United States Patent

Frederick et al.

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[45] **May 16, 1972**

[54] DOCUMENT TRANSPORT SYSTEM

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[52] **U.S. Cl.** **271/14,** 271/54

[51] **Int. Cl.** **B65h 5/10**

[58] **Field of Search** ..... 271/54, 14, 55, 4, DIG. 9

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Primary Examiner—Joseph Wegbreit

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[57] **ABSTRACT**

This invention applies to a document transport system for rapid and precise movement and positioning of sheet material and particularly to such a system adapted for use in business machines. The system includes reciprocating sheet gripping means for moving and positioning a document having machine readable and human readable portions thereon. The document gripper provision includes a pair of jaw assemblies for gripping the leading edge portion of a document inserted into the throat of the machine. Each jaw is individually mounted on a support arm or rail for mutual travel in a bi-directional fashion perpendicular to the document inserting throat. A reversely rotatable drive shaft is coupled to the jaw assemblies, such as by elongated flexible members, for imparting precise bi-directional movements to the jaw assemblies concurrently in the same direction and at relatively high speeds along their respective rails and for accurately stopping the document in different positions in the machine. The gripper jaws are normally biased to a closed position but are activated to open condition only when the jaws are at their terminal position adjacent to the throat for receiving the leading edge of an inserted document or for releasing a document already handled by the machine. The pull and push action of the document gripping mechanisms are assisted by document engaging rollers adjacent to the throat of the machine whose speed and direction of rotation is controlled so as to impose a tension on the document at all times while it is in the machine. The movement and positioning of the document is under the control of mechanism which senses the machine readable portion of the document and governs the direction and distance of rotation of the drive shaft and the sheet engaging rollers thereby precisely moving and positioning the document as machine operations are performed.

