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UNLOADABLE DOCUMENT STACKING MECHANISM

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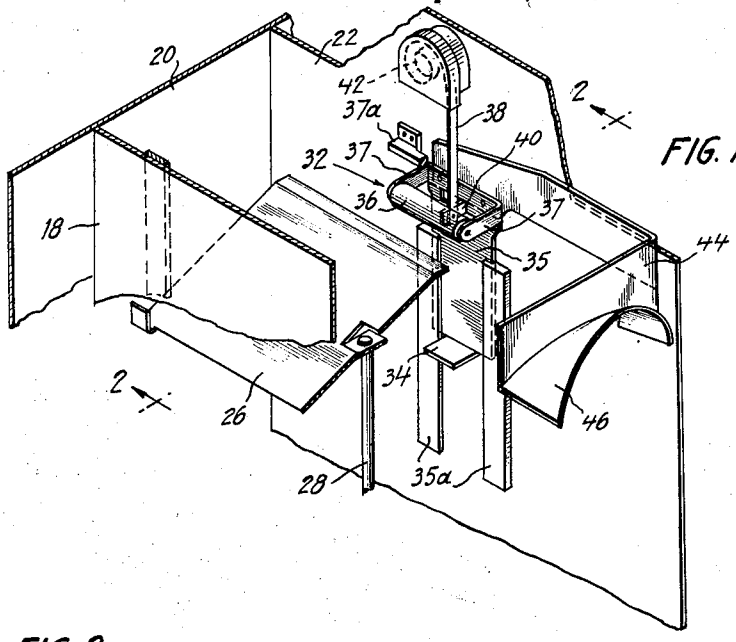


FIG. 1.

FIG. 2.

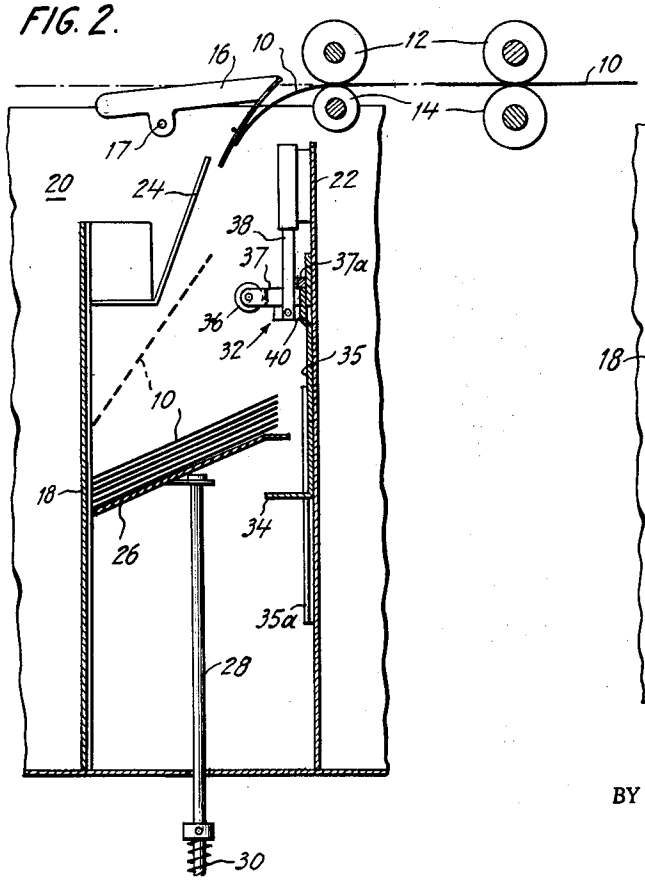
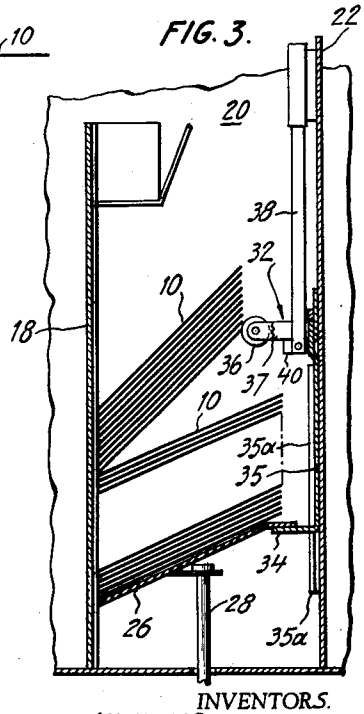


FIG. 3.



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UNLOADABLE DOCUMENT STACKING MECHANISM

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The invention hereinafter described and illustrated in the accompanying drawing pertains, in general, to magazines for stacking documents such as punched cards and the like which are received from such data processing machines as sorters, card-readers, etc. More particularly, the invention relates to a document stacking magazine which may be partly unloaded without interrupting feeding of the remaining documents to the magazine and without the risk of dropping the documents, upsetting the order of the documents, or causing a jam.

