May 27, 1969 J. A. MEIER 3,446,500

ARTICLE FEEDING CONSTRUCTION

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FIG. 1

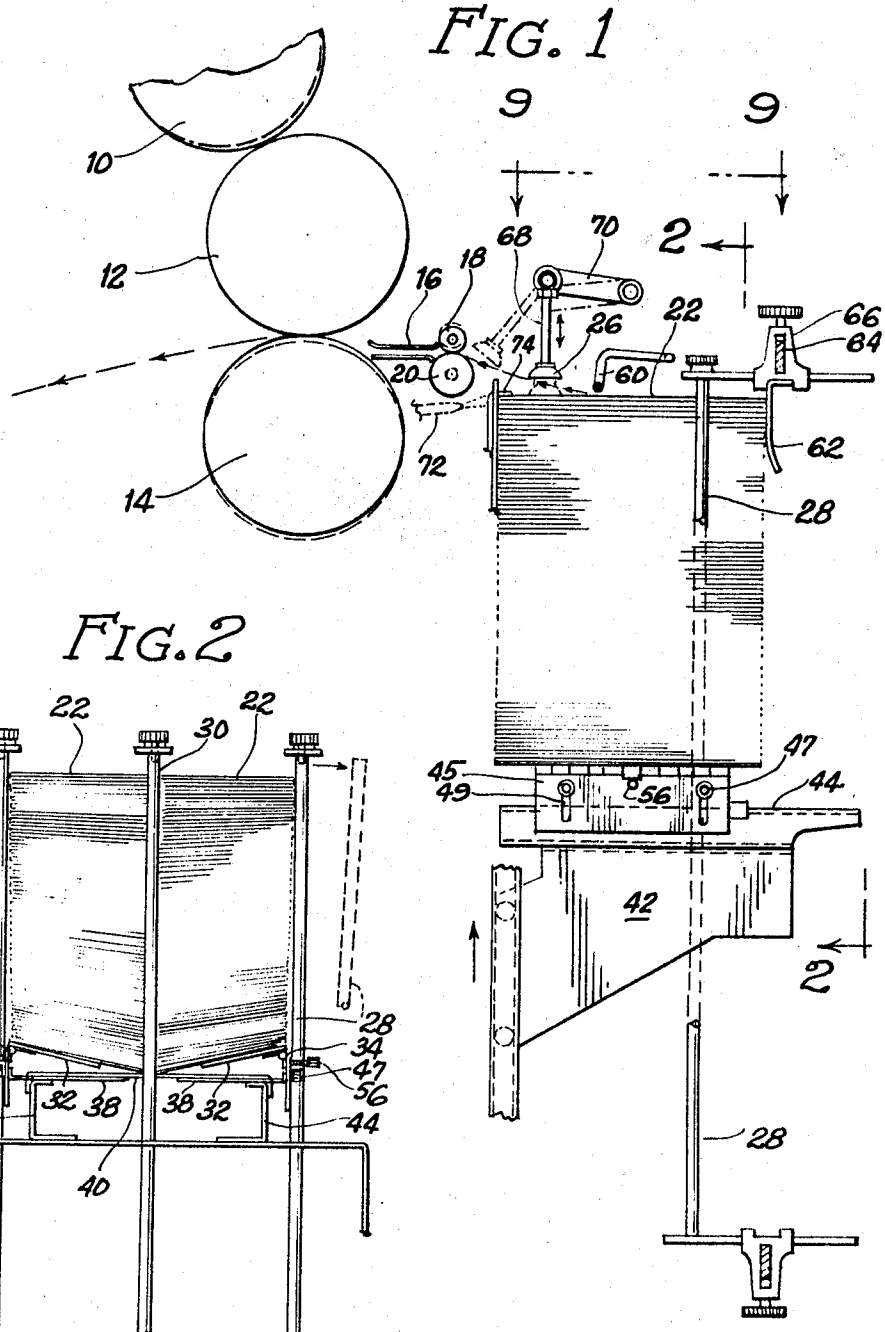
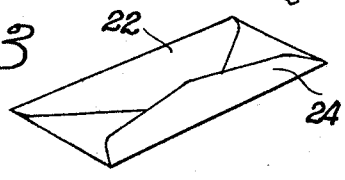


