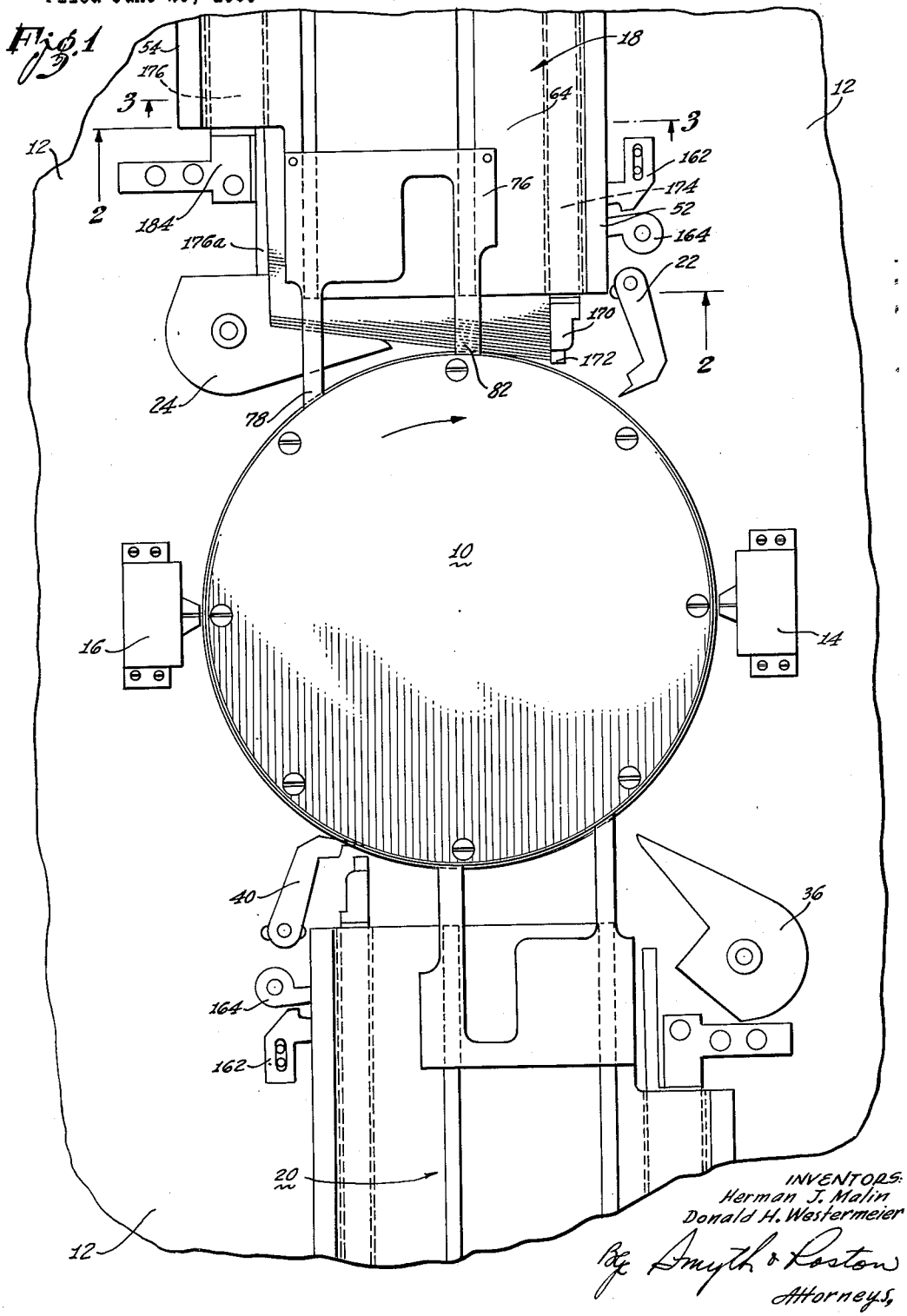
March 28, 1961 H. J. MALIN ET AL 2,977,113

CARD PROCESSING APPARATUS

Filed June 29, 1959 4 Sheets-Sheet 1

Fig. 1



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CARD PROCESSING APPARATUS

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Fig. 2

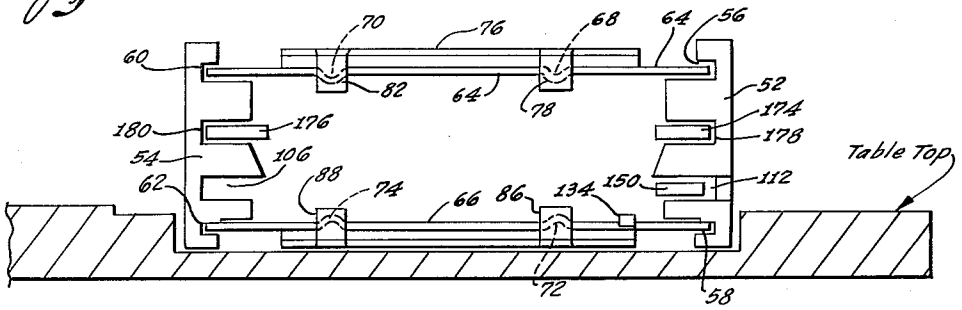


Fig. 3

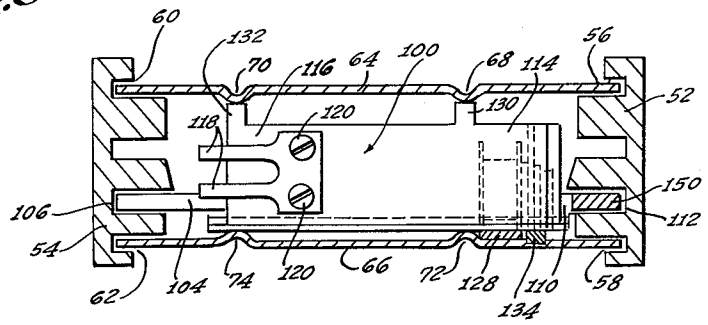
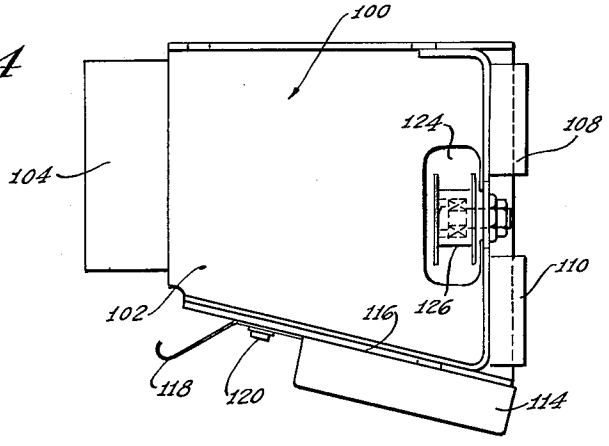


