Sept. 22, 1959 E. AZARI ET AL 2,905,466

CARD PROCESSING APPARATUS

Filed Oct. 10, 1957 2 Sheets-Sheet 1

Fig. 1

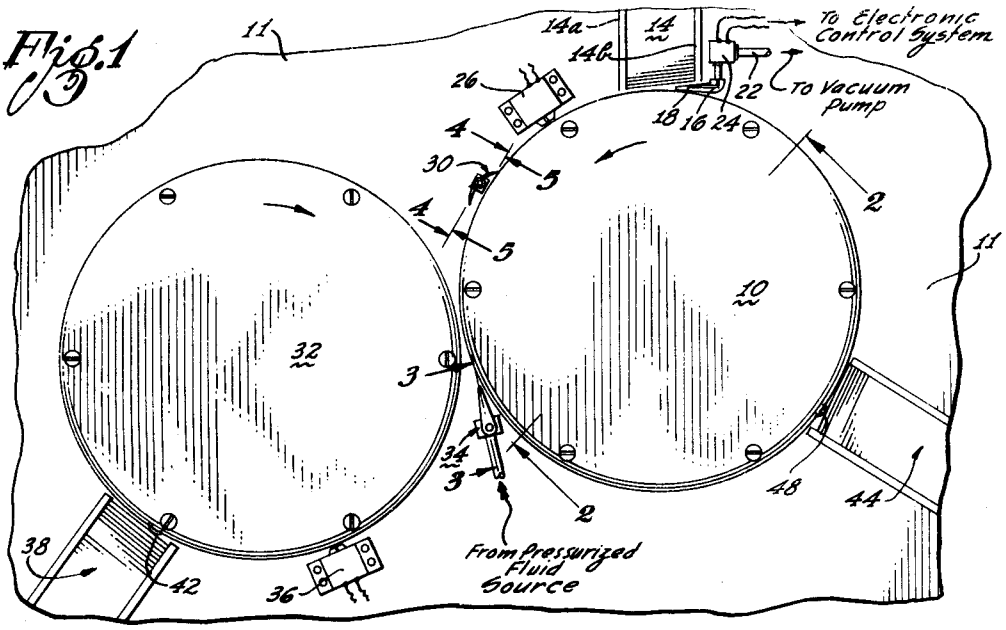


Fig. 2

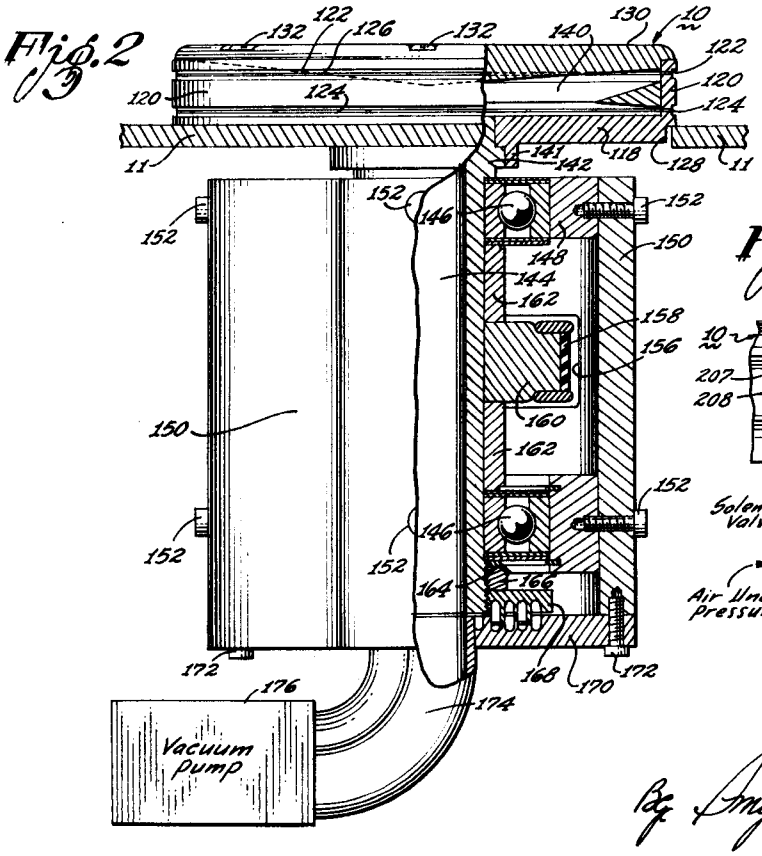
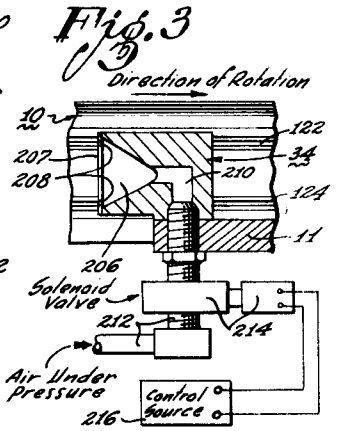


