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Designated Contracting States:  
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Applicant: Ordibel, Inc.  
90 Park Avenue  
New York N.Y. 10016(US)

Designated Contracting States:  
DE FR GB

Applicant: Holliday, David H.  
15521-15th NE  
Seattle Washington 98155(US)

Designated Contracting States:  
DE FR GB

Inventor: Greene, Ronald W.  
3116 South 133rd St.  
Seattle Washington 98168(US)

Inventor: Clarkson, Anthony C.  
Turk Hill Road  
Brewster New York 10509(US)

Inventor: Holliday, David H.  
15521-15th N.E.  
Seattle Washington 98155(US)

Representative: Everitt, Christopher James  
Wilders et al,  
F.J. CLEVELAND & COMPANY 40/43 Chancery Lane  
London WC2A 1JQ(GB)

**Bin receiver mechanism for a continuous paper sorting machine.**

Receiver mechanism for a continuous paper sorting machine, in which the receiver 10 is comprised of two columns of inclined side-by-side stacks of paper storage bins with entrances for receiving paper sheets from a reversible feeder conveyor 14. The receiver 10 is mounted on track means 16 for lateral movement relative to its feeder mechanism 14, such that the bin entrances move past the feeder 14 in a generally vertical plane. The bins within the receiver 10 are vertically spaced from each other by a predetermined distance and are laterally offset by a predetermined amount of overlap. The bottom bin of one column is laterally offset by the same incremental distance from the top bin of the next column as adjacent bins in one column. There may be several receiver modules each including two inclined columns and they may be detachably secured together.

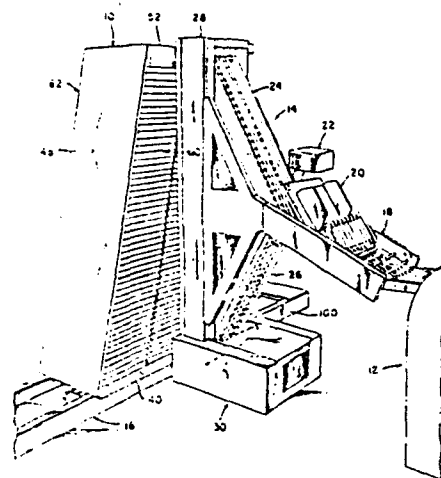


FIG. 1

- 1 -

"BIN RECEIVER MECHANISM FOR A  
CONTINUOUS PAPER SORTING MACHINE"

This invention relates to sheet distributing  
or sorting devices and more particularly to a receiver  
apparatus which can continuously receive and sort  
large numbers of multi-paged documents as copies of a  
5 page proceed from a reproducing device such as a  
printer or copy making machine. This application  
references copending European Patent Application No:  
79300624.3 filed on eventdate herewith for "Continuous  
Paper Sorting Machine" and corresponding to U.S.  
10 Patent Application Serial No: 897 272 filed 17th April  
1978.

Prior art paper distributors, sorters and/or  
collators have encountered many problems. One is that  
the large increase in the costs of labour and

materials has made it more imperative that the available press or duplicator capacity be utilized to its fullest. In order for the maximum production capability of a printing or copy making machine to be utilized, it is necessary that the sorter have the capacity to receive the printer or copy machine output without loss of press, duplicator or copy making machine time. Large capacity sorting machines have been introduced to the market place but they are not continuous. For instance, in some sorters, after a vertical column of trays or bins has been filled, it is necessary to stop the press and shift that filled column away from the feeder and then move an empty column into position. Thus, there is a significant amount of press or copy machine production time lost. Additionally, time is lost if the bins have to be unloaded on line.

The variety of copy sorting jobs sorter/collators must handle suggests that the receiver should be modular to the extent that if one unit does not have the capacity, additional receiver capacity may be provided without any substantial loss of time or extra handling of the copied material. While smaller collators or sorters are mainly intended for the office market as a necessary adjunct to office copying machinery, larger sorters are more intended for the high production commercial market and for large in-plant reproduction centers, commercial houses and printing departments. These higher volume paper handling installations may be turning out catalogs, maintenance manuals, instruction books, brochures, sales material and perhaps other items such as reports, bid specifications and other large quantity multi-page publications. Those skilled in the art will appreciate the savings in labor, time and expense if the reproduction capacity of a particular printing or copying center can be sorted at a rate which is consistent with the copy making capability.

Among the prior art references which may be considered with respect to the features of this invention are the following: United States Patent Nos. 3,420,517; 3,273,882; 3,356,362; 3,848,867; 3,937,459; 3,938,801; 3,740,050; 3,944,217; and 3,963,235. The devices covered by the above patents do not disclose the structure of this invention.

-4-

A continuous paper sorting machine in which the receiver with the bin is designed generally in accordance with the teachings of U. S. Patent No. 3,938,801 which describes side-by-side stacks of inclined columns of paper receiving bins or shelves. The receiver is moved laterally with respect to a generally upright feeding device, in which the feeder presents a generally vertical feed conveyor with deflectors and guides for intercepting sheets moving up or down the conveyor and directing them into bins in the receiver as the receiver moves a given bin in a column past a given deflector. The receiver is constructed in two column modules and moves on casters along a track assembly. A chain drive mechanism has means for being releasably engaged by a fork on the receiver base. The chain is precisely controlled to present a particular bin address to a deflector at a given instant in time. Several modular receivers may be detachably engaged to each other so that as many as 600 bin addresses may be utilized. The bins are generally horizontal at their entrance end but tilt or slant to one side in order to aid the alignment of paper sheets into neat stacks as the sheets are fed into the bin.

