June 16, 1964 S. E. HOTCHKISS ETAL 3,137,496

CARD FEEDING DEVICE

Filed Sept. 15, 1961 4 Sheets-Sheet 1

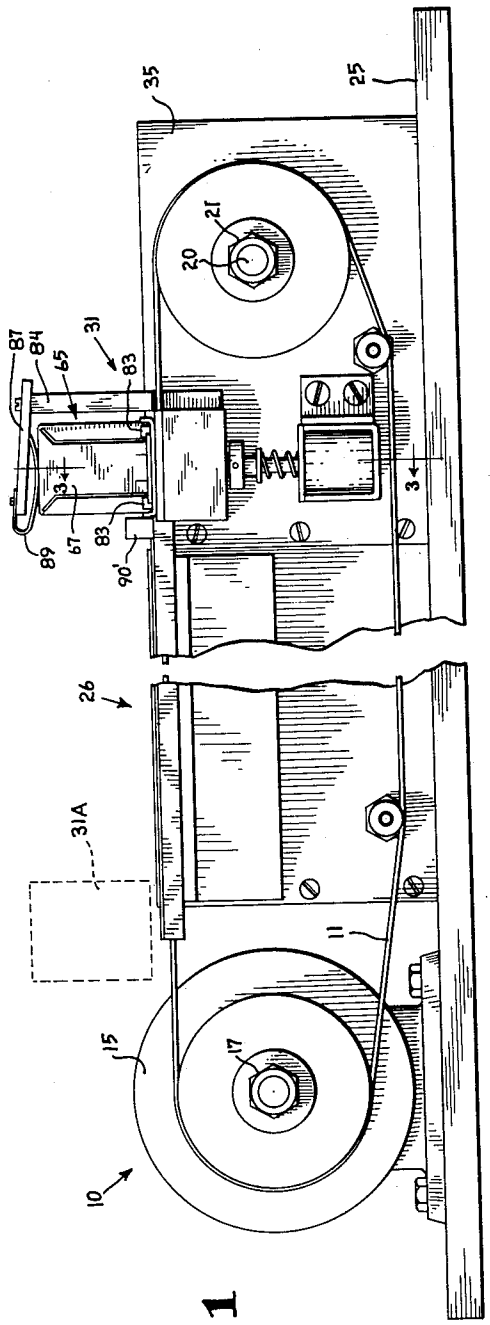


Fig. 1

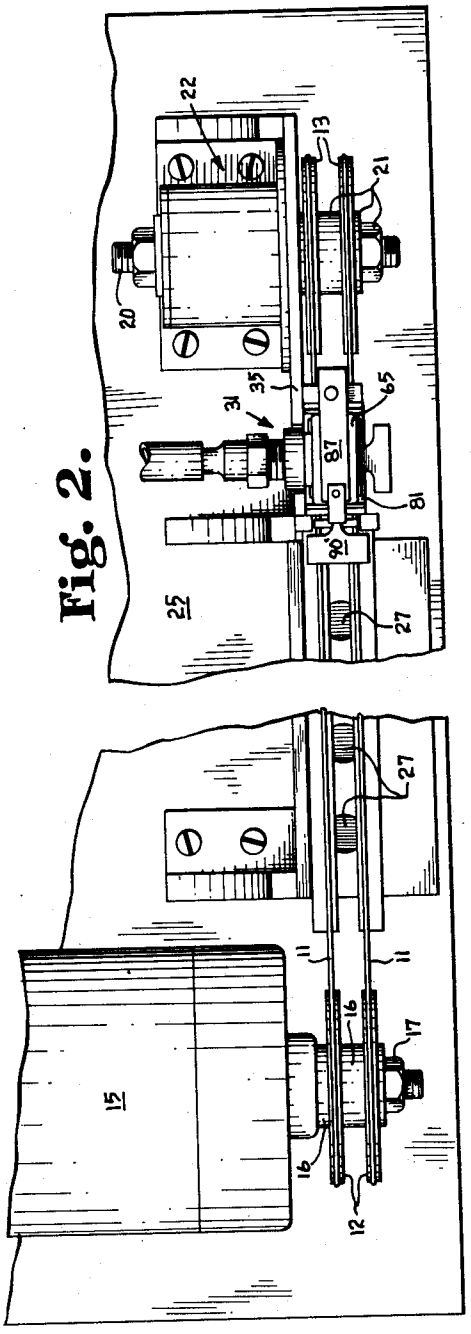


Fig. 2.

