ABSTRACT: A stacker for document cards having a card-receiving pocket, a rotatable roller yieldably disposed at the top of the pocket by means of a cantilever spring, a pressure shoe disposed at the card entrance side of the pocket, and a resilient card stop at the other side of the pocket. A supporting plate for the cards is disposed in the pocket and is yieldably held from downward movement in the pocket so as to support a stack of cards therein. As the cards enter the pocket, they deflect the cantilever spring while making contact with the roller and cause the roller to rotate so that the roller drives the cards forwardly and snaps the cards off the pressure shoe; and the roller also, due to its rotation, prevents substantial rebound of the cards from the card stop.
STACKER FOR DOCUMENT CARDS

BACKGROUND OF THE INVENTION

The invention relates to document cards and more particularly to stackers for such cards. It has been previously proposed in stacking document cards to prevent the rebound of the cards as they are stacked at high speeds by means of a brush which rests on the top surface of each succeeding card as it is moved onto the stack. The brush extends at an acute angle with respect to the top surface of a card as it moves onto the stack so that the card moves easily in one direction but is prevented from moving substantially in the other direction. Such an arrangement is shown in International Business Machines Technical Disclosure Bulletin, Volume 7, Number 8, Jan. 1965, Page 714, the disclosure therein being entitled “Document Stacker” by H. P. Braun and C. E. Lorensen.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved stacker for document cards which not only prevents substantial rebound of a card from its stacked position but also provides a force on a card being stacked, moving the card in its original direction even after the card has left contact with a driving belt that functions to move the card originally into a stacker pocket. In a preferred form, the stacker of the invention includes a roller contacted by each card as it enters the stacker pocket so that the roller is thereby put into rotation. Due to its rotational inertia, the roller prevents rebound of a card stop; and the roller also assists in drawing the card completely into the pocket, snapping the card off of a pressure shoe at the entrance end of the pocket. The roller is preferably mounted on a cantilever spring so that, as the cards stack in the pocket, the cantilever spring not only yields to allow the entrance of each individual card into the pocket but also moves the card stack downwardly in the pocket. The roller and spring in combination provide a constant resistance to card entrance regardless of stacker orientation or card volume.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view of a machine utilizing document cards in its operation and incorporating the stacker of the invention; FIG. 2 is a plan view of the stacker taken from line 2—2 of FIG. 1; and FIG. 3 is a view similar to FIG. 2 but with certain parts being broken away to show other, internal parts.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the illustrated document card machine includes a friction belt 10 for the purpose of transporting a series of document cards 11. The belt 10 travels over a series of rolls 12, 13, 14, and 15 positioned within the belt; and these rolls are disposed on shafts or axles 16, 17, 18, and 19 that are fixed with respect to a machine frame 20 so that the shafts 16–19 extend approximately at an angle of 15° with respect to vertical as shown in FIG. 1.

The machine includes also a card stacker 21, and the stacker comprises a pair of vertically extending guide blocks 22 and 23 and a base 24 extending at substantially 15° with respect to horizontal. The guide blocks 22 and 23, and the base 24 define a pocket 25 for receiving a stack of cards 11.

The machine includes belt-supporting rolls 26, 27, and 28 which are respectively rotatably supported by means of mountings 29, 30, and 31. The belt 10 moves in the direction indicated by the arrow A about the rolls 12–15; and the rolls 26 and 27 are respectively disposed in positions just prior to the rolls 13 and 14 considering the direction of movement of the belt 10. The rolls 26 and 27 hold the belt moved inwardly with respect to lines of tangent connecting the rolls 13, 14, and 15. The roll 28 is disposed just below the roll 15 and is apaced just sufficiently from the roll 15 so that a document card 11 may pass along with the belt 10 through the nip between the roll 15 and roll 28.

A pressure shoe 32 is provided adjacent the periphery of the roll 14 and is mounted on a cantilever leaf spring 33. The pressure shoe 32 is moved toward the roll 14 by means of a plurality of springs 34, and the upward movement of the leaf spring 33 and thereby the shoe 32 is limited by screws 35. A card stop 36 of resilient material is fixed with respect to the mounting 29 on the side of the stacker 21 opposite to that on which the pressure shoe 32 is disposed, and a card guide 37 is positioned adjacent the pressure shoe 32 for the purpose of directing a card 11 downwardly into the pocket 25. A roller 38 is disposed at the upper end of the pocket 25 and is rotatably carried by means of a leaf spring 39 arranged as a cantilever and fixed by means of a rivet 40 with respect to the mounting 29.