Accordingly, it is among the features, objects and advantages of the invention to provide a paper sorting machine feeder device which is continuous and uniquely designed and intended for maximizing the production of a commercial printing, reproducing, duplicating or copying

center. The invention is particularly intended to reduce and to minimize the amount of time that a reproduction, printing or copying device loses other than that time which must be sacrificed to replacing masters in the press, duplicator or copy machine. Because of the unique receiver concept in conjunction with its unique feeder there is no necessity to stop the sorting of paper copies from column to column. The machine can continue to sort as the receiver moves in either direction on its track. A filled receiver can be easily disengaged from the driving means and rolled off the track assembly and an empty receiver moved onto the track and engaged and the feeder mechanism restarted. Thus, the receiver can be unloaded off line. The invention is particularly suited for use in printing shops or reproduction centers for such things as multi-page brochures, catalogs, books and other items which must be produced in large numbers. The machine is capable of receiving sheets at the high speeds of present day advanced copying, printing and duplicating machinery. The apparatus is uniquely simple and inexpensive for continuously filling a large number of bins.

Figure 1 is a perspective view showing generally the general arrangement and organization of the sorter and particularly the receiver and feeder mechanism of this invention;

Figure 2 is a front elevation view of the receiver of this invention;

Figure 3 is a partial top plan view of the track assembly showing details of the track construction;

Figure 4 is a partial elevational cross-section view of the receiver and track along the line 4-4 of Figure 2 receiver base and track assembly;

Figure 5 is a partial elevational cross-section view showing details of the chain engagement means and the module interlock;

Figure 6 is a partial plan view of the details of Figure 5;

Figure 7 is a partial plan view of a bin in the receiver;

Figure 8 is an end elevational view of the bin of Figure 7;

Figure 9 is a partial elevation cross-section of a bin and particularly of its entrance end with respect to deflector guides on its feeder; and

Figure 10 is a partial front diagrammatic view of the receiver to further illustrate details of construction.

Referring now to the drawings and particularly Figure 1, it will be seen that the receiver mechanism of this invention, generally designated by the number 10, is in position to receive paper copies from a duplicator or press device generally designated by the number 12 by way of a feeder mechanism generally designated by the number 14.

-7-

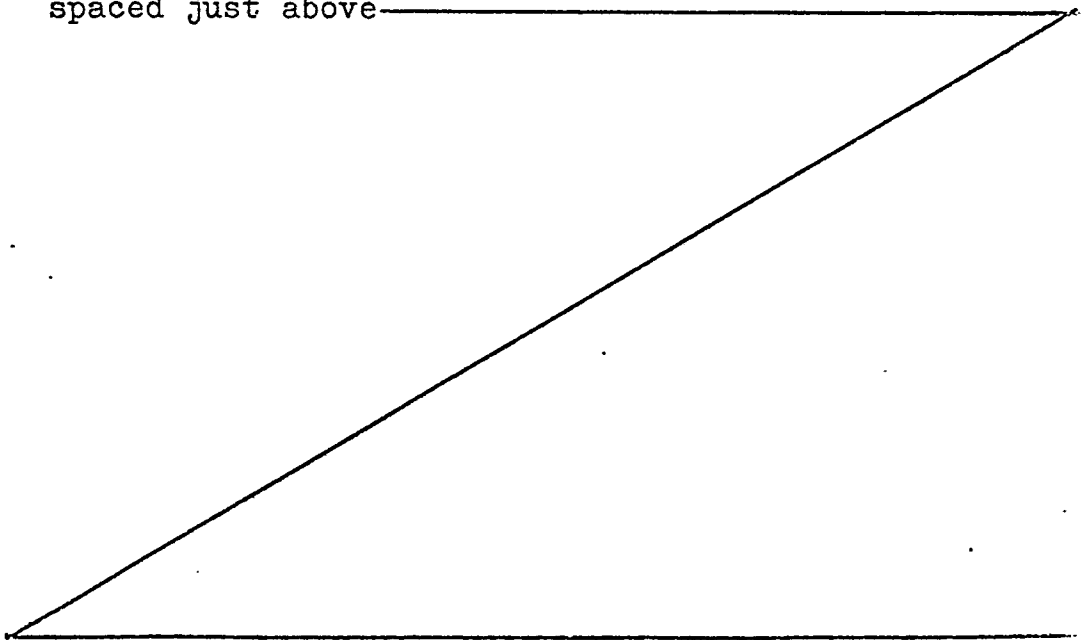
The receiver 10 moves laterally on a track structure 16 in close proximity to the feeder. Feeder 14 includes infeed conveyor section 18, a proof tray assembly 20 and a control panel 22. The infeed  
5 conveyor directs paper copies either to an upwardly angled intermediate conveyor 24 or a downwardly angled intermediate conveyor 26. A tower section generally designated by the number 28 supports a vertically disposed reversible feeder conveyor, bin  
10 deflectors and guides described in detail in our copending European Patent Application No: 79300625.5 for "Feeding Mechanism for a Continuous Sorting Machine" which corresponds to U.S. Patent Application Serial No: 897,274 filed 17th April 1978. The tower  
15 section 28 is supported on a base section 30 shown in generally outlined form in Figure 1.

It will be seen by reference to Figure 2 that the receiver 19 is comprised of a base section 40 having a bottom wall 41, and castors 42 and 46 with  
20 the castors 46 being located under the extension section 44 of the base 40. Upwardly extending side frame members 48 and 50 are interconnected at their

- 8 -

upper end by frame top section 52. A centre frame piece 53 divides the receiver into two angled columnar spaces 54 and 56. The columnar spaces 54 and 56 include individual shelves or bins 140 which will be described more in detail hereinafter. The generally upstanding receiver structure has an entrance side 60 and an unloading or exit side 62. The frame is generally vertical in the plane of its entrance and exit sides and inclines at a predetermined angle in the direction of its movement.