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CARD FEEDING DEVICE

Filed Sept. 15, 1961 4 Sheets-Sheet 2

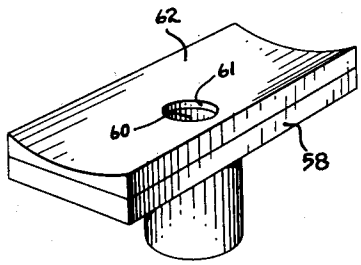


Fig. 4.

Fig. 3.

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CARD FEEDING DEVICE

Filed Sept. 15, 1961 4 Sheets-Sheet 3

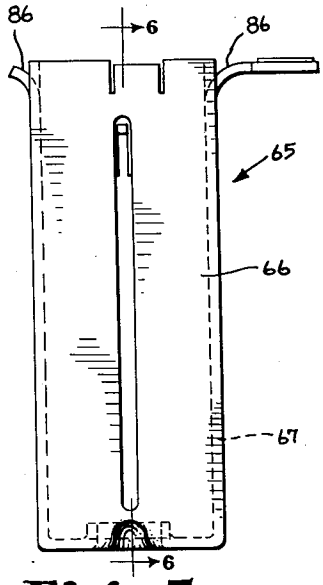


Fig. 5.

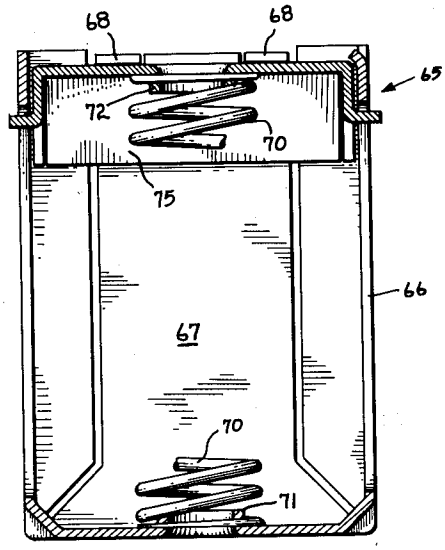


Fig. 6.

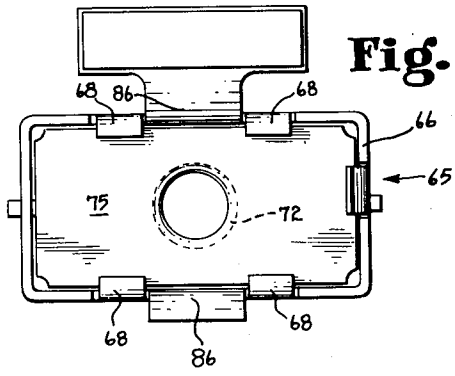


Fig. 7.

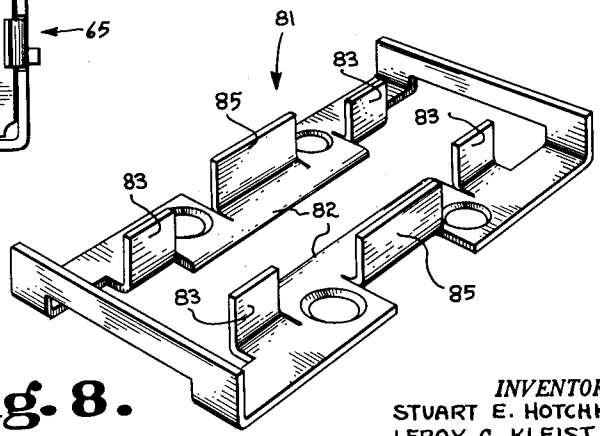


Fig. 8.

