Dec. 30, 1930. P. KRUSE 1,787,077

APPARATUS FOR SEPARATING SHEETS

Filed July 22, 1927 2 Sheets-Sheet 1

Fig. 1.

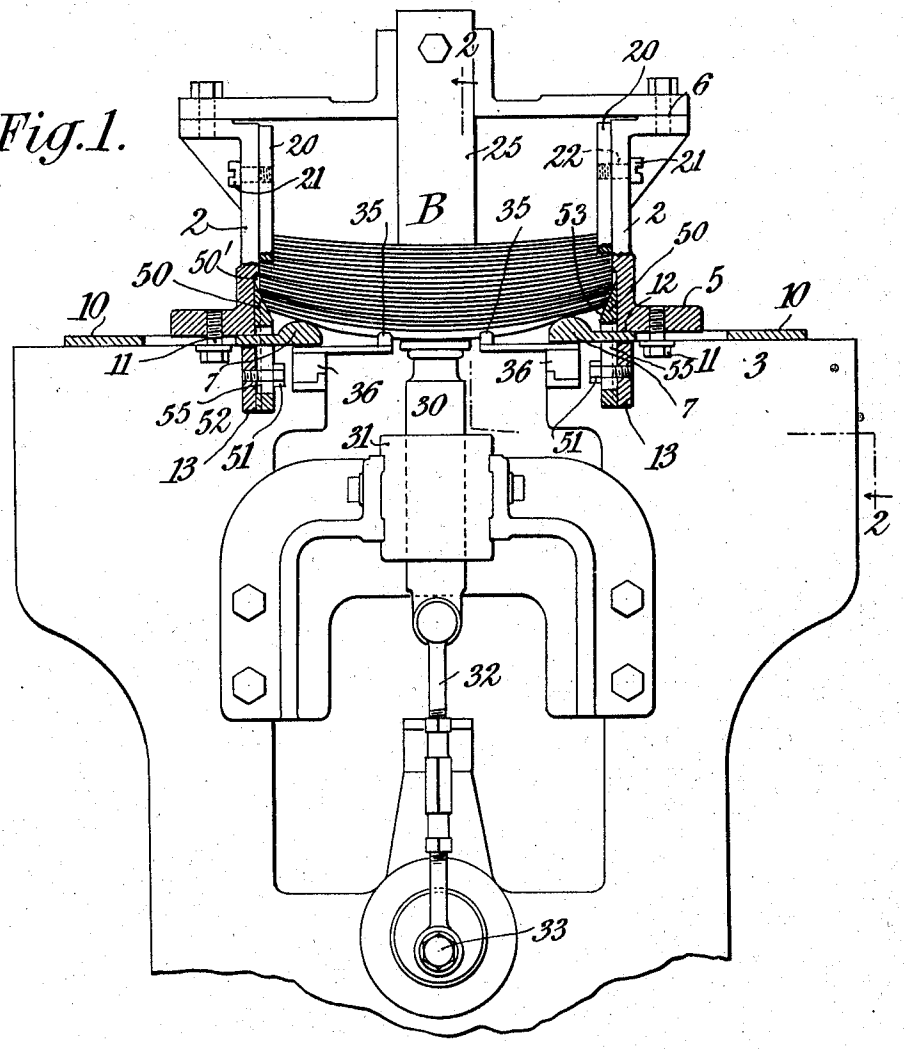
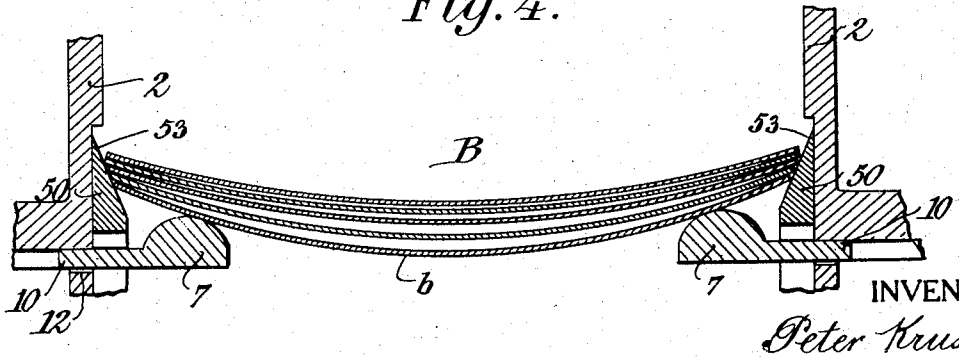