Extending across the depth of the machine from the entrance to the unloading side, as best seen in Figures 4 and 6, is an actuator rod 66 which is spaced just above



bottom wall 41 and which rod 66 is supported by bearing 68 at one end and bearing 70 on the exit side of the machine. Rod 66 can be seen to extend through the base wall 40 to the exit side and on the outside is provided with a handle 72, which extends generally upwardly for easy access by the operator.

Secured to rod 66 are a pair of depending engagement forks 74 which extend through an opening 76 in bottom wall 41. As can be seen, the forks 74 are spaced apart so that they will not interfere with the receiver chain drive on the support and drive track. Handle 72 of the engagement rod 66 engages a notch 78 in a holding clip 80 secured to the center frame piece 53 on the unloading side. It will be noted that the handle 72 engages retainer notch 78 in the generally perpendicular position and in which position the forks 74 extend generally straight down. A spring latch member 80 is supported at its anchor end 82 by wall 41. The spring latch member has a generally horizontal section 84 which extends under rod 66 and towards that end of the base away from extension platform 44. An opening 86 is provided in base wall 41 to receive a coupler section 88 formed in the other end of the spring latch 80 with the latch 80 also having an angled end ramp 89. When handle 72 is in the vertical position, as shown in Figure 5, spring latch 80 with the coupler section 88 is in its up position so that if a second modular unit 10 is being used the two units will be latched together. By pushing the second unit against the first the platform 44 slides under the first unit and

rides against ramp 89 to pull the latch down and engage  
the two receiver modules together. An opening is located  
in extension section 44 of each module which will slide  
under the opposite end of the base and will register with  
5 the opening 86. When the forks on rod 66 are straight  
down and thus engaged with the chain, as mentioned above,  
spring latch 80 is engaged. Rod 66 is provided with  
a flat which coincides with the latch when the modules are  
engaged. When the handle 72 is moved the flat on rod 66  
10 moves out of registry and acts as a cam to force the latch  
down thus disengaging the receiver modules from each other.  
It will be noticed that the handle 72 is moved according  
to the direction which it is desired to roll the receiver.  
If an empty receiver is being rolled onto the track  
15 section, the handle will be moved in one direction so as  
to present the forks 74 at an appropriate angle. If it  
is desired to roll the receiver off after it is filled,  
then the handle 72 is moved in the opposite direction to  
permit forks 74 to release from the chain mechanism.

20 The track section 16 includes a floor wall 100 with  
upstanding side channel 100 on the entrance side and up-  
standing channel 102 on the exit side. Supported on the  
floor wall 100 of the track section 16 are caster guide  
walls 104 for casters 42 and 46 and track guide walls  
25 106 near side rail 102 for receiver the other casters 42,  
46. The guide rails 104 and 106 can be seen in Figure  
3 to be spread slightly at the incoming end of the track  
to facilitate rolling an empty unit onto the track.

-11-

Between the guide rail channels for the casters is a drive motor 110 which through drive chain 112 turns a reduction gear which in turn drives a main chain pulley 114. An idler chain pulley 116 is located at the other end of the track section so that a continuous drive chain 118 extends around the chain pulleys 114 and 116. Secured to the chain as can be seen in Figures 4, 5 and 6, is a transverse arm member 120 which is mounted on the chain such that it extends out on either side to be engaged by forks 74. When a new receiver has been rolled onto the track section, the handle 72, which controls the position of the engaging forks 74, is moved so that the forks are angled to allow the forks to engage member 120. As soon as engagement has been made, the bar is moved to the upright position to firmly secure the receiver to the chain. The controls will then by appropriate energizing signals to motor 110 position the receiver with respect to the feeder 14 to present a particular bin address such as bin number 1 in proper position for beginning a sorting operation.

The bins, best shown in Figures 7 through 10, and generally identified by the number 140, have a generally upstanding entrance wall 142 which has an upper edge 144 which as can be seen is spaced a predetermined distance below the bin next above. The deflector guides 146 are part of the feeder and are in approximately the position shown in Figure 9, when the sorter is in operation. Thus, the entrance wall 142 is angled as at 148 and 150 to facilitate the entrance of sheets of paper which will

be entering a bin either from above or from below depending upon whether the feeder is sending sheets over the top or around the bottom. The bins 140 have main support wall or shelf portion 152 which also can best be seen in Figure 5 7 to have a center cut-away portion 154 which extends from the exit or unloading end 156 generally centrally thereof to an inner end 158 which as can be seen is a slightly more than half-way toward the entrance end of the bin. The bins 140 are formed such that the shelf 10 portion 152 is generally horizontal across the front.

Extending diagonally from one side of the front to the opposite side at the unloading end is a line 160 which places the approximate other half of the shelf portion 152 at a slight downward angle to assist in moving paper 15 into lined stacks in the bin. A side wall 162 is formed along the high side of the bin and on the opposite side is wall 164 along that side of the bin having the angled down section. At the top and bottom of the sorter frame structure are two support rods 170, only one of which is 20 shown in Figure 7, which support releasable slide pieces 172. A belt member 174 attaches to the pieces 172 and extends through the cut-out portion of the stack of bins to arrest the motion of the sheets of paper after they enter the bins. The belt 174 is not a jogging device since the 25 slanting of the bin shelves is the primary factor in the alignment of the sheets of paper into neat stacks.

