FOREIGN PATENTS OR APPLICATIONS
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ABSTRACT
Document handling apparatus for positioning documents in a sorting operation. As the documents are driven or otherwise propelled into the sorting pockets, control mechanism in the form of a continuously rotating, multi-bladed wheel, located adjacent the pocket entrance, contacts a portion of each document and moves the trailing edge thereof to a sideways position out of the path of the leading edge of the succeeding document. The wheel includes extended blade portions wherein such portions contact the trailing edge of the documents for laterally moving the trailing edge thereof to a position so as to provide a clear, unobstructed path for the succeeding document.

7 Claims, 8 Drawing Figures
DOCUMENT SORTING CONTROL MECHANISM

BACKGROUND OF THE INVENTION

In the field of business machines, there is the requirement for accurately and speedily processing numerous documents such as checks, deposit slips, and the like by means of separating or sorting the documents into desired packets or bundles which have a common mode or destination. These machines are useful in banking operations wherein it is desirable to process such checks and to sort or separate the processed checks by means of delivering them into bins or pockets to enable further processing thereof. This sorting operation is generally included in proofing, endorsing, and encoding systems to automatically separate selected documents into such bins or pockets. As is well-known, the checks or deposit slips vary in size, shape, and thickness so as to demand precise handling thereof at the speeds attained in operating or transporting the documents through the several stations of the machine.

Various ways and means have been employed in the past to propel and to position such documents into the sorter pockets or bins so that successive documents follow a path unobstructed by previous pocketed documents. A review of the prior art disclosing such various ways and means indicates that feeding means for separating successively the lower blanks from a stacked supply is accomplished by a pair of disks, each having two peripheral arm portions, rotating synchronously in opposite directions about vertical axes to support the supply of blanks, together with vertically reciprocated suction means disposed under each disk and timed to draw each successive blank into position for separation by the disks, all as shown and described in U.S. Pat. No. 2,817,520, on the application of H. G. Gentry.

U.S. Pat. No. 2,970,836 to J. G. Smith shows and describes item handling apparatus wherein a plurality of nozzles direct a flow of air against the checks as they enter the pockets or bins to bow the checks in a particular direction. Additionally, a pair of rotatable members are driven to engage each of the checks on the underside thereof and to transversely move the checks to positions away from the ingress of succeeding checks. The rotatable members have auger-type fins thereon, one member having fins of a conical-helix or helicoidal shape and the other having fins of a cylindrical helix shape.

Another form of a document stacking device is disclosed in U.S. Pat. No. 3,078,089, on the application of E. P. Maudlin, wherein a worm feed screw engages the lower edge of each check near its trailing edge and aids to feed the edge over toward a back-up plate and to assure that the leading edge of the next check will not be inhibited when entering the pocket or bin.

A high speed sheet stacking system is shown and described in U.S. Pat. No. 3,162,438 to G. E. Perry wherein a pair of disks, each with a plurality of arcuate slots extending inwardly from the periphery thereof, receive the documents at a speed in excess of the speed of the perimeter of the disk and effect a centrifugal braking force between the surface of the document and the outer surface of the slot to arrest motion of the documents at an extracting station.

And, finally, U.S. Pat. No. 3,325,165 to D. H. Davis discloses document stacking apparatus for moving the trailing edge of such documents out of the path of the next or succeeding documents by means of a power driven paddle wheel or impeller positioned at the trailing edge of the documents to move such edge sideways, and a rotating keeper to maintain the documents to one side.

