Sept. 15, 1970 E. M. BINZONI 3,528,565

PRINTING PLATE STACKER

Filed Dec. 23, 1968 2 Sheets-Sheet 1

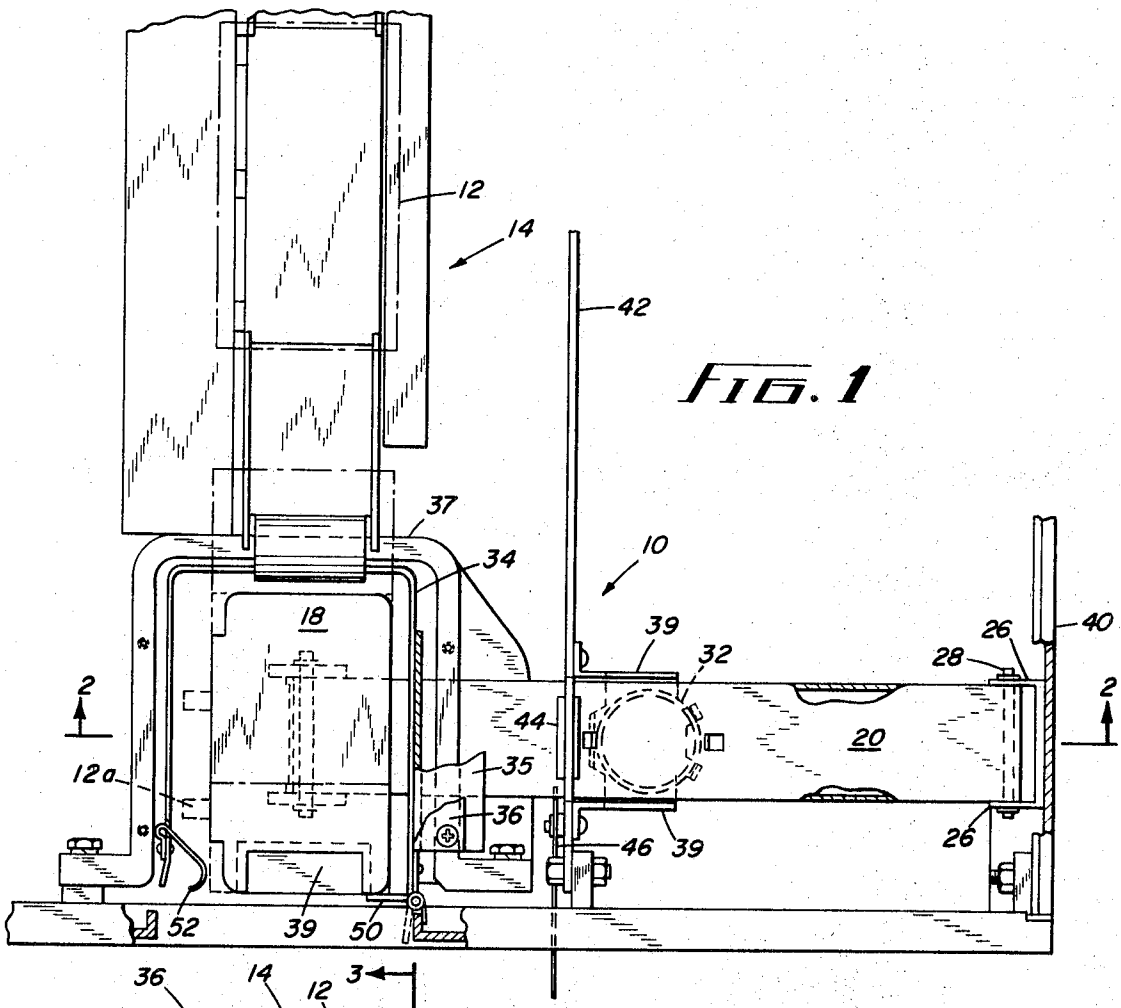


FIG. 1