Fig. 4



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CARD PROCESSING APPARATUS

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Fig. 5

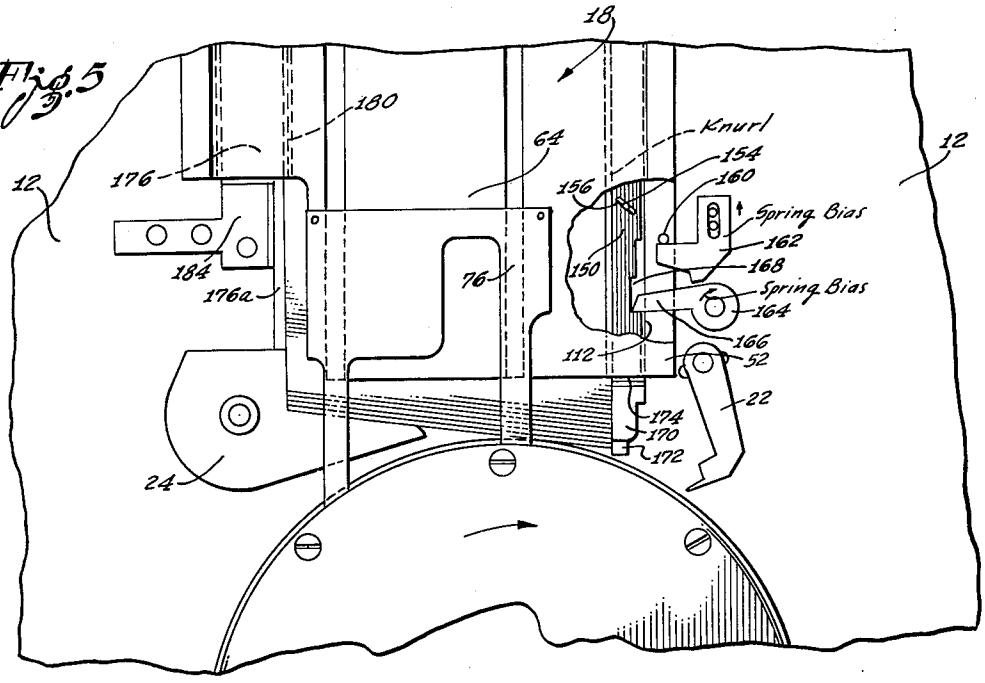
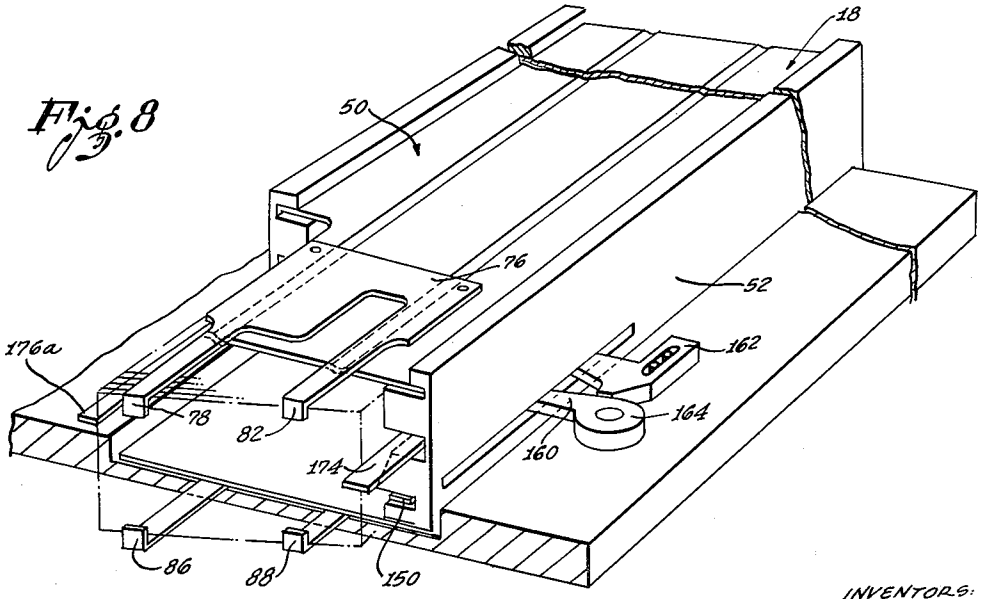


Fig. 8



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CARD PROCESSING APPARATUS

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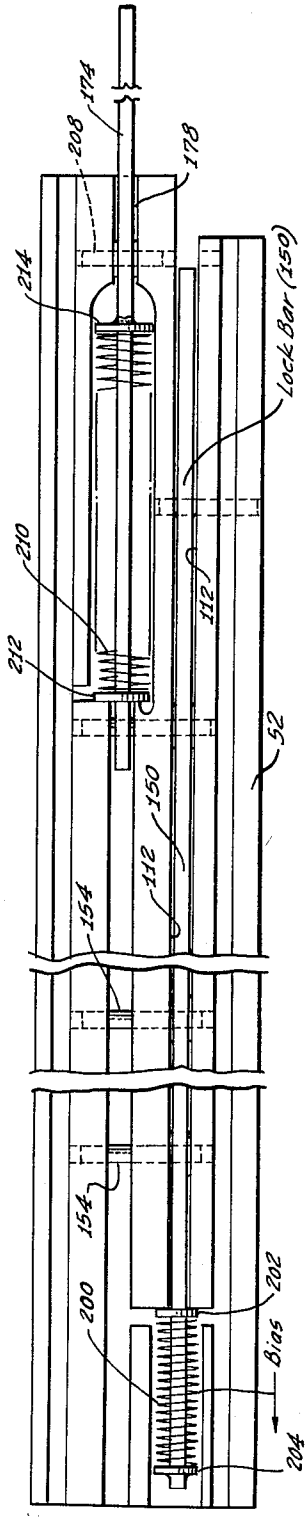


Fig. 6

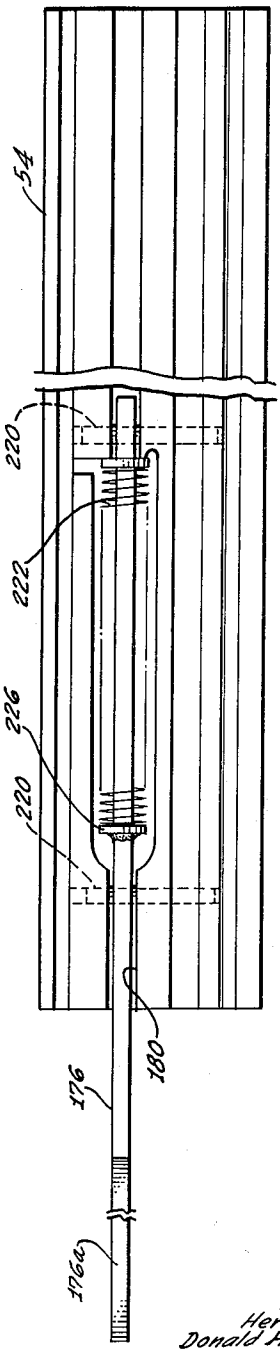


Fig. 7

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2,977,113

CARD PROCESSING APPARATUS

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Filed June 29, 1959, Ser. No. 823,690

15 Claims. (Cl. 271—11)

The present invention relates to information storage card processing apparatus; and it relates more particularly to a feeding-stacking station which may be included in such apparatus, and which may be used to feed successively cards to a transport means in the apparatus, or to receive cards from the transport means.