Fig. 3



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Filed Oct. 10, 1957 2 Sheets-Sheet 2

Fig. 4

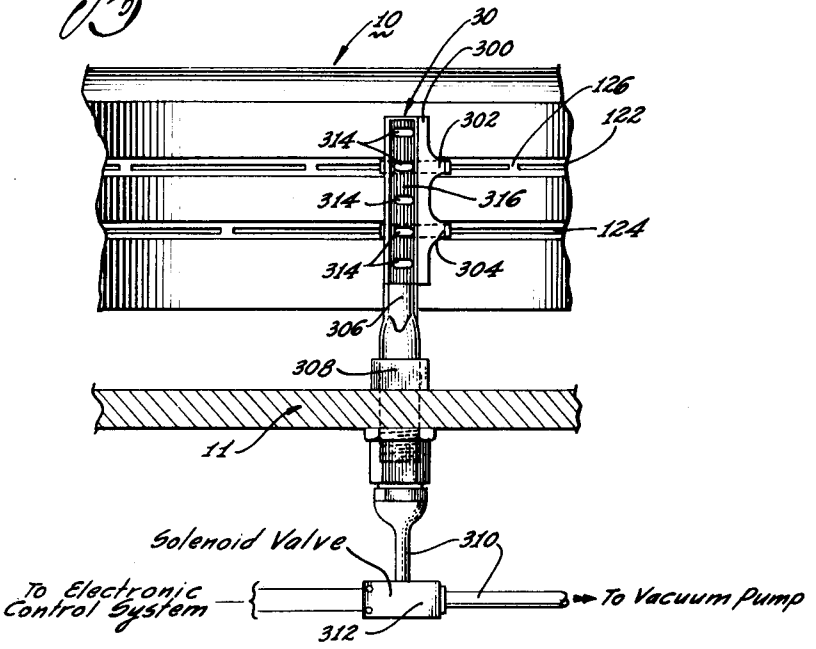


Fig. 5

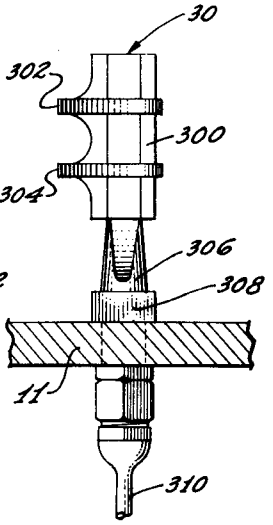
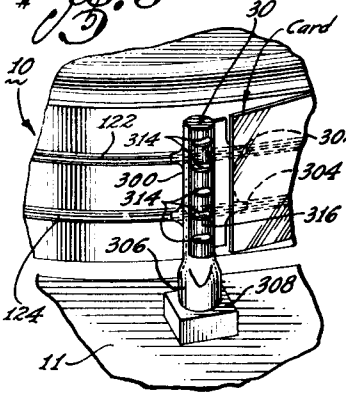


Fig. 6



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CARD PROCESSING APPARATUS

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Application October 10, 1957, Serial No. 689,347

11 Claims. (Cl. 271—11)

The present invention relates to apparatus for carrying information storage cards from one station to another and for processing the cards during such transport. The invention is concerned more particularly with a holding assembly for controlling the position of individual cards on the transporting means.

Systems and apparatus have been devised in recent years for selecting, storing, filing, collating, sorting and for otherwise processing recorded data on a plurality of information storage cards. This data may be recorded on these cards by a series of selectively positioned holes or by discrete areas of different magnetic polarities. The data may also be recorded on a photographic basis such that black areas, for example, represent particular information and white areas represent other information. The data may also be recorded on a combined magnetic or photographic basis, or in any other suitable manner.

For the purposes of the present description, the information or data is assumed to be recorded on the cards in the form of magnetic polarized areas. Also, the assembly of the invention will be described in conjunction with suitable transport means such as a rotatable vacuum pressure transporting drum. This drum develops a vacuum pressure at its peripheral surface, and this vacuum pressure enables the information cards to be firmly retained on the periphery of the drum so that they may be carried by the drum from one station to another. The vacuum transporting drum described above may be used in data processing apparatus in conjunction with other similar drums. Appropriate mechanisms have been devised for transferring the cards from various input stations to the drums and between different ones of the drums and from the drums to various output stations.

It is often required in apparatus of the type described above for the position of a card on the peripheral surface of the transporting drum to be altered relative to the positions of other cards. This has usually been carried out in the prior art systems by transferring such a card to an auxiliary circulating drum and by subsequently returning the card to the original drum. This prior method, however, is somewhat slow and it requires a relatively large number of extraneous elements.