Figure 10 indicates diagrammatically more detail about the arrangement of the bins. The bins are arranged so that the bin next below the bin next above is spaced

laterally a specified amount as for instance .30 0005042  
.242 inches depending upon the width of the bins in the  
particular receiver being used. The increment of distance  
by which the bins are laterally offset from each other is  
5 consistent down the entire length of the column from  
B1 to B50. In like manner, the top bin B51 in the second  
column is spaced the same amount of distance laterally  
from B50 as the rest of the bins are from each other.  
The controls are set to index the motor or movement of  
10 the chain to present a particular bin dress from B1  
through B100 to a delivery position adjacent the feeder 14.

Operation of the feeder and receiver is continuous  
and is best described as follows. A first or page "1"  
master is inserted in the press or duplicator. Several  
15 copies are first directed to the proof tray 20 and then  
the sorting job begins. Odd numbered pages coming out of  
the press are directed to lower intermediate conveyor 26  
and up the feeder conveyor to the top bin. Sheets will be  
fed up the conveyor and deflected to the desired bin address  
20 by a deflector and the lower surface of a Y-shaped de-  
flector. The receiver moves a discrete distance from left  
to right and presents the next bin address until all 50  
bins in a column have been filled. If the sorting job  
extends to the next column copies continue to be fed to  
25 the feeder conveyor via lower intermediate conveyor 26 and  
up the feeder conveyor to the topmost bin in the second  
column. The topmost bin of the second column is offset  
from the lowermost bin of the first column by the same  
increment of distance as the bins are offset from each

- 14 -

other in each column. Assuming that two complete columns  
of bins are being used for a sorting job, the feeder continues  
to feed around the lower intermediate conveyor until all  
fifty bins in the second column are filled. By the time  
5 the bottom-most bin in the second column has received its  
copy of page 1 from the press, copies of the page 2 master  
are already proceeding up the upper intermediate conveyor  
24. The feeder conveyor belts are reversed to bring the  
first sheet from the top to the bottom of the feeder conveyor  
10 and filling of the bins with copies of page 2 begins with  
the lowest bin in column 2 where the first page sorting  
job ended. Thus the feeding of bins is continuous not  
only from bin to bin but from column to column. Also, it  
can be appreciated that odd numbered pages from the dup-  
15 licator are fed from the bottom up while the receiver  
indexes from left to right and even numbered pages are  
fed from the top down while the receiver moves from right  
to left. Obviously, also, two adjacent deflectors are  
needed for a single bin address. When coming down the  
20 conveyor sheets are deflected by the top one of two adjacent  
deflectors and directed against the top surface of a de-  
flector guide and into the bin opening. When coming from  
the bottom the sheet is deflected by the lower one of two  
adjacent deflectors and off the lower surface of a de-  
25 flector into the same bin address. Thus the need for one  
more deflector than there are bins or guides.

-15-

CLAIMS

1. A paper copy receiver mechanism for a continuous paper sorter device, in which said sorter includes a stationary feeder mechanism with a generally vertically disposed bi-directional feed conveyor including a plurality of paper deflector means for directing sheets of paper off said feed conveyor and into said receiver, said receiver, comprising:

a) a support frame including a base section with caster means attached to the bottom of said base for movement of said receiver in a direction generally parallel to said feed conveyor and further including upstanding support frame means for supporting a predetermined equal number of paper receiving bin means in side-by-side columns in such a way that said columns are canted at a preselected angle in the direction of movement of said receiver and which frame means has an entrance side and an unloading side and which sides are generally vertical and parallel to said feed conveyor, said base section including a releasable drive engaging member,

b) a predetermined number of vertically spaced-apart bin means in each column of said frame means, each bin means having an entrance and an unloading end and side edges and at least said entrance end being substantially horizontal, all bins in a column being out of perpendicular alignment along their side edges with the bin next above and next below by a predetermined horizontal index distance such that the bottom bin of one column is spaced the same

horizontal index distance from the top bin of the next column,

5 c) a floor track assembly extending generally at a right angle to said feed conveyor for supporting said receiver mechanism thereon, said track assembly including channel means for guiding said casters along a set path with respect to said feed conveyor, said track assembly further including chain drive means for moving said receiver along said channel means, said chain drive means including 10 a holding member for releasably engaging said drive engaging member to position said receiver at a preselected position with respect to said chain drive means, and power means for driving said chain.

15 2. The paper sorter receiver mechanism according to Claim 1 and in which each column contains 50 bins such that numerically corresponding bins are horizontally aligned at their entrance ends.

20 3. The paper sorter receiver mechanism according to Claim 2 and in which each bin has a generally upstanding entrance wall extending upwardly to within a preselected distance of the bin next above it to define an entrance opening.

4. The paper sorter receiver mechanism according to Claim 1 and in which at least a portion of each of said bins tilts downwardly to assist in the alignment of paper copies into neat stacks.

5           5. The paper sorter receiver mechanism according to Claim 4 and in which said bins are provided with cutaway sections extending from the unloading end toward the entrance end such that an unobstructed cavity is defined from the base to the top of said receiver frame through each column of bins and through which cavity paper arresting means extend.

6. The paper sorter receiver mechanism according to Claim 1 and in which said base of said receiver extends generally horizontally in the direction in which the bin columns are angled to form a base extension and under which extension is located caster means.

7. The paper sorter receiver mechanism according to Claim 6 and in which said holding member is a transversely disposed arm member secured to the upper run of said chain drive means and in which said releasable drive engaging means is a pivotal fork member for releasably engaging said arm member for precise positioning of said receiver on said track.

8. The paper sorter receiver mechanism according to Claim 7 and in which said pivotal fork member is secured to an actuator bar having an operator handle which releasably locks the bar and fork member into operative engagement with said arm member for positioning of said receiver, and which actuator bar and operator handle can be moved so as to disengage said fork member from said arm member to allow the receiver to be rolled onto or off said floor track assembly.