The invention is primarily concerned with an improved feeding-stacking station which cooperates with the other components of the card processing apparatus, and which serves to hold the information storage cards in a stacked condition. In this way, the cards may be controllably fed to the transport medium when the station is in a feeding mode. The feeding-stacking station of the invention is also capable of receiving the cards from the transport medium when the station is operated in a stacking mode.

The feeding-stacking station constituting this invention is of the magazine type in which the information storage cards in the station are stacked in a removable magazine. This arrangement permits a group of cards to be conveniently inserted in the station for processing, and it also permits the group of cards to be conveniently removed from the station at the termination of such processing.

The term "information storage card" is intended to be used in a generic sense in the present specification and claims. This term is intended to cover any discrete element on which the information may be appropriately recorded. Such discrete elements may include, for example, plates, boards, panels and the like.

In one type of data processing system, information is stored in digital form on a plurality of separate cards. Each of the cards is provided with a number of positions, each of which for example is capable of storing a different multidigit binary number. The information may be stored in the form of discrete magnetic areas of one magnetic polarity or the other, as is the case with the embodiment of the invention which will be described. Alternately, the information may be stored in the form of hole patterns in the cards, in the form of photographic representations, or in any other appropriate form. It will be appreciated that for these various recording forms, it is merely necessary that the apparatus include appropriate transducers for transforming the information into electrical signals and vice versa.

A large number of information storage cards of the type discussed in the preceding paragraph are often required in complex data processing systems. This is because millions of bits of binary information are required to represent the information stored in the more complex data processing systems. It is most essential, therefore, in such data processing systems to provide some means for storing the cards themselves in a manner in which they may be quickly and conveniently fed to the card processing apparatus.

In one type of prior art card processing apparatus, for example, the information storage cards are maintained in stacked relationship in a card feeding station,

and the cards in the card feeding station are controllably fed in succession from the station to an appropriate transport medium. The cards are then carried by the transport medium in the prior art apparatus past a transducer station at which the information on the cards is read and transformed into electrical signals, or at which new information is written on the cards from input electrical signals.

To provide flexibility in the card processing apparatus of the type under discussion, it is preferable that the card feeding stations be of the reversible type. That is, each of the card feeding stations should also be capable of stacking operations. To that end, each of the stations should be able to operate in a first mode in which cards may be controllably fed from the station in sequence to a transport medium. Each of the stations should also be capable of operating in a second mode in which cards may be removed from the transport medium and sequentially deposited in the station. Such reversible feeding-stacking stations are described and claimed, for example, in copending application Ser. No. 538,111 filed October 3, 1955, in the name of Robert M. Hayes (now United States Patent No. 2,842,362), and in copending application Ser. No. 645,639 filed March 12, 1957, in the name of Alfred M. Nelson et al.

A certain problem is sometimes encountered in the reversible card feeding-stacking stations discussed above, and in other types of feeding-stacking stations included in the card processing apparatus. This problem concerns the provision of a convenient means for inserting a stack of cards into the feeding-stacking station for processing, and for permitting the convenient removal of the stack of cards from the station at the termination of such processing.

The large number of cards involved in the more complex card processing systems usually require that the cards not actually being processed be stored in an appropriate file block separate from the card processing apparatus. Then, when any particular group of cards is to be processed, that group is removed from the file block and inserted in one of the feeding-stacking stations of the card processing apparatus. This enables the cards of that particular group to be processed, and at the termination of such processing the group of cards is returned to the file block and another group may then be inserted in the station to be processed.

Copending application Ser. No. 685,539, filed September 23, 1957 (now United States Patent No. 2,901,247), in the name of Allan Orner discloses and claims an improved card processing apparatus in which the different groups of cards are held in individual magazines, with each magazine holding its group of cards in a stacked condition. The magazines can be conveniently stored in a separate file block, such as referred to in the preceding paragraph. The magazines may then be individually removed (either mechanically or manually) from the storage area and placed in a feeding-stacking station of the card processing apparatus whenever a desired group of cards is to be processed.

The improved card processing apparatus of the copending application Ser. No. 685,539 (now United States Patent No. 2,901,247), is constructed so that a selected magazine of cards may be quickly snapped into place in a feeding-stacking station in a position to permit the cards immediately to be fed in succession to the card processing apparatus. The construction of the apparatus of the copending application is such that the magazine can be inserted and withdrawn from the feeding-stacking station without interfering in any manner with the card transfer control components of the feeding-stacking station.

Copending application Ser. No. 767,132, filed Octo-

ber 14, 1958, in the name of Alfred M. Nelson et al., also is directed to card processing apparatus in which removable magazines may be inserted and withdrawn from the feeding-stacking stations. In the magazine used in the apparatus of that application, each magazine is provided with a closure member at its forward end and with a spring-biased card follower for urging the stack of cards forward in the magazine and towards the mouth of the magazine.

The magazine of the apparatus described in the copending application Ser. No. 767,132 referred to in the preceding paragraph is supported in its feeding-stacking station in a position spaced from the transport medium. This is so that the magazine will not interfere with the card transfer components of the feeding-stacking station, as these components are moved from one position to another when the feeding-stacking station becomes conditioned from any one of its two operating modes to the other.

An appropriate mechanism is provided in the copending application Ser. No. 767,132 referred to above for opening the closure member of the magazine when the magazine is placed in the feeding-stacking station. Then, when the closure member is opened, the spring-loaded card follower in the magazine forces the cards out of the mouth of the magazine and against the transport medium. The card follower is positioned behind the stack of cards in the magazine so that it may accomplish this purpose. A guide member is permanently positioned in the feeding-stacking station to guide the stack of cards so pushed out of the magazine into a proper position against the transport medium for the successive feeding of the cards to that medium.

The present invention is also concerned with the magazine type of card processing apparatus, such as the apparatus described in the preceding paragraphs. In the apparatus of the present invention, the spring-biased card follower is controlled to perform a dual function. The second function performed by the card follower, in addition to the function described in the preceding paragraphs, is that of firmly retaining any number of cards in the magazine after the magazine has been removed from the feeding-stacking station.

When the magazine is in place in a feeding-stacking station in the apparatus of the present invention, the card follower moves with the spring-biased action described above to urge the cards out of the mouth of the magazine and to hold the cards in the magazine in a stacked condition against the transport medium.

However, when the magazine is removed from the feeding-stacking station, the card follower in the apparatus of the invention immediately locks at the last position in the magazine which it occupied just before the magazine was removed. The card follower now holds the cards firmly in a stacked condition against the closure member, or other card retaining means, at the mouth of the magazine.

The apparatus of the invention solves a problem which has been at times troublesome in the prior art. That is the problem of holding the cards firmly in the magazine when the magazine is withdrawn from the feeding-stacking station. The problem is also concerned with providing the desired biasing effect on the cards whereby the cards are urged towards the mouth of the magazine when the magazine is inserted into the feeding-stacking station.

In the improved apparatus of the invention, immediately upon the insertion of the magazine into the feeding-stacking station, the card follower is released and it moves under its spring-biased pressure towards the mouth of the station. This spring-biased pressure of the card follower causes the cards in the station to be biased in a stacked condition towards the mouth of the station and against the transport medium for the successive feed of the cards to the transport medium. This spring-biased pressure of the card follower also provides for the retention of the cards in a stacked condition as they are fed, during a stacking operation, from the transport medium to the station.