Copending application 638,033 filed February 4, 1957 in the name of Alfred M. Nelson et al, discloses and claims a relatively simple assembly for accomplishing the above purpose without the requirement of an auxiliary drum. This assembly includes a holding member which is positioned adjacent the periphery of the transporting drum. The holding member is spaced from the periphery of the drum, and it has an arcuate surface facing the peripheral surface of the drum. A vacuum pressure is established at the arcuate surface of the holding member, and this vacuum pressure serves to overcome the retaining effect of the drum on the cards coming under its influence. In this manner, a particular card may be held by the holding member against rotation by the drum.

In one embodiment of the invention disclosed and claimed in the copending application, a card is held stationary by the holding member with a portion of the card engaging the periphery of the drum while the drum rotates. Preferably the trailing portion of the restrained card is held against the holding member of the copending case while the leading portion of the restrained card is disposed against the periphery of the drum. This holding operation is continued for a selected interval so as to change the position of the restrained card on the drum with respect to other cards, or to delay its transfer to another drum.

The present invention provides a holding station that is similar in its accomplishment to the embodiment of the copending application described in the paragraph above. However, the station of the present invention is constructed in an extremely simple manner, and it requires less space than the embodiment of the copending case. The assembly of the present invention, moreover, may be operated by an inherently simple control system. The assembly includes a pick-off member having a configuration for lifting the cards from the drum, for guiding the cards along the drum and for subsequently returning the cards to the drum. Means including a hollow tube with a plurality of openings are inclined in the pick-off member for imposing a vacuum force on the cards to restrain the cards from returning to the drum after being transferred to the member.

In the drawings:

Figure 1 is a top plan view somewhat schematically illustrating the apparatus of the invention and showing a rotatable vacuum pressure transporting drum and a holding station as well as associated controls and auxiliary mechanisms for controlling the position of selected information storage cards on the periphery of the drum;

Figure 2 is an enlarged sectional view substantially on the line 2—2 of Figure 1 and shows details of a vacuum pressure transporting drum which may be included in the apparatus of the invention;

Figure 3 is a sectional view substantially on the line 3—3 of Figure 1 and illustrates on an enlarged scale and in specific detail a pneumatic gate transfer mechanism used in the illustrated apparatus of the invention;

Figure 4 is a view substantially on the line 4—4 of Figure 1 and shows on an enlarged scale a holding station constituting one embodiment of the invention and also shows means for providing vacuum pressure at an arcuate surface of the holding station to selectively arrest cards on that surface from being transported by the rotating drum;

Figure 5 is a view substantially on the line 5—5 of Figure 1 and also shows on an enlarged scale several of the components of the holding station; and

Figure 6 is a fragmentary perspective view of the holding station and an adjacent portion of the drum to illustrate in further detail the construction of the holding member and the disposition of the member relative to the drum.

The apparatus of the invention includes suitable transport means such as transport means movable in a closed loop. For example, the transport means may be a drum 10 which is rotatably mounted on a table top 11, only a fragment of the table top being shown. The drum 10 is constructed in a manner described in detail subsequently, and it carries information cards on its peripheral surface from one station to another.

An input station 14 is positioned to be contiguous to the peripheral surface of the drum 10. This input station serves to hold a plurality of information storage cards in a stacked condition between a pair of walls 14*a* and 14*b*, with the cards extending generally vertically and with the lower edges of the cards resting on the table top 11.

The cards are moved forwardly in the input station 14 by suitable resilient biasing means (not shown) so that the

face of the leading card is biased against the peripheral surface of the transporting drum **10**. This leading card is under the influence of vacuum pressure provided, in a manner to be described, at the peripheral surface of the drum. Because of this vacuum pressure, the rotating drum creates a pull on the leading card which tends to remove it from the input station. However, the removal of the card from the station may be prevented by a feed head **16**. This feed head may be constructed in a manner similar to that disclosed and claimed in copending application Serial No. 552,506 filed December 12, 1955 in the name of Hans M. Stern.

The feed head **16** extends through the trailing wall **14***b* of the input station **14**. This feed head has a face **18** which engages a trailing portion of the surface of the leading card in the station. A conduit extends through the feed head **16** and communicates with an orifice, or series of orifices, at the face **18**. A vacuum pressure feed line **22** is coupled to a vacuum pump (not shown), and a solenoid actuated valve **24** of appropriate known construction is positioned in the feed line. This valve serves selectively to control the vacuum pressure to the face **18** of the feed head **16**. The solenoid valve is controlled by a suitable control circuit which is not shown.

Whenever the vacuum pressure from the vacuum pump is introduced by the feed line **22** to the feed head **16**, the orifices in the face **18** of the feed head exert a vacuum pressure on the leading card in the input station **14**. This vacuum pressure is sufficient to overcome the pull exerted on that card by the vacuum pressure at the peripheral surface of the transporting drum **10**.

