July 29, 1969 V. C. DRAUGELIS ET AL 3,458,187

SHEET HOLDER

Filed Oct. 11, 1966 3 Sheets-Sheet 1

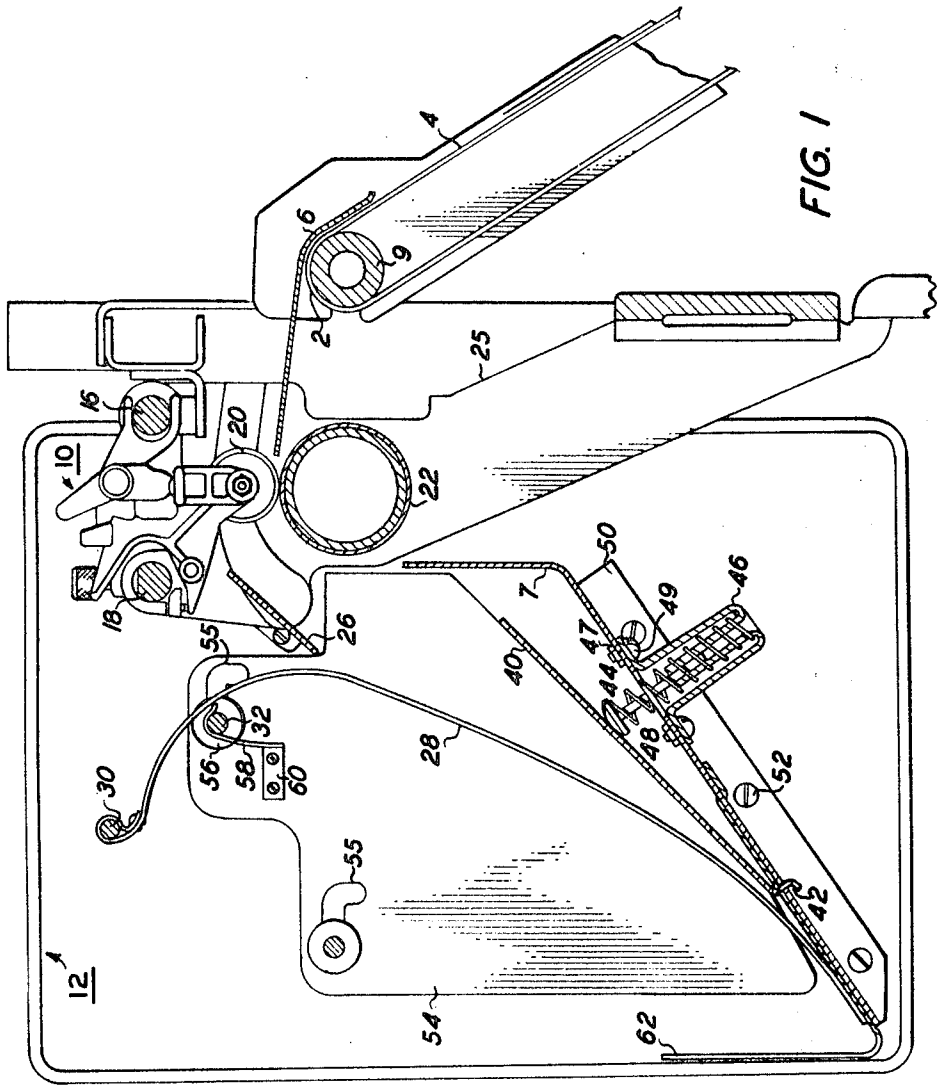


FIG. 1

INVENTORS
VAIDEVUTIS C. DRAUGELIS
THOMAS P. REDDING
BY Stanley B. Cole
B. A. Chiama
ATTORNEY

July 29, 1969 V. C. DRAUGELIS ET AL 3,458,187

SHEET HOLDER

Filed Oct. 11, 1966 3 Sheets-Sheet 2

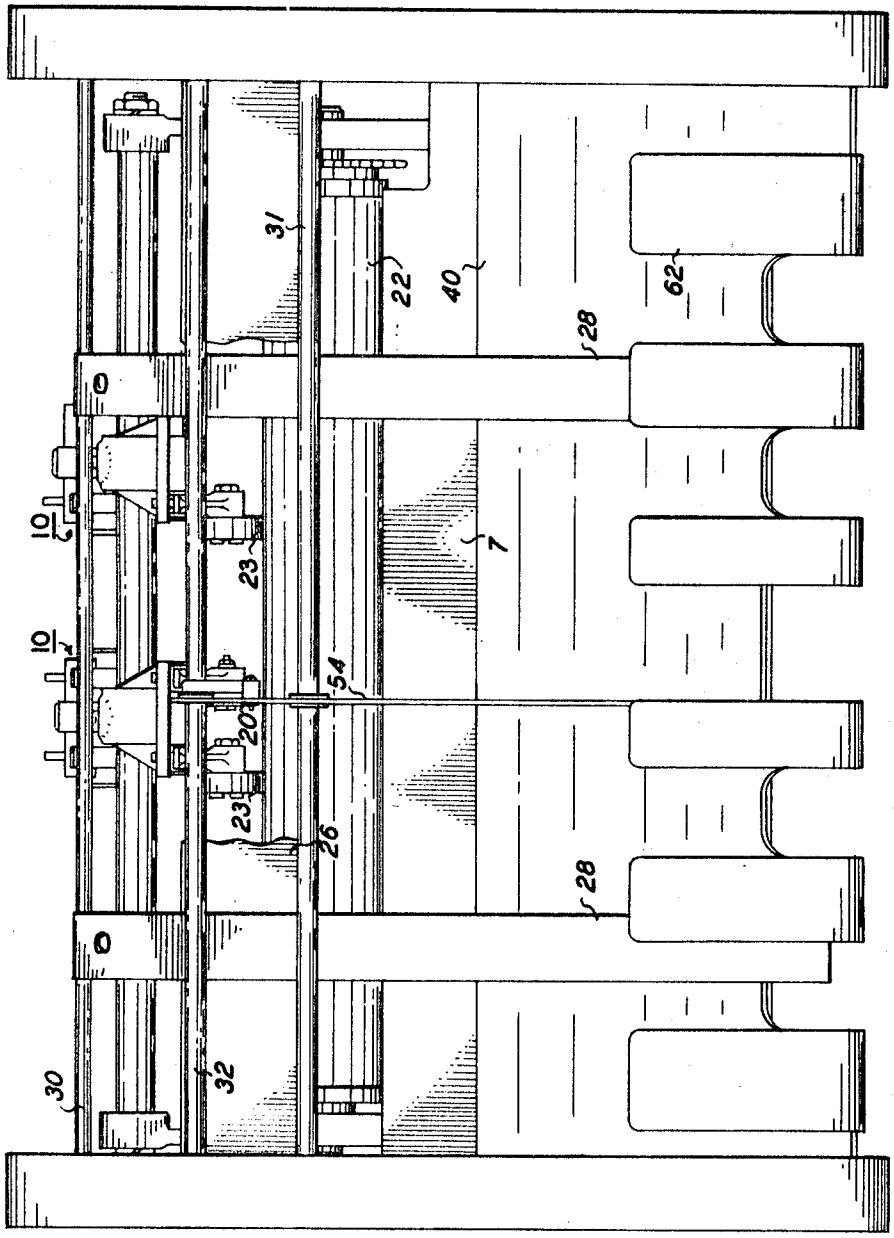


FIG. 2

INVENTORS
VAIDEVUTIS C. DRAUGELIS
THOMAS P. REDDING
BY Stanley Z. Cole
B. A. Chiama
ATTORNEY

July 29, 1969 V. C. DRAUGELIS ET AL 3,458,187

SHEET HOLDER

Filed Oct. 11, 1966 3 Sheets-Sheet 3

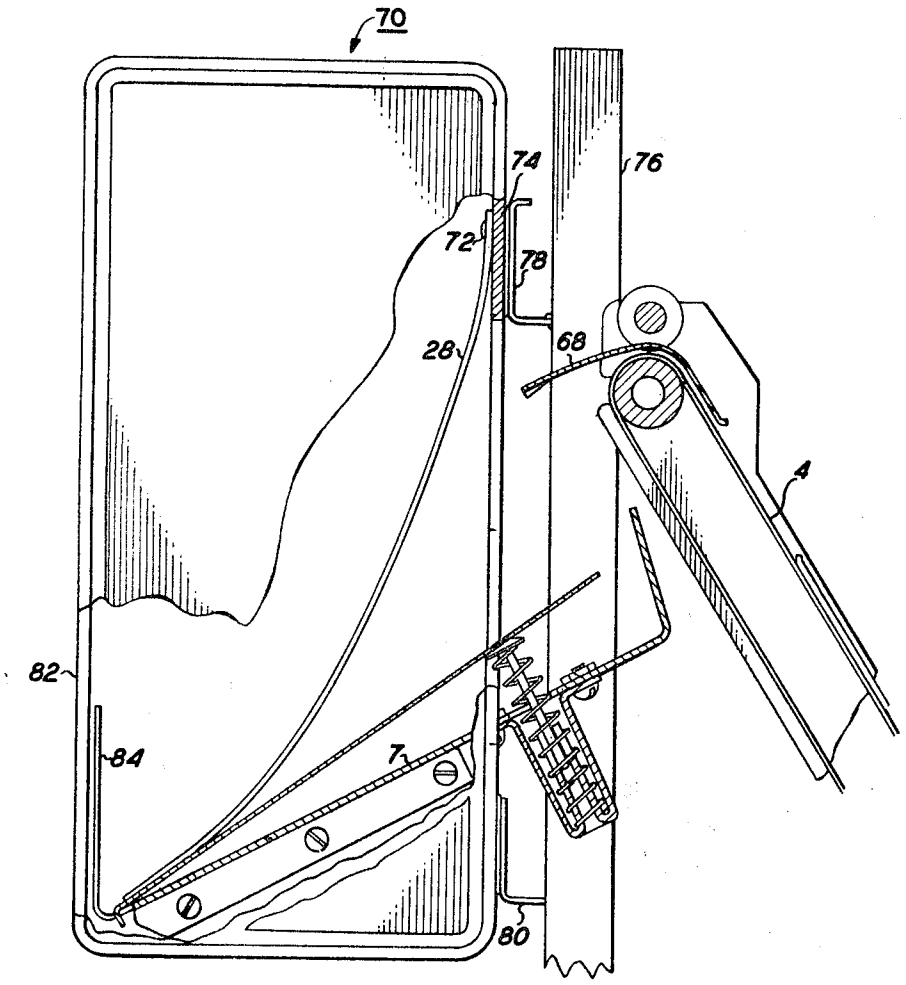


FIG. 3

INVENTORS
VAIDEVUTIS C. DRAUGELIS
THOMAS P. REDDING
BY
B. A. Chiama
ATTORNEY

United States Patent Office

3,458,187

Patented July 29, 1969

3,458,187

SHEET HOLDER

Vaidevutis C. Draugelis, Rochester, and Thomas P. Redding, Penfield, N.Y., assignors to Xerox Corporation, Rochester, N.Y., a corporation of New York

Filed Oct. 11, 1966, Ser. No. 585,887
Int. Cl. B65h *31/04, 31/12*
U.S. Cl. 271—88 10 Claims

ABSTRACT OF THE DISCLOSURE