SUMMARY OF THE INVENTION

The present invention relates to sorting of documents and more particularly to control mechanism for receiving such documents and for positioning a portion of each document in a manner to provide a clear and unobstructed path for each succeeding document. Such mechanism is provided adjacent the precise travel or transport path of the document or check as it is being propelled from an operating station toward and into a pocket or bin. The propelling means sufficiently drives the checks into the pocket so that the leading edge of the checks is in abutment with the end wall of the pocket and positioned against biasing means laterally movable for admission of a number of checks during the filling of the pocket. The control mechanism of the present invention includes a rotating wheel disposed to occupy a position adjacent such precise path, said wheel including a pair of peripheral tip portions diametrically opposed to engage with, in successive manner, the lower, trailing portion of each check, positioned in the pocket, and to move the trailing edge of each check sideways to a position to provide a clear path for the next check. The positioning or diverting and retaining wheel is shaped to include a bowed diametrical portion carried on a hub or journal and forming into a peripheral portion at each end of the diametrical portion with each of the peripheral portions having a curvature corresponding to that of the diametrical portion and extending in a peripheral path beyond a centerline through the hub of the wheel or the bottom of the bow.

A slot is provided in a floor plate adjacent the check path with the wheel hub or journal being supported from the plate and the diametrical peripheral portions extending through the slot. As each check is transported or driven into the pocket, one or the other of the peripheral tip portions rotates in a manner to engage the lower and rear portion of each check and carry such portion in a positive sideways movement out of the precise path of the next check. After such rear portion of each check is sideways moved, the junction of diametrical and peripheral portion of one blade of the wheel stays engaged with the check and retains it in the sideways position, after which the other peripheral portion engages the succeeding check.

An aid in positioning that portion of each check for engagement by a peripheral tip portion is provided by a diverter or deflector element secured in a wall plate adjacent the check path and disposed in relation to the rotating peripheral tip portion to insure engagement of said peripheral portion with one side of the check. The diverter element, in effect, aids in directing each check into the pocket for placement in a positive attitude and plane for engagement by the peripheral tip portion. While not all checks require such aid in positioning thereof for engagement by the wheel, the diverter element directs the propelled check along a path into the pocket and additionally allows for placing the trailing portion of each check in the desired attitude for peripheral tip portion engagement.
In line with the above discussion, the principal object of the present invention is to provide means for controlling the position of documents in a sorting operation.

Another object of the present invention is to provide control mechanism for positioning the trailing edge of documents in a sorting pocket so as to permit an unobstructed path for the successive document.

An additional object of the present invention is to provide a positioning wheel adjacent the path of each sorted document to transversely move the trailing portion of each document out of the path of a successive document.

A further object of the present invention is to provide a positioning and retaining wheel adjacent each sorted check to positively move the trailing portion of each document in a sideways direction and to retain such portion thereat.

Additional features and advantages will become apparent and fully understood from a reading of the following description taken together with the annexed drawings, in which:

FIG. 1 is a elevational view of apparatus incorporating the subject matter of the present invention;

FIG. 2 is a top plan view of the subject matter shown in FIG. 1;

FIG. 3 is a view taken on the plane 3—3 of FIG. 1;

FIG. 4 is a view similar to FIG. 3 and showing a progressive step thereof;

FIG. 5 is a view showing in detail the multibladed wheel;

FIG. 6 is a view taken on the plane 6—6 of FIG. 5;

FIG. 7 is a view taken on the plane 7—7 of FIG. 5; and

FIG. 8 is a view taken on the plane 8—8 of FIG. 5.

Referring now to the drawing, certain of the various figures (i.e., FIGS. 1 and 2) show a portion of a document sorting machine wherein such documents are driven in individual and successive manner along a path and deposited into a selected pocket. Although only one sorting pocket is shown and described in the present application, suffice it to say that additional pockets are usually provided so as to separate the various documents according to the desired sorting procedure. As seen in such FIGS. 1 and 2, the sorting machine includes the necessary framework to support the various parts and a passageway is provided for transport of the documents or checks in their travel to the desired pocket. While such framework may take any one of many forms and shapes, a support member 12, which may be of angle or channel shape, carries the structure of the present invention, such member being adequately secured to the machine frame and including a plurality of upright studs or bolts 14 connected to and supporting a planar table 16 of generally rectangular shape extending from left to right in FIGS. 1 and 2. Approximately two-thirds of the distance from the studs 14 on the left to the stud 14 on the right, the table 16 bends downwardly and proceeds on an incline to the pocket area, such incline providing the bottom surface to support the documents in the pocket.