The cards, therefore, are retained in the input station **14** so long as a vacuum force is produced at the orifices in the face **18** of the feed head **16**. However, under the control of the solenoid valve **24**, the vacuum pressure at these orifices can be intermittently or continuously interrupted to permit one or more cards to be successively fed by the input station **14** to the peripheral surface of the drum **10**. Any cards so fed to the drum **10** are firmly retained on the peripheral surface of the drum by a vacuum pressure which is developed at that surface, and these cards are carried by the drum for subsequent processing.

Transducing means **26** may be positioned on the table top **11** adjacent the drum **10**. The transducing means are displaced slightly from the input station **14** in the direction of rotation of the transporting drum. The transducing means **26** may be of known construction and may include a plurality of individual transducer heads. Each transducer head may be disposed in contiguous relationship to a different row of recorded data on the cards transported by the drum as the cards are carried past the transducer heads.

A holding station **30** is also mounted on the table top **11**, and this holding station is positioned adjacent the periphery of the transporting drum **10**. The holding station may be displaced angularly from the transducing means **26** by a slight amount in the direction of rotation of the drum. The holding station **30** is constructed in accordance with the present invention, and its structural details will be described subsequently. It is believed sufficient at present to point out that the holding station includes a holding member having an arcuate-shaped surface and which includes a pair of fingers at its leading edge. These fingers extend into contiguous relationship with the peripheral surface of the transporting drum, and they serve to withdraw the cards from the drum for movement over the arcuate-shaped surface.

The surface of the holding member has a series of orifices extending across its width, and in a manner to be described, a vacuum pressure is established at these orifices selectively to arrest a card passing over the surface. The holding station **30**, therefore, serves to hold any card transported to it by the drum **10** against further rotation by the drum until the vacuum pressure at the surface of the arcuate-shaped member is removed.

A second vacuum pressure transporting drum **32** may be rotatably mounted on the table top **11** adjacent the drum **10**. The constructional details of the drum **32** may be similar to those of the drum **10**. The drum **10** may be rotatable in a counterclockwise direction, and the drum **32** may be rotatable in a clockwise direction.

A gate transfer mechanism **34** is positioned adjacent the contiguous positions of the drums **10** and **32**. This gate transfer mechanism may be constructed in a manner similar to that described in copending application Serial No. 562,154 filed January 30, 1956 in the name of Stuart L. Peck et al. The gate transfer mechanism serves to transfer selected cards from the drum **10** to the drum **32**. The constructional details of a suitable embodiment for the gate transfer mechanism **34** will be disclosed in conjunction with the description relating to Figure 3.

Further transducing means **36** may be mounted on the table top **11** and may be positioned adjacent the periphery of the vacuum transporting drum **32**. The transducing means **36** are spaced angularly by a slight amount in the direction of rotation of the drum **32** from the contiguous position between the drums **10** and **32**. The transducing means **36**, like the transducing means **26**, may be of known construction and may also comprise a plurality of individual transducer heads. Each of these latter heads, as in the case of the transducing means **26**, is associated with a different row of magnetically recorded data on the cards transported by the peripheral surface of the transporting drum **32**.

An output station **38** may be mounted on the table top **11**, and this output station may be positioned adjacent the peripheral surface of the transporting drum **32**. The station **38** has its trailing wall protruding into contiguous relationship with the periphery of the drum **32**. This trailing wall serves to arrest the motion of cards transported to it by the drum **32**.

A stationary pick-off member **42** is mounted adjacent the drum **32**, and this pick-off member is displaced from the trailing wall of the station **38** by a distance which is less than the length of the individual information cards. The end portions of the pick-off member **42** are formed into fingers which extend into axially spaced peripheral grooves in the drum **32**. The pick-off member also has a central portion which is bulged outwardly from the periphery of the drum **32**.

The construction of the output station **38** and the pick-off member **42** may be similar to that described in copending application, Serial No. 538,111, filed October 3, 1955, in the name of Robert M. Hayes et al.

The pick-off member **42** operates in conjunction with the drum **32** and the output station **38** to insure that the cards become stacked in the station in the same order as their movement with the drum **32** toward the station. This results from the fact that any card transported by the drum **32** is brought against the trailing wall of the stations **38**, and such card is held with its trailing end displaced outwardly from the periphery of the drum **32** by the lifter member **42**. The next card then passes under the preceding card, and it also is arrested by the trailing wall of the station **38**. This succeeding card causes the preceding card to be deposited in the output station **38**.

In this manner, all cards transferred to the drum **32** by the gate transfer mechanism **34** may first be processed by the transducing means **36** and may then be deposited in their proper sequence in the output station **38**. The cards are supported in the output station **38** in a generally stacked condition between the walls of the station and with their lower edges resting on the table top **11**.