Then, whenever a magazine is removed from a feeding-stacking station, the card follower is immediately locked in the magazine to firmly hold the cards when the magazine is returned to the file block. This provides for the firm retention of any number of cards in the different magazines when the magazines are in the file block, and when the magazines are moved from the file block to the feeding-stacking station or from the feeding-stacking station to the file block.

In the drawings:

Figure 1 is a top plan view of a simplified form of card processing apparatus which is constructed to incorporate the present invention, the illustrated apparatus including a pair of feeding-stacking stations constructed in accordance with the invention and disposed adjacent a transport medium such as a vacuum pressure rotatable drum;

Figure 2 is a sectional view substantially on the line 2—2 of Figure 1 to show the details of a removable magazine which is positioned in that particular feeding-stacking station, the sectional view illustrating various slide members which are positioned in the magazine for card-retaining reasons to be explained;

Figure 3 is a sectional view substantially on the line 3—3 of Figure 1, the latter sectional view also showing details of the magazine in the particular station and also showing a spring-biased card follower which is positioned in the magazine for motion towards and away from the mouth of the magazine;

Figure 4 is a top view of the card follower which is positioned in the magazine, this latter view illustrating various components of the follower and various guide members which engage slots in the walls of the magazine to permit the follower to move back and forth in the magazine;

Figure 5 is a fragmentary top plan view, partly in section and on an enlarged scale with respect to the view of Figure 1; the sectional portion of the view of Figure 5 illustrating the manner in which a pair of actuators cooperate with one another and with a locking bar in the magazine to cause the locking bar to be moved between an engaged position with respect to the card follower of Figures 3 and 4, and a disengaged position;

Figure 6 is a side view on an enlarged scale, showing the inner side of one of the walls of the magazine and the locking bar positioned in a channel therein and also showing one of the slide members positioned in a channel formed on that side wall and a biasing spring which normally biases the slide member to its illustrated extended position;

Figure 7 is a side elevational view on an enlarged scale of the other side wall of the magazine, this latter view illustrating the inner surface of the other side wall and the slide member which is positioned in a channel on that surface and a resilient spring which biases that slide member to its illustrated extended position; and

Figure 8 is a perspective view of the magazine of Figure 1, illustrating that magazine positioned in its corresponding feeding-stacking station but with certain stop members removed to reveal the slide members in their extended positions, and illustrating the engagement of other components in the magazine with corresponding components in the station.

The data processing apparatus and system of Figure 1 is shown as including a transport medium such as a vacuum transport drum **10**. This drum is constructed, for example, in the manner described and claimed in copending application Ser. No. 600,975 (now United States Patent No. 2,883,189) which was filed July 30, 1956 in the name of Loren R. Wilson. The drum is rotatably mounted on a table top **12** for rotation in a clockwise direction. The drum is capable of exerting a vacuum

pressure at its peripheral surface, and it is by means of this vacuum pressure that the information storage cards are held at spaced angular position on the peripheral surface and the drum for transportation from one station to another. Full details of a rotatable vacuum pressure transport drum, such as the drum **10**, may be found in the Wilson application referred to above.

Although rotatable vacuum pressure transport drums, such as the drum **10**, are shown for transporting the cards, any other suitable transport means may be used and such transport means do not necessarily have to be movable. For example, stationary transport means such as disclosed in copending application Serial No. 730,102 filed April 22, 1958 in the name of Eric Azari et al.; and in copending application Serial No. 731,413 filed April 28, 1958 in the name of Eric Azari may be used.

A first transducing means **14** is mounted on the table top **12**, and that transducing means is positioned to be contiguous to the periphery of the vacuum pressure transport drum **10**. A second transducing means **16** may also be mounted on the table top **12**. This second transducing means is positioned on the opposite side of the drum **10** from the transducing means **14**, and the transducing means **16** is also positioned to be contiguous to the periphery of the drum. Each of the transducing means **14** and **16** may, for example, comprise a series of electromagnetic write or read transducer heads. Each of these heads is positioned to sense and process a different row of data on each of the cards transported on the periphery of the transport drum **10** past its corresponding transducer means.

The transducer means **14** and **16** are positioned to permit the cards to be carried past their activated faces by the transport drum **10**. Each of these transducer means functions to read data on the transported cards, or to write new data on the cards, as mentioned above. Also, and as also mentioned above, the type of transducer means corresponds to the particular type of recording by which the information is stored on the different cards.

A first reversible feeding-stacking station is indicated generally as **18**, and this station is positioned on the table top **12** at one side of the drum between the transducing means **14** and **16**. A second reversible feeding-stacking station **20** is also positioned on the table top **12**, the station **20** being positioned on the opposite side of the drum **10** from the station **18**. Both the feeding-stacking stations **18** and **20** are shown in fragmentary form to conserve space. The forward end of each of these stations only is shown, as such a showing is believed to be sufficient for purposes of explaining the operation of the present invention.

The station **18** includes a stack head **22** and it includes a feed head **24**. These heads may be constructed and controlled in a manner fully described in the copending application Ser. No. 645,639 referred to above. Briefly, the stack head **22** is movable from a stand-by position to the right in Figure 1, as illustrated, to an operative position in which its end is contiguous to the periphery of the drum **10**. In its operative position, the stack head engages cards transported on the peripheral surface of the drum and causes such cards to be moved from the peripheral surface of the drum and to be deposited in the station **18**.

The feed head **24** is movable from a stand-by position to the left in Figure 1 to its illustrated operative position. When the feed head is in its operative position it controls the feed of cards to the peripheral surface of the drum **10**. This control is made through a vacuum pressure which the feed head exerts on the cards in the station, and which may be controllably interrupted. Such a feed head and its vacuum pressure control on the cards is described in detail in the copending application Ser. No. 645,639 referred to above.

The copending application Ser. No. 645,639 also fully describes the manner in which the feed head **24** and the stack head **22** may be moved between their stand-by and operative positions. Because the actual control and operation of the feed head and of the stack head form no part of the present invention, it is believed unnecessary to describe in detail the manner in which these heads are controlled. It is believed sufficient to state that the heads may be conveniently controlled by mounting them on appropriate levers and by providing a cam control for the levers. Such a control is described, for example, in the copending application Ser. No. 645,639, and it provides for one of the heads to be moved to its operative position as the other is moved to a stand-by position, and vice versa.

The feeding-stacking station **20** may also include a feed head **36** which is movable between an operative and a stand-by position, and it may include a stack head **40** which likewise is movable between a stand-by and an operation position. The stack head **40** and the feed head **38** may be similar to the corresponding heads **22** and **24** described above in conjunction with the feeding-stacking station **18**. The heads **36** and **40** may be controlled to be moved between their individual operative and stand-by positions in the same manner as described in the copending application Ser. No. 645,639.