A sheet retaining tray with a retractable spring held bottom shelf and at least one flexible strip to contact curlable sheets entering the tray in order to prevent their curling before they come to rest at the shelf or bottom of the stack and a front slotted wall for permitting easy removal of the stack from the tray. Also, the tray may have adjustable spacers spaced parallel with the flow of previously divided sheets into the tray in order to provide stacks for each of the divisions of the sheets entering the tray while preventing overlapping or curling by use in conjunction with the retractable shelf and flexible strips.

This invention relates to pack receivers and in particular to a catch tray adapted to receive sheet material seriatim fed at a rapid rate and to prevent curling thereof while properly aligning the sheets.

More specifically, this invention relates to a stack tray having a portion adapted to engage initial seriatim fed sheet material to prevent its curling or turning while placing it on a copy holder adapted to provide maximum stacking capabilities with minimum curling or buckling of the sheets rapidly fed thereto.

During the transport of sheet material, there is often a distance over which the sheet material must travel where it is not supported by any member. If this distance is more than a few inches, there is a tendency for the sheet to buckle or turn under or pivot. In machine feeding of sheets to a final depository, such as the copy catch tray of an office copier apparatus, this buckling causes a difficulty in stacking the final copy sheet material. If the sheets pivot or buckle or in some way exit misaligned from the transport section of the apparatus they will not stack properly in the catch tray, thereby causing a loss of efficiency in stack height in the catch tray as well as other problems. Buckling of the sheets being deposited in the copy catch tray will cause succeeding sheets to be misaligned and perhaps fed, not into, but over and out of the copy catch tray as the sheets slide over the previous buckled sheet. As speeds of machines and their paper output increase, the problem becomes all the more severe.