A further output station indicated generally as **44** may be mounted on the table top **11**, and this latter output station may be disposed adjacent the periphery of the transporting drum **10**. The output station **44** is posi-

tioned with respect to the drum **10** at a position displaced in the direction of rotation of the drum from the position of contiguity between the drum **10** and the drum **32**. This latter output station may be similar in its constructional details to the output station **38**, and it may be provided with a corresponding pick-off member **48**.

In the system of Figure 1, the cards in the input station **14** may be controllably released by the feed head **16** in a one-by-one sequence to the peripheral surface of the drum **10** under the control of the solenoid valve **24**. The cards so fed to the peripheral surface of the drum **10** are sensed by the transducing means **26**. This transducing means may, by an appropriate control system, control the operation of the holding station **30** and of the gate transfer mechanism **34**. That is, certain selected cards processed by the transducing means **26** may cause the control system to activate the gate transfer mechanism **34** so that such cards may be transferred to the drum **32** for further processing by the transducing means **36**. This further processing may comprise, for example, recording new data on the selected cards; or it may comprise reading data already recorded on the selected cards. The selected cards, after such further processing, are then deposited in the output station **38** in the described manner.

Certain other cards processed by the transducing means **26** may, on the other hand, cause the control system to activate the holding station **30** so that a particular card may be held by the holding station against the rotation of the drum **10**. This holding may delay the transfer of that card by the gate transfer mechanism **34** to the drum **32** until other cards have been fed to the latter drum by other adjacent drums or input stations (not shown). Alternately, the particular card may be held by the holding station **30** until other cards are fed to the drum **10** either by the input station **14**, or by other input stations and contiguous drums (not shown).

The retention of a particular card by the holding station **30** facilitates the handling of the cards in different types of data processing systems. For example, such retention of cards may be advantageous when cards from a plurality of stations are to be merged or collated or when cards from one or more stations are to be sorted. The time interval for the retention of the particular card by the holding station is controllable by suitable electrical control signals.

The rotatable vacuum pressure transporting drums **10** and **32** may be constructed in a manner similar to that described in copending application Serial No. 600,975 filed July 30, 1956, in the name of Loren R. Wilson. Details of the drum **10** are shown, for example, in Figure 2. As previously stated, the drum **32** may have a similar construction.

As fully described in the copending Wilson application Serial No. 600,975, the drum **10** is provided with a lower section and an upper section. The lower section of the drum includes a disk-like bottom portion **118** and an integral annular side portion **120**. A pair of axially spaced peripheral slots **122** and **124** extend through the side portion **120**. The slots **122** and **124** extend completely around the periphery of the side portion **120**. In order to retain the integral construction of the side portion **120**, this portion may be reinforced at its inner surface by a plurality of ribs **126**. A pair of axially spaced peripheral grooves extend around the outer peripheral surface of the side portion **120**. These grooves are respectively positioned adjacent the slots **122** and **124**, and they receive the finger-like portions of the pick-off members **42** and **48**, as described above.

The disk-like bottom portion **118** of the lower section is undercut, as shown at **128**. This enables the table top **11** to extend beyond the outer limits of the side portion **120** so that the side portion overlaps the table top in the manner shown. Therefore, the cards supported endwise on the table top by the input station **14**, and by the other stations have no tendency to slip down between the table and the drum and become misplaced or damaged.

The upper section of the drum **10** is in the form of a disk-like member **130** which engages the annular side member **120** of the lower section. The upper section **130** forms an enclosure with the lower section of the drum, with the upper section parallel to the disk-shaped bottom portion **118** of the lower section. The upper section **130** is held in place on the side portion **120** by a plurality of screws **132**.

When one of the cards is fed from the input station **14** to the drum **10**, this card is held on the outer peripheral surface of the side portion **120** of the drum by vacuum pressure. It is, of course, important that the cards be fed to this peripheral surface in an accurately oriented position so that they may be properly processed in the system.

A deflector ring **140** is supported within the interior of the drum in press-fit with the inner surface of the annular side portion **120**. This deflector ring is tapered toward the center of the drum to minimize the turbulence of air flowing through the drum and to provide a streamlined path for the air which is drawn in through the orifices **122** and **124**. The under surface of the upper section **130** is bulged so as to have a convex shape. This convex shape cooperates with the ring **140** in providing a smooth path for the air drawn in through the orifices **122** and **124**.

The portion **118** of the lower section of the drum **10** contains a central opening which is defined by an annular collar **141**. The collar **141** fits on a second collar **142** positioned at the end of a shaft **144**. This shaft extends into the opening in the lower portion **118** of the drum in a press-fit with that portion. Therefore, rotation of the hollow shaft **144** causes the drum **10** to rotate. Moreover, the interior of the shaft **144** communicates with the interior of the drum **10**. Bearings **146** are provided at opposite ends of the shaft **144**. The inner races of the bearings **146** are mounted on the shaft **144**, and the outer races of these bearings are disposed against bushings **148**. The bushings **148** are secured to a housing **150** by a plurality of studs **152**.