One object of this invention is to provide an improved document-stacking magazine which may be emptied of portions of its document content without interrupting the feed of the remaining documents and without risk of upsetting the order of the card feed.

It is another object of the invention to provide a document-stacking magazine of the type described which may be incorporated into presently used document processing machines.

According to one illustrative embodiment of the invention, there is provided a punched-card stacking magazine having a chamber for receiving punched cards. Within the chamber there is a longitudinally tilted tray on which the cards rest. The tray is arranged to be depressed under the weight of the cards disposed within the chamber. Supported on one wall of the chamber is a mechanism which functions cooperatively with the tray to separate the cards on the tray into an upper and lower stack. This stack separating mechanism comprises a tray-interposer and a card-interposer, both arranged for downward movement against spring pressure. As the received cards accumulate in a stack on the tray, the tray, overcoming spring-restraint, descends into the chamber. At a certain point in its descent the tray engages the tray-interposer thereby carrying the tray-interposer downwardly into the chamber with the tray. As the tray-interposer descends with the tray toward the bottom of the chamber the tray causes the card-interposer to intercept the cards presently being received at the top of the chamber. Both interposers, being spaced apart from each other a fixed distance, descend into the chamber. This separates the cards vertically into two stacks. The card-interposer functions to maintain a gap between the two stacks of punched cards. When the tray is near the bottom of the chamber, the stack of cards on it may be removed.

Advantageously, a retainer wall may be attached to the stack-separating mechanism and moved therewith to retain the cards in the upper stack, that is the cards supported by the card-interposer, so that the cards in the upper stack will not be disturbed as the lower stack of the cards is manually removed.

The various features and advantages of the invention may be best understood by referring to the following description of one embodiment thereof and to the accompanying drawing in which:

FIG. 1 is a perspective view, partly sectioned, of the document-stacking magazine of the invention.

FIG. 2 is a sectioned-elevation view, showing a stack of cards on the tray during the intial portion of the tray's descent into the chamber. The view being taken along the lines 2—2 indicated at FIG. 1.

FIG. 3 is another elevation view, showing the separation of the punched cards into an upper stack and a lower stack.

Referring now to the drawing figures, wherein like reference numerals are used throughout to designate like elements, there is illustrated a punched-card stacking magazine embodying the invention. The magazine illustrated may, for purposes of the present discussion, be considered to be one of the many magazines used in connection with a punched-card sorting machine. As is illustrated, a plurality of punched cards 10, some of which are intended to be received and stacked in the magazine shown, are conveyed between the sets of rollers 12 and 14 toward the magazine. Suitable card sensing means (not shown), well known in the art, are employed to sense each of the cards. In accordance with the positions of the holes punched through the cards (or the absence of holes) a particular card will be routed to a particular magazine. The cards to be deposited in the magazine illustrated are routed thereto by the pivoted deflector 16.

The card-sensing means causes the deflector 16 to partly rotate counterclockwise about the pivot-point 17 thereby intercepting the leading edge of the punched cards 10. The smooth, curved leading-edge portion of the deflector 16 causes the punched cards 10 to curve slightly and drop downwardly into the magazine. Cooperating with the deflector 16 is a card-guide member 24, angularly shaped as illustrated and fixed to a side wall of the magazine, the magazine chamber being defined by the three side walls 18, 20 and 22. The chamber is open on the fourth side.

Supported within the chamber defined by the three side walls is the vertically movable card tray 26. Resiliently supporting the tray is a rod 28, the rod being restrained by a coil spring 30 (partially shown for purposes of clarity). The spring 30 is purposeful for normally biasing the position of the tray 26 to the top portion of the chamber. As may be appreciated from the respective views of the drawing the tray 26 moves downwardly into the chamber as the punched cards 10 being stacked thereon progressively increase the load on the tray.

Designated generally by the reference numeral 32 is the stack-separating mechanism which cooperates with the movable tray 26 to separate the punched cards into two separate stacks i.e., an upper stack and a lower stack. As is illustrated in FIG. 1, the stack-separating mechanism 32 comprises a tray interposer 34, a card-interposer 36, and a restraining spring 38, the tray-interposer 34 comprising the bottom bent over portion of a slider-bar 35. The upper end of the slider-bar 35 is formed with a pair of bent over ears 37 supporting a suitably journaled roller 36 which serves as the card-interposer. The bar 35 is suitably guided for vertical motion by a pair of grooved rails 35*a* secured to the side wall 22 and is limited in its upward travel by a limit stop 37*a* also secured to the magazine side wall 22.