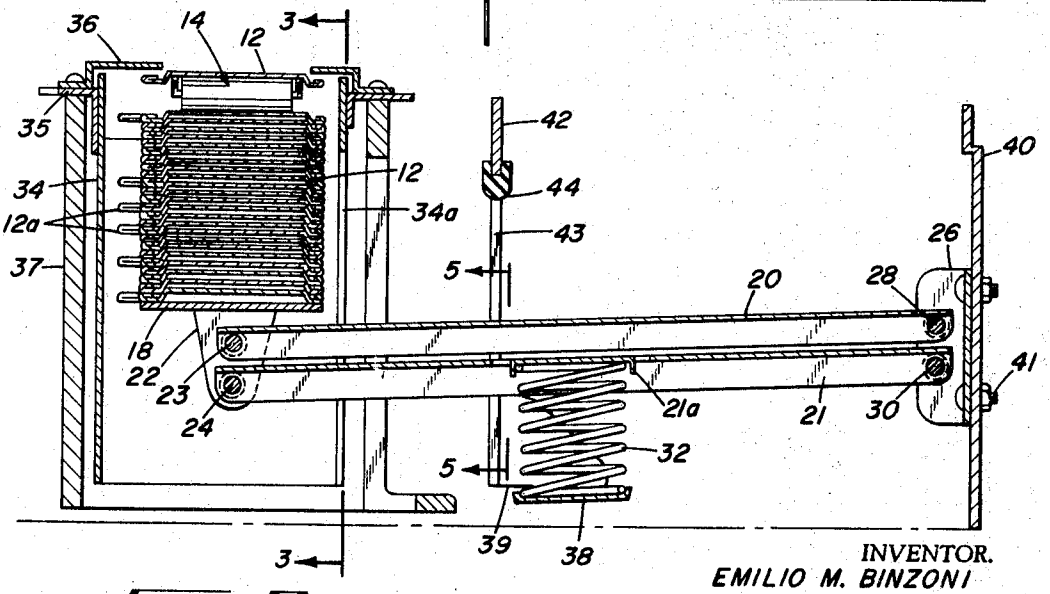


FIG. 2

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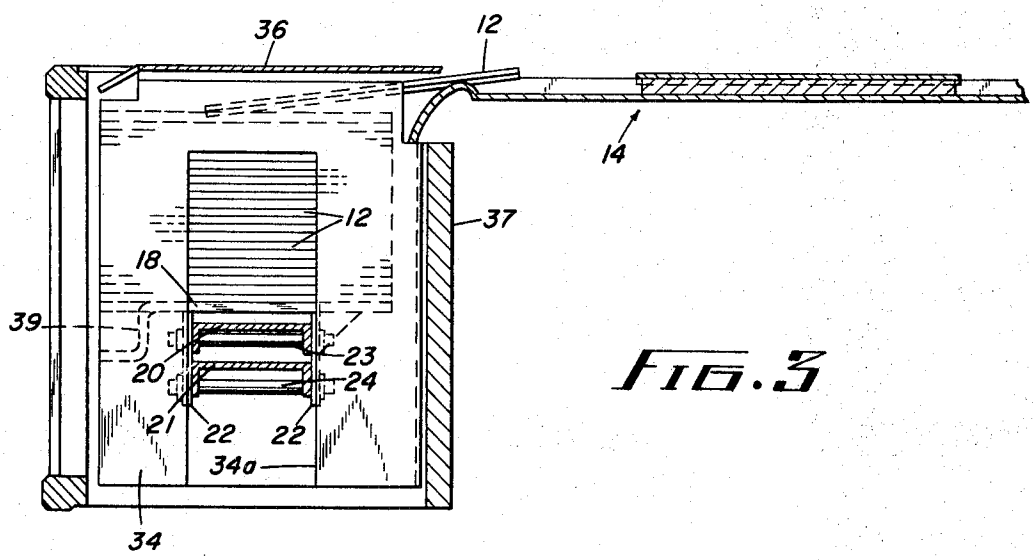