An opening **156** is provided in the housing **150** between the bearings **146** so that a drive belt **158** may extend through the opening into the housing **150** and around a pulley **160**. The pulley **160** is keyed to the shaft **144** between the bearings **146**, and the pulley is held against axial movement by a pair of sleeves **162**. These sleeves are mounted on the shaft **144** and are respectively positioned between the pulley and respective ones of the bearings **146**.

The bearings **146** and the sleeves **162** are held on the shaft **144** by a nut **166**. This nut is screwed on a threaded portion at the bottom of the shaft, and a lock washer **164** is interposed between it and the lower bearing **146**. A sealing disk **168** is also screwed on the threaded portion at the bottom of the shaft **144**. The sealing disk **168** operates in conjunction with a bottom plate **170** to resist the movement of air between the interior of the housing **150** and the interior of the hollow shaft **144** when a pressure differential exists between the housing and the shaft.

The bottom plate **170** is secured to the housing **150** by a plurality of studs **172**, and the bottom plate has a central circular opening. A hollow conduit **174** extends into the opening in the bottom plate **170** and in friction-fit with that plate. The conduit **174** is axially aligned with the hollow shaft **144** so that air may be exhausted from the hollow interiors of the shaft and the conduit by a vacuum pump **176**. This pump may be of any suitable known construction and, for that reason, is shown in block form only.

The vacuum pump **176** draws air inwardly through the slots **122** and **124** and through the interior of the drum **10** and downwardly through the shaft **144** and through the conduit **174**. This creates a vacuum pres-

sure at the outer peripheral surface of the annular portion **120** of the lower section of the drum **10**. The deflector ring **140** and the convex underside of the section **130** assures that the air will flow smoothly and with a minimum of turbulence. This enables a high and adequate vacuum pressure to be produced around the outer surface of the annular side portion **120** firmly to retain the cards on that surface.

The gate transfer mechanism **34**, as mentioned above, is disposed between the vacuum transport drums **10** and **32**. This gate is positioned in generally tangential relationship with the periphery of the drum **10**. However, the gate is spaced from that periphery a distance sufficient to allow the cards on the drum **10** to be circulated between it and the drum. As illustrated in Figure 1, the gate has a plan shape corresponding substantially to a teardrop, and it is symmetrical about its central axis. This central axis, as previously noted, is tangential to the periphery of the drum **10**.

The gate **34** has a tapered configuration such that its narrow end or mouth is near the periphery of the drum **10**. It has a hollow interior, preferably of parabolic shape. This hollow interior defines a mouth portion **206** as shown in Figures 3. A plate **207** is mounted across the mouth portion of the gate, and this plate is provided with a pair of apertures **208**. These apertures extend through the plate **207** in respective alignment with the peripheral slots **122** and **124** in the drum **10**.

The gate transfer mechanism **34** is so positioned that air or other fluid under pressure may pass through its mouth portion **206** and outwardly through the apertures **208** along the periphery of the drum **10**. A passageway **210** extends through the gate and communicates with the mouth portion **206**. A feed line **212** is coupled to the other end of the passageway **210** by any suitable coupled. The feed line **212** is adapted to supply pressurized fluid, such as air, to the gate transfer mechanism for any suitable source (not shown).

A suitable valve **214** is disposed in the feed line **212** to control the flow of pressurized fluid through the line. This valve may be actuated in known manner by a solenoid. A control source **216** is provided for controlling the energizing of the solenoid selectively to activate the valve **214**. The valve is opened whenever the solenoid is energized. When the solenoid is energized, therefore, air under pressure passes to the gate transfer mechanism **34**. This air flows through the passageway **210** and through the mouth **206** of the gate. The air emerges from the apertures **208** as pressurized streams.

The pressurized streams emerging from the apertures **208** have a relatively high velocity because of the relatively small diameter of the apertures. These streams, therefore, pass along the periphery of the drum **10** with relatively high force. This passage of the streams is in a tangential direction with respect to the drum **10**. Therefore, the streams exert a shearing force between the periphery of the drum **10** and the leading edge of the particular card which they contact on the drum. This causes the leading portion of the card to be moved radially outwardly from the drum. That is, the streams lift the leading edge of the card from the periphery of the drum in opposition to the retaining vacuum pressure exerted on the card through the orifices of the drum.

After being lifted from the periphery of the drum **10**, the leading edge of the card in question passes over the gate **34** and comes under the influence of the vacuum pressure at the periphery of the drum **32**. Subsequent rotation of the drum **10** moves the card over the gate **34** so that the entire card comes under the influence of the vacuum pressure at the peripheral surface of the drum **32**. In this manner, a card is transferred from the drum **10** to the drum **32** when the solenoid actuated valve **214** is energized.