Further, as the storage capability of the catch tray is increased, the situation becomes a more and more difficult one since the initial sheets fed into the catch tray have a greater distance to travel in an unsupported manner before they finally come to rest. It is preferable to guide these sheets as they transcend from the transport section of the machine to their stacked position in the catch tray or at least shorten the distance they travel

without proper support to insure their alignment and prevent their buckling or curling.

It is therefore an object of this invention to improve the transport of sheets over a gap in their path of travel.

Another object of this invention is to prevent the buckling or curling of sheets as they are stacked.

Yet another object of this invention is to guide, as much as possible, sheets being stacked in a final depository.

A further object of this invention is to insure that sheets of paper will not buckle or invert when delivered to a depository stack.

Still another object of this invention is to improve sheet catch trays to prevent the misalignment of sheets being gathered therein. A further object is to shorten the distance the sheet must travel unsupported from a transport mechanism to a depository without decreasing the storage capability of the depository.

Another object of this invention is to prevent separate pieces of sheets fed simultaneously from interfering with each other as they are separately stacked.

These and other objects of the invention are attained by means of a flexible member guiding a sheet emerging from a transport mechanism and working in cooperative array with the bed portion of the copy stacking tray which is pivotally retractable from the transport mechanism as it gathers the sheets fed seriatim thereon.

For a better understanding of the invention as well as other objects and further features thereof reference is had to the following detailed description of the invention to be read in conjunction with the accompanying drawings wherein:

FIG. 1 is a right-hand side view partly in section of a copy catch tray with a sheet transport and slitter shown;

FIG. 2 is a front view of the copy catch tray of FIG. 1; and

FIG. 3 is a side elevation partly sectioned of another embodiment of a copy catch tray.

Referring now to the drawings, there is shown in FIG. 1 the last portion of a paper transport device of the type that would be found within the superstructure of an office copier machine as described in copending application Ser. No. 400,363 filed in the name of Robert Osborne on Sept. 30, 1964. The paper handling system is comprised primarily of endless belt transports which support and guide sheet material through the copier machine to an exit position **2** for deposit in the catch tray. The sheet material is held to the endless belt **4** by a vacuum drawn therebeneath and is removed from belt **4** by nullifying the vacuum as the sheet passes the roller **9**. As the belt continues to travel its predetermined path, the sheet leaves the belt and is guided by baffle **6** through the exit slot **2** to be gathered up as shown in FIG. 1 by a pinch roller and a slitter mechanism generally designated as **10**. Since the copy catch tray is adapted to maintain many sheets, its stack bottom **7** is a relatively large distance from the exit slot. The invention herein prevents the sheet exiting from slot **2** buckling or curling as it reaches the stack bottom of the copy catch tray.

Before entering the catch tray **12** for deposit and stacking, a sheet may be cut or perforated by a cutting mechanism **10**. A copy sheet is received from the conveyor **4** by the cutting mechanism **10** because of its path deter-

mined by guide 6. The cutting mechanism 10 is supported by tie rods 16 and 18 which also connect the side plates to form the rigid framework. Disposed below the tie rods 16 and 18, and in pressure contact with the cutting unit blade 20, when it is in its operative position, is a backing roller 22 which is rotatably supported in the side plate frames 21 of the Slitter Perforator assembly. The nip formed by the copy roller 22 and the cutter blade 20 serves to advance a sheet into the copy tray, generally designated 12, for aligning and stacking, also, a pinch roll 23 is attached to the cutter assembly 10 to insure feeding of a sheet transported thereto.

To advance the copy sheet a drive mechanism (not shown) causes the backing roller 22 journaled in cutter side plate 25 to rotate in a counterclockwise direction as viewed from FIG. 1. After a sheet is advanced past the backing roller and cutting blade it is forced into contact with the baffle 26 causing the paper to change direction and advance in a manner generally parallel to the position on the stack bottom 7 of tray 12. For a more detailed description of the slitter mechanism see the copending application Ser. No. 585,885, filed in the name of T. Redding on Oct. 11, 1965, now Patent No. 3,402,628.