As best shown in Figure 8, the table top **12** is provided with a groove at the station **18** for receiving a magazine **50**. The magazine **50** may have a rectangular configuration, and it is equipped with a pair of side walls **52** and **54**. As best shown in Figures 2, 3 and 8, the inner surface of the side wall **52** is provided with an upper slot **56** and a lower slot **58**. These slots extend lengthwise along the entire inner surface of the side wall **52**. In like manner, the inner surface of the side wall **54** is provided with a slot **60** which is aligned with the slot **56** in the side wall **52**, and which extends along the entire inner surface of the side wall **54**. A lower slot **62** is also formed in the inner surface of the side wall **54**, and the latter slot is aligned with the slot **58** in the side wall **52** and extends along the entire inner surface of the wall **54**.

A top panel **64** is inserted in the slots **56** and **60** and is attached to the side walls by welding, or by any other appropriate means. Likewise, a lower panel **66** extends into the slots **58** and **62**, and the lower panel is attached to the side walls by welding, or by any other appropriate technique. The panels **64** and **66** form the top and bottom of the magazine respectively. These panels, together with the side walls **52** and **54** cooperate to form an open mouth at the forward end of the magazine.

A pair of ribs **68** and **70** is formed on the inner surface of the upper panel **64**, and these ribs extend in parallel relationship lengthwise along the panel. A similar pair of ribs **72** and **74** are formed on the inner surface of the lower panel **66**, and these latter ribs extend in parallel relationship along the entire length of the lower panel. The ribs **68** and **70** are spaced and parallel to one another in the plane of the upper panel **64**, and the ribs **72** and **74** are spaced and parallel to one another in the plane of the lower panel **66**. The ribs **68** and **72** are axially aligned with one another, as are the ribs **70** and **74**. These ribs engage the edges of the cards which are to be held in the magazine, and they form guides for the cards as the cards are moved back and forth in the magazine.

An upper bracket **76** (see Figures 1 and 8) is affixed to the top panel **64** of the magazine by welding, or by any other appropriate means. The bracket **76** has a pair of finger elements **78** and **82** which extend outwardly from the mouth of the magazine and over the upper peripheral surface of the drum **10**. These finger-like elements have downwardly extending bent-over end portions which extend over the top edges of the cards transported by the drum to the mouth of the station.

A similar bracket **84** is mounted to the underside of the lower panel **66**, and the latter bracket has a pair of finger-

like elements 86 and 88 which extend outwardly from the mouth of the magazine and under the rim of the transport drum 10. The fingers 86 and 88 have bent-over ends which extend up over the lower edges of the cards transported by the drum to the mouth of the magazine.

The finger-like elements 78, 82, 86 and 88 permit the mouth of the magazine itself to be spaced back from the peripheral surface of the drum 10, so that the feed head 24 and the stack head 22 may be moved between their operative and stand-by positions without interference by the walls of the magazine. The finger-like elements extend outwardly over the cards which are disposed in the space between the mouth of the magazine and the periphery of the drum 10, as such cards are successively fed from the magazine in sequence to the periphery of the drum during a feeding mode of operation; or when such cards are fed from the periphery of the drum into the magazine during a stacking mode of operation.

Then, when it is desired to withdraw the magazine from the station, the bent-over portions of the finger-like elements engage the card actually on the periphery of the drum 10 and draw that card, and the cards in the space between the mouth of the magazine and the periphery, away from the drum. The bent-over finger-like elements, and certain sliding elements (which will be described) cage the cards at the forward end of the magazine as the magazine is withdrawn from the station. These elements firmly retain the cards in the magazine so as to prevent them from falling out of the magazine.

A card follower 100 (Figures 3 and 4) is positioned in the magazine for longitudinal movement along the ribs 72 and 74 towards the mouth of the magazine and back away from the mouth. The card follower 100 may be constructed in the manner described in copending application Serial No. 717,270, filed February 24, 1958, in the name of Eric Azari et al. It is spring-biased towards the mouth of the magazine, and its function is to maintain the cards in a stacked condition in the magazine and to urge the cards against the peripheral surface of the transport drum 10. Then, as the cards are sequentially fed to the periphery of the drum, the card follower 100 is moved forward in the magazine by its spring-biasing pressure. Conversely, when the cards are stacked from the drum in the magazine during a stacking mode of operation, the card follower 100 moves back against its spring-biasing pressure. During both modes of operation, however, the card follower is forced against the rear of the stack of cards in the magazine to hold the cards in a stacked condition.

The card follower 100 includes a flat bottom panel 102 which may have a lubricating substance, such as Teflon, secured to its lower surface and which engages the ribs 72 and 74. A first guide strip 104 is secured to one side of the bottom panel 102, and this guide strip extends into a slot 106 which is formed on the inner surface of the side wall 54. The slot 106 extends for the length of the side wall 54, and it serves as a guide for the card follower 100.

The bottom panel 102 of the card follower also has a pair of elongated members 108 and 110 secured to its opposite edge. These latter members serve as guide strips and are disposed adjacent a slot 112 which is formed in the inner surface of the side wall 52. The latter slot extends lengthwise along the entire length of the inner surface of the side wall 52.

A resilient pad 114 formed, for example, of sponge rubber or similar substance, is secured to an upstanding bracket 116 at the front of the follower 100. As illustrated in Figure 4, the bracket 116 and the member 114 are inclined when viewed in plan so that the cards may be brought into the proper position for feeding them to the periphery of the drum 10, when the station is conditioned to the feeding mode.

A pair of electric switching contacts 118 are secured to the bracket 116 by a pair of screws 120. These contacts are short-circuited with one another, and they serve to engage a pair of further electric switching contacts on the face of the feed head 24 when the last card is fed out of the station 18. This completes an appropriate electric circuit, and under the control of appropriate logic circuitry, certain desired controls may be initiated after the station is empty. For example, when the station is empty, it is desirable to change its mode of operation from the feeding mode to the stacking mode, so that cards now in the station 20, for example, may be fed from that station and returned to the station 18.

The bottom panel 102 of the card follower 100 has a slot 124 formed in it adjacent the guide strips 108 and 110. A bearing 126 is rotatably mounted on an appropriate bracket to be disposed over the slot 124. A resilient spring strip 128 is secured to the panel 66 at its forward end, and this spring strip has a tendency to curl up on itself around the rotatable bearing 126. This action of the spring strip 128, and of the bearing 126, causes the card follower to be biased forwardly towards the mouth of the magazine, for the reasons described above.

The upstanding bracket 116 is equipped with a pair of upwardly extending portions 130 and 132 (Figure 3). These portions 130 and 132 engage the ribs 68 and 70 respectively. A guide rail 134 is inserted in the lower panel 66, and this guide rail extends into a slot formed in the bottom of the panel 102. Therefore, the spring-biased card follower 100 is supported between the ribs 68, 72 and 70, 74 and by the guide bracket 104 and its guide slot 106, and by the guide rail 134 and its corresponding slot in the bottom panel 102. The card follower 100 is supported in this manner for longitudinal movement in the magazine toward and from the mouth of the magazine. As mentioned above, the spring strip 128 serves to bias the follower towards the mouth of the magazine.