FIG. 2

FIG. 3



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FIG. 4

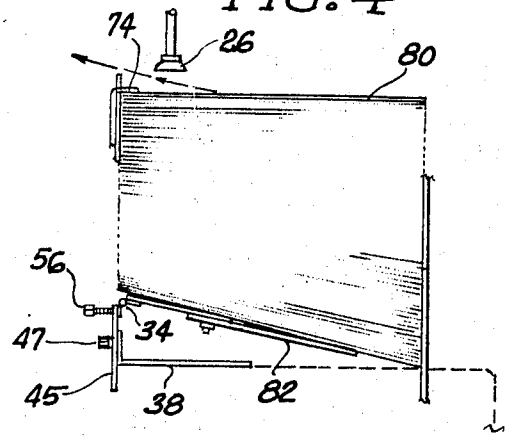


FIG. 5

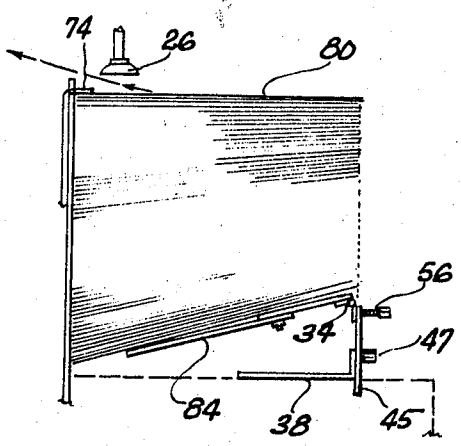


FIG. 6

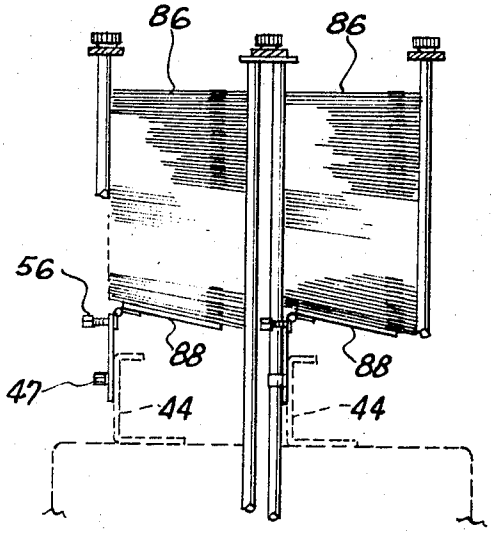


FIG. 7

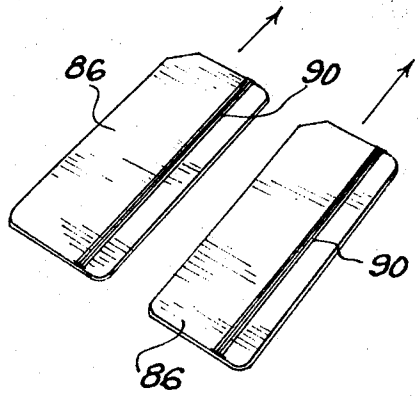
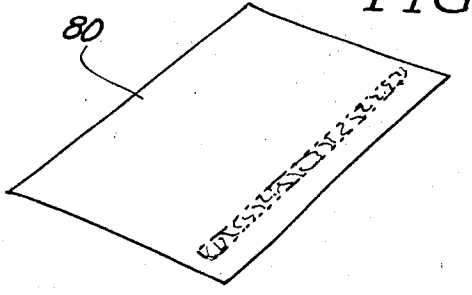