The sheet material generally fed through an office copier machine is a paper stock. Paper is a material that is humidity or moisture sensitive and tends to curl depending upon the amount of moisture absorbed thereby. Bond paper of the type recommended for use in an office copier machine has a felt side and a wire side. It is recommended that the input stack be placed wire side up for better operation of the machine when selecting and feeding the sheet material through it to provide copy reproduction output of the original document selected for copying. As more moisture is added to the paper it tends to curl toward the felt side or downward as it would move through the machine and ultimately be stacked in the copy tray 12. As moisture is removed from the paper it would tend to curl toward its wire side or upward as it is passed through the machine and ultimately to the copy tray 12.

To insure that this curling will not interfere with the stacking and alignment of the paper fed into the copy tray, the copy tray is provided with one or more flexible strips of material 28 which may be of a plastic or Mylar material or any other material of comparable rigidity. The strip may be fastened or riveted to the rear portion of the copy tray 12 as in FIG. 3, above the paper path as it passes a baffle 26 to guide the sheet in a manner generally parallel to its final resting position. The strip 28 may be placed on one of the tie rods maintaining the side panels of the catch tray such as tie rod 30 and looped over tie rod 32 as shown in FIGS. 1 and 2, causing the strip or strips to exert a slight pressure contact with a sheet which may pass through the transport system and into the copy tray 12. If a thinner stack of sheet material is used, it would be advantageous to loop the strip 28 behind the tie rod 32 thereby exerting less force on the sheet passing into contact therewith.

The flexible strip or strips prevent the lead edge of the sheet from curling upward, toward its wire side, as more moisture is added and maintains the sheets in their final stacked position on the lower portion of the copy tray. If the paper when fed is for some reason curled downward as it emerges past baffle 26 it would normally tend to strike the bottom portion of the copy tray and turn over or in some manner fall misaligned with other sheets being fed thereto. However, the strips 26 prevent the sheet from turning back over front by exerting a force on the top of the sheet which counteracts its tendency to invert. Further, the reclining shelf 40, pivotally mounted on the bottom of the copy tray, contacts the sheets being fed through the system before the sheets have an opportunity to curl or buckle and therafter fall misaligned. The shelf 40 has the advantage of being retractable to permit the stacking of large numbers of sheets without the need to remove a stack while permitting contact with a feed sheet at a time before it can buckle, either by itself contacting the sheet or by the top sheet of the stack it helps to support.

The shelf 40 is pivoted at a point 42 through the stack bottom portion 7 of the copy tray 12. The shelf 40 is maintained in its biased upper position by a coil spring 44 held in a receptacle 46 mounted by nuts 47 and screws 49 below the stack bottom holder 7 of the copy tray. Passing through the center of the coil spring 44 is a plunger 48 upon whose head the pivotal bed 40 rests. The stack bottom 7 and the mounting 46 attached thereto are held within the copy tray 12 by two brackets mounted on the side frames of the copy tray. The one bracket shown is designated 50 and is suitably mounted to the side frame by screws 52.

When the slitter mechanism 10 is used to divide the sheets fed through the transport mechanism by the endless belt 4, spacers such as spacer 54 are mounted in the copy tray to prevent the pieces of sheet slit by the cutter mechanism 10 from overlapping as they are deposited in the copy tray and from otherwise falling misaligned. The spacers are mounted on tie rods 31 and 32 by suitable bushings such as 56. The spacers are prevented from moving laterally along the tie rods by a clamping spring 58 fastened to the spacer 54 by bracket 60.

At each of the bushings 56 there is a slot 55 formed in the spacer 54, said slots extending from the normal engaged position toward the cutter mechanism 10, thereby providing a means of moving the spacer 54 to maintain itself on the tie rods 31 and 32 in the lower segments of the slots 55. By pulling the spacer so that the tie rods 41 and 32 rest in the lower portions of the slot, the spring 58 becomes disengaged from tie rod 32 and the spacer may be moved laterally along the tie rods to a new position within the tray. The spacer 54 may then be pushed toward the cutter mechanism assembly 10 and the spring 58 engaged across the top of tie rod 32 thus stabilizing the spacer in a more advantageous position for maintaining a separation between pieces of a sheet fed through the cutter assembly. Therefore, as the cutter mechanism is moved to form variable size pieces from the sheet material fed therethrough the spacer may be independently moved to maintain its effectiveness with respect to the cutter mechanism. Of course, as many spacers as are necessary to provide separation of pieces of cut sheets may be provided in the catch tray. Those that are not in use may be moved to the extreme side portions of the catch tray where they will not interfere with the sheet material fed thereinto. The flexible strips 28 are placed in all of the positions between the spacers such that there is at least one flexible strip per divided piece of sheet exiting from the splitter mechanism.