40 Claims, 26 Drawing Figures

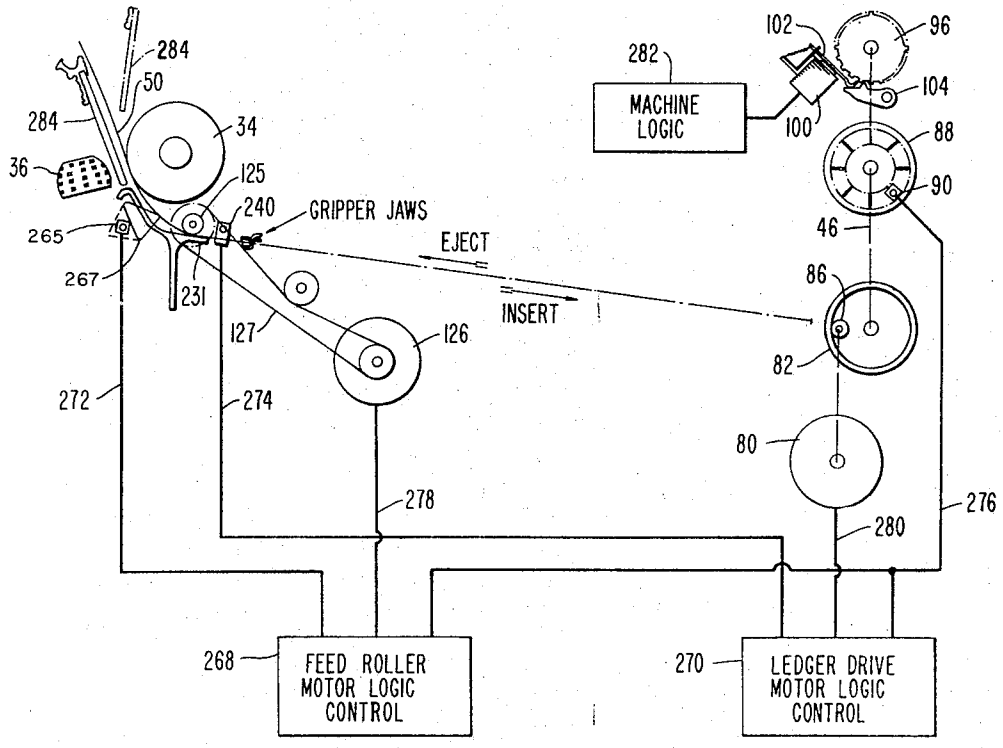


FIG.1

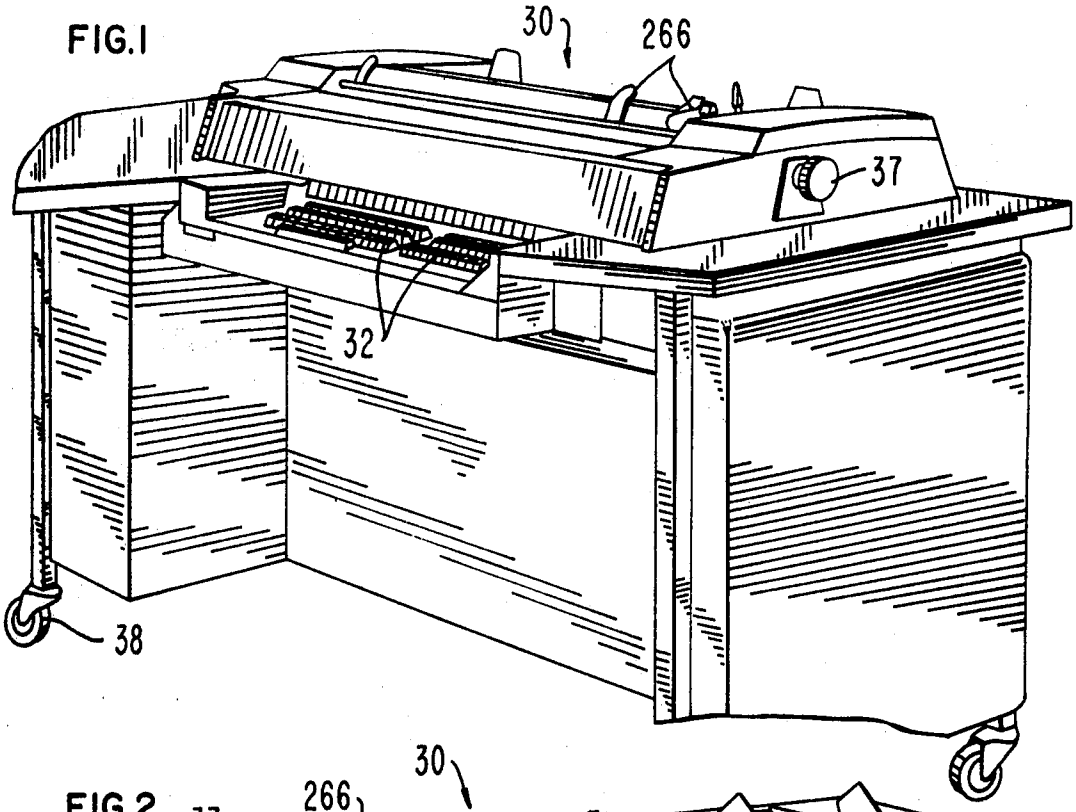
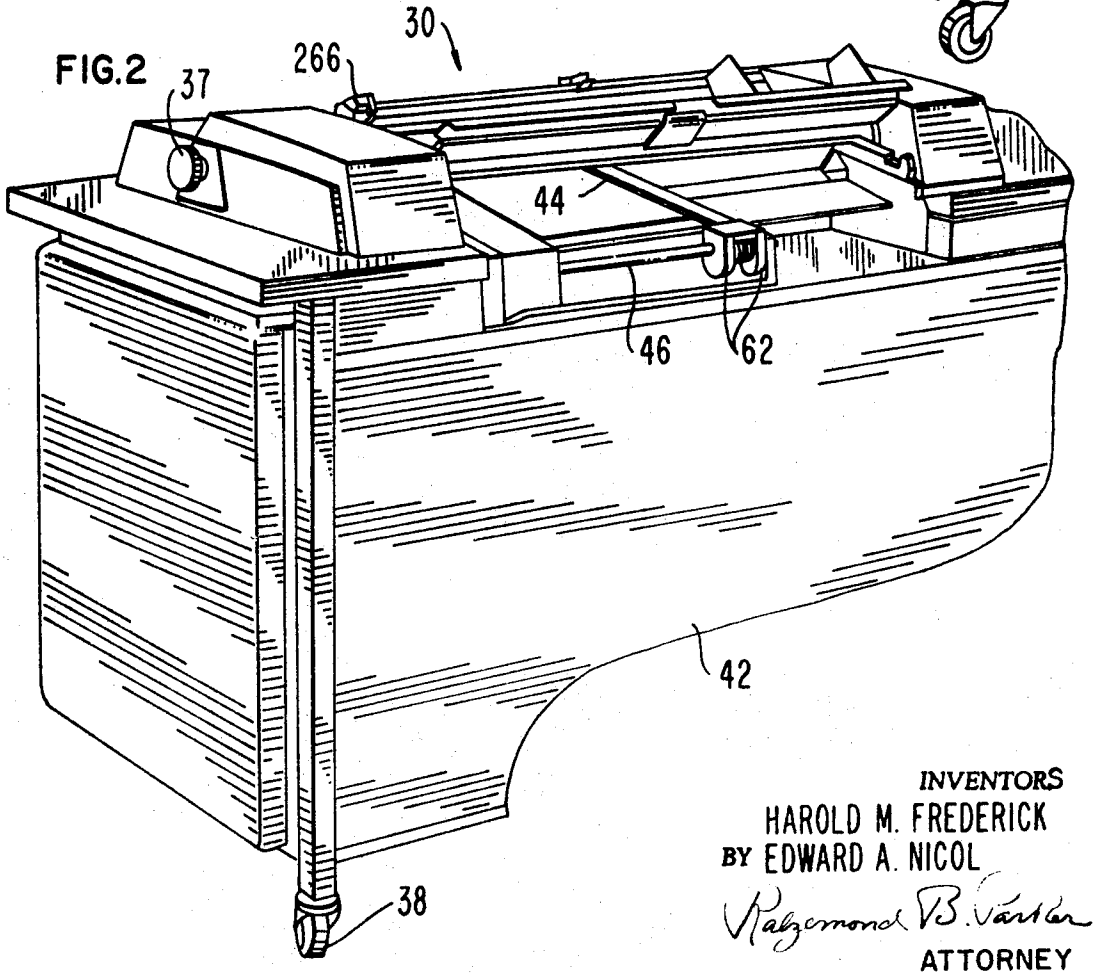