FIG. 3

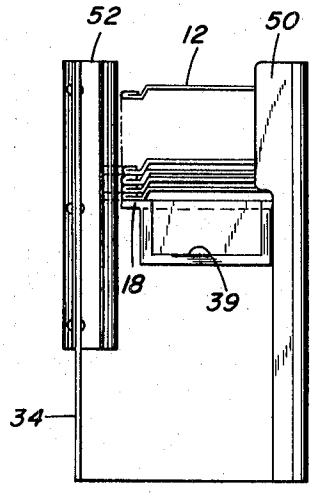


FIG. 4

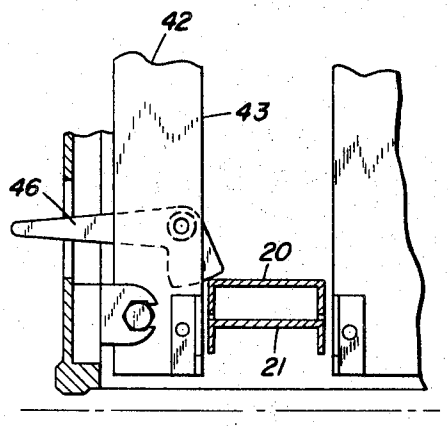


FIG. 5

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PRINTING PLATE STACKER

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Continuation-in-part of application Ser. No. 668,092, Sept. 15, 1967. This application Dec. 23, 1968, Ser. No. 786,349

Int. Cl. B65g 57/11

U.S. Cl. 214—6 3 Claims

ABSTRACT OF THE DISCLOSURE

The stacker apparatus includes a tray for supporting successively received plates in stacked relation. A pair of elongated parallel arms, pivotally connected at their one ends to the tray and at their other ends to a support, maintain the tray horizontally oriented during generally vertical movement within a housing. A spring positioned beneath the arms beyond the housing permits automatic, incremental downward movement of the tray as each plate is stacked thereon. The housing is apertured to accommodate entry of the plates in succession, extension of the arms therein, and withdrawal of plate stacks, and also includes means for guiding incoming plates onto the stack.

REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of my copending application entitled "Printing Plate Stacker," Ser. No. 668,092, filed Sept. 15, 1967, now abandoned.

BACKGROUND AND OBJECTS OF THE INVENTION

The invention is directed to apparatus for accepting plate-like elements in rapid succession and automatically orienting them for subsequent mass withdrawal in stacked relation. A specific, but not necessarily limited application of the invention is to automated address printing equipment wherein address plates are conveyed in series from an input stack of address plates to a printing station. The arrival of each address plate at the printing station is coordinate with the arrival of an envelope, and the address information embossed on the plate is printed on the envelope. From the printing station, the plates are conveyed in series to collection apparatus. Since the only practical way to handle large numbers of plates is in stacked form, the collection apparatus is invariably in the form of a stacker.

Modern printing equipment of this type operates at an extremely rapid rate and are largely unattended in series from an input stac kof address plates to a print- and the input stack of address plates, and for removal of the stacked plates from the output stacker. As a consequence, there is considerable emphasis placed on the reliability of the various components of the equipment, including the output stacker. In achieving high printing rates, the plates must be rapidly conveyed through the equipment, arriving at the output stacker with a relatively high velocity. Should a jam occur at the output stacker, the plates, the output stacker and/or the plate conveying apparatus may be damaged. The most common form of jam at the output stacker is when a previously received plate has been improperly handled such that it interferes with the arrival of the next plate. Thus, the output stacker must operate rapidly and reliably to initially accept each plate and relegate it to a position where it will not interfere with the acceptance of succeeding plates.

A second equally important requirement of the output stacker is that it must properly align each plate as it is being stacked. Misalignment of plates in the stack may

interfere with the relegation of the received plates to positions where they will not interfere with the acceptance of subsequent plates. In addition, plate misalignment in the stack may interfere with withdrawal of the plate stacks from the output stacker, storage of the plates, and later acceptance of the stacked plates at the input of the equipment.

The problem of stack alignment is further complicated by the fact that in recent years address plates, for example, have been adapted with coding tabs. The presence and location of these coding tabs are rapidly sensed by sensing apparatus in the printing equipment for determining which of the plates conveyed to the printing station are to be printed out. For example, tabs are selectively positioned along one edge of the address plates to signify the geographical location of the address embossed thereon. In a mass mailing operation, it may be desired to print out only those addresses going to a particular locality. Thus, those plates bearing addresses to other localities are conveyed to the output stacked without being printed out.

The presence of these coding tabs along the edges of the plates complicates the provisions for relegating and aligning the incoming plates on top of the plate stack.