The embodiment of the holding station **30** of the present invention shown in Figures 4, 5 and 6 includes an arcuate-shaped member **300**. This member has a pair of axially spaced, integral fingers **302** and **304** at its leading edge, and these fingers extend into respective ones of the peripheral grooves in the drum **10** adjacent the slots **122** and **124**. The extremities of these fingers extend into the grooves flush with the outer surface of the peripheral edge of the drum **10**. However, the outer surface of this arcuate-shaped member is bulged outwardly in a radial direction from the peripheral surface of the drum.

The member **300** is supported by a tubular element **306**. This tubular element extends through the table top **11**, and it is secured to the table top by means of a nut **308** which is threaded to that element. The portion of the tubular element **306** extending under the table top is threaded to receive a conduit **310**. This conduit extends to a suitable vacuum pump (not shown). A solenoid-actuated valve **312** is interposed in the conduit **310** to control the vacuum pressure exerted through the conduit at the surface of the arcuate-shaped member **300**.

The arcuate-shaped member **300** has a series of orifices **314** extending across its outer surface. The tubular element **306** communicates with these orifices. Also, a rubber-like element **316** is inset on the surface of the arcuate-shaped member **300** adjacent the orifices **314**. This element **316** exhibits a relatively high coefficient of friction to the cards.

In a constructed embodiment of the invention, a sheet of rubber of thickness of $\frac{1}{32}''$ was bonded to the surface of the member **300**, and five orifices $\frac{1}{16}''$ wide and $\frac{5}{16}''$ long were cut through the member and through the rubber sheet. This rubber sheet was found to increase materially the holding capabilities of the member **300** when a vacuum pressure was established at its arcuate surface.

In the absence of a vacuum pressure through the solenoid-actuated valve **312**, any card transported on the periphery of the drum **10** engages the fingers **302** and **304** of the arcuate-shaped member **300**. This card is then forced upwardly over the outer surface of the arcuate-shaped member **300**. The card is then moved by the drum **10** over the member **300** and returned to the drum. However, the control provided by the solenoid valve **312** to produce a vacuum pressure at the orifices **314** causes the card to become arrested on the member. The card is held in this manner against the force exerted on it by the vacuum pressure at the periphery of the drum **10**. The card is held by the member **300** with its trailing edge engaging the periphery of the drum **10** while the drum continues to rotate. As previously noted, this holding may continue for a selected interval to change the position of the particular card on the periphery of the drum **10** for any particular reason, or to delay the transfer of that card to the drum **32**, or to fulfill any other particular requirement. At the end of the interval, the card may be released by de-energizing the solenoid controlling the valve **312**. The card is now able to continue to be transported by the drum **10**.

Although the holding station of the present invention has been illustrated as incorporated in a particular type of data processing system, the invention is clearly not limited to such a system. The principles and techniques involved in the present invention are clearly susceptible to numerous other applications which will be apparent to persons skilled in the art. For example, the holding station would not necessarily have to be included in a card processing system which includes a pair of drums such as the drums **10** and **32**, transducing means **26** and **36** respectively associated with the drums **10** and **32**, output stations **44** and **38** associated with the drums and the gate transfer mechanism **34** for transferring cards from the drum **10** to the drum **32**. It should be appreciated that the holding station can be employed in any other system using transport means for carrying cards.

Although this application has been disclosed and illustrated with reference to particular applications, the principles involved are susceptible of numerous other applications which will be apparent to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

We claim:

1. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: transport means for the cards, a holding member for the cards and mounted adjacent said transport means and having a surface extending outwardly from the transport means at opposite ends and having a humped configuration to withdraw each card from the transport means for movement over said surface and to return the cards to the transport means after movement thereof over said surface, and means for introducing a holding force to said surface of said holding member to cause a card from said transport means to be held adjacent said surface in position to be returned to said transport means upon an interruption of the holding force at said surface of said holding member.

2. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: transport means for the cards, a holding member for the cards mounted adjacent said transport means and having a surface with a looped configuration and with opposite ends extending to the transport means to withdraw each card from the transport means for movement over said surface and to return the cards to the transport means after movement thereof over said surface, said surface having at least one aperture therein, and means for providing for a flow of fluid through the orifice for the imposition of a force to cause a card from said transport means to be held against said surface and to be restrained from movement with the transport means during imposition of the force.

3. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: means including a rotatable transporting drum for carrying the cards on its peripheral surface, a holding member for the cards mounted adjacent the peripheral surface of the transporting drum and having an arcuate-shaped surface disposed relative to said peripheral surface of said drum with opposite ends of the holding member disposed in coupled relationship to the drum to withdraw each card from the transporting drum for movement over said surface and to return the cards to the drum after movement over said surface, said surface having at least one orifice therein, a tubular element communicating with the orifice in the surface for providing for a flow of fluid through said orifice to produce a force for holding the cards against said holding member for restraint against movement with the drum, and valve control means coupled to said tubular element to control the flow of fluid through said orifice.