An elongated locking bar 150 is mounted in the channel 112 of the side rail 52 to lie adjacent the edges of the elongated members 108 and 110. The outer edges of the members 108 and 110 may be knurled, as may the facing edge of the locking bar 150. As will be described in more detail subsequently, the locking bar 150 is mounted in the slot 112 for limited longitudinal movement relative to the side wall 52. The arrangement is such that when the locking bar 150 is moved forwardly in the slot 112, it moves laterally away from the members 108 and 110 to a disengaged position. However, when the locking bar 150 is moved back along the slot 112, and it is moved laterally inwardly so that its inner edge engages the facing edges of the members 108 and 110. This latter movement of the locking bar 150 is into an engaged position with respect to the card follower 100. When the locking bar 150 is in such an engaged position, it firmly retains the card follower 100 in whatever position the card follower is established by the stack of cards in the magazine when the locking bar 150 moves to its engaged position.

As more clearly shown in Figure 5, the locking bar 150 is retained in the channel 112 by means of a plurality of upstanding studs, such as the stud 154. These studs extend through inclined slots, such as the slot 156, which are formed in the locking bar. A suitable resilient spring, which will be described in conjunction with Figure 6, serves to normally bias the locking bar 150 towards the rear of the magazine. Such biasing action causes the studs 154 to engage the sides of the slots 156, so that the locking bar 150 is moved against the members 108 and 110 of Figure 4 to engage those members and thereby to lock the card follower 100.

As shown in Figure 5, a projection 160 is formed on the side wall 52 of the magazine, and a pawl 162 is mounted in the station 18. The pawl has a portion ex-

tending through a slot in the magazine to be engaged by the projection **160** as the magazine is moved into place in the station **18**. The pawl **162** is mounted for limited reciprocal movement in the station **18**, and it is spring-biased by any appropriate biasing means (not shown) in a direction towards the rear of the magazine.

A further actuating pawl **164** is rotatably mounted in the station **18**, and this latter pawl is spring-biased by any appropriate biasing means (not shown) in a clockwise direction. The pawl **162** engages the further pawl **164**, so that when the pawl **162** is moved by the projection **160**, it moves against the further pawl **164** and rotates the further pawl in a counterclockwise direction against its spring-biased pressure. The further pawl **164** has an actuating arm **166** which extends through a slot in the magazine and into engagement with a shoulder **168** formed in the side of the locking bar **150**.

The result is that when the magazine is moved into place in the station **18**, the projection **160** moves against the pawl **162** and causes the pawl **162** to move against the pawl **164**. The pawl **164** is thereby rotated in a direction such that its actuating arm **166** causes the locking bar **150** to be moved forward toward the mouth of the magazine. This action serves to disengage the locking bar from the card follower **100**. Conversely, when the magazine is moved back out of the station **18**, the locking bar **150** becomes disengaged from the arm **166** of the pawl **164** and it is spring-biased back into locked engagement with the card follower **100**.

The operation described above provides that whenever the magazine is placed in the station **18**, its card follower **100** is freed and spring-biased towards the mouth of the magazine. This permits the card follower to perform its intended function of maintaining the cards in the magazine in a stacked condition against the peripheral surface of the transport drum **10**. However, whenever the magazine is removed from the station, and regardless of the number of cards in the magazine, the card follower immediately becomes locked against the stack of cards in the magazine firmly to retain the cards in the magazine, and to prevent the cards from falling from the magazine when the magazine is in the file block, or as the magazine is moved to and from the file block.

As shown in Figure 1, for example, a stop member **170** is positioned in the station **18** adjacent the leading edge of the side wall **52** of the magazine when the magazine is moved into position in the station **18**. The stop member **170** has an extremity **172** which is precisely positioned adjacent the periphery of the drum **10**. The extremity **172** defines a feed throat with the drum **10**, and it permits one card at a time only to pass the station onto the periphery of the drum.

The station **18** is illustrated in Figure 1 as being in its feeding mode of operation. For that mode of operation, the stack head **22** is withdrawn to a stand-by position, and the feed head **24** is moved to an operative position. A vacuum pressure is established at the face of the feed head **24**, and that face engages the leading card in the station **18**. The vacuum pressure exerted at the periphery of the drum **10** also acts on the leading card, but the former vacuum pressure is greater so that the feed head **24** holds the card in the station **18**. However, whenever the vacuum pressure at the face of the feed head **24** is interrupted, the cards pass in a one-by-one sequence through the feed throat formed by the extremity **172** of the stop member **170**.

As best shown in Figures 2, 6 and 7, a pair of elongated slide members **174** and **176** are positioned in slots **178** and **180** formed in the inner surfaces of the side walls **52** and **54** respectively. These slide members **174** and **176** are spring-biased in a manner to be described, so that they normally extend adjacent the mouth of the magazine beyond the ends of the side walls **52** and **54** to the position illustrated in Figures 5, 6, 7 and 8. When the slide members **174** and **176** are in their extended positions, their extremities extend into the plane of the ends of the finger-like elements **78**, **82** and **76**, **88**.

The slide members **174** and **176** serve to cage the leading cards in the magazine when the magazine is withdrawn from the station **18**. These cards are rigidly retained in the magazine between the bent-over extremities of the finger-like elements **78**, **82**, **86** and **88** and the locked card follower **100**. At the same time, lengthwise movement of the cards is prevented by the slide members **174** and **176** in their extended position. The constructional details of the slide members **174** and **176** will be described in more detail in conjunction with Figures 6 and 7, and the action of the slide members is fully described and claimed in copending application Serial No. 829,430, filed July 24, 1959.

When the magazine is moved into position in the station **18**, a stop member **184**, which is mounted in the station **18** adjacent the feed head **24**, engages a shoulder on the slide member **176** and forces that slide member to a retracted position back into the slot **180** against the pressure of its biasing spring. This occurs because the slide member is held stationary by the stop member **184** as the magazine is moved forwardly into position in the station. However, when the slide member **176** is in its retracted position, a portion **176***a* of the slide member extends out from the mouth of the magazine, as shown in Figure 1, into a position closely adjacent the feed head **24**. This protruding portion **176***a* of the slide member **176** has a cammed inner surface which is inclined slightly inwardly and serves to shift or cam the cards in the station laterally to the right into an appropriate feeding position with respect to the feed head after the magazine is in place. The end of the slide member **174**, on the other hand, engages the stop member **170**, and the latter slide member is forced entirely back into its slot **178** to a retracted position when the magazine is moved into place. Here, the stop member **170** holds the slide member **174** stationary as the magazine moves forwardly into position.

As best shown in Figure 6, the locking bar **150** is positioned in the slot **112** in the inner surface of the side wall **52** by a plurality of studs **154**. These studs, as explained on conjunction with Figure 5, extend through inclined slots in the locking bar, so that the locking bar moves laterally in and out of an engaged position, as the bar is moved longitudinally in the slot **112**. A bias spring **200** is mounted on the rear end of the locking bar **150**. One end of this spring abuts against a washer **202** which, in turn, engages a shoulder at the rear end of the slot **112**. The other end of the spring **200** engages a washer **204** which is welded, or otherwise mounted, on the end of the locking bar **150**. This spring **200**, therefore, serves normally to bias the locking bar **150** towards the rear of the magazine and into its engaged position with respect to the card follower **100**.