In order to maintain a stack of sheets at the bottom of the copy tray, the stack bottom member 7 has attached thereto in its front portion on the side of the copy tray opposite the side through which sheets enter, a member 62 which can readily hold a stack of sheets from the bottom of the tray to the top of the fingers. The member 62 is formed as fingers rather than a solid piece to permit easy removal of sheets or the divided pieces of sheets from the copy tray when such is required or desired. The member is laterally movable in order to permit optimum spacing in relation to divided pieces of sheets by proving a portion of member 62 in contact with the corners of the pieces.

FIG. 3 is a less complex embodiment of a copy catch tray which does not incorporate a cutter mechanism such as that designated by the numeral 10 in FIG. 1 and 2. Here, the guide 68 which is responsible for taking a sheet from the transport conveyor belt 4 and associated pinch roller 5 into the copy catch tray 70 is somewhat longer and shaped to bring a sheet, not vertically to the cutter mechanism as in FIG. 1, but downward at some

angle from the horizontal approximately a path generally parallel to the stack bottom portion **7** of the copy catch tray. The flexible strip **28** used to guide the lead edge of the sheet moving through the copy tray may be positioned above the ingress point of a sheet being transported through the transport mechanism by a suitable means such as a screw **72** mounted on the rear portion **74** of the copy tray **70**. The tray in turn may be bracketed to a suitable frame **76** of an office copier machine by brackets **78** and **80**. The strip **28** extends beyond the front wall **82** of the catch tray and beyond the front portion **64** of the stack holder **7**. This prevents the lead edge from curling as it reaches its final resting place in the stack. This is important to insure that sheets falling on the stack thereafter will not be turned by the curl sheet in such a manner that they will fall up and over the retaining front portion **84** in FIG. 3 or a finger front portion **62** in FIGS. 1 and 2.

In operation, a sheet is transported by the endless belt **4** through the guide member **6**, cutter assembly **10**, and baffle **26**, or the guide member **68**, depending on the embodiment of the copy catch tray, and is forced against the flexible strip **28** which contacts the lead edge of the sheet and guides it generally toward the bottom portion **7** of the copy catch tray. This guidance occurs whether the sheet is being propelled by the motor operated mechanisms of the transport or slitter rollers or whether being moved by the force of gravity pulling it down into the copy tray. As the divided portions of the sheet exiting from the cutter mechanism **10** fall into the copy catch tray **1** they may tend to be fed in an overlapping manner due to irregularities in the backing roller **22** or the idler pinch rolls **23**. It is likely that the pieces will turn toward the cutter tool since they are held by idler rollers **23** and are more free to move at all other portions along their surface, causing a rotation about the point, or line of contact with the idler roller **23** and the backing roller **22**. The divided pieces, however, are prevented from overlapping each other by a suitable spacer such as **54** serving not only to prevent overlapping of individual pieces of the fed sheet but also to maintain reasonable alignment of each of the pieces within its own stack being formed on the stack bottom portion **7** and the shelf **40**.

As the sheets of material are fed to the copy catch tray they begin to form a stack on the lower portion **7** thereof and the pivotally movable shelf **40**. The flexible strip **28** will ride along the top or front edge of the topmost sheet in the stack. As the stack increases in size it increases in weight causing a greater force upon the pivotally movable shelf **40** and the spring **44** maintaining it in its biased position. As this occurs, the spring is forced down into the retainer **46** and the movable shelf **40** is lowered along with the stack resting thereon. This permits a greater portion of sheets to form the stack without overflowing or rising too high. It also permits the sheets to contact either the bed, if it is the first sheet, or the topmost sheet of the stack reasonably close to its exit position from the transport mechanism thus reducing the possibility of curl or flip since the sheet is brought to rest sooner than it would be without the shelf **40**.

While this invention has been described with reference to the structure disclosed herein, it is not confined to the details set forth; and this application is intended to cover such modifications or changes as may come within the purposes of the improvements or scope of the following claims.