As is illustrated, one end of the restraining spring 38 is affixed to a journal member 40, the journal member being rigidly mounted on the slider-bar 35. The other end of the restraining spring 38 is coiled about a small drum 42 which is rigidly fixed to the side wall 22. Advantageously, the spring 38 is a noncumulative-force spring, that is to say, its restraining force does not increase as it is linearly extended downwardly into the chamber. Rather, a constant restraining force is exerted by the spring 38. Such springs are known in the art and are commercially available. For example, one source from which such noncumulative-force, or constant-force, springs may be purchased is the Hunter Spring Company of Lansdale, Pennsylvania. One such spring, suitable for the purpose, is known as the Neg'ator spring, the name Neg'ator being a proprietary name. The reason for using a constant-force spring will appear hereinafter when the operation of

the stack-separating mechanism 32 is discussed in more detail with reference to FIG. 2 and FIG. 3.

In FIG. 2 of the accompanying drawing, the magazine provided by the invention is illustrated as being in an initial filling condition, i.e., the tray 26, having an accumulating stack of cards 10 thereon, is in the initial stages of its descent downwardly into the magazine's chamber. As is shown, the tray 26 with its accumulated stack of cards has not yet reached the position where it will engage the tray-interposer 34. Since the tray interposer 34 is not as yet actuated by engagement of the tray 26, the spring 38 is not yet extended and, of course, the roller 36 (card-interposer) is not yet urged downwardly to a position at which it can intercept the punched cards being fed into the chamber.

Shown at FIG. 3 is the condition of the card stacks, the card tray 26, and the stack-separating mechanism 32 when the card tray is at its lowest position. The condition illustrated at FIG. 3 is the result of the following actions:

The tray 26, carrying its stack of cards 10, has engaged the tray-interposer 34, and, as additional punched cards accumulate on the tray 26, it pushes the tray-interposer 34 downwardly through a given distance. Of course, the slider-bar 35 is carried downwardly with the tray-interposer 34. Likewise, the roller 36 moves downwardly into a position at which it intercepts the trailing edge of one of the punched cards 10 being fed into the chamber. As is illustrated in FIG. 3, the roller 36, or card-interposer, separates the punched cards being fed into two stacks, an upper and a lower stack. As may be appreciated from the illustration of the card stacks shown in FIG. 3, the weight of the upper stack is partially loaded onto the cards of the lower stack, that is, the leading edge of the cards in the upper stack bear against the leading edge of the cards in the lower stack. Of course, the accumulated weight of the upper stack upon the lower stack will cause the tray 26 to descend further into the chamber.

In the preferred embodiment of the magazine shown in the drawing figures, it is highly advantageous to employ a constant-force spring 38, rather than a conventional "Hooke's-Law" spring. Unlike a Hooke's-Law spring, the constant-force spring 38 provides the same restraining force no matter how far the spring 38 (which is a metallic ribbon coiled about the small fixed drum 42) is extended from the drum. Employing a spring with constant restraining force throughout the length of its extension, allows the weight of the cards accumulating on the stack to cause the stacks of cards to descend uniformly and smoothly into the chamber. If, however, the conventional coil spring (which is a Hooke's-Law spring) were used, the restraining force would increase linearly as it was stretched. This would cause the stacks of cards to descend much more slowly into the chamber or, possibly, stop thereby causing a build-up of the upper stack, which would, eventually, cause the cards being fed to jam up at the feeding entrance of the chamber.

Referring again to FIG. 1, there illustrated are two other features of the invention, a small retainer-wall 44 which may be suitably attached to the journal member 40, or the slider-bar 35 and a hand guide 46, integral with the retainer-wall 44.

As appears in FIG. 1, the purpose of the retainer-wall 44, which moves together with the stack-separating mechanism 32, is to maintain the upper cards in a neat stack during the descent of the upper stack into the chamber. The retainer-wall 44 maintains only the upper stack of cards in a neat stack. It does not prevent access to the lower stack of cards. Advantageously, the hand guide 46 permits easy access of a human attendant's hand for the purpose of extracting the lower stack of cards from the chamber. Of course, when the lower stack of cards is extracted, the tray 26 will move upwardly by virtue of the biasing force of the spring 30 while at the same time the upper stack of cards will drop fully onto the tray.

After the lower stack of cards is extracted, the attitude of the tray 26 and the various parts of the stack-separating mechanism 32 are the same as is illustrated in FIG. 2.

In the embodiment shown by way of example, while the number of cards in the lower stack may be varied by adjustment of tension of the springs and choice of the distance between the tray-interposer 34 and card-interposer 36, I prefer to limit the lower stack to about 350 cards. This is about the maximum number of cards an operator can readily handle, although there may be a total of 1000 cards in the magazine.

The punched-card stacking magazine, incorporating the stack-separating mechanism hereinbefore described and illustrated in the accompanying drawing figures, is to be considered as being an illustrative example of the invention. Many changes, substitutions for, and other arrangements of the means hereinbefore described, may be made without departing from the spirit and scope of the invention which is defined by the claims hereinafter set forth.