Fig. 4.



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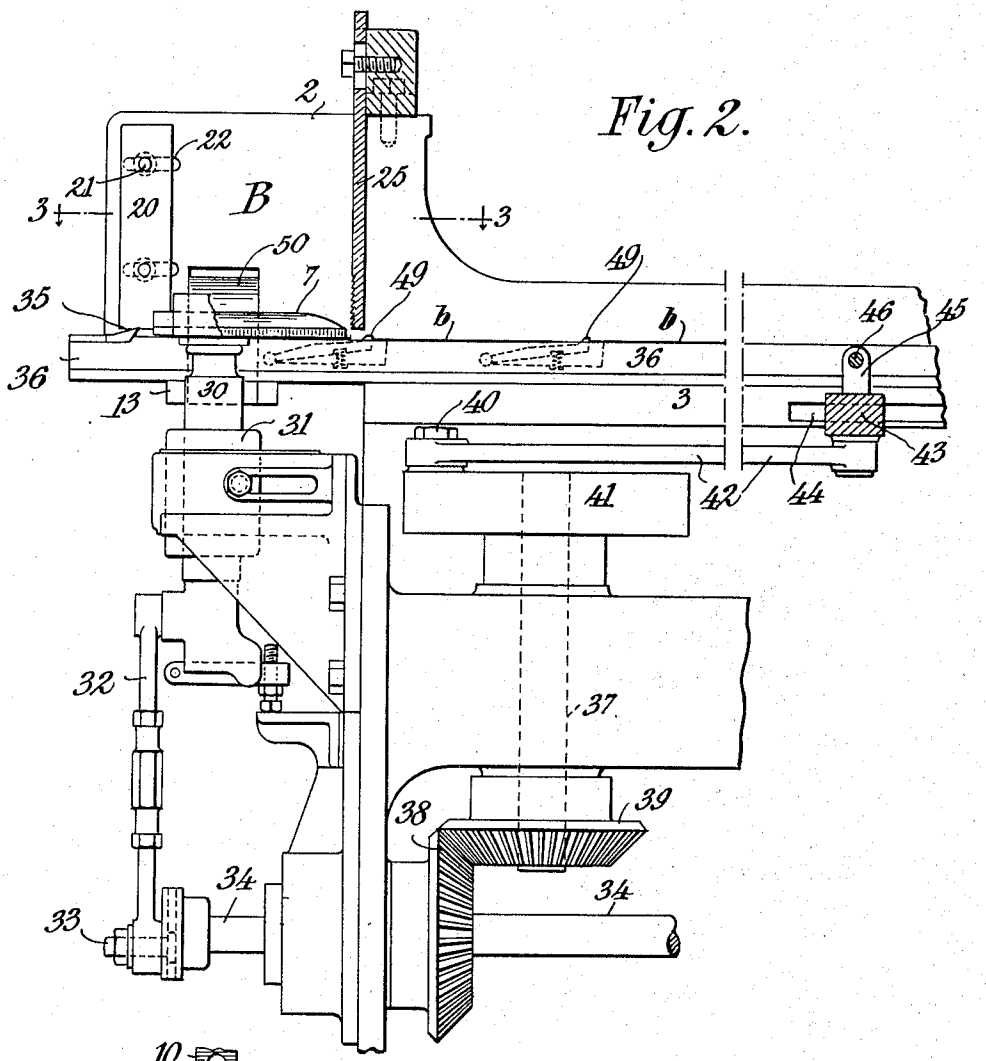


Fig. 2.