FIG.2



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ATTORNEY

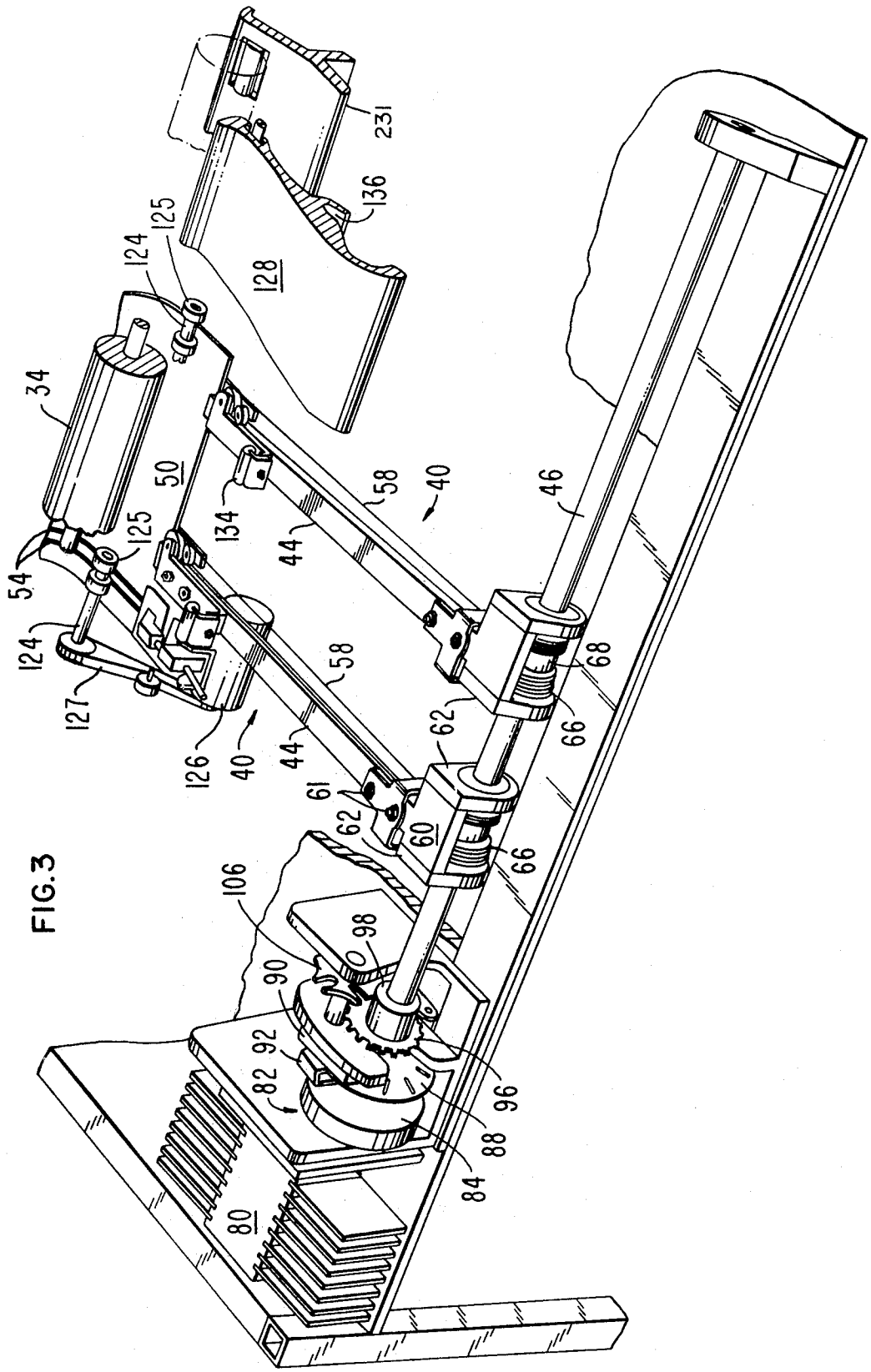
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FIG.3