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CARD FEEDING DEVICE

Filed Sept. 15, 1961 4 Sheets-Sheet 4

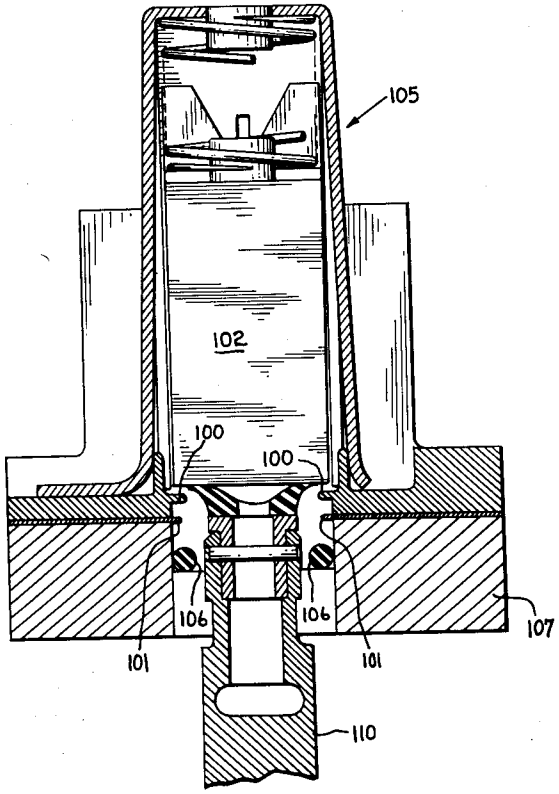


Fig. 9.

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3,137,496

CARD FEEDING DEVICE

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Filed Sept. 15, 1961, Ser. No. 138,742
5 Claims. (Cl. 271—12)

The present invention relates generally to a positioning device finding important utility as a feeding station for placing small sized photographic film segments, hereinafter called cards, upon a conveyor.

It is known in the art to establish filing systems using small film records or cards of documents whereby it is unnecessary to keep files of the original full sized paper documents. Various systems of storing documentary information on microfilm have been devised. Certain of these, which operate almost completely automatically, require complicated and expensive equipment. In an effort to simplify the equipment involved in such systems, it has been found that an efficient, relatively inexpensive means is needed for removing the cards from their storage containers and placing them on a conveyor for transportation to positions for selecting desired cards, reproducing the information thereon, and replacing the selected cards in the containers.

The principal object of the present invention is to provide a feeding station for placing cards on a conveyor.

Another object of the present invention is to provide a positioning device capable of efficiently removing cards from a storage capsule and placing them on a conveyor.

Still another object of the present invention is to provide a feeding station for placing cards on a conveyor at predetermined intervals.

Still a further object of the present invention is to provide a positioning device for mechanically removing film segments from a compartment or magazine and placing them in a suitable location for transporting to a selected location.

Related objects and advantages will become apparent as the description proceeds.

One embodiment of the invention comprises a positioning device including a reciprocable plunger having a port opening externally thereof. The plunger is provided with means for conducting a vacuum to said port when the plunger is toward one end of its stroke and for connecting said port to atmosphere when the plunger is toward the other end of its stroke whereby a card may be captured by said plunger and deposited at a new location.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a side elevation of a conveyor arrangement incorporating the feeding station of the present invention.

FIG. 2 is a plan view of the structure illustrated in FIG. 1.

FIG. 3 is a vertical section taken along the line 3—3 of FIG. 1 in the direction of the arrows showing the internal details of the feeding stage.

FIG. 4 is a perspective view of the head of plunger forming a part of the structure of FIG. 3.

FIG. 5 is a side elevation of a card carrying capsule for use with the feed station of the present invention.

FIG. 6 is a section along the line 6—6 of FIG. 5.

FIG. 7 is a bottom view of the capsule.

FIG. 8 is a perspective detail view of an element including the feed lips for the feeding station.

FIG. 9 is a vertical section similar to FIG. 3 showing the internal details of an alternative embodiment of the feeding station of the present invention.

Referring now more particularly to the drawings, there is illustrated a conveyor arrangement **10** which includes a pair of belts **11** received in parallel spaced relation about sheaves **12** and **13** having suitable peripheral grooves in retaining the belts. The sheaves **12** are fixed in spaced relation to one another upon the driveshaft of a suitable motor **15** by means of spacer elements **16** and a suitable nut and washer **17**. The idler sheaves **13** are fixed in spaced relation upon a shaft **20** by means of suitable spacers, washer and nut **21**, the shaft **20** being rotatably received within a suitable bearing arrangement **22**. Both the bearing arrangement **22** and the motor **15** are fixed upon a base plate **25**.