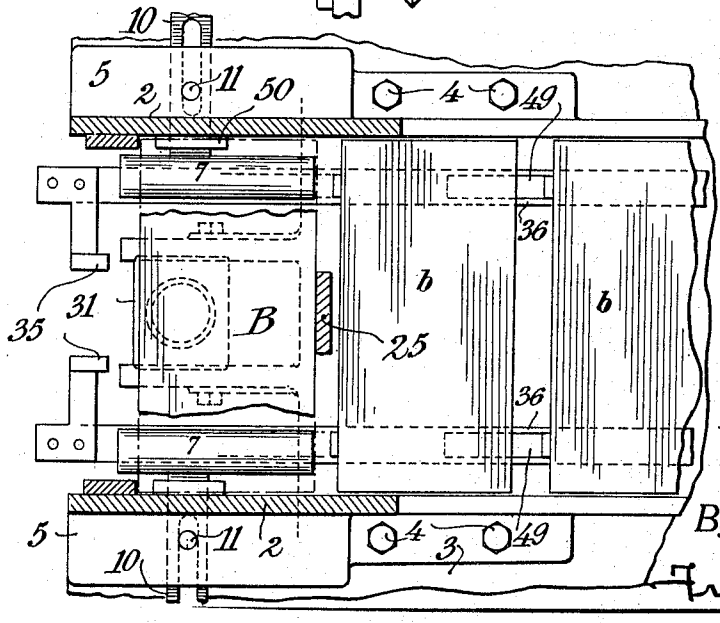


Fig. 3.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR SEPARATING SHEETS

Application filed July 22, 1927. Serial No. 207,594.

This invention relates to an improved apparatus for separating sheets which have been stacked together, whereby one or more of such sheets may be readily withdrawn from the stack by any suitable feeding mechanism.

The object of the present invention is to provide an improved retaining means for a stack of sheets whereby they will be caused to separate automatically.

The apparatus according to the present invention is applicable in a can body-making machine of the type disclosed in my prior Patent No. 1,081,050 granted December 9, 1913, and also to any type of machine in which fairly stiff sheets are stacked together and fed successively from such stack. The patent above referred to discloses the general relationship and nature of the several cooperating parts in a can body-making machine, which will be used by way of example to disclose one adaptation of the present invention. The device according to the present invention will be described in connection with the general disclosures of the said patent and also with reference to the accompanying drawings relating to the present invention, wherein:

Figure 1 is a front elevation partly in section of the sheet separating device, as applied to a can body-making machine;

Fig. 2 is a side elevation partly in section of the same device, the section being taken along the line 2—2 of Fig. 1.

Fig. 3 is a plan view partly in section of the device shown in Figs. 1 and 2, the section being taken along line 3—3 of Fig. 2.

Fig. 4 is an enlarged view of the sheet-separating magazine, as shown in Fig. 1.

Referring to the accompanying drawings, B represents a stack of metal sheets, can body blanks in the present instance, the sheets *b* being confined between side retaining wall members 2, 2. These members are of channel section, as shown in Fig. 1 and are secured in any suitable manner to the bed or platform 3 of the can body-making machine as by means of screws 4, (Fig. 3) which pass through the lower flanges 5 of the said members. If the machine is designed to accommodate blanks of various widths any suitable transverse adjustment may be provided for the side wall members as, for example, the construction illustrated in my prior patent hereinbefore referred to. The upper flanges 6 of the side wall members serve as a reinforcement and also provide a flat table-like surface which will not mar or deform the lower blanks of a stack which the operator may desire momentarily to rest upon them in loading the blanks into the feed device proper.