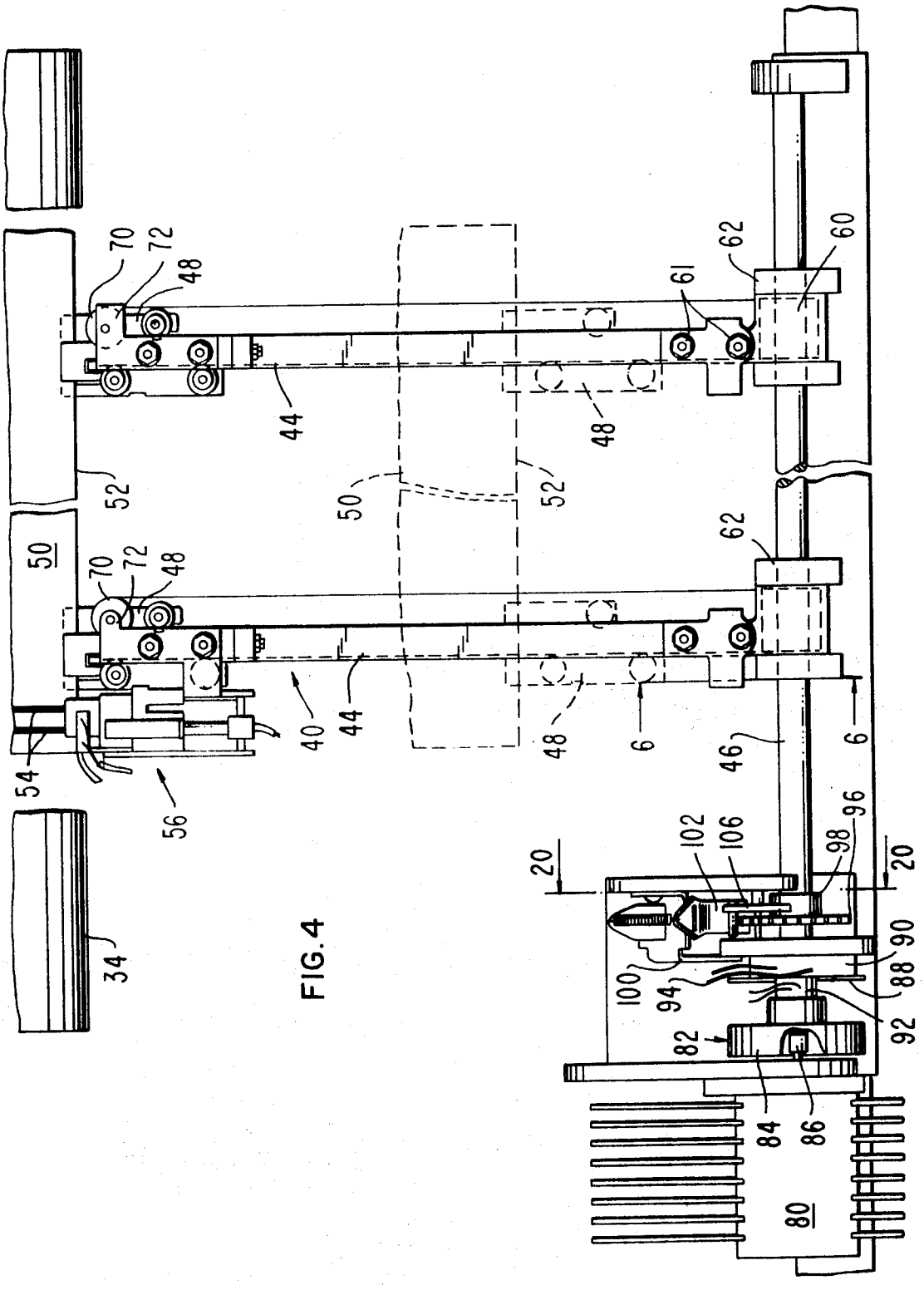
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FIG. 4

FIG.24.

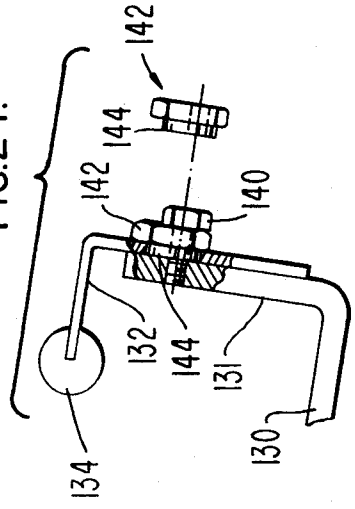
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FIG.5.