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9. The paper sorter receiver mechanism according to Claim 1 and in which latching means are provided on said base section such that at least two receiver mechanisms can be releasably attached to each other to increase the number of bins available for sorting operations.

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10. A paper copy receiver mechanism for a continuous paper sorter device, in which said sorter includes a stationary feeder mechanism with a generally vertically disposed bi-directional feed conveyor including a plurality of paper deflector means for directing sheets of paper off said feed conveyor and into said receiver, said receiver, comprising:

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a) a support frame including a base section with means attached to the bottom of said base for movement of said receiver in a direction generally parallel to said feed conveyor and further including upstanding support frame

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means for supporting a predetermined equal number of paper receiving bin means in side-by-side columns in such a way that said columns are canted at a preselected angle in the direction of movement of said receiver and which frame means has an entrance side and an unloading side and which sides are generally parallel to said feed conveyor, said base section including a releasable drive engaging member,

b) a predetermined number of vertically spaced-apart bin means in each column of said frame means, each bin means having an entrance end, an unloading end and side edges and at least said entrance end being substantially horizontal, all bins in a column being out of perpendicular alignment along their side edges with the bin next above it and next below it by a predetermined horizontal index distance such that the bottom bin of one column is spaced approximately the same horizontal index distance from the top bin of the next column, and

c) a floor track assembly extending generally at a right angle to said feed conveyor for supporting said receiver mechanism thereon, said track assembly including guide channel means for guiding said movement means along a set path with respect to said feed conveyor, said track assembly further including drive means for moving said receiver along said guide channel means, said drive means including a holding member for releasably engaging said drive engaging member to position said receiver at a preselected position with respect to said drive means, and power means for driving said drive means.

11. The paper sorter receiver mechanism according to Claim 10 and in which there are two columns and each column contains 50 bins such that numerically corresponding bins are horizontally aligned at their entrance ends.

5           12. The paper sorter receiver mechanism according to Claim 11 and in which each bin has a generally upstanding entrance wall extending upwardly to within a preselected distance of the bin next above it to define an entrance opening.

10           13. The paper sorter receiver mechanism according to Claim 10 and in which at least a portion of each of said bins tilts downwardly to assist in the alignment of paper copies into neat stacks.

15           14. The paper sorter receiver mechanism according to Claim 13 and in which said bins are provided with cutaway sections extending from the unloading end toward the entrance end such that an unobstructed cavity is defined from the base to the top of said receiver frame through each column of bins and through which cavity paper arresting means extend.

20

15. The paper sorter receiver mechanism according to Claim 10 and in which said base of said receiver extends generally horizontally in the direction in which the bin columns are angled to form a base extension and under which extension is located caster means.

5

16. The paper sorter receiver mechanism according to Claim 15 and in which said holding member is a transversely disposed arm member secured to said drive means and in which said releasable drive engaging means is a pivotal fork member for releasably engaging said arm member for precise positioning of said receiver on said track.

10

17. The paper sorter receiver mechanism according to Claim 16 and in which said pivotal fork member is secured to an actuator bar having an operator handle which releasably locks the bar and fork member into operative engagement with said arm member for positioning of said receiver, and which actuator bar and operator handle can be moved so as to disengage said fork member from said arm member to allow the receiver to be rolled onto or off said floor track assembly.

15

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18. The paper sorter receiver mechanism according to Claim 10 and in which latching means are provided on said base section such that at least two receiver mechanisms can be releasably attached to each other to increase the number of bins available for sorting operations.

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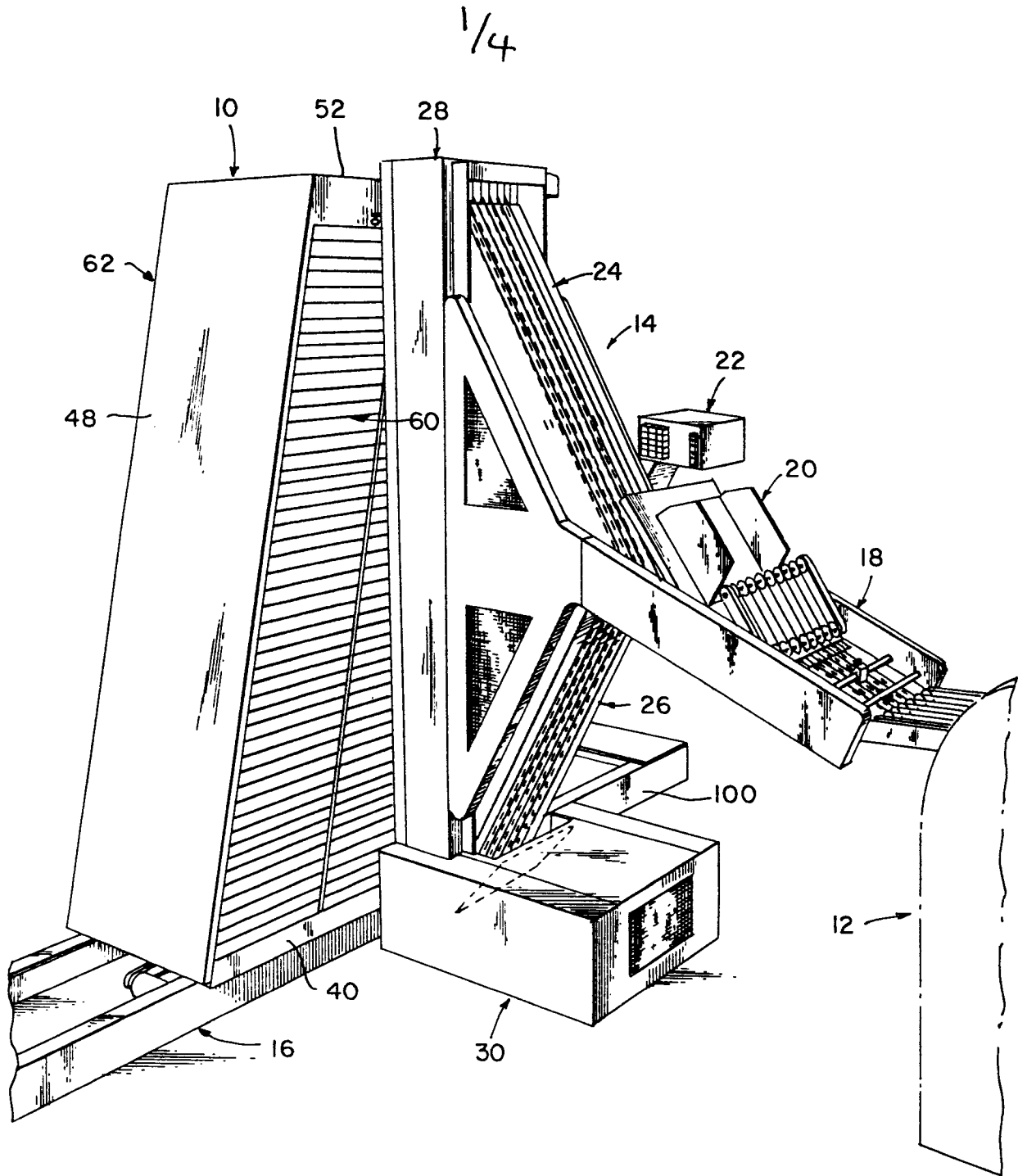