FIG. 8



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FIG. 9

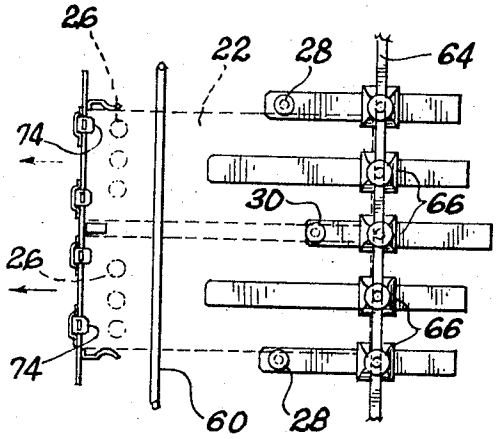


FIG. 10

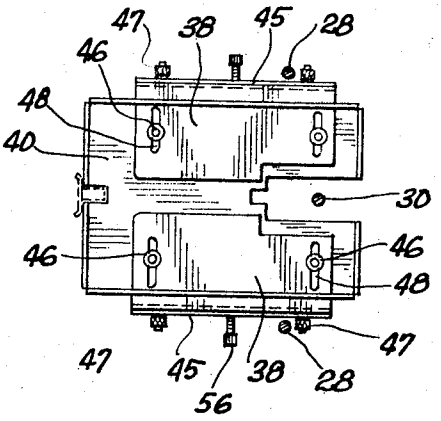
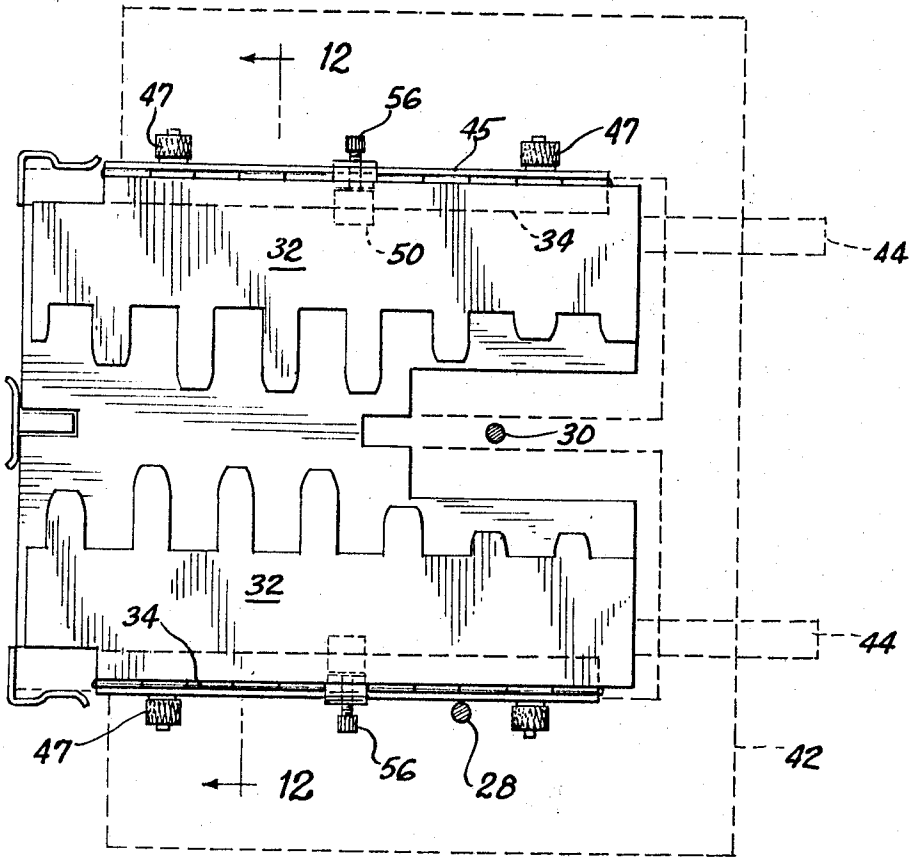