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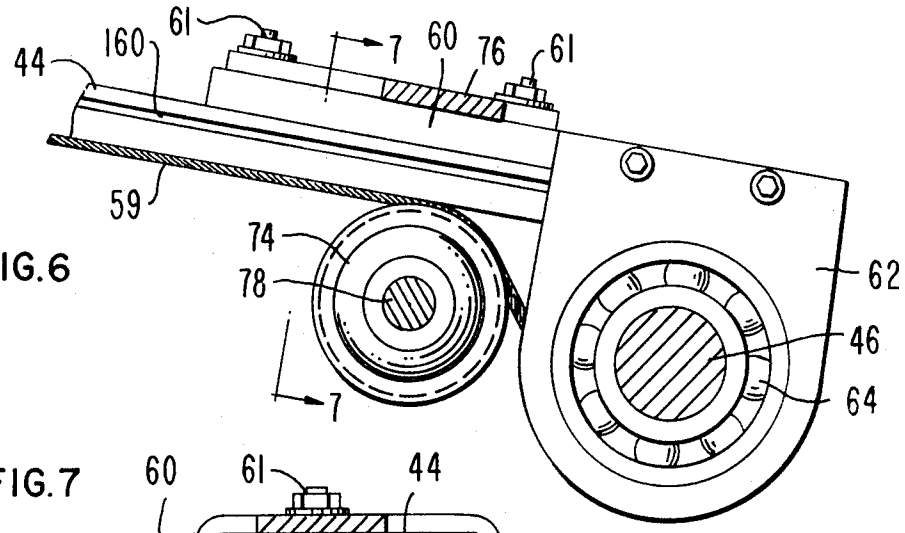
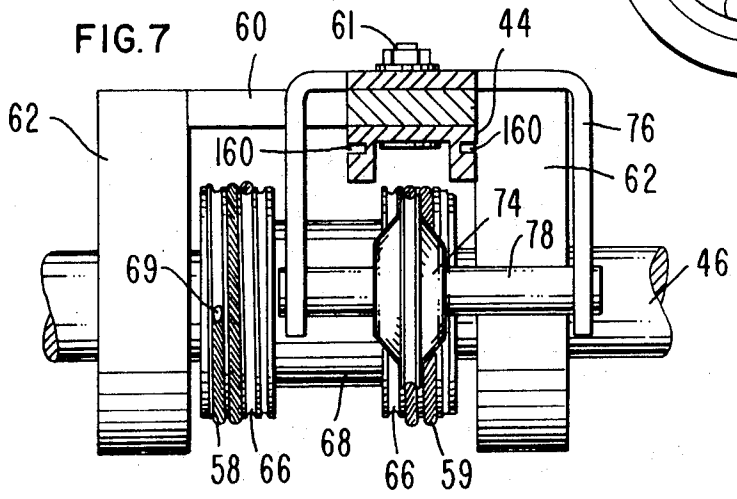