The conveyor **10** further includes a central structure **26** which provides tracks for the strands **11** and which provides a vacuum between the belts for maintaining the cards in engagement with the belts. The structure **26** is fixedly mounted upon the base plate **25** and is provided with a plurality of apertures **27** which open upwardly between the strands **11** and to which is provided a vacuum acting to draw the cards downwardly into engagement with the strands. The trackways provided by the structure **26** are very similar to the indentations **30** appearing in FIG. 3 and, along with the remainder of the central structure **26**, are illustrated and described in greater particularity in copending application, Serial Number 67,825 filed November 7, 1960, invented by Donald E. Craig and assigned to the same assignee as the present invention.

As mentioned above, the present invention relates particularly to the feeding station **31** associated with the present conveyor and does not relate to the details of the conveyor **10**. However, it should be mentioned that a suitable retrieval station **31A** may be provided to take up the cards once they have been conveyed across the central structure **26**. There may also be provided suitable reading and reproducing devices (not shown) which are located between the feeding station and the retrieval station.

Referring more particularly to FIG. 3, the details of the feeding station are illustrated and comprise a solenoid **32** which is fixed in position by suitable end plates **33** which are in turn secured to a vertically extending mounting plate **35**. The upright mounting plate **35** is fixed at its lower end to the base plate **25** and is also supported by the central structure **26**. The solenoid **32** is provided with a suitable armature **36** which is moved downwardly by the energization of the solenoid **32**. A plunger shaft **37** is fixed, by means of a suitable pin **40**, to the armature and is urged to an upward position by means of a suitable coiled compression spring **41** received between the fixed end plate **33** and a collar **42** integral with the plunger shaft **37**.

A head **45** is fixedly mounted upon the vertically extending plate **35** and reciprocally receives the shaft **37**, a suitable pin, **44**, being provided to prevent rotation of the shaft with respect to the head. Formed within the side of the head **45** is a bore **46** which communicates with a bore **47** in an adaptor **50** threadedly secured to a conduit **51** and tightly fitted within a suitable counterbore in the head. The conduit **51** is connected to a suitable source of vacuum whereby a vacuum is supplied to the bore or port **46**.

A limit ring **52** is provided with a suitable set screw **53** and may be fixed thereby at a selected height upon the shaft **37** whereby the upward extent or limit of the stroke of the shaft may be adjusted. By adjusting the collar **52** downwardly, relative to the shaft **37**, the spring **41** will act on the shaft, when the solenoid is deenergized, to move the shaft to a higher limiting position.

A bore **55** is formed in the sidewall of the shaft **37** and intersects with an axially extending bore **56** in the shaft. An insert **57**, the upper portion **58** of which is in the form of a flat horizontal plate, is fixedly received in the

upper end of the shaft 37 and is provided with a central aperture 60 which registers with the bore 56 and is in turn in registry with an elongated aperture 61 (FIG. 4) in a rectangular plunger head 62 secured to the insert 57 and formed of a resilient material such as rubber or the like. The upper surface of the element 62 is concave in transverse cross section and has the same thickness and concave configuration all along its length.

The tracks 30 formed in the head 45 receive the strands 11 so as to continuously guide them through the head at precisely the same position. As mentioned above, the central structure 26 is provided with vacuum ports 22 which function to maintain a vacuum below the belts holding the cards in engagement with the strands 30 whereby the cards move with the belts. The purpose of the plunger 37 is to engage a card received within a capsule 65 and to place that card on the strands 30 and then to repeat this operation at a predetermined interval.

The cards of the present system are kept in a suitable filing location within capsules such as the capsule 65. The capsule 65 comprises a container 66 having flexible, resilient sidewalls or panels 67 which have inwardly projecting lips or tabs 68 at their distal ends. Within the container 66, there is provided a spring 70 which has one end anchored about an annular projection 71 integral with the container and has its other end anchored about an annular projection 72 forming a part of a plunger 75 engaging the cards 76. When the capsule 65 is away from the feed station 31, the tabs 68 function to prevent the cards from moving out of the capsule under the urging of plunger 75.