What is claimed is:

1. A tray including a front and rear portion for aligning and storing sheets of the type tending to curl fed seriatim therein through the rear thereof, said front portion having an opening for front removal of sheets from the tray,

a flexible strip for preventing curling of sheets fed into the tray, said flexible strips maintained above the position at which sheets enter the tray, a shelf having a front portion pivotally mounted on the bottom of the tray said shelf having its rear portion elevated above the bottom of the tray and adapted to move downward from the rear portion to the front of said shelf whereby, as sheets are fed seriatim into the tray, they are contacted by said flexible strip and curled and guided thereby to said shelf for storage,

spring biasing means for maintaining the rear portion of the shelf yieldingly elevated above the bottom of the tray, said biasing means receivable in the tray at the bottom thereof and arranged to maintain said shelf thereon at the end of said biasing means opposite the end receivable at the bottom of the tray, and

the tray further including a front retaining and registration wall attached to the bottom of the tray to provide for superposed stacking of several sheets, said retaining wall formed with at least one slot therein for relatively easy removal of a stack of sheets at the front of said tray said front being in the path of travel of the sheets in a direct line with the ingress into the tray and the feed thereinto of the sheets.

2. The apparatus of claim **1** wherein said front retaining and registration wall is slidably attached to the bottom of the tray to permit lateral movement thereof.

3. The apparatus of claim **1** wherein said front retaining wall includes a plurality of spaced fingers extending substantially vertically from the bottom of the tray.

4. A tray having a front and rear portion for aligning and storing sheets fed seriatim therein through the rear thereof, said tray comprising:

a flexible member maintained above the position at which sheets enter the tray, a shelf having a front and rear portion and located at the bottom of the tray, said shelf having its rear portion elevated above the bottom of the tray and adapted to move downward as sheets are deposited thereon, said flexible member extending downward at least partially across said shelf from the rear portion to the front of said shelf whereby, as sheets are fed seriatim into the tray, they are contacted by said flexible belt and curled and guided thereby to said shelf for storage, and

means associated with said tray for dividing the sheets entering the tray whereby the sheets fed thereinto are first divided providing multiple, simultaneously fed input into the tray, the tray having further associated therewith spacers movably positionable with the tray parallel to the feed of sheets for positioning at the divisions of the sheets for preventing the crossing or misalignment of the divided input.

5. The apparatus of claim **4** wherein said flexible member includes a plurality of flexible strips positioned to provide at least one strip for each division of a sheet entering the tray.

6. A tray having a front and rear portion for aligning and storing sheets fed seriatim therein through the rear thereof, said tray comprising;

a flexible member maintained above the position at which sheets enter the tray, a shelf having a front and rear portion and located at the bottom of the tray, said shelf having its rear portion elevated above the bottom of the tray and adapted to move downard as sheets are deposited thereon, said flexible member extending downward at least partially across said shelf from the rear portion to the front of said shelf whereby, as sheets are fed seriatim into the tray, they are contacted by said flexible belt and curled and guided thereby to said shelf for storage, and means to divide the sheets entering the tray whereby the sheets fed thereinto are first divided providing multiple, simultaneously fed input into the tray, the tray having further associated therewith spacers movably positionable within the tray parallel

to the feed of sheets for positioning at the divisions of the sheets for preventing the crossing or misalignment of the divided input.

7. The apparatus of claim 6 wherein said spacers are shaped and positioned to extend above the path of travel of the sheets entering the rear of the tray.

8. The apparatus of claim 7 said spacers further including

a rod extending across the tray

slots within the spacer through which said rod is positionable

said rod and said slots located such that a portion of said spacer extends above the path of travel of sheets entering the tray.

9. The apparatus of claim 8, said spacers having further associated therewith means to securely fasten the spacer to the rod for preventing relative movement therebetween.

10. The apparatus of claim 9 wherein said means to securely fasten the spacer to the rod includes a spring means detachably engageable with said rod, and brackets intimately attaching said spring means and said spacer.

References Cited

UNITED STATES PATENTS

1,355,364	10/1920	Strawn	271—86 XR
1,864,075	6/1932	Lasker.	
2,234,263	3/1941	Lake et al.	271—88 XR
2,487,347	11/1949	Malmros et al.	271—86 XR
2,765,167	10/1956	Maher	271—86
2,770,192	11/1956	Mitchell et al.	271—86 XR

EDWARD A. SROKA, Primary Examiner