FIG.6

FIG.7



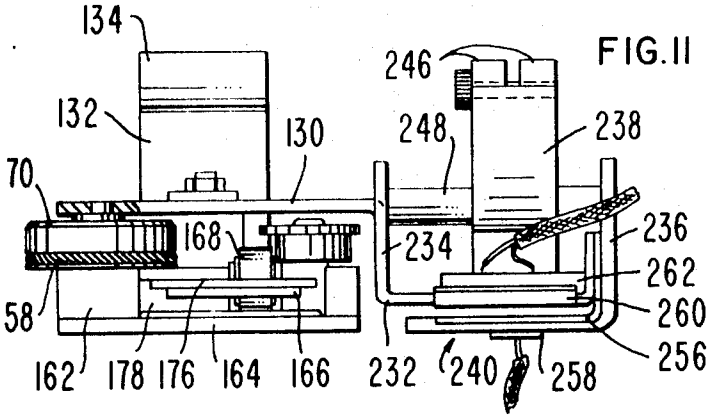


FIG.11

FIG.12

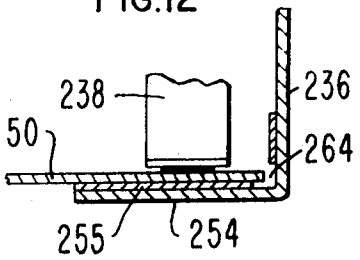


FIG.13

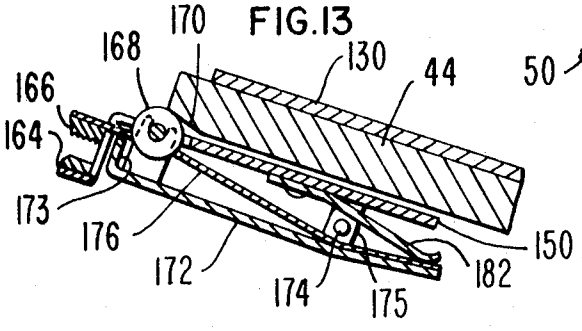


FIG.14

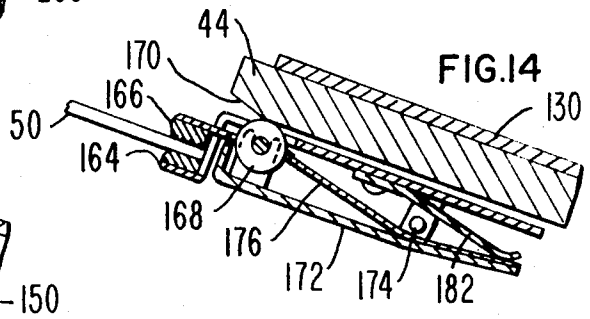


FIG.9

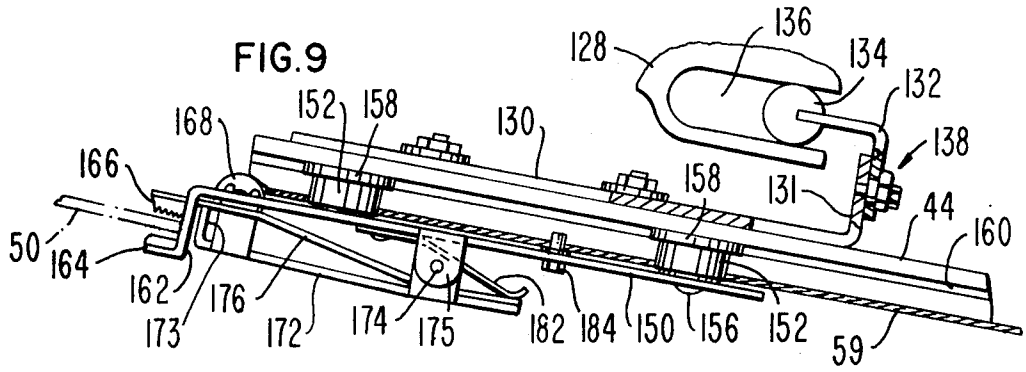


FIG.8