Fixed to the head 45 in spaced relation by means of suitable screws and a spacer 80 is a generally rectangular element 81 which is provided with a pair of inwardly projecting lips 82. The element 81 also has an upwardly extending flange 85 located to engage the outwardly flaring portions 86 of the panel 67 so as to separate those panels and open the tabs 68 of the container 66. By forcing the capsule down on the element 81 as shown in FIGS. 1–3, the tabs 68 will be spread to the point that the plunger 72 will urge the cards 76 downwardly against the stationary lips 82. It should be noted that upstanding flanges 83 function to guide the capsule into position and alignment with the conveyor so that the length of the cards extends in the same direction as the conveyor.

The feed lips, item 82, specifically prohibit cards from entering upon the belts, and their configuration is extremely critical, being a function of the size of the cards being used, the contour of the plunger head 62, and the vacuum force available. Consideration of these features will be of use in determining if these lips are properly proportioned.

Fixed with relation to the upright plate 35 is an upright bar 84 having horizontal bar 87 swingably secured thereto about screw 88. A spring 89 is secured to the horizontal 87 and acts to urge the capsule against the stationary lip element 81. The capsule may be removed or replaced by pivoting the horizontal to a position wherein it is no longer above the fixed lips.

The device may be operated to withdraw the cards 76 one by one from the capsule 65 and to place each card upon the belts 11. Assume the solenoid 32 is deenergized permitting the spring 41 to move the plunger 37 upwardly. As the bores 46 and 55 move into registry, vacuum is communicated through the bores 56 and 60 and the aperture 61 causing the lowermost card 76 to be drawn against the rubber plunger head 62. At such time as a preceding card moving on the conveyor enters into a station and contacts a suitable actuating means, for example into a receive station, a signal is communicated to the solenoid 32 causing the energization thereof and causing the plunger 37 to be moved downwardly pulling the lowermost card past the fixed lips 82. Just prior to the completion of the downward stroke, the card is brought into contact with the belts 11. The structure is so arranged that immediately thereafter, the vacuum within the bores 55, 56, 60 and aperture 61 is exposed to atmosphere by the narrow indentation 90 axially parallel to the plunger 37 and formed in the lower portion of the head 45.

The removal of the vacuum from the plunger causes the card to be released by the plunger and to be carried away from the feeding station by the moving strands 11. The solenoid remains in an energized condition until the card passes an actuating means, for example the element 90', which causes the current to the solenoid to be deenergized and causes the plunger 37 to be moved upwardly by means of the spring 41. As the plunger moves upwardly and the port 55 comes into registry with the port 46, vacuum is again transmitted to the bore 60 and a further card is engaged by the upward end of the plunger. The plunger is again moved downwardly and the cycle is repeated until the capsule has been emptied.

Referring to FIG. 9, there is illustrated a feeding station which is identical or similar in all respects to the above described feeding station with the primary exception being that two pair of lips 100 and 101 are provided instead of the single pair of lips 82 of the above described embodiment. The lips 100 function similarly to the lips 82 in supporting the stack 102 of cards received within the capsule 105 which is identical to the capsule 65 above described. The conveyor belts 106 are supported upon the head 107 and function similarly to the belts 11 above described. Vacuum is provided to the plunger 110 in a manner identical to the above described embodiment.

It has been found that in extracting the cards past the additional set of lips 101, the additional bending of the cards completely separates the lowermost card from the remaining cards in the stack, thereby insuring that only one card is extracted at a time. The second set of lips serves to catch any additional card or cards which are extracted or fall through the upper lips. If a card is left on the lower set of lips after an extracting operation, the card will be extracted by the plunger on the next stroke in the same fashion as from the upper lips.

From the above description it can be appreciated that the present invention provides a positioning device capable of efficiently removing cards from a storage capsule and placing them on a conveyor. It can also be seen that the present device is capable of feeding cards from a capsule at a predetermined rate in such a manner that the cards are depositied at desired time intervals upon the conveyor.