A base plate 41 is movable longitudinally of the pocket 25 and has a portion extending into and traveling in a longitudinal slot 42 provided in the base 24. This part of the plate 41 within the slot 42 is secured with respect to the pocket 25 by a screw 43 that the upper surface of the plate 41 is disposed at a small acute angle of about 7°, for example, with respect to the slot 42 and with respect to the guide blocks 22 and 23 as may be seen from FIG. 3 whereby the cards 11, as they are stacked in the pocket 25, extend in the same direction with respect to the sides of the stack. In this connection, the angle at which the plate 41 is disposed with respect to the guide blocks 22 and 23 assists the card 11 in snapping off the pressure shoe 32 in entering the pocket 25, without presenting a large resisting force component to the card.

A spring 43 fixed at its upper end by means of a pin 44 and fixed at its lower end to the plate 41 functions to yieldably urge the plate 41 upwardly in the pocket 25. The spring 43 is relatively long and low rate so that the force it applies on the plate 41 does not change very substantially as the stack of cards 11 in the pocket 25 increases in size.

In operation, the cards 11 are inserted one-by-one into the nip between the roller 28 and the roll 15 so that the belt 10 in its movement moves the cards 11 edgewise toward the pocket 25. The cards 11 pass over the roll 27 as transported by the belt 10 and pass into contact with the pressure shoe 32 and pressure shoe 32 and then in contact with the card guide 37 which directs the cards downwardly edgewise into the pocket 25. The cards pass beneath the roller 38; and as they enter the pocket 25 completely, they snap off the pressure shoe 32 and move into contact with the card stop 36 which cushions and stops the cards. As the cards 11 enter the pocket 25 one-by-one they build up in the form of a stack which is supported by the plate 41; and as the stack increases in height, the plate 41 moves downwardly against the action of the spring 43 so as to maintain the top of the stack adjacent the lower horizontal surface of the mounting 29.

As each care enters the pocket 25, it makes contact with the roller 38 and rotates the roller. This movement of a card beneath the roller 38 moves the roller 38 upwardly against the spring 39 which yields for the thickness of the card, and the spring 39 subsequently forces the stack of cards downwardly so as to move the plate 41 downwardly in the pocket 25 to maintain the uppermost card in the stack in close proximity to the lower surface of the mounting 29 substantially as shown in FIG. 3. The yielding effect of the spring 39 always takes place uniformly as the pocket 25 becomes filled with cards regardless of the varying inertia of the card stack.

Each of the cards 11, as it travels into the pocket 25 on top of previous cards 11 in the pocket 25, drivenly rotates the roller 38; and the momentum of the roller 38 has the function of providing a frictional drive force to the card that propels the card toward the card stop 36 and assists the card in clearing the pressure shoe 32. The momentum is further enhanced by the additional effect of counteracting rebound of the card as it strikes the stop 36, so that the cards present an aligned edge in their
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stacked condition in the pocket 25. The roller 38 stops after each card 11 reaches its position on top of the stack of cards 11 in the pocket 25 and remains stationary until the next card 11 strikes it and causes it to rotate again.

It is apparent that the stacker as above described may be useful with many different types and sizes of documents; however, the stacker has been found particularly suitable for small cards such as, for example, cards having a length of about 3 1/2 inches and a width of 2 inches. Such a card of the document type weighs about 0.0017 pound; and the speed of a card 11 as it travels into the pocket 25 may, for example, be about 135 inches per second. The roller 38 may for example have a diameter of 3/4 inch, may be made of a suitable plastic for example, and may for example have a rotational inertia of 0.5X10^-5 lb. sec. The spring 39 may, for example, exert a 0.5 down downward force on the stack of cards 11 of 0.55 pound. The weight of a stack of the cards 11 in the pocket 25, as the cards increase in stacking height, may vary from zero to 4.5 pounds; and the base 24 may, for example, be of aluminum or steel.

The coefficient of friction between the base 24 and the sliding stack of cards 11 as it moves downwardly in the pocket 25 is approximately equal to the tangent of the angle of declination of the base 24 which, in this case, is 15°. The declination of 15° is provided so that the stack of cards 11 in the pocket 25 just barely moves down the declining surface of the base 24 with no appreciable force exerted on the stack of cards from the top.