Output plate stackers typically employ amovable platform or tray on which the plates are stacked. The tray is spring biased upwardly to the point where, in the absence of plates thereon, the upper surface of the tray is somewhat below the exit level of the conveying means bringing the plates to the stacker. As each plate is stacked on the tray, its weight acting against the spring, causes the tray to move downwardly by an increment at least equal to the plate thickness. It will be appreciated that if this does not occur, the top of the plate stack will ultimately interfere with the arrival of subsequent plates.

It is also important that the level differential between the stack and the exit of the conveyor means not be excessive, otherwise the incoming plates may be excessively titled during stacking, making stack alignment more difficult. It is thus apparent that the level of the plate stack in the output stacker not only must always be below the exit level of the conveyor, but it cannot be so much lower that the plates become improperly aligned on the stack as the result of excessive and uncontrolled fall from the exit of the conveyor. As a consequent, the spring controlling the incremental downward movement of the stack supporting tray must be of high quality with rather precise operating characteristics.

Heretofore, the spring has typically been located directly beneath the stack supporting tray. This location has not been altogether satisfactory since, due to the relatively light weight of each plate, it is difficult to obtain uniform incremental compression of the spring in response to the stacking of each plate. If the spring is the sole mounting element for the tray, its lateral flexibility allows the tray to bind against contiguous structure, thus inhibiting requisite spring response.

It has been proposed to support the tray on laterally extending pivotally mounted arms with a spring acting on the arms at a point spaced laterally from the tray. The leverage afforded by the arms serves to magnify the weight of each plate as it is stacked, and thus the spring need not be as sensitive as where it works directly against the bottom of the tray. The problem remains, however, to provide appropriate stack aligning means for insuring that each plate, as it assumes its position on the top of the stack, is in proper alignment with the other stacked plates.

It is accordingly an object of the present invention to provide apparatus for reliably stacking plate-like elements received in rapid succession.

Yet another object of the invention is to provide plate stacking apparatus capable of accepting plate-like elements in rapid succession, aligning them in stacked relation, and permitting withdrawal of stacked plates en masse.

A further object of the invention is to provide plate stacking apparatus reliably operating to rapidly relegate each received plate to an out-of-the-way position atop the plate stack such as to avoid interference with the next incoming plate.

An additional object of the invention is to provide plate stacking apparatus capable of aligning and stacking plate-like elements having a varying and irregular edge configuration.

Still another object is to provide stacking apparatus which is simplified in design and inexpensive to manufacture.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided stacking apparatus for plate-like elements. While in the disclosed embodiment the plate-like elements are address printing plates used in automated envelope addressing equipment, it is understood that the principals of the invention may be adapted to stacking plates of other types and shapes.

According to the invention, the plate-like elements are stacked on a tray supported on the ends of a pair of elongated, parallel arms. The other ends of the arm are pivotally mounted to a support. The tray is thus supported by the arms for vertical movement in a stack aligning housing while being maintained horizontally oriented. The tray is biased upwardly by a compression spring positioned beneath the arms beyond the housing. As each plate is stacked on the tray, its weight, magnified by the inherent leverage of the tray supporting arms, causes an incremental compression of the spring and a corresponding incremental downward movement of the tray by an amount at least equal to the plate thickness.

The housing serves to align the plates as they are relegated to the top of the plate stack, and yet is suitably apertured to accommodate entry of the plates in succession, extension of the tray supporting arms therein, and withdrawal of plate stacks. The stack withdrawal aperture is partially closed off by a flap which is spring biased into closure position, but readily swings open to accommodate withdrawal of plate stacks. The flap also serves as an abutment against which the plates strike pursuant to being stacked.

The housing is further adapted with a resilient guide operating in conjunction with the flap to force each plate, upon entry into the housing, to assume proper orientation on the plate stack. The guide performs this alignment function despite the presence of coding tabs attached to the plates. The resilient guide is readily deflected to permit plate stack withdrawal from the housing.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a plan view, partially broken away, of plate stacking apparatus constructed according to the invention.

FIG. 2 is a side elevational, sectional view taken along line **2**—**2** of FIG. 1;

FIG. 3 is a side elevational, sectional view taken along line **3**—**3** of FIG. 2;

FIG. 4 is a side elevational view of the portion of the stacking apparatus of FIG. 1 including the stack withdrawal aperture; and

FIG. 5 is a fragmentary side elevational, sectional view taken along line **5**—**5** of FIG. 2.