The stack of blanks B rest upon ledges 7 which lie parallel to the side walls 2 and are adjustably secured thereto in the following manner: The ledges 7 have transversely-extending arms 10 which are slotted to receive screws 11 for clamping the said arms against the under-surface of flanges 5. The ledge-supporting arms 10 pass freely through openings 12 cut in the depending walls 13 of members 2. By this construction, the ledges 7 are readily adjusted to move them towards or away from one another by simply loosening screws 11 and sliding the ledges to the desired position. The upper surfaces of the ledges are rounded, as shown in Fig. 1, to avoid engaging the lower blank of the stack with a sharp edge, regardless of how the blank may be inclined with respect to such ledge, as will hereinafter be more fully explained. The sheets *b* are retained between the side walls 2 and prevented from being displaced rearwardly, i. e., to the left in Fig. 2, by means of guide strips 20 which engage the rear corners of the blanks. These strips are adjustably fastened to the side walls by means of screws 21 which pass through slots 22 formed in the side walls 2. The blanks are similarly prevented from accidental forward displacement by means of guide strip 25 mounted forwardly between the side walls.

The sheets are drawn downwardly from the bottom of the stack by means of a sucker head 30, in accordance with well-known practice, the suction permitting of a secure grip on the bottom of the lower blank. The head 30 is mounted for free reciprocation within

a vertical guide 31 and is actuated by a connecting rod 32 which connects the head with the crank pin 33 on a longitudinal driving shaft 34.

The object of centrally engaging the blank and springing or bowing it downwardly between the ledges 7, as indicated in Fig. 1, is to accurately space the central portion of the lowest blank of the stack from the next blank above it, so that the feed fingers 35 carried by the reciprocating feed bars 36, may, upon a forward movement, positively engage the lowest blank without danger of engaging the blank above it. It is of great importance in modern high-speed can-making machines, for example, that double feeds be avoided as the feeding of two blanks at one time almost necessarily results in a stoppage of the machine with consequent loss of time and the possibility of damage to the apparatus. The reciprocating feed bars 36 are actuated by a crank movement at the upper end of a vertical shaft 37 which is connected to the shaft 34 through gears 38, 39. A crank pin 40 mounted upon the rotating head 41 at the upper end of shaft 37 is connected through connecting rod 42 to a cross-head 43 which slides freely along the cross-head guide 44. Projecting upwardly from cross-head 43 is a rigid bracket 45, through the upper end of which passes a transverse bar 46 which engages the two feed bars 36. By this construction the feed bars are reciprocated in a definite timed relationship with respect to the vertical reciprocation of the sucker device 30, the mechanical connections being such that the bottom sheet of the stack is drawn downwardly into the position indicated in Fig. 1 just prior to the advance of feed fingers 35. As is well understood in the art, the blank is relieved from the suction grip of head 30 just prior to it being advanced by feed fingers 35, by the action of a valve which is automatically controlled.