The momentum of the roller 38 not only provides a frictional drive force that assists a card in its movement, but also counteracts card return movement whereby the card stacker herein disclosed contains a device that provides a reduced resistance with respect to card entrance in the pocket 25 and provides some driving force on the cards and resists card rebound from stop 36 as the cards enter the pocket 25. The spring 39 yields slightly as a card moves into the pocket 25 to raise the roller 38 by a corresponding amount, and the roller 38 and its supporting spring 39 thus allow a relatively easy entrance of a card into the pocket 25 while subsequently acting to move the cards 11 and the plate 41 downwardly in the pocket 25 against the action of the spring 43. In order to render this action relatively expeditious, the base 24 has been slanted downwardly as seen in FIG. 1 so that there is relatively little frictional resistance of the cards 11 against moving downwardly in the pocket 25 as the stack height increases; and the plate 41 is slanted with respect to the blocks 22 and 23 defining the sides of the pocket 25, as seen in FIGS. 2 and 3, so that the cards 11 may easily enter the pocket 25. The resistance to a card entering the pocket 25 remains constant and is dependent only upon the force required to accelerate the spring 39 and the roller 38 upwardly; and, in this connection, the weight of the roller 38 should be kept desirably small.

The downward movement of the stack of cards 11 in the pocket 25 occurs substantially once for each card 11 entering the pocket 25; however, since the cards 11 enter the pocket 25 at a high rate, these incremental movements of the card stack are not noticeable.

Although we have illustrated the pocket 25 as having the base 24 extending at 15° with respect to horizontal, it will be apparent that the pocket 25 may instead be vertical or at any angle between horizontal and vertical; and the roller 38 supported by the spring 39, in all of these cases, has the desirable function of rendering facile the entrance of a card into the pocket 25 and of preventing rebound of the card. If the angle of the base 24 with respect to horizontal is changed, it will, of course, be desirable to change the rate of the spring 43.

What is claimed is:

1. A stacker for document cards comprising:
means forming a pocket adapted to hold a stack of document cards;
means for moving the cards one at a time edgewise into one end of the pocket from one side of the pocket toward the other side of the pocket;
a nondriven inertia member which is round in cross section at right angles to a major axis thereof; and
means for supporting said member at said end of the pocket so that said member may rotate about its said major axis and so that, as each of the cards enter the pocket, the card contacts said member and causes it to start rotating whereby said member due to its contact with the card and due to its rotation and rotational inertia assists in moving the card into contact with said other side of the pocket and resists rebound of the card from said other side of the pocket.

2. A stacker for document cards as set forth in claim 1, said inertia member being in the form of a roller which is mounted with its axis at right angles to the direction of movement of said cards into said pocket.

3. A stacker for document cards as set forth in claim 2, said member-supporting means including a spring which yields as the individual cards enter said pocket on top of previous cards therein.

4. A stacker as set forth in claim 3, said spring being in the form of a cantilever spring, the stacker including a card-supporting plate longitudinally movable within said pocket and a spring for yieldably urging said plate toward said one end of the pocket, said cantilever spring supporting said roller forcing the document cards as stacked downwardly in the pocket against said second-named spring which is effective on said plate.

5. A stacker as set forth in claim 3, and including a roll adjacent the side of the pocket at which the document cards enter the pocket and a spring pressed pressure shoe adjacent the periphery of the roll, said cards entering said pocket between said pressure shoe and roll, and said roller due to its contact with a card and due to its rotation and rotational inertia assisting the card entering the pocket in snapping off the pressure shoe.

6. A stacker for document cards comprising:
means forming a pocket adapted to hold a stack of document cards;
means for moving the cards one at a time edgewise into one end of the pocket from one side of the pocket toward the other side of the pocket;
a card-supporting plate longitudinally movable within said pocket and a spring for yieldably urging said plate toward said one end of the pocket; and
force applying means at said one end of the pocket and bearing on the individual cards as they enter the pocket and including another spring which yields as each card enters the pocket and which applies force to force the cards downwardly in the pocket against said first-named spring as the stack of cards is built up by the individual cards.

7. A stacker as set forth in claim 6, said other spring being in the form of a cantilever leaf spring.