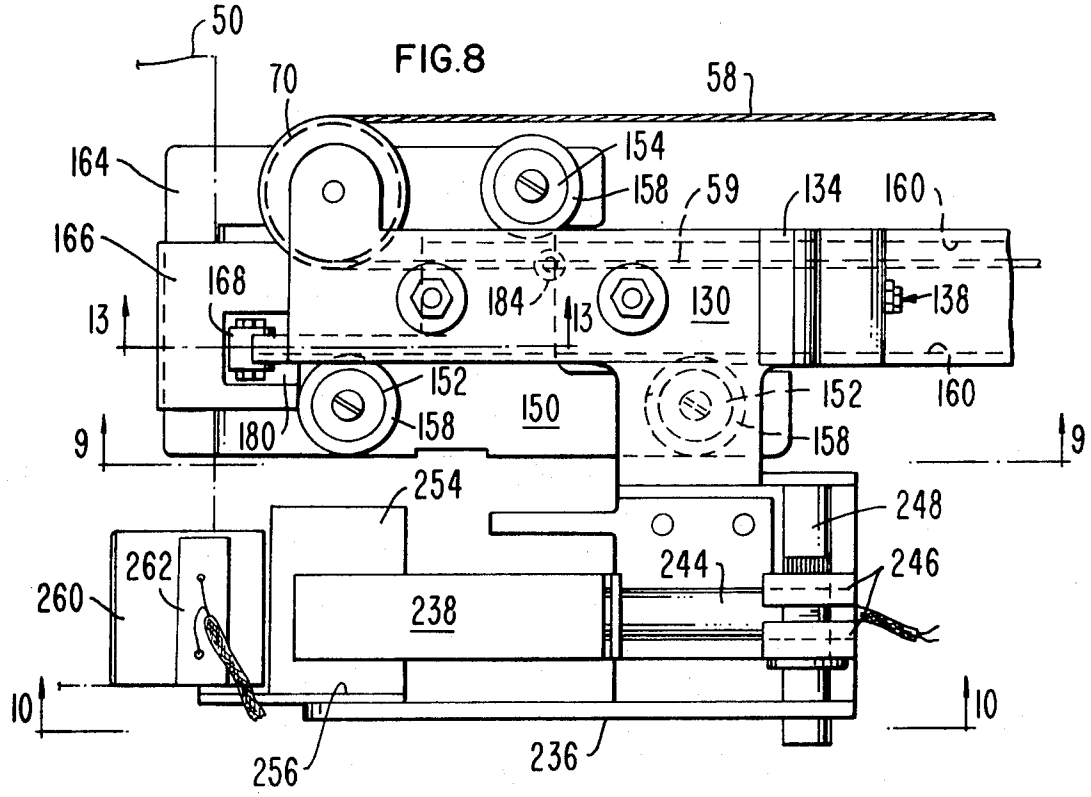


FIG.10

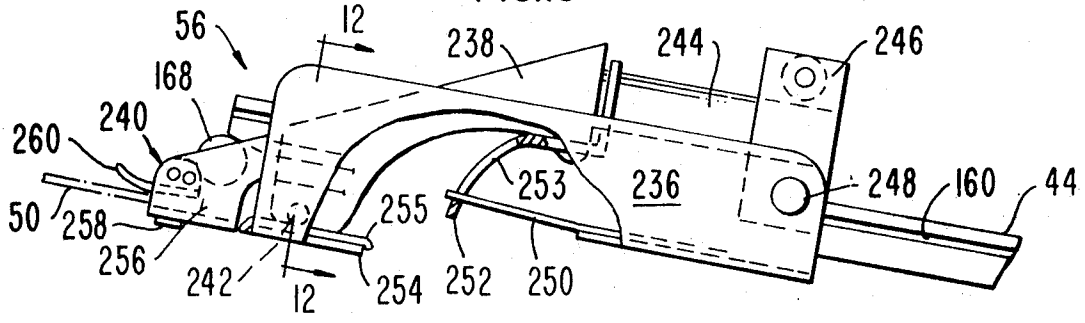


FIG.16

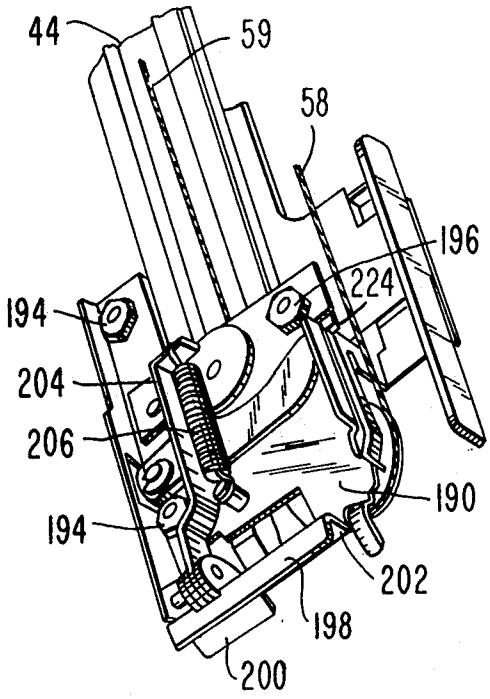


FIG.15

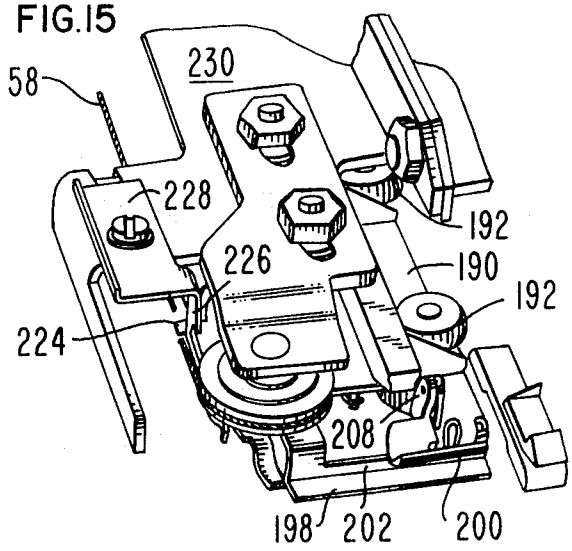


FIG.17

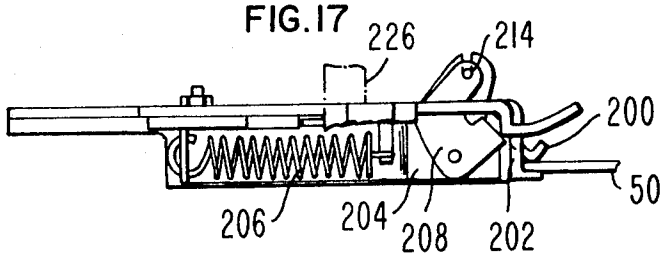


FIG.18

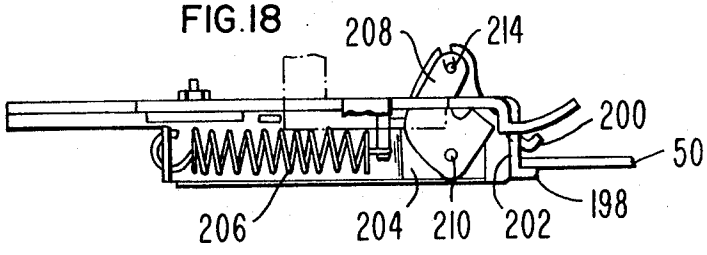


FIG.19