The path of travel of the documents is through a passageway 20 which turns a corner, as seen in FIG. 2, such passageway being provided with appropriate side-walls for retaining the documents in upright manner during their travel to the sorting pocket. A guide assembly 22 forms a structural part of the corner of the passageway and continues to a wall 24 which provides full support for the documents as it is driven into the pocket. Means for propelling the documents toward and into the pocket are provided by drive wheels located at strategic stations along the document path such as wheels 25 and 26 which comprise O-rings carried on suitable drive bearings and driven at appropriate speeds. A limp wheel 28 is positioned along the check passageway proximal the entrance to the pocket. A pressure arm (not shown) is positioned adjacent the limp wheel 28 and on the opposite side of the check passageway to help guide the check into the pocket. An additional feed roller 30 and an idler wheel 32 are provided in the pocket area to continuously exert a force on each succeeding document as it is driven into the pocket.

The pocket area (see also FIGS. 3 and 4) comprises the bottom member 40 or inclined portion of the table 16 as a continuation thereof, an angle shaped pressure plate forming a side wall 42 and an end wall 44, and a movable side wall 46 in the nature of a pressure plate swingable by means of a pin 48 on a spring-loaded arm 49 and connected to the plate 46 with the pin being contained in a curved aperture 50, and there being a torsion spring 52 (FIG. 1) operably connected to bias the side wall 46 in the direction toward the side wall 42. In this manner, the pocket area is allowed to expand upon receipt of a plurality of checks, yet provide the biasing action for limiting the pocket area to maintain the checks in upright manner.

A cover or table 56 of stepped design occupies a portion of the surface over the table 16, a rear portion 58 of the cover 56 also acting as a guide along one side of the passageway 20 for a distance therealong to a step portion 60, the cover then proceeding to an incline 62 which is along the same angle as the inclined portion 40 of the pocket. The cover 56 includes a triangular-shaped portion or plateau 64 which is slumped downwardly from its apex 66 toward the wall 24, the cover 56 also having a portion 68 sloping downwardly toward the pocket so that a pocketed document is supported on a rounded knoll 70 and on the junction line 72 of the triangular portion 64.

As illustrated in FIGS. 1 and 2, a document 76 is shown rounding the curve in the passageway 20 and being driven by the drive rollers 25 and 26 toward the pocket. The guide assembly 22 with its various portions and the edge of cover 56 direct the driven document 76 into the pocket, with each successive document being disposed adjacent the preceding document during the filling of the sorting pocket. Therefore each document, as it is driven into the pocket by the various drive wheels and rollers must be positioned therein so as not to interfere with the path of travel of the succeeding document. Since the documents or checks may be of different sizes and shapes and also in various conditions of thickness, deformity, wear, etc., it is extremely important that the checks are properly stacked in the pocket. Especially is this true of the longer checks by reason of their tendency to bend, the natural inclination of the holder to fold the check, and its susceptibility to being damaged or torn. It is therefore necessary to provide certain structure, as by the present invention, to maintain the pocketed checks in an attitude so...
as not to obstruct the entry of each succeeding check into the pocket.

The present invention provides rotatable means, generally indicated as 80, positioned adjacent the path of travel of the check to engage with each check and to move and maintain the rearward portion thereof to one side to allow for unrestricted flow of each succeeding check into the pocket. Such rotatable means 80, as illustrated in detail in FIG. 5, takes the form and shape of a twobladed wheel having an integral hub 82 with a diametral portion 84 attached to the hub and extending across the hub in opposing directions and connecting to two blade or paddle portions 86 and 88 curving in circular or peripheral manner to terminal portions 90 and 92, such terminal portions each extending beyond the centerline of the hub in its respective circular fashion so that each paddle and terminal portion occupies more than a quadrant of a circle.