FIG. 1

2/4

FIG. 2

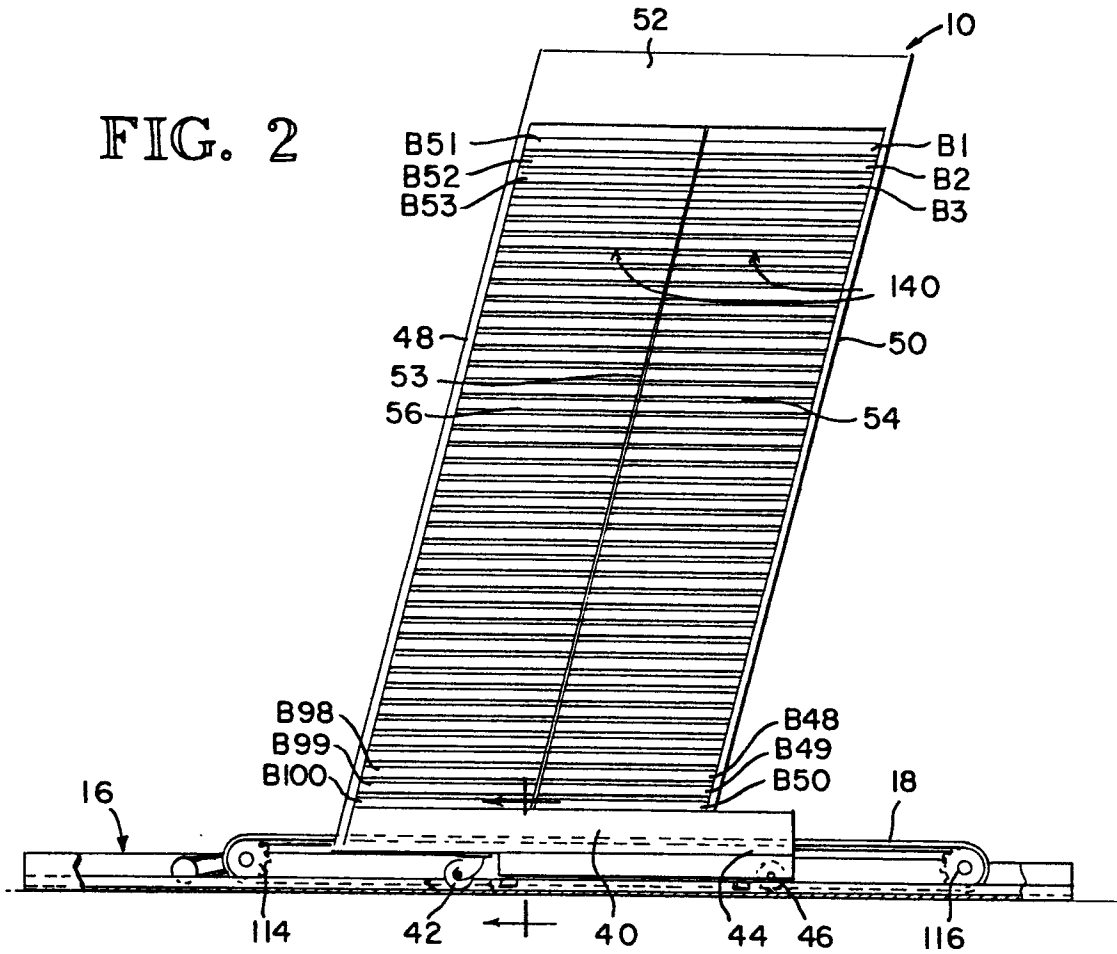


FIG. 3

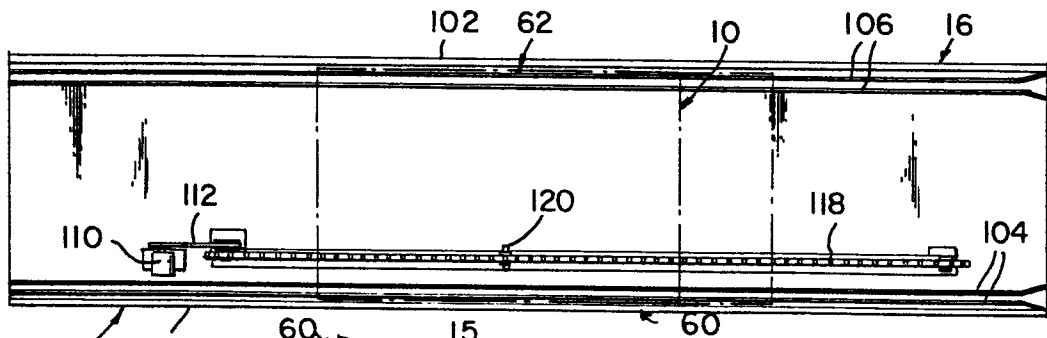
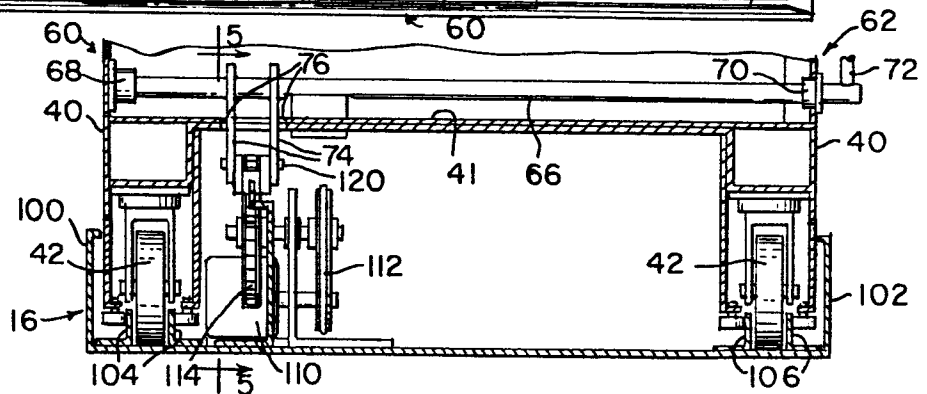