As also shown in Figure 6, the slide member **174** is positioned in its slot **178** in the side wall **52** by means, for example, one of the studs **154** and by a stud **208**. These studs extend through appropriate slots which extend longitudinally in the slide member **174**. A spring **210** is positioned on the slide member **174**, and one end of the spring bears against a washer **212**. The washer **212**, in turn, abuts against a shoulder formed in the side wall **52**. The forward end of the spring **210** abuts against a washer **214** which is welded, or otherwise mounted, on the slide member **174**. Therefore, the slide member **174** is normally biased to its protruding position shown in Figure 8. However, when the magazine is inserted into place, as shown in Figure 1, this bar is forced back into its slot by the stop member **170** by holding the bar stationary as the magazine is moved forwardly.

As shown in Figure 7, the slide member **176** is mounted in its slot **180** in the side wall **54** by a pair of studs **220**. These studs extend through appropriate longitudinal slots in the slide member **176**, and they permit lim-

ited movement of the slide member **176** with respect to the side wall **54**. A spring **222** is mounted on the slide member **176**, and the rear end of that spring abuts against a washer **224** which, in turn, abuts against a shoulder formed in the side wall **54**. The forward end of the spring **222** abuts against a washer **226** which is mounted on the slide member **176**. The spring **222**, therefore, serves to bias the slide member **176** to its protruding position as shown in Figure 8. However, when the magazine is moved into place in the station **18**, the stop member **184** forces the slide member **176** back to the position illustrated in Figure 1 by holding the slide bar stationary as the magazine is moved forwardly. As mentioned above, the structural composition and operation of these slide members and their associated components are fully described in the copending case Serial No. 829,430.

The invention provides, therefore, a new and improved feeding-stacking station of the removable magazine type. The removable magazine portion of the station of the invention is constructed and equipped, so that when it is removed from the station, the cards in the magazine are firmly retained and do not have any tendency to become loose or damaged in the magazine or to fall out of the magazine. When the magazine of the invention is placed into the station, it is immediately placed in an operative condition, and the cards in the magazine are biased in the manner described towards the mouth of the station to be fed to the transport means, or to receive cards from the transport means.

We claim:

1. In apparatus for processing data on a plurality of information storage elements, the combination of: transport means for the information storage elements, a magazine for holding the storage elements in a stacked relationship and movable to a position in operatively coupled relationship to the transport means, means in the magazine for biasing the storage elements in the plurality forwardly in the magazine for a sequential transfer of the storage elements from the magazine to the transport means in the operatively coupled relationship of the magazine and the transport means, locking means disposed in a first position in an engaged relationship with the biasing means to hold the biasing means against movement in the magazine when the magazine is disposed out of operatively coupled relationship with the transport means, and means coupled to the locking means for causing said locking means to be moved to a second position out of engaged relationship with the locking means when the magazine is moved into operatively coupled relationship with the transport means.

2. In apparatus for processing data on a plurality of information storage elements, the combination of: transport means for the storage elements, a magazine having a mouth and constructed to hold the information storage elements in a stacked relationship, supporting means operatively coupled to the magazine for holding the magazine in a particular position with the mouth of the magazine facing the transport means, means in the magazine for biasing the storage elements in the plurality toward the mouth of the magazine and movable in accordance with the transfer of the storage elements from the magazine in the particular position of the magazine to obtain a sequential transfer of the storage elements from the mouth of the magazine to the transport means, locking means movable to a first position in an engaged relationship with the biasing means to hold the biasing means against movement in the magazine upon a movement of the magazine from the particular position, and means disposed on said supporting means for engaging said locking means upon the movement of the magazine to said particular position on said supporting means to move the locking means to a disengaged relationship with the biasing means.

3. In apparatus for processing data on a plurality of information storage cards, the combination of: transport means for the cards, a removable magazine having a mouth and constructed to hold the information storage cards in a stacked relationship, supporting means operatively coupled to the magazine for holding the magazine in a particular position thereon with the mouth of the magazine facing the transport means, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower unit for biasing the card follower forwardly in the magazine towards the mouth thereof in the particular position of the magazine to urge the cards in the plurality against the transport means for the sequential transfer of cards from the mouth of the magazine to the transport means, locking means mounted in the magazine and movable to an engaged relationship with the card follower in positions of the magazine other than the particular position to hold the follower against longitudinal movement in the magazine, and means positioned on said supporting means for engaging said locking means in the particular position of the magazine means to move the locking means to a disengaged relationship with the card follower for a biasing action by the spring-loaded means against the card follower.

4. In apparatus for processing data on a plurality of information storage cards, the combination of: transport means for the cards, a removable magazine having a mouth and being constructed to hold the information storage cards in a stacked relationship, supporting means coupled to the magazine for holding the magazine in a particular position thereon with the mouth of the magazine facing the transport means, a spring-loaded card follower unit disposed in the magazine and resiliently biased for movement forwardly in the magazine for biasing the cards in the plurality toward the mouth of the magazine for the sequential feed of cards from the mouth of the magazine to the transport means, locking means mounted in the magazine and having a disengaged position and an engaged position, the locking means engaging the card follower unit when in its engaged position to hold the same against movement in the magazine, means mounted on the supporting means and positioned to engage the locking means for causing the same to move to its disengaged position when the magazine is placed in the particular position on the supporting means, and means coupled to the locking means for causing the locking means to move to its engaged position when the magazine is moved from the particular position.

5. In apparatus for processing data on a plurality of information storage cards, the combination of: transport means for the cards, a removable magazine constructed to hold the information storage cards in a stacked relationship and having a mouth and further having a pair of side walls, supporting means operatively coupled to the magazine for holding the magazine in a particular position thereon with the mouth of the magazine facing the transport means, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth of the magazine, spring-loading means coupled to the card follower for biasing the follower forwardly in the magazine towards the mouth of the magazine to urge the cards in the plurality against the transport means for sequential transfer of cards from the magazine to the transport means, a locking bar positioned in at least one of the side walls of the magazine in communication with the interior of the magazine and mounted for lateral movement between a disengaged position and an engaged position with respect to the card follower unit to hold the card follower against movement in the magazine when the locking bar is in its engaged position, means mounted on the supporting means for engaging said locking bar upon a movement of the magazine to said particular position on said supporting means to move said locking

bar to the disengaged position, and resilient means mounted on said magazine for moving said locking bar to the engaged position upon the removal of the magazine from said particular position on said supporting means.

6. In apparatus for processing data on a plurality of information storage cards, the combination of: transport means for the cards, a removable magazine constructed to hold the information storage cards in stacked relationship and having a mouth and further having a pair of side walls, supporting means for holding the magazine in a particular position thereon with the mouth of the magazine facing the transport means, a plurality of finger elements mounted on the magazine and extending outwardly from the mouth thereof, each of said finger elements having a bent-over end portion for extending over the edges of cards transported by the transport means to the mouth of the magazine, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower unit for biasing the card follower forwardly in the magazine towards the mouth thereof to urge a stack of cards therein against the transport means for the sequential transfer of cards from the magazine to the transport means, a locking bar positioned in at least one of the side walls of the magazine in communication with the interior of the magazine and mounted for lateral movement between a disengaged position and an engaged position with respect to the card follower to hold the card follower against movement in the magazine when the locking bar is in its engaged position, means mounted on the supporting means for engaging said locking bar to move said locking bar to the disengaged position when the magazine is moved to said particular position on said supporting means, and resilient means mounted on said magazine for moving said locking bar to the engaged position upon the removal of the magazines from said particular position on the supporting means.