As seen in FIGS. 5, 6, and 7, the stacking wheel has such form and shape wherein, in one plane, FIG. 6, the diametral portion 84 is arcuate, with its end portions 94 and 96 elevate from the diametral portions adjacent the hub 82. From such end portion elevated positions the blade portions 86 and 88 then curve downwardly to a plane along the centerline 98 (FIG. 5) which plane is on a level with the portion of the diameter adjacent the hub. The tip portions 90 and 92 then curve again toward an elevated plane, as seen in FIG 7, wherein the wheel, as shown at a right angle from the view of FIG. 6, is symmetrically arcuate in a bowed or concave manner to provide a pitch therein. FIG. 8 shows a cross-sectional view of the blade tip portion 92 which includes a beveled edge 100 along the blade to provide for clean engagement with the documents when they are positioned in the pocket and for moving the trailing portion to one side.

The stacking wheel 80 is driven by a motor 110 (FIG. 1) supported from suitable framework under the passageway 20 and its associated structure, there being a drive belt 112 trained around a drive pulley 114, an idler pulley 115, an idler pulley 116 under the pocket arm, a pulley 118 angled for driving the roller 30 (FIG. 2) adjacent the pocket, and returning above an idler pulley 119, and driving the limp wheel 28 pulley 121, the pulley 122 for drive wheel 26, and the pulley 124 for the drive wheel 24, then back to the drive pulley 114. The support for the idler pulley 115 is biased by a tension spring 125.

The specific drive means for the paddle wheel 80 is derived from the pulley 122 for the drive wheel 26, wherein an O-ring 130 (FIG. 2) is trained around a pulley (not shown) above the pulley 122 (FIG. 1) and around a pulley 132 journaled on a shaft 134 suitably supported from a mounting plate 136 which plate carries an upright member 138 for supporting a stud 140 on which is pivoted one end of a tension arm 142 biased by a spring 144, the other end of the tension arm providing a journal for a shaft 146 which carries a large pulley 148 having an O-ring 150 therearound, the O-ring being in biased engagement with the surface of pulley 132, and a small pulley 152 is carried on the shaft 146, there being an O-ring 154 trained around the pulley 152 and around a recess in the hub 82 (FIGS. 6 and 7) of the paddle wheel 80 for driving thereof. It is thus seen that the engagement of the O-ring 150 with the surface of the pulley 132 provides a frictional clutch action in the drive train for the wheel 80 which readily permits stoppage of the wheel by the operator. The hub 82 is carried on a shaft 156 journaled in a pillow block 158 suitably supported from the underside of the table 16. As noted in FIG. 2, the pillow block 158 supports the shaft 156 and the wheel at a slight angle from the path of travel of the checks.

The table 16 has an elongated cutout 160 (FIG. 2) of symmetrical shape for providing the opening for rotation of the wheel therein, there also being an elongated aperture 162 in the cover plate 56 allowing for the end portions of the wheel blades to rotate in the direction as shown in FIG. 1. The aperture 162 extends to the edge of the cover plate 56 for a portion thereof as seen by one edge 164 shown in FIG. 2. A diverter or deflector element 166 (FIGS. 1 and 2) is secured to the wall 24 and projects into the passageway of the checks, the tip portion 168 thereof extending to a position above one end of the aperture 160 and above the circular path of the blade tip portions 90 and 92 of the wheel 80.