Similar reference numerals refer to corresponding parts through the several views of the drawings.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the plate stacking apparatus of the invention, generally indicated at **10** in FIG. 1, is adapted to stack a series of address plates **12** conveyed thereto in rapid succession by a suitable conveyor, generally indicated at **14**. It will be understood that the details and construction of the conveyor **14** form no part of the invention, except that the conveyor must establish a fixed exit level from which the plates **12** are successively delivered to the stacking apparatus **10**.

The plates **12** arriving at the stacking apparatus **10** are stacked on a platform or tray **18**, best seen in FIG. 2. The tray **18** is mounted by a pair of elongated channel-shaped arms **20** and **21**. A pair of laterally spaced brackets **22**, depending from the underside of tray **18**, mount a pair of vertically aligned pins **23** and **24** extending therebetween (FIG. 3). Pins **23** and **24** extend through the depending side portions of arms **20** and **21**, respectively, to pivotally connect the tray **18** to the left hand ends of the arms. Similarly, a pair of spaced brackets **26** (FIGS. 1 and 2) support the ends of a pair of vertically aligned pins **28** and **30**, which extend through the depending side portions of arms **20** and **21** to pivotally mount the right hand ends of the arms. Brackets **26** are secured to an upright support member **40** by suitable means such as bolts **41**.

It is seen that the arms **20** and **21** form a parallelogram linkage supporting the tray **18** for generally vertical movement while maintaining the tray horizontally oriented. Strictly speaking, the movement of the tray **18** is along a vertical arc whose radius corresponds to the length of the arms **20** and **21**.

Downward movement of the tray **18** is controlled by a compression spring **32** positioned beneath arm **21** at a location substantially mid-way between its ends. The lower end of spring **32** bears against a base plate **38** supported by brackets **39** depending from a fixed upright support member **42**. The upper end of spring **32** bears against the underside of arm **21**, biasing tray **18** upwardly to the point where arm **20** abuts a resilient stop **44** carried along the upper edge of an aperture **43** in support member **42**. The base plate **38** has upwardly turned edge portions while the upper surface of arm **21** has downwardly struck portions **21***a* serving to retain the ends of spring **32** in place.

In the absence of plates stacked on tray **18**, spring **32** is designed to bias the tray to its uppermost position as defined by abutment of upper arm **20** against resilient stop **44**. As each plate is stacked on tray **18**, its weight creates a moment about pivot pins **28** and **30** causing incremental compression of spring **32** and corresponding downward incremental movement of tray **18**. Each increment of downward movement of the tray is at least equal to the thickness of each plate, thus maintaining the level of the plate stack below the exit level of the conveyor **14**.

It is seen that the moment created by the weight of each plate produces a larger incremental compressive force on spring **32** than would be the case if spring **32** were disposed immediately beneath the tray **18**. As a consequence, spring **32**, as employed in the instant invention, may be less sensitive.

As seen in FIGS. 1 and 2, tray **18** moves vertically within a housing **34**. The housing is three sided, with one side open to permit manual withdrawal of a plate stack from the stacking apparatus **10**. One of the remaining three sides of housing **34** is formed having a vertically elongated aperture **34***a* accommodating the extension therethrough of arms **20** and **21**. As best seen in FIG. 2,

the housing **34** is supported by brackets **35** which are secured to a generally U-shaped frame member **37** together with a housing cover member **36**. The central portion of cover **36** is open to avoid contact with the embossed address print carried by the address plates **10**.

Referring now to FIG. 4, a flap **50** is pivotally mounted to housing **34** adjacent the open end thereof. Flap **50** is spring biased to a position, shown in solid lines in FIG. 1, partially closing off the open end of the housing. The upper portion of flap **50** is somewhat enlarged to serve as a resilient abutment against which the plates entering the housing strike pursuant to being stacked on tray **18**. Flap **50** is readily deflected to an open position, seen in phantom in FIG. 1, upon withdrawal of a stack of plates **12**. In this connection, stack withdrawal is also facilitated by the provision of a depression **39** formed in tray **18** for accommodating a finger of the operator in grasping the stack.