FIG. 4



3/4

FIG. 5

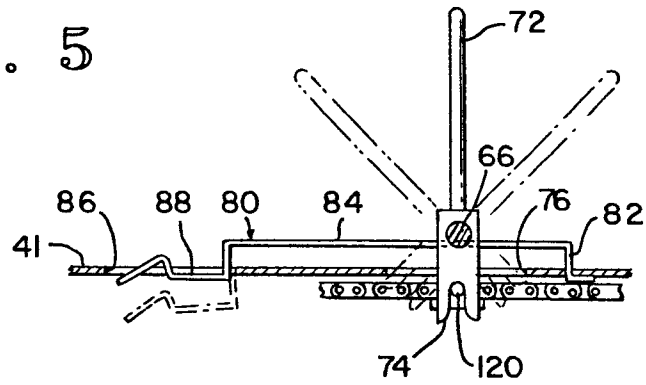


FIG. 6

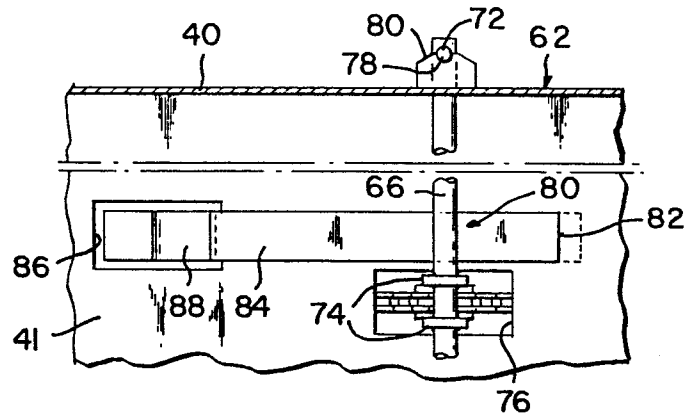
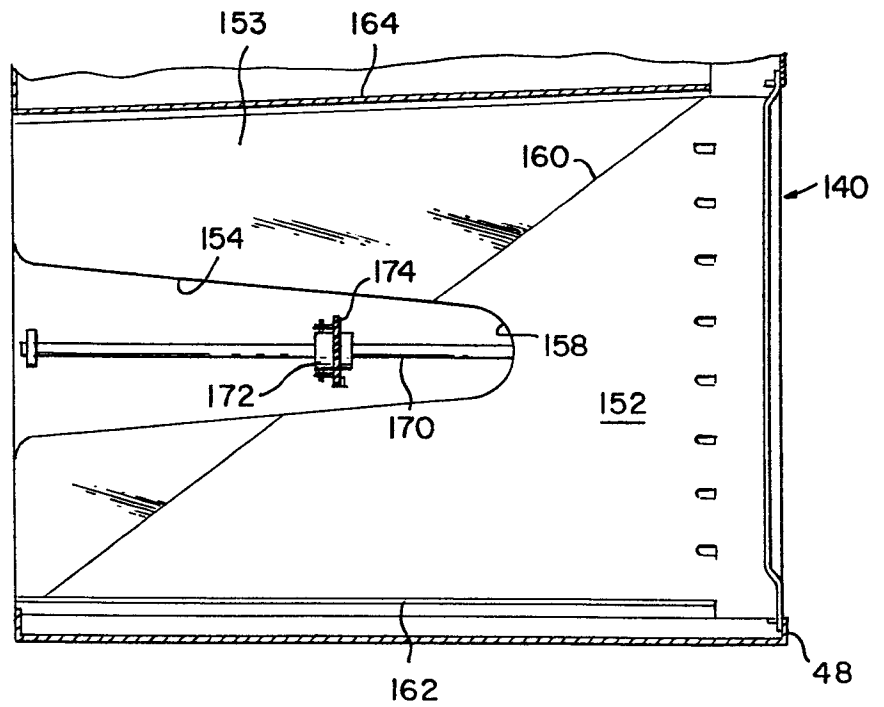