The invention claimed is:

1. In combination for use with a plurality of cards each having information disposed at a plurality of positions on the cards,

a movable conveyor including a pair of members disposed in spaced relationship to hold the cards and movable in a first direction to obtain a transport of the cards,

means operatively coupled to the conveyor for obtaining a movement of the conveyor,

a capsule constructed to hold the cards in the plurality in stacked relationship and provided with resilient walls to provide for a retention of the cards in the stacked relationship upon a disposition of the resilient walls in a first position and to provide for a release of the cards from the capsule upon a disposition of the resilient walls in a second position displaced from the first position,

control means disposed on one side of the conveyor in a second direction transverse to the first direction for receiving the capsule and for providing a disposition of the resilient walls on the capsule in the second position, the control means being disposed relative to the conveyor to obtain a controlled release of the cards in the capsule to the conveyor, and

means disposed on the opposite side of the conveyor belt from the control means and movable in the second direction to obtain a controlled transfer of the cards in the capsule to the conveyor upon the reception of the capsule by the control means.

2. In combination for use with a plurality of cards each having information disposed at a plurality of positions on the cards,

a movable conveyor including a pair of members disposed in spaced relationship to hold the cards and movable in a first direction to obtain a transport of the cards,

means operatively coupled to the conveyor for obtaining a movement of the conveyor,

a capsule constructed to hold the cards in the plurality in stacked relationship and provided with a pair of resilient walls movable between first and second positions to obtain a retention of the cards within the capsule in the first position of the resilient walls and to provide for a release of the cards from the capsule in the second position of the resilient walls,

control means disposed on a first side of the conveyor in a second direction transverse to the first direction and constructed to receive the capsule and to obtain a disposition of the resilient walls on the capsule in the second position,

a plunger movable in the second direction between a first position adjacent to the cards in the capsule upon the disposition of the capsule on the control means and a second position displaced from the cards in the capsule, the first position of the plunger being on the first side of the conveyor in the second direction and the second position of the plunger being on the opposite side of the conveyor in the second direction,

means operatively coupled to the plunger in the first position of the plunger for obtaining the production of a pneumatic force by the plunger for a removal of the cards from the capsule, and

means operatively coupled to the plunger during the movement of the plunger to the second position for obtaining an interruption in the pneumatic force to provide for a transfer to the conveyor of the card removed by the plunger.

3. In combination for use with a plurality of cards each having information disposed at a plurality of positions on the cards,

a capsule constructed to hold a plurality of cards in a stacked relationship and provided with a pair of resilient walls movable between first and second positions to provide for a retention of the cards in stacked relationship in the capsule in the first position of the resilient walls and to provide for a transfer of the cards from the capsule in the second position of the resilient walls, the resilient walls in the capsule being biased to the first position,

a conveyor constructed to provide a movement in a first direction of the cards transferred to the conveyor from the capsule, the conveyor including a

pair of spaced members movable synchronously in the first direction to obtain a movement of the cards in the first direction,

support means,

means coupled to the conveyor and support means for obtaining a synchronous movement of the movable members in the conveyor in the first direction,

a pair of control members coupled to the support means for receiving the capsule on a first side of the conveyor in a second direction transverse to the first direction and for disposing the resilient walls on the capsule in the second position to obtain a transfer of cards from the capsule to the conveyor, the control members having a spacing at least equal to the spacing between the movable members in the conveyor,

a plunger provided with a first face, the piston being movable in the second direction to obtain a disposition of the first face between a first position contiguous to the capsule and the control means and on the first side of the conveyor and a second position displaced from the conveyor on a second side of the conveyor opposite to the first side in the second direction,

means operatively coupled to the plunger for obtaining a movement of the plunger between the first and second positions,

means operatively coupled to the plunger for producing a vacuum force at the first face of the plunger in the first position of the plunger to obtain a removal of the cards from the capsule, and

means operatively coupled to the plunger for obtaining an interruption in the vacuum force at the first face during the movement of the plunger from the first position to the second position to facilitate the transfer of the cards from the first face of the plunger to the conveyor.

4. The combination set forth in claim 3 in which means are included in the support means for insuring that only a single card is transferred to the first face of the plunger from the capsule during each movement of the plunger from the first position to the second position.

5. The combination set forth in claim 3 in which the plunger is movable in a bore and in which at least a first lip member is provided internally within the bore at a position near the first position of the first face on the piston and in which at least a second lip member is provided internally within the bore at a position between the first lip portion and the conveyor to insure that only a single card is transferred to the first face of the plunger from the capsule during each movement of the plunger from the first position to the second position.

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