As mentioned above, a check 76 is shown in the passageway in FIG. 2 and another check 77 is shown in phantom line and disposed in the pocket, such check 77 appearing in a canted position by reason of the incline of the pocket in relation to the table 16 (FIG. 1). The position of the wheel 80 with regard to the blade tips 90 and 92 is in similar orientation in FIGS. 1 and 2 wherein the incoming check 76 is being driven at a fast rate into the pocket and with tip portion 90 being in position for engaging with the rearward or trailing portion of the check after the check has been driven into the pocket. Referring now to FIG. 3, wherein a plurality of checks of different lengths are shown deposited in the pocket with the previously noted check 77 among the several checks, one of which is a check 75 in engagement with portion 96 of the wheel and being moved sideways in a direction toward check 77. Check 76 has been driven into the pocket with the wheel tip portion 90 being rotated into engagement with the check along the lower edge thereof. As illustrated in FIG. 4, the wheel has been further rotated in a counter clockwise direction wherein the tip portion 90 has further advanced and the distal portion 96 (FIG. 5) of the diametral portion 84 is still in engagement with the trailing portion of check 75 and has moved it away from the path of the incoming check while tip portion 90 has been rotated into further engagement with check 76. Another check 79 is shown as having been propelled into the pocket and in position to be engaged by blade tip portion 92 as it is rotated into the position occupied by tip portion 90 in FIG. 2. The feeding or driving of the checks through the passageway 20 and into the pocket is in timed relationship with the rotational speed of the wheel 80 so that the tip portions 90 and 92 thereof are synchronized to engage with respective checks as they are delivered to the pocket, and for a certain portion of the rotation of the wheel 80, there are always two checks in engagement therewith.

It is thus seen that herein shown and described is a document sorting control mechanism which operates to move the trailing portion of each check into an attitude to present a clear path for each succeeding check. The control mechanism includes a multi-paddle wheel disposed and driven in relationship with the pocketed checks to move a portion of each check in a sideways direction and to maintain the check in the desired posi-
tion. While only one embodiment has been disclosed for the construction and operation of the control mechanism, certain variations on the above may occur to those skilled in the art, so it is contemplated that all such variations having these features are within the scope of the invention.

What is claimed is:

1. Control mechanism for handling documents comprising:
   means for propelling said documents on edge along a path into a sorting pocket,
   rotatable means positioned adjacent said path for engaging the trailing portion of each document for sideways movement thereof and thereby providing an unobstructed passageway for succeeding documents, said last means comprising a multi-bladed member being arcuately shaped and positioned with the arcuate form in concave manner from the path of said documents and having blade terminal portions extending beyond the center of concavity of said arcuate form and rotatable in a vertical plane angularly disposed from the plane of said propelling path, and means including frictional clutch elements for driving said rotatable means.

2. The control mechanism of claim 1 wherein said multi-bladed member includes a diametral portion and identical wing portions extending in oppositely disposed manner therefrom for engageably moving a document and for retaining movement thereof.

3. The control mechanism of claim 1 including a deflector element positioned adjacent said path and disposed on the opposite side thereof from said rotatable means.

4. In a document sorting machine, means for propelling the documents on edge along a predetermined path to a sorting pocket, and means for moving the trailing edge of each entered document in the pocket into a sideways position and for retaining thereat so as to provide a clear path for a succeeding document comprising:
   a support member, a guide member secured to said support member and positioned adjacent said predetermined path of said documents for retaining said documents on edge during their travel, means journaled on said support member and rotatable in a vertical plane and positioned to extend beyond said guide member to engage with each document upon entering of such document into said pocket, said rotatable means comprising a multi-bladed member being arcuately shaped and positioned with the arcuate form in concavity from said predetermined path and having a pair of peripheral portions each extending in excess of a quadrant and terminating beyond the center of concavity of said arcuate form, and means including frictional clutch elements for driving said rotatable means.

5. In the machine of claim 4 wherein said guide member includes a raised portion adjacent said path and a lower portion having an inclined surface adjacent said sorting pocket.

6. In the machine of claim 4 wherein said multi-bladed member includes a diametral portion and said peripheral portions comprise identical wing portions extending in oppositely disposed manner from said diametral portion.

7. In the machine of claim 4 including a deflector element positioned adjacent said path and disposed on the opposite side thereof from said rotatable means.

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