FIG. 7



4/4

FIG. 8

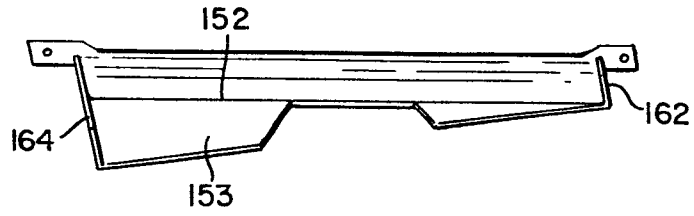


FIG. 9

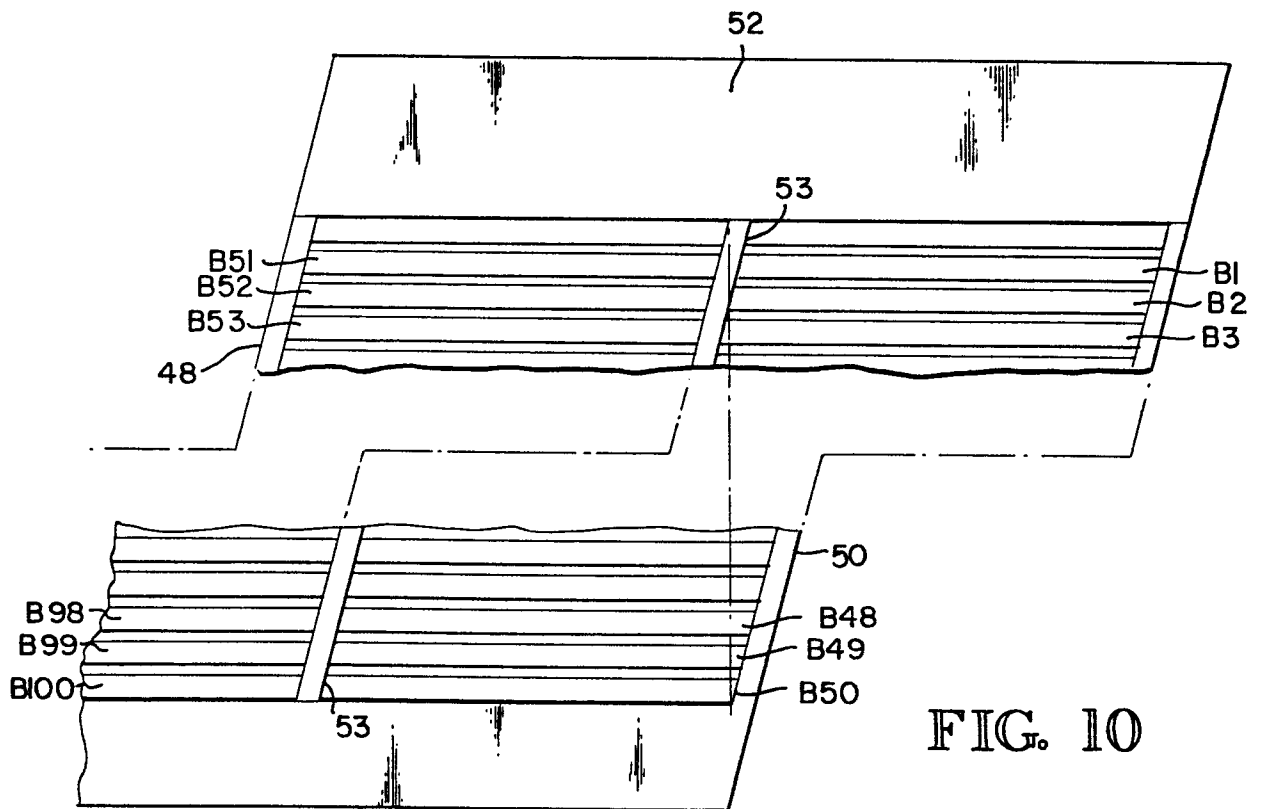
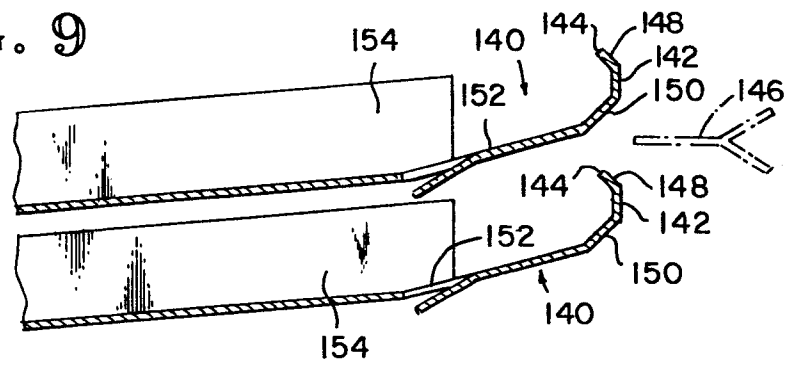


FIG. 10



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
D, A	<u>US - A - 3 938 801</u> (HOLLIDAY) * the complete description *	1	B 65 H 31/24
D, A	<u>US - A - 3 963 235</u> (NORFIN) * the complete description *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.²)
			B 65 H B 07 C
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	04-07-1979	LONCKE	