As illustrated in my prior patent hereinbefore referred to, the feed bars 36 carry a plurality of finger-like sheet-feeding elements 49, the function of which is to successively advance the sheets withdrawn from the stack B to successive positions of rest along the feed bars where the various operations of making a can-body are performed. The improvement, according to the present invention, is primarily concerned with a novel form of sheet-guiding or sheet-retaining means, whereby the sheets, particularly those toward the bottom of the stack of sheets, are automatically caused to separate one from another independently of the action of the sucker head 30 hereinbefore set forth. This is important for two reasons, one being that in the absence of such a separating device, if the two lower sheets of the stack have a tendency to cling together the sucker device will pull them both down into a position to be engaged by the feed fingers 35 and a double feed will occur. The second advantage is that the sucker head is to a considerable extent relieved of the burden of bending the lower sheet into position to be engaged by the feed fingers and its action is therefore rendered more positive. It has been found that when accurately-cut blanks are employed the convergent sheet-separating guides, according to the invention, will produce by their simple wedging action, a sufficient separation of the lower blank from the remainder of the stack to permit of its being individually engaged by feed fingers or the like without the use of any sort of sucker device, but because of the lack of uniformity in the blanks it is preferable that the two means for separating the sheets be used together. The automatic separation of the sheets, according to the present invention, is very simply accomplished in the following manner: Toward the lower part of the sheet-retaining space, wherein the blanks are stacked, special guide members 50 are provided, these members having inclined surfaces which are not parallel but converge downwardly. It will be clear that the blanks in being fed downwardly between converging guide surfaces such as these must bend or buckle in order to pass between them, and as the blanks advance the lowermost one will be the most buckled because it engages the converging guide surfaces at points which are closer together than the points at which the superimposed blanks are able to engage such surfaces. It will be understood that the usual vertical side walls 2 are spaced apart sufficiently to permit the stack of blanks to freely pass downward between such walls without buckling. As soon, however, as the blanks engage the convergent surfaces of these special guide members 50, according to the present invention, they are compelled to buckle, and the further downward the blanks move between such guide surfaces the greater will be the buckling. In actual practice it has been found that the lower blanks of a stack can be made to separate one from another by this progressive buckling action, the bottom blank being removed from the blank next above it by as much as one-quarter of an inch, and the successive blanks above this, which have been fed between the convergent guide surfaces, will be separated, although to a somewhat lesser extent. This progressive separation of the blanks is aided to a certain extent in the particular mechanism illustrated by the jarring action of the reciprocating sucker head which upon its upward movement somewhat agitates the lower blanks of the stack B.

The converging guides 50 may be formed in any suitable manner, the only important requirement being that they present surfaces which converge in such manner as to cause

the sheets or blanks which pass between them to buckle progressively more and more toward the delivery end of the stack. In the particular construction illustrated the guides 50 comprise plate-like elements, which are adjustably secured in a shallow guideway 50′ formed in the inner face of side wall members 2, by means of screws 51 which pass through vertical slots 52 in said elements and enter the depending walls 13 of the said side members 2. These elements are tapered toward their upper edge to provide the inclined surfaces or ramps 53 which the side edges of the blanks engage under the pressure of at least a part of the weight of the stack of blanks. The vertical adjustment provided for these guide elements permits of their being variously positioned to produce the desired buckling effect upon blanks of different sizes, and also to compensate for different transverse adjustments of the ledges 7 which in part support the weight of the stacked blanks. As will be readily understood, the stack of blanks being flexible to a certain degree, will not lie perfectly flat across the ledges which engage the stack toward the sides of the lower blank. The buckling of the blanks, due to their being supported not at the center but toward their edges, will, however, be substantially uniform throughout the lower part of the stack so that the blanks are not separated one from another due to such usual buckling action. As will be readily understood, the closer the ledges are brought together, the less buckling will occur due to the non-support of the central part of the stack, and conversely the greater the separation of the ledges, the greater will be the buckling of the blanks under their own weight. For this reason, different transverse adjustments of the ledges 7 require different adjustments in the height of the converging guide surfaces 53. The more the stack buckles under its own weight, due to the absence of central support, the higher surfaces 53 must be set in order to effectively engage the edges of the blanks to cause the extra-buckling action hereinbefore referred to, wherein the lowermost blank is caused to buckle more than the blank next above it, the second blank more than the third, etc. etc.

The special guide elements 50 above described have elongated central openings 55 through which the arms 10 which support the ledges 7 freely pass, the depth of such opening being sufficient to permit of the required vertical adjustment of the element 50 referred to above. It will be obvious that the special converging guides which produce the differential buckling effect of successive blanks at the bottom of the stack may take a wide variety of forms, the guide elements 50 being shown merely to illustrate one possible construction.