7. In apparatus for processing data on a plurality of information storage cards, the combination of: transport means for the cards, a removable magazine constructed to hold the information storage cards in a stacked relationship and having a mouth and further having a pair of side walls, supporting means for holding the magazine in a particular position thereon with the mouth of the magazine facing the transport means, a plurality of finger elements mounted on the magazine and extending outwardly from the mouth thereof, each of said finger elements having a bent-over end portion for extending over the edges of cards transported by the transport means to the mouth of the magazine, a card follower supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower for biasing the card follower forwardly in the magazine towards the mouth of the magazine to urge the cards in the plurality aganst the transport means for a sequential transfer of cards from the magazine to the transport means, an elongated locking bar, means coupled to the locking bar for mounting the locking bar in one of the side walls of the magazine for limited longitudinal movement with respect thereto and in communication with the interior of the magazine, the inner edge of the locking bar extending inwardly from the side wall to a position adjacent the card follower and such longitudinal movement of the bar producing corresponding lateral movement thereof between a disengaged position and an engaged position with respect to the card follower to hold the card follower against movement in the magazine when in its engaged position, resilient means mounted in the magazine and coupled to the locking bar for biasing the locking bar in a longitudinal direction to cause the bar normally to move laterally into its engaged position, an actuating member mounted on the magazine, and means positioned on the supporting means for engagement with the locking bar and for actuating by the actuating member to move the locking bar longitudinally against the force of the resilient means and thereby cause the bar to move laterally to its disengaged position when the magazine is placed in the particular position on the supporting means.

8. A removable magazine for use in apparatus for processing data on a plurality of information storage cards and constructed to hold the information storage cards in a stacked condition in the apparatus, said magazine including: means including a pair of side walls defining a mouth at the forward end of the magazine, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower for biasing the card follower forwardly in the magazine to urge a stack of cards therein towards the mouth thereof for the sequential feed of the cards out of the magazine, a locking bar positioned in at least one of the side walls of the magazine and mounted for lateral movement to an engaged position with respect to the card follower to hold the card follower against movement in the magazine and for lateral movement to a disengaged position with respect to the card follower, and resilient means coupled to the locking bar for normally biasing the same to its engaged position.

9. The magazine defined in claim 8 and which includes an actuating member mounted on the magazine for engagement with an external control member, said external control member being engaged by the actuating member to cause the locking bar to move to its disengaged position when the magazine is placed in position in the card processing apparatus.

10. A removable magazine for use in apparatus for processing data on a plurality of information storage cards and constructed to hold the information storage cards in a stacked condition in the apparatus, said magazine including: means including a pair of side walls for defining a mouth at the forward end of the magazine, a plurality of finger-like elements mounted on the magazine and extending outwardly from the mouth thereof, each of said finger-like elements having a bent-over end portion, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower for biasing the card follower forwardly in the magazine towards the mouth thereof to urge the cards in the plurality against the bent-over end portion of said finger-like elements, a locking bar positioned in at least one of the side walls of the magazine in communication with the interior of the magazine and mounted for lateral movement to an engaged position with respect to the card follower to hold the card follower against movement in the magazine and for lateral movement to a disengaged position with respect to the card follower, and resilient means coupled to the locking bar for normally biasing the same to its engaged position.

11. A removable magazine for use in apparatus for processing data on a plurality of information storage cards and constructed to hold the information storage cards in a stacked condition in the apparatus for transfer with respect to a transport means, said magazine including: means including a pair of side walls defining a mouth adapted to be disposed adjacent the transport means, a card follower unit supported in the magazine for longitudinal movement therein towards and away from the mouth thereof, spring-loaded means coupled to the card follower for biasing the same forwardly in the magazine towards the mouth thereof so as to urge a stack of cards therein against the transport means, an elongated locking bar, means for mounting the locking bar in one of the side walls of the magazine for limited longitudinal movement with respect thereto, the inner side of the locking bar extending inwardly from the side wall to a position adjacent the card follower, and such longitudinal move-

ment of the locking bar producing corresponding lateral movement thereof between a disengaged position and an engaged position with respect to the card follower to hold the same against movement in the magazine when the locking bar is in its engaged position, resilient means mounted in the magazine and coupled to the locking bar for biasing the locking bar in a longitudinal direction to cause the locking bar normally to move laterally into its engaged position, and an actuating member mounted on the magazine for engagement with an external control means to move the locking bar longitudinally against the force of the resilient means and thereby cause the locking bar to move laterally to its disengaged position when the magazine is placed in position in the apparatus with its mouth adjacent the transport means.

12. A removable magazine for use in apparatus including transport means for processing data on a plurality of information storage elements and constructed to hold the information storage elements in a stacked relationship and to provide a transfer of elements between the transport means and the magazine in a first position of the magazine relative to the transport means and to prevent a transfer of cards between the transport means and the magazine in other positions of the magazine relative to the transport means, said magazine including: means for biasing the storage elements in the plurality toward the transport means for a sequential transfer of the cards from the magazine to the transport means, the biasing means being movable in the magazine in accordance with the transfer of the elements in the plurality between the magazine and the transport means, locking means movable to a first position in an engaged relationship with the biasing means selectively to hold the biasing means against movement in the magazine and movable to a second position out of engaged relationship with the biasing means, means responsive to the disposition of the magazine relative to the transport means in the other positions for moving the locking means to the first position, and means responsive to the disposition of the magazine relative to the transport means in the first position for moving the locking means to the second position.

13. A removable magazine for use in apparatus including transport means for processing data on a plu-

rality of information storage cards and constructed to hold the information storage cards in a stacked condition and to provide a transfer of cards between the magazine and the transport means in a first position of the magazine relative to the transport means and to prevent a transfer of cards between the magazine and the transport means in other positions of the magazine relative to the transport means, said magazine including: means including a pair of side walls defining a mouth at the end of the magazine facing the transport means in the first position of the magazine relative to the transport means, a card follower unit supported in the magazine for longitudinal movement in the magazine towards and away from the mouth of the magazine, spring-loaded means coupled to the card follower for biasing the card follower forwardly in the magazine to urge the information storage cards in the plurality toward the mouth of the magazine for a sequential transfer of the cards from the magazine to the transport means in the first position of the magazine relative to the transport means, locking means positioned in the magazine and movable to an engaged position with respect to the card follower unit to hold the card follower against movement in the magazine and movable to a disengaged position with respect to the card follower unit, means responsive to the disposition of the magazine in the other positions with respect to the transport means for moving the locking means to the engaged position of the locking means with respect to the card follower unit, and means responsive to the disposition of the magazine relative to the transport means in the first position for obtaining a movement of the locking means to the disengaged position with respect to the card follower unit.

14. The magazine defined in claim 8 in which means are operatively coupled to the locking bar to move the locking bar to the disengaged position with respect to the card follower unit.

15. The magazine defined in claim 10, including, means operatively coupled to the locking bar for moving the locking bar to the disengaged position.

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