We claim:

1. An unloadable document stacking magazine comprising, in combination:
   (*a*) a chamber for receiving documents;
   (*b*) a tray situated within the chamber for descent into said chamber as the received documents are accumulated in a stack on the tray; and
   (*c*) stack separating means positioned along one side and within said chamber and continuously actuable by the descending tray after descent through a predetermined distance for accumulating received documents in separate stacks.

2. The magazine defined in claim 1 wherein the stack separating means comprises a movable tray interposer, actuable by descent of the stack bearing tray through a predetermined distance, for intercepting and accumulating documents in separate stacks.

3. An unloadable document stacking magazine comprising, in combination:
   (*a*) a chamber including a document receiving entrance;
   (*b*) means for deflecting and guiding documents into said entrance;
   (*c*) a tray for receiving documents and arranged within said chamber for descent as the received documents accumulate in a stack on said tray, said tray having a projection;
   (*d*) a movable card-interposer positioned along one side and within said chamber and depressible for accumulating received documents in separate stacks after movement through a predetermined distance;
   (*e*) a tray-interposer coupled to and below said card-interposer and engageable by said projection of said tray and actuable by the descent of the stack-bearing tray for depressing the card-interposer; and
   (*f*) a retainer wall forming one side of said chamber for retaining the separate stacks.

4. An unloadable document stacking magazine comprising in combination,
   means defining a chamber for receiving documents,
   means for directing documents into said chamber,
   a movable tray positioned within said chamber for descent into said chamber as the received documents are accumulated in a stack on said tray,
   said tray supporting a projection,
   a pair of upright grooved rails supported by and within said chamber,
   stack separating means positioned for slidable excursions within said rails,
   and an interposer coupled to said stack separating means for engaging said projection of said tray after a predetermined excursion of said tray to permit said stack separating means to form partially separated stacks of documents.

5. An unloadable document stacking magazine comprising in combination,
means defining a chamber for receiving documents,
means for directing documents into said chamber,
a movable tray positioned within said chamber for descent into said chamber as the received documents are accumulated in a stack on said tray,
said tray supporting a projection,
a pair of upright grooved rails supported by and within said chamber,
stack separating means positioned for slidable excursions within said rails,
resilient means secured to said chamber and said separating means and urging said separating means in an upward direction,
and an interposer coupled to said stack separating means for engaging said projection of said tray after a predetermined excursion of said tray to permit said stack separating means to form partially separated stacks of documents.

6. An unloadable document stacking magazine comprising in combination,
means defining a chamber for receiving documents,
means for directing documents into said chamber,
a movable tray positioned within said chamber for descent into said chamber as the received documents are accumulated in a stack on said tray,
said tray supporting a projection,
a pair of upright grooved rails supported by and within said chamber,
a card-interposer positioned for slidable excursions within said rails,
a tray-interposer coupled to said card-interposer for engaging said projection of said tray after a predetermined excursion of said tray to permit said card-interposer to form partially separated stacks of documents,
and means coupled to said card-interposer and said tray interposer for urging both of said interposers upwardly but permitting downward movement as said tray is accumulating documents.

7. An unloadable document stacking magazine comprising in combination,
means defining a chamber for receiving documents,
means for directing documents into said chamber,
a movable tray positioned within said chamber for descent into said chamber as the received documents are accumulated in a stack on said tray,
said tray supporting a projection,

a pair of upright grooved rails supported by and within said chamber,
stack separating means positioned for slidable excursions within said rails,
an interposer coupled to said stack separating means for engaging said projection of said tray after a predetermined excursion of said tray to permit said stack separating means to form partially separated stacks of documents,
and an integral hand guide and retainer wall positioned at one end of said chamber to facilitate the removal of one of the separated stacks of documents.

8. An unloadable document stacking magazine comprising in combination,
means defining a chamber for receiving documents,
means for directing documents into said chamber,
a movable tray positioned within said chamber for descent into said chamber as the received documents are accumulated in a stack on said tray,
said tray supporting a projection,
a pair of upright grooved rails supported by and within said chamber,
a card-interposer positioned for slidable excursions within said rails,
a tray-interposer positioned below and in the path of said projection of said tray,
a slider bar for joining and retaining at a predetermined distance said interposers,
and means for biasing said interposers upwardly but permitting downward excursions after engagement with said projection to cause said card-interposer to form partially separated stacks of documents.

9. The combination as defined in claim 8 including an integral hand guide and retainer wall positioned at one end of said chamber to facilitate the removal of one of the separated stacks of documents.

10. The combination as defined in claim 8 wherein said card-interposer includes a roller for permitting rolling engagement with the documents as they proceed to said tray.

11. The combination as defined in claim 8 wherein said means for biasing the interposers upwardly is a non-cumulative force spring.

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