suction cup 42 is disposed at a level lower than suction cup 44. When lever 38 is moved from this position suction cup 42 is lowered below the bottom of suction cup 44 and suction cup 42 there is additionally mounted on lever 38 a depending stop pin 56. Generally speaking, a stop pin 56 is adjusted so that with the lever in the position shown in FIG. 2, the extreme lower end of pin 56 is disposed below the bottom of suction cup 44 and slightly above the bottom of suction cup 42.

With the arrangement thus far described it will be observed that when cylinder 20 is actuated to extend the piston rod 22 downwardly, cross-head 24 descends. Eventually the cross-head will reach the position shown in FIG. 2 wherein the lower suction cup 42 engages the upper-most sheet metal blank 58 and grips the blank. At this point the lower end of stop pin 56 is either engaged with the topmost blank 58 or is about to engage the topmost blank. It is assumed, of course, that at this time a vacuum is applied to conduit 50. Further downward movement of head 24 causes lever 38 to rock in a counterclockwise direction since the engagement of stop pin 56 with the uppermost blank produces an upwardly directed force on lever 38, while pin 40 exerts a downward force on lever 38. Thus, since pin 56 is engaged with the uppermost blank and lever 38 is pivoted counterclockwise, suction cup 44 engages and grips the opposite portion of the uppermost blank. Thereafter the actuation of the cylinder 20 is reversed to elevate head 24 and to lift the uppermost blank 58 from the stack 34.

In the arrangement illustrated, base 10 also supports a frame 60 on which an endless belt conveyor 62 is arranged. When piston rod 22 is fully retracted cylinder 18 is actuated to shift carriage 16 to a position vertically above conveyor 62. When carriage 16 over conveyor 62 the vacuum in line 50 is discontinued and the elevated blank 58 is permitted to drop onto the conveyor 62.

With the suction cup and lever arrangement shown in FIGS. 2 and 3, the tendency for lifting more than one blank at a time is minimal; however, additional means
are provided for preventing more than one blank at a time from being transferred to conveyor 62. One of these means may be in the form of an air nozzle 64 supported as by a bracket structure 66 at the end of lever 38 adjacent suction cup 42. Nozzle 64 is preferably in the form of a closed-ended tube having a plurality of ports 68 therein which are oriented to direct pressurized air from conduit 69 toward the lower edge of nozzle 64 and thus against the edges of the blanks at the upper end of stack 34. This assists in the action of separating and peeling the topsheet 58 from the next lower blank.

A further means employed to assure transporting one blank at a time from stack 34 to conveyor 62 is illustrated in FIGS. 1 and 6. These additional means are in the form of a lever 70 pivotally supported as at 72 on a bracket 74 mounted on frame 60. Lever 70 is biased by a spring 76 in a counterclockwise direction as viewed in FIG. 6 to a position illustrated in FIG. 6 wherein the lower edge of the lever engages a stop surface 78 on the pivot bracket 80. The generally vertically extending edge 82 of lever 70 is serrated adjacent its upper end as at 84. Lever 70 is positioned such that when a blank is elevated by head 24 an edge portion of the blank is caused to scrape across the serrated portion 84 of the lever as it travels upward. Experience has shown that with this arrangement if two or more blanks are elevated at the same time, the blanks adhering to the topmost blanks gripped by such edge 82 will become detached and fall down on to the stack 34 as they traverse the serrated portion 84 of lever 70.

Although no controls are illustrated, it will be apparent to one skilled in this art that any conventional type of controls such as limit switches, solenoids, trip levers, etc., may be employed for controlling the operation of cylinders 18 and 20 as well as the application of vacuum to conduit 50 and pressurized air to conduit 69.

Likewise it will be appreciated that although suction cups are illustrated and their use is preferred, other forms of lifting members such as electromagnets, etc., may be employed if desired.

I claim: 1. In a device for lifting the topmost blank from a stack of sheet metal blanks the combination comprising a support, a vertically reciprocal head on said support, a lever fulcrumched on said head between its ends for pivotal movement about a generally horizontally extending axis, a pair of sheet metal lifting and gripping members mounted on said lever on opposite sides of said fulcrum, said lever being normally oriented so that one of said lift members is disposed at a distance adjacent to the other lift member, a stop on said lever positioned between said fulcrum and the lower lift member, said stop depending from said lever to a level generally below the bottom of the higher lift member and adapted to engage the topmost blank in the stack when the head is lowered to engage the lower lift member with said blank, whereby upon further downward movement of the head with said stop and lower lift member engaging the topmost blank, said stop causes said lever to pivot the lower lift member upwardly and thereby flex the portion of the blank gripped by the lower lift member upwardly as the lever rocks about said fulcrum to bring the other lift member into contact with said blank.

2. The combination called for in claim 1 wherein said lift members comprise suction cups connected to a source of vacuum.

3. The combination called for in claim 1 including means biasing said lever to said position wherein said one lift member is disposed at a level below the other.

4. The combination called for in claim 1 wherein said stop projects downwardly to a level slightly above the bottom of the lower lift member so that the lower lift member engages and grips the blank before the lever is caused to rock in response to the further downward movement of the head.

5. The combination called for in claim 1 including a means for directing a stream of air under pressure in a direction generally horizontal toward the bottom of the lower lift member to assist in separating the topmost blank from the next blank as the portion of the blank engaged by the lower lift member is flexed upwardly.

6. The combination called for in claim 5 wherein said last-mentioned means comprises an air nozzle mounted on said lever adjacent the end thereof closest said lower lift member.

7. The combination called for in claim 1 including means on said support positioned to engage the edge of a sheet metal blank lifted by said lift members when the head is elevated for dislodging one or more blanks that may be adhered to the uppermost blank.

8. The combination called for in claim 7 wherein said last-mentioned means comprises a lever having a generally vertically extending serrated edge lying in the path of travel of an edge portion of the blank lifted by said head.

9. The combination called for in claim 8 wherein said lever is spring biased such that said serrated edge is urged laterally inwardly toward the blanks being elevated by the head.

10. The combination called for in claim 1 wherein the lower lift member is spaced more remotely from said fulcrum than said upper lift member.

11. In a device for lifting the topmost blank from a stack of sheet metal blanks the combination comprising a support on which a plurality of blanks are adapted to be supported as a vertical stack, a pair of spaced sheet metal gripping and lifting members positioned above said support, a stop located between said members and generally in line therewith, said members and said stop being vertically movable toward and away from the stack of sheet metal blanks on the support, said members being adapted to grip the topmost blank when engaged therewith, means for lowering said members and stop into engagement with the topmost blanks so that one of the members is in work-gripping relation with the blank adjacent one edge portion thereof and the stop engages a portion of the blank spaced more remotely from said one edge portion than said one member, means for raising said one member while the stop remains in engagement with the topmost blank so that said one member flexes that portion of the blank between it and the stop upwardly to thereby peel said one edge portion upwardly away from the next lower blank in the stack and means for thereby raising the stop and the other member to therefrom by lifting the blank as a whole, said means for raising and lowering the members and the stop including a vertically reciprocable head and a lever journaled on the head for pivotal movement about a generally horizontally extending axis, said members and said stop being mounted on said lever, said members having lower ends adapted to engage the blank and said stop projecting downwardly beyond a line extending between the blank engaging lower ends of said members.

12. The combination called for in claim 11 including means biasing said lever so that it normally assumes a position inclined to the horizontal.

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