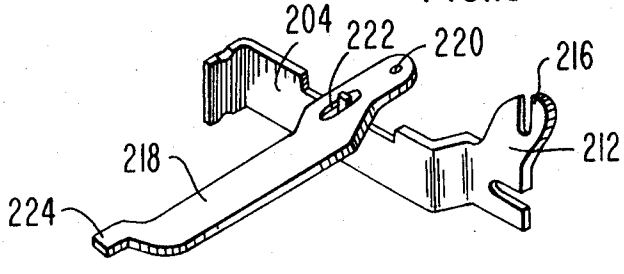


FIG.20

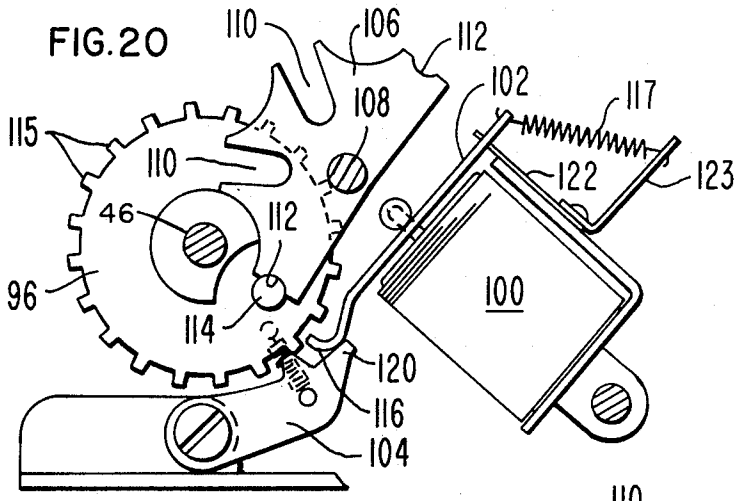


FIG.21

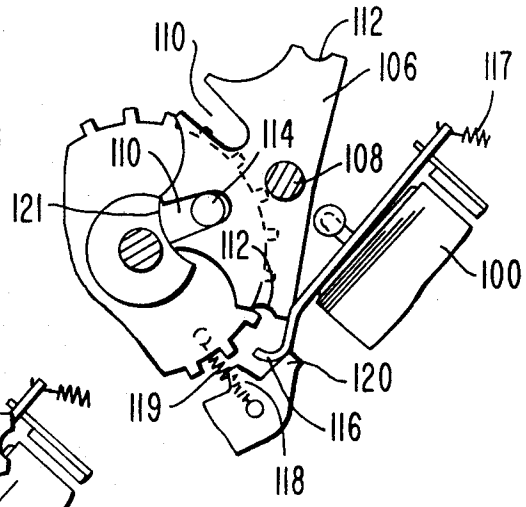


FIG.22

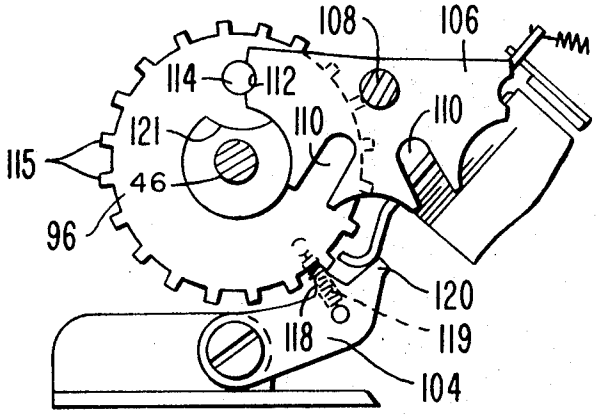


FIG.23A

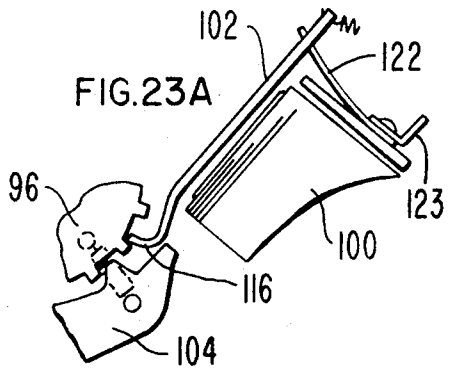
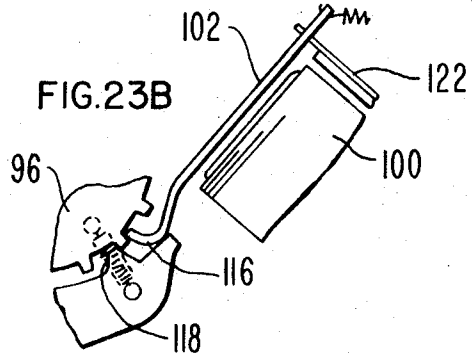