The operation of the sheet separating device, according to the present invention, has been set forth in detail in connection with the foregoing description of the mechanism itself. This operation may be briefly summarized as follows: The several parts which retain and guide the blanks into position above the feed bars 36 having been properly adjusted to the particular size of blank which is to be used, a stack of such blanks is placed between the side wall members 2 which transversely align the blanks in such stacks the fore and aft alignment of the blanks being maintained by vertical guide members 20, 25. The blanks, as they reach the inclined surfaces 53 of the convergent guides 50, are caused to buckle, the lower blank buckling more than the one above it because of its being advanced further between the converging surfaces 53. This differential bending or buckling causes the lower blank to separate from the one above it, so that the possibility of the reciprocating sucker head 30 drawing down more than one blank in front of the horizontal reciprocating feed fingers 35, is practically eliminated. In accordance with usual practice, the sucker head acts in timed relationship with the said feed fingers in such manner that the blank is released from the suction grip just prior to or coincident with the engagement of such fingers with the blank upon the forward movement of the feed bars, whereby the lower blank of the stack may be freely carried forward onto the working platform of the machine.

While only a single embodiment of my invention has been hereinbefore described and illustrated, it is to be understood that the invention is not limited thereto but may be otherwise variously modified and embodied without departing from the spirit thereof, as set forth in the following claims.

What I claim is:

1. A sheet-separating device, comprising convergent guides, the surfaces of which approach sufficiently to cause a plurality of the sheets of a stack which is fed between them to buckle, whereby the most advanced sheet will be centrally separated from the sheet next succeeding it, the convergence of said guides being insufficient to prevent the downward movement of the said stack, and stack-supporting means adapted to engage the exposed surface of said advanced sheet between the central portion and the edge thereof whereby the stack of sheets will be retained between the said guides, an adjusting means being provided between said convergent guides and said stack-supporting means, whereby the said supporting means can be adjusted to engage the stack only after the convergent guides have, by their wedging action, buckled the sheets to produce the required separation of such sheets.

2. A sheet-separating device, comprising convergent guides between which a stack of sheets is fed, the surfaces of said guides being separated at the receiving end to receive the said sheets without deforming them, and said surfaces approaching one another toward the delivery end sufficiently to cause the sheets which are fed between them to buckle, whereby the advanced sheet will be centrally separated from the next succeeding sheet by the progressive buckling action of said guides, the convergence of said guides being insufficient to prevent the downward movement of the said stack, transverse sheet-feeding means adapted to slide the advanced sheet transversely from the bottom of the stack, and stack-supporting ledges engaging the exposed surface of the advanced sheet at points between said sheet-feeding means and the edges of the sheet, whereby the sheets in the stack will be retained in definite relation to said convergent guides.

3. A sheet-separating device, comprising convergent surfaces between which sheets are stacked, the said surfaces approaching one another sufficiently at the delivery end of the stack to buckle the sheets at such end, the end sheet being thereby buckled more than the next succeeding sheet, stack supporting ledges, and transversely reciprocating feed means adapted to engage the said end sheet which is thus buckled away from the next succeeding sheet and to slide said end sheet sideways from between the stack and the said supporting ledges.

4. The sheet-separating device, according to claim 2, further characterized in that a suction head is provided to grip the exposed surface of the said end sheet, together with mechanical means to reciprocate said head, whereby to draw such sheet into a definite relationship with respect to said transverse feed means.

5. A sheet-separating device, comprising side guides having convergent surfaces, and between which sheets are vertically-stacked, ledge members to support a portion of the weight of the said stack, transverse sheet-feeding mechanism, and a vertically-reciprocating suction head, the said suction head centrally engaging the lower sheet of the stack and being disposed so as to bow said sheet downwardly between said ledge members and accurately position it for engagement by said transverse sheet-feeding mechanism, and said ledges being disposed with respect to the said convergent surfaces of the side guides so as to permit the wedging action of the guides to differentially buckle the lower sheets of the stack before the main weight of the stack is borne by said ledges.

6. A sheet-separating device, comprising side guides having convergent surfaces between which sheets are wedged and progressively fed, by the weight of the stack, and ledges disposed between said guide surfaces adapted to support that part of the weight of the stack which is not supported by the marginal engagement of the sheets with said convergent guide surfaces between which the said sheets are wedged.

In witness whereof, I have hereunto signed my name.

PETER KRUSE.