FIG. 11



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FIG. 12

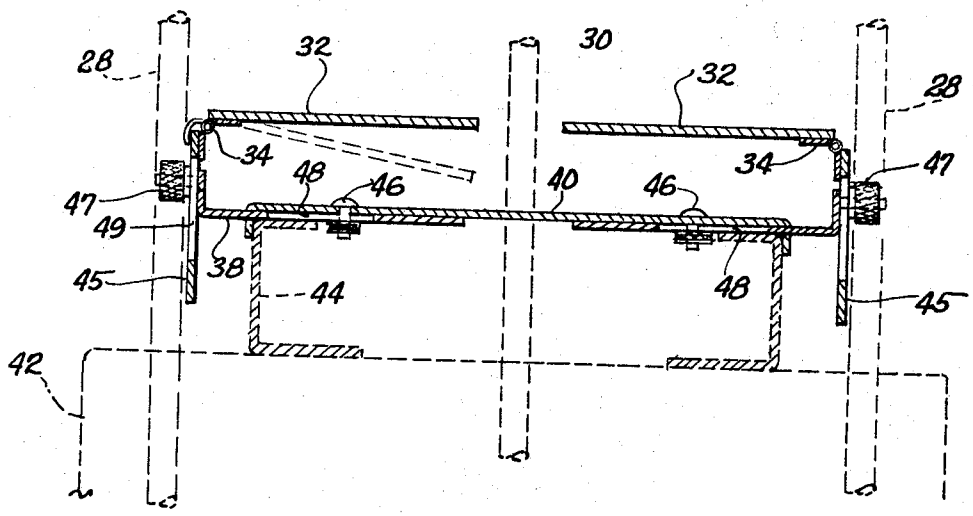


FIG. 13

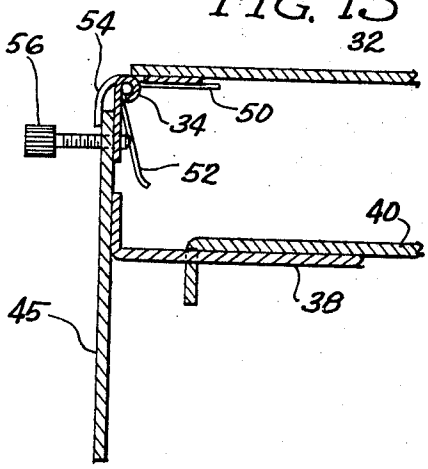


FIG. 14

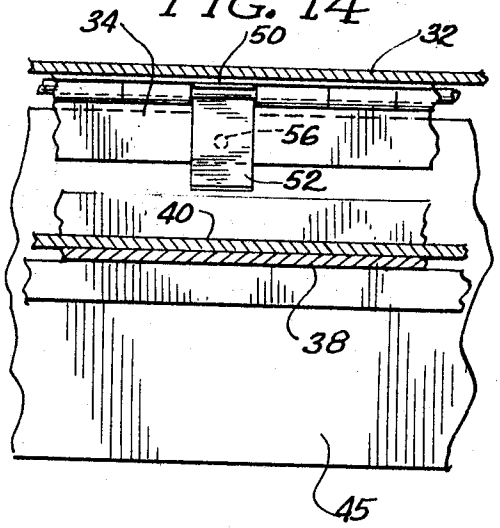
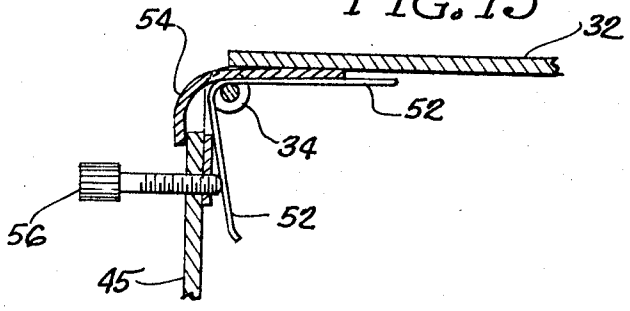


FIG. 15



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Patented May 27, 1969

3,446,500

ARTICLE FEEDING CONSTRUCTION

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Int. Cl. B65h 1/00
U.S. Cl. 271—62 7 Claims

ABSTRACT OF THE DISCLOSURE

A construction including a hopper for stacking a plurality of separate pieces, the pieces being characterized by a non-uniform thickness whereby a pile of the pieces supported on a flat surface will include pieces having a progressively greater angle with the horizontal from the bottom of the pile to the top of the pile. The hopper includes a bottom plate which will be depressed in response to the weight of the pile in the hopper and the amount of depression is such that the top piece in the pile will always be maintained in a substantially horizontal position to facilitate removal of the top piece from the pile for feeding purposes. Means are provided for adjusting the resiliency of the bottom plate so that pieces of differing characteristics can be accommodated in the construction.

This invention relates to a hopper construction for supporting articles so that the articles can be efficiently removed from the hopper for feeding purposes. The invention is particularly suitable for use in connection with duplicating equipment where articles must be fed into the equipment in a prescribed manner so that printing on the surface of the articles will be properly located.

In the operation of duplicating equipment, automatic means are generally employed for feeding blank pieces. In a typical operation, a stack of blank sheets are located in a hopper adjacent feed rolls. Suction cups or other devices are employed for lifting the top piece from the stack and for moving the piece into position for engagement with the feed rolls. Such operations take place at a high rate of speed, even in less sophisticated duplicating equipment.

Devices of the type described are entirely suitable where sheets of paper or other substantially flat pieces are being fed to the duplicating machine. Problems arise, however, when pieces of a non-uniform thickness are being handled. For example, in the case of envelopes, the area of the sealing flap comprises an area which is thicker than other areas of the envelope and when the envelopes are placed in a large pile, the difference in thickness provides a progressively greater change in the angular disposition of the envelopes when compared with the horizontal. Conventional feeding equipment cannot readily handle pieces which are so disposed. For this reason, spacers have been inserted at intervals in a stack of envelopes in an attempt to offset the non-uniform character of these pieces. This results in added labor and it is not an entirely satisfactory solution.

It is a general object of this invention to provide a hopper construction which is particularly suitable for use in conjunction with duplicating equipment.

It is a more specific object of this invention to provide a hopper construction of the type described which is adapted to handle pieces of non-uniform thickness whereby the pieces can be efficiently removed and fed to duplicating equipment or to other devices.

These and other objects of this invention will appear hereinafter and for purposes of illustration, but not of limitation, specific embodiments of the invention are shown in the accompanying drawings in which:

FIGURE 1 is an elevational view of a hopper construction characterized by the features of this invention;

FIGURE 2 is a side elevational view of the construction shown in FIGURE 1;

FIGURE 3 is a perspective view of a business envelope of the type advantageously handled by the construction of this invention;

FIGURES 4 and 5 comprise side elevations of two alternative forms of the invention;

FIGURE 6 is a front elevation of a further alternative form of the invention;

FIGURE 7 is a perspective view of data processing cards of a type advantageously handled by the construction of this invention;

FIGURE 8 is a perspective view of an embossed sheet of a type advantageously handled by the construction of this invention;

FIGURE 9 is a plan view taken about the line **9—9** of FIGURE 1 illustrating feeding and supporting mechanisms utilized in the construction of this invention;

FIGURE 10 is a plan view of one form of supporting plate means used in the hopper construction;

FIGURE 11 is an enlarged view of supporting plate means used in the hopper construction;

FIGURE 12 is a cross-sectional view taken about the line **12—12** of FIGURE 11;

FIGURE 13 is a detail, fragmentary view of the adjusting means utilized in association with the bottom plate;

FIGURE 14 is a detail, fragmentary view of the adjusting means shown in FIGURE 13; and

FIGURE 15 is an enlarged fragmentary view, particularly illustrating the hinge arrangement employed in conjunction with the adjusting means.

The apparatus of this invention generally comprises a hopper adapted to be situated adjacent a feeding mechanism so that pieces piled in the hopper can be individually removed for feeding purposes. In one application of the invention, the pieces may be fed to a duplicating machine so that printing can be formed thereon.

The hopper includes a bottom plate which provides support for the pile situated in the hopper. The bottom plate is normally maintained in a horizontal position; however, it is hinged along one side edge so that it can pivot downwardly in response to the weight of pieces maintained in the hopper. Where these pieces comprise envelopes or other articles of non-uniform thickness, the degree of depression of the plate can be regulated so that the top piece in the pile will be substantially horizontally disposed. This will greatly facilitate removal of the pieces by the feeding mechanism.

FIGURE 1 illustrates application of the instant invention to a duplicating construction. The construction comprises conventional duplicating cylinders **10**, **12** and **14**. Guide plates **16** are located adjacent feed rolls **18** and **20** whereby articles to be printed can be fed between the cylinders **12** and **14**.

In describing the operation of the structure shown in FIGURES 1 and 2, reference will be made to business envelopes **22** of the type shown in FIGURE 3. These envelopes include a sealing flap **24** representing a thicker area of the envelopes. When the envelopes are all aligned in the same manner and stacked vertically, the presence of these thicker areas will result in progressively changing angular disposition of the envelopes in the pile. Obviously, if these envelopes were stacked in a hopper with a flat bottom surface, the uppermost envelope would be positioned at a relatively great angle compared with the horizontal.

Disposition of the envelopes in this manner creates difficulties when the envelopes are to be picked up and then fed between the feed rollers **18** and **20**. A typical mechanism for effecting this feeding comprises suction

cups 26. A plurality of these suction cups are positioned above the envelopes 22 (see FIGURE 9), and it will be apparent that one or more of the suction cups could not engage the uppermost envelope if the envelope were disposed at an angle with respect to the horizontal.

In accordance with the instant invention, a hopper construction is provided which provides for horizontal disposition of the uppermost envelopes in the hopper. The arrangement illustrated comprises outer upstanding rod 28 and central rod 30 which divide the hopper into two sections. A pile of envelopes 22 is provided in each of these sections.

Bottom plates 32 support each pile of envelopes. Each of the plates 32 is attached by means of a hinge 34 so that the plates are adapted to be pivotally depressed when a pile of envelopes is placed in the hopper.

FIGURES 10 through 15 illustrate the manner in which the plates are secured in the hopper construction. Bottom sections 38 are attached to supporting plate 40 which is mounted on the table 42 by means of legs 44. As best shown in FIGURE 10, the bottom sections 38 are secured to the plate 40 by means of bolts 46. Slots 48 are defind by the sections 38 so that the positions of these sections can be adjusted relative to the plate 42. Adjustments can then be made to accommodate pieces of different sizes within the hopper.

Sheet members 45 are secured to bottom sections 38 by means of bolts 47. Slots 49 permit adjustment of the sheet members 45 relative to the bottom section 38. The hinges 34 are attached to the sheet members 45. These hinges permit the bottom plates 32 to swing downwardly as best shown in FIGURES 2 and 12.

A leaf spring is interposed in the area of these hinges whereby a first portion 50 of the leaf spring will engage the underside of each bottom plate while a second portion 52 of each leaf spring extends downwardly. The leaf springs must be compressed in order to assume a 90 degree configuration whereby in the normal condition of the construction, the springs will tend to force the bottom plates upwardly. A stop member 54 is formed as an integral part of the hinge 34 to prevent upward movement of the bottom plates beyond a horizontal position. This stop member 54 can be provided by bending an intermediate section of the hinge 34 so that this section engages the outside surface rather than an inside surface to which the remaining portions of the hinge are attached.

A set screw 56 is threaded through the wall of the construction so that the end of the set screw engages the portion 52 of the leaf spring. It will be apparent that rotation of the set screw will vary the amount of pressure exerted by the leaf spring against the bottom plate.

In the operation of the construction described, stacks of envelopes 22 are positioned between rods 28 and central rod 30. Each envelope is positioned so that the sealing flap 24 will be positioned adjacent the central rod whereby depression of the plates 32 will result in a substantially horizontal position for each of the uppermost envelopes 22. It will be apparent that the set screws 56 can be adjusted after the envelopes are in place to provide the desired position for the uppermost envelopes.

The hopper construction may be provided with various conventional elements including a wire member 60 extending across the top of each stack, and a backing plate 62 for confining the ends of the envelopes in the stacks. A transversely extending bar 64 is provided with adjustable brackets 66 which support the rods 28 and 30. With this arrangement, the envelopes can be aligned in a uniform manner within the hopper, and adjustments can be made to accommodate pieces of different sizes.

The suction cups which pick up the uppermost envelopes are mounted on arms 68, and these arms are in turn secured to a reciprocating mechanism including arms 70. This mechanism is of conventional design, and it provides for downward movement of the suction cups for picking up of the uppermost envelopes and then swinging movement during an upward stroke whereby the ends of the envelopes will be moved into the nip of the feed rolls. Gas jets form nozzles 72 which may be directed between the uppermost envelopes in the stacks to reduce the likelihood of more than one envelope being picked up by the suction cups. Fingers 74 which extend over the leading edges of the envelopes cooperate in this respect.

The table 42 which supports the hopper may be provided with a drive mechanism which gradually moves the table upwardly relative to the feeding mechanism. These drive mechanisms are conventionally tied in with the drive mechanisms for the suction cups whereby the removal of each piece in the stacks will provide for an upward increment of movement. Accordingly, the uppermost piece in each stack will always be in position for engagement by the suction cups.

The arrangement of this invention automatically compensates itself as envelopes are removed from the stacks. Thus, the weight of each stack is gradually reduced so that the opposition to the leaf spring will be gradually reduced Since the cumulative effect of the sealing flaps 24 is reduced at the same rate, the bottom plates 32 will gradually swing toward the horizontal to always maintain the uppermost envelope in a substantially horizontal plane.

FIGURES 4 and 5 illustrate alternative arrangements of the invention. In each case, the piece 80 forming the stack may comprise embossed sheets as shown in FIGURE 8. Such sheets will include areas of greater thickness resulting from the embossing, and the cumulative effect of these areas will result in a non-uniform stack. Where the embossing is compensated near the trailing edge of a sheet, the pivotally mounted bottom plate 82 is attached at the front of the hopper. The reverse condition is shown in FIGURE 5 wherein the plate 84 is pivotally attached at the rear of the hopper.

FIGURE 6 illustrates an arrangement wherein a pair of stacks formed of data processing cards 86 are disposed in adjacent hoppers. In these instances, the bottom plates 88 are attached at the sides of the respective hoppers. The data processing cards are characterized by a magnetic strip 90 which represents a thicker area. A mechanism embodying the concepts of this invention is ideally suited for handling cards of this type.

In comparing the arrangements of FIGURES 2 through 6, it will be appreciated that the structure of the instant invention can accommodate a wide variety of situations which require handling of pieces of non-uniform thickness. The bottom plates can be attached at various locations in the hopper structures without difficulty and without disrupting the operation of the construction.

A conventional feeding construction can be readily modified to incorporate the features of this invention. When considering FIGURE 12, for example, it will be appreciated that the provision of the pivotally mounted bottom plates can be accomplished through the mere attachment of the illustrated assembly to an existing construction. Once attached, a flat plate could merely be positioned over the bottom plates 32 when feeding sheets of uniform thickness. On the other hand, the assembly including the bottom plates 32 can be readily removed, particularly when shifting to an alternative form of the invention.

The provision of additional rods to divide the hopper into separate sections can be readily accomplished by attaching the rods as shown in FIGURE 9. Again, conventional equipment need not be modified to any significant extent in order to utilize the structures of the instant invention.

It will be understood that various changes and modifications may be made in the constructions described which provide the characteristics of this invention without departing from the spirit thereof particularly as defined in the following claims.

That which is claimed is:

1. In a construction of the type including a hopper for the stacking of a plurality of separate pieces one

on top of the other to form a pile, and having means for removing the top piece from said pile for feeding purposes, said pieces having a non-uniform thickness whereby stacking of the pieces on a flat surface produces a pile having the pieces thereon disposed at a progressively greater angle with the horizontal from bottom to top, the improvement wheren said hopper defines a pair of bottom plates so that side-by-side stacks can be provided for feeding purposes, means pivotally connecting one side edge of each plate whereby each plate is angularly depressed due to the weight of said pieces when said pieces are placed in the hopper, and resilient means associated with said plates for pressing on said plates in opposition to the weight of said pieces, said resilient means being characterized by an opposing force sufficient to offset the progressive change in angular disposition of the pieces whereby the top piece will be substantially horizontally disposed when removed from said pile, and including upstanding rods extending along the sides of said hopper for maintaining the pieces within the hopper, and including a central rod separating the adjacent stacks supported by the respective plates.

2. In a construction of the type including a hopper for the stacking of a plurality of separate pieces one on top of the other to form a pile, and having means for removing the top piece from said pile for feeding purposes, said pieces having a non-uniform thickness whereby stacking of the pieces on a flat surface produces a pile having the pieces thereon disposed at a progressively greater angle with the horizontal from bottom to top, the improvement wherein said hopper defines a bottom plate, means pivotally connecting one side edge of said plate whereby the plate is angularly depressed due to the weight of said pieces when said pieces are placed in the hopper, and resilient means associated with said plate for pressing on said plate in opposition to the weight of said pieces, said resilient means being characterized by an opposing force sufficient to offset the progressive change in angular disposition of the pieces whereby the top piece will be substantially horizontally disposed when removed from said pile, and wherein said resilient means comprises a leaf spring means having a first portion pressing against the underside of said plate and a second portion extending downwardly from said plate, and means for adjusting the pressure exerted by said spring comprising a set screw pressing against said second portion and adapted to move said second portion to thereby change the pressure exerted by said first portion.

3. In a construction of the type including a hopper for the stacking of a plurality of separate pieces one on top of the other to form a pile, and having means for removing the top piece from said pile for feeding purposes, said pieces having a non-uniform thickness whereby stacking of the pieces on a flat surface produces a pile having the pieces thereon disposed at a progressively greater angle with the horizontal from bottom to top, the improvement wherein said hopper defines a bottom plate, means pivotally connecting one side edge of said plate whereby the plate is angularly depressed due to the weight of said pieces when said pieces are placed in the hopper, spring means associated with said plate and pressing on said plate for normally forcing the plate to a substantially horizontal position when the hopper is empty and for holding the plate in an angular position in opposition to the weight of said pieces, said spring means being characterized by an opposing force sufficient to offset the progressive change in angular disposition of the pieces whereby the top piece will be substantially horizontally disposed when removed from said pile, and manually operable adjusting means connected to said spring means for adjusting the pressure exerted by said spring.

4. A construction in accordance with claim 3 wherein said pieces comprise envelopes with the sealing flap of each envolpe comprising an area which is thicker than the remainder of the envelope.

5. A construction in accordance with claim 3 wherein said pieces comprise data processing cards having a magnetic strip formed in one section thereof providing an area of greater thickness.

6. A construction in accordance with claim 3 wherein said pieces comprise sheets having embossed portions thereof comprising areas of greater thickness than remaining areas of the sheets.

7. A construction in accordance with claim 3 including stop means for preventing said plate from moving upwardly beyond a horizontal position.

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EDWARD A. SROKA, *Primary Examiner.*