4. The combination defined in claim 3 in which at least a portion of said surface of said holding member is provided with properties for exhibiting a relatively high coefficient of friction with respect to the cards.

5. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: a table, a vacuum pressure transporting drum rotatably mounted on said table top for carrying cards on its peripheral surface, a holding member for the cards and mounted on said table adjacent the peripheral surface of the transporting drum, said holding member having an arcuate-shaped surface including at least one finger at its leading edge extending into contiguous relationship with the peripheral surface of the drum to withdraw the cards from the transporting drum for movement over said arcuate-shaped surface of said holding member, said holding member also including at least one finger at its trailing edge and extending into contiguous relationship with the drum to obtain a return to the drum of the cards moving along the holding member, said arcuate-shaped surface having a plurality of orifices therein, and a tubular element communicating with said orifices for introducing a vacuum pressure to the orifices to cause a card transferred from the drum to the holding member to be held against the surface of said holding member in position to be returned to the drum upon an interruption of the vacuum pressure at the orifices.

6. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: a table, a vacuum pressure transporting drum rotatably mounted on said table for carrying cards on its peripheral surfaces, said drum having a plurality of axially spaced grooves extending around its peripheral surface, a holding member for the cards and mounted on said table top adjacent the peripheral surface of the transporting drum, said holding member having an arcuate-shaped surface and further having a plurality of fingers at its leading edge extending into the peripheral grooves of said drum and serving to withdraw the cards from the drum for movement over said surface of said holding member, a tubular element extending through said table and serving to mount said holding member on said table, said tubular element communicating with said orifices for introducing a vacuum pressure to the orifices to cause a card from said drum to be held against the surface of said holding member in position to be returned to said drum upon an interruption of the vacuum pressure at the orifices.

7. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: a table, a vacuum pressure transporting drum rotatably mounted on said table top for carrying cards on its peripheral surface and having a plurality of axially spaced peripheral grooves extending around such surface, a holding member for the cards and mounted on said table adjacent the peripheral surface of the transporting drum, said holding member having an arcuate-shaped surface of which at least a portion is composed of a material exhibiting a relatively high coefficient of friction, and said holding member including a plurality of fingers at its leading edge extending into the peripheral grooves in the peripheral surface of the drum, said fingers serving to withdraw the cards from the transporting drum for movement over said surface of said holding member to be subsequently returned to the drum, said surface of said holding member having a plurality of orifices therein, a tubular element extending through said table and serving to mount said holding member on said table, said tubular element communicating with said orifices for introducing a vacuum pressure to the orifices, and valve control means in said tubular element for causing a selected card from said drum to be held against said surface of said holding member in position to be returned to said drum upon an interruption of the vacuum pressure at the orifices by the control means.

8. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: transport means for the cards, transducing means disposed in coupled relationship to the transported cards to process selected information on the cards, a holding member disposed in coupled relationship to the transported cards at a position past the transducing means in the direction of movement of the cards and provided at its peripheral surface with a looped configuration in which opposite ends of the loop are disposed in coupled relationship to the transport means to withdraw cards from the transport means and to return cards to the transport means after movement of the transport means and in which the loop extends outwardly from the transport means from the opposite ends of the loop, and means coupled to the holding means and responsive to the information processed by the transducing

means for introducing a holding force to the looped surface of the holding means to cause particular cards transferred from the transport means to the peripheral surface of the holding means to be retained by the holding means against movement in accordance with the processed information.

9. The apparatus as set forth in claim 8 in which the transport means are movable and are constructed to hold the cards for movement with the transport means and in which the holding means are constructed to introduce a vacuum force against the cards on the peripheral surface of the holding means for retaining the cards against movement.

10. In apparatus for processing data as represented by signal information on a plurality of information storage cards, the combination of: transport means for the cards, transducing means disposed in coupled relationship to the transported cards to process selected information on the cards, holding member having an arcuate periphery and having opposite ends disposed in coupled relationship to the transport means to withdraw cards from the transport means and to return cards to the transport means after movement along the arcuate periphery of the holding member, the holding member being disposed at a position after the transducing means in the direction of movement of the cards and being provided with at

least one orifice in its arcuate periphery for the withdrawal of air through the orifice, and vacuum means responsive to the information processed by the transducing means and coupled to the holding member for obtaining a withdrawal of air through the orifice in the holding member in accordance with the processed information to obtain a retention of particular cards by the holding member against movement.

11. The apparatus set forth in claim 10 in which the transport means are movable in closed loops and are constructed to hold the cards in fixed position on the transport means for movement with the transport means and in which an input stack is disposed in contiguous relationship to the transport means at a position before the transducing means and the holding member in the direction of movement of the cards and is constructed to hold the cards in stacked relationship for an individual transfer of cards from the input stack to the transport means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,040,025	Schlesinger	Oct. 1, 1912
2,806,695	Carlisle	Sept. 17, 1957