The resilient aspect of flap **50** is also significant from the standpoint that if the operator fails to promptly remove the plate stack when the tray reaches its bottommost position, the top plate on the stack can be pushed out the open end of the housing by the next incoming plate. Thus jam-ups and possible damage to apparatus and plates are avoided.

A resilient guide **52**, seen in FIGS. 1 and 4, is carried by the sidewall of housing **34** opposite from flap **50** for extension into the housing adjacent the open end thereof. Guide **52** is positioned such as to engage a corner portion of each plate **12** just prior to engagement with flap **50** upon entry into the housing **34**. This guide **52** serves to insure that each plate **12** is properly aligned as it is being stacked. It is to be noted that due to the dished configuration of the plates **12**, final alignment atop the stack is accomplished as each plate nests with its predecessor.

It will be appreciated that, since the movement of tray **18** within housing **34** is along an arc, the lateral sidewalls of the housing **34** cannot conveniently serve as stack aligning elements. This is due to the fact that the spacing between the housing sidewalls must be somewhat greater than the width of plates **12**, in order to accommodate this arcuate movement of the tray **18** as well as the plates stacked thereon. As a consequence, the guide **52**, acting as a part of the housing **34**, serves to insure that each plate, as it enters the housing, is initially sufficiently aligned to assume nested, stacked relation with the other plates on the tray **18**.

The significance of guide **52** is even greater when the plates **12** are adapted with coding tabs **12***a* extending from their left hand edge, as seen in FIG. 2. This necessitates an even greater lateral spacing between the housing sidewalls. Yet, guide **52**, working against the leading corner of each arriving plate **12** where there is no coding tab, insures the requisite alignment of each plate pursuant to being stacked.

Due to the resiliency of guide **52**, it is readily deflected along with flap **50** to permit withdrawal of plate stacks from the stacking apparatus **10**.

Referring to FIG. 5, a latch **46** is pivotally mounted to upright support member **42** adjacent the aperture **43** therein. During normal operation, latch **46** is pivoted to an out-of-the-way position beyond aperture **43** so as not to interfere with movement of the arms **20** and **21** therein. However, during transport of the apparatus to which the stacker **10** is adapted, it is preferable to immobilize arms **20**, **21** and tray **18**. The arms are depressed to their lower most positions, and the latch **46** pivoted to bring its tip into overlying relation with arm **20**, as seen in FIG. 5. If desired, latch **46** may also be employed to hold the tray **18** down during withdrawal of plate stacks.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described by invention, what I claim as new and desire to secure by Letters Patent is:

1. Stacking apparatus for receiving a series of plates and aligning them in stacked relation, said apparatus including in combination:

a plate receiving means including a box-like housing adapted to receive plates at one longitudinal end thereof and substantially open at the other longitudinal end thereof so as to allow the endwise withdrawal of plates that have been stacked in said housing;

a horizontally disposed plate tray supported within said housing;

means mounting said horizontal plate tray for vertical movement within said housing, said mounting means including a parallelogram linkage extending substantially horizontally perpendicular to the longitudinal axis of said housing whereby said plate tray is always disposed in substantially parallel horizontal planes during vertical movement thereof in said housing;

said linkage connected adjacent one end to said tray and adjacent its opposite end to a support, the linkage extending through an opening in a sidewall of said housing;

spring means located mediately of the ends of said linkage for upwardly biasing said tray towards a normal upper position in said housing;

plate deflecting means in said housing for deflecting each plate fed into said one end of said housing so that said deflected plates are displaced substantially horizontally in a direction substantially perpendicular to the longitudinal axis of said housing and are properly stacked and aligned in said housing;

yieldably mounted panel means disposed adjacent said other end of said housing for yieldably retaining the stacked plates in said housing until they are longitudinally withdrawn from said other end of said housing, and

said housing being larger widthwise than the width of the stacked articles to accommodate arcuate movement of said tray.

2. Apparatus as defined by claim **1**, additionally comprising means for releasably retaining said plate tray in a position remote from its said normal position.

3. Apparatus as defined by claim **1** wherein said plate deflecting means comprises a yieldable element disposed adjacent one lateral side of said housing.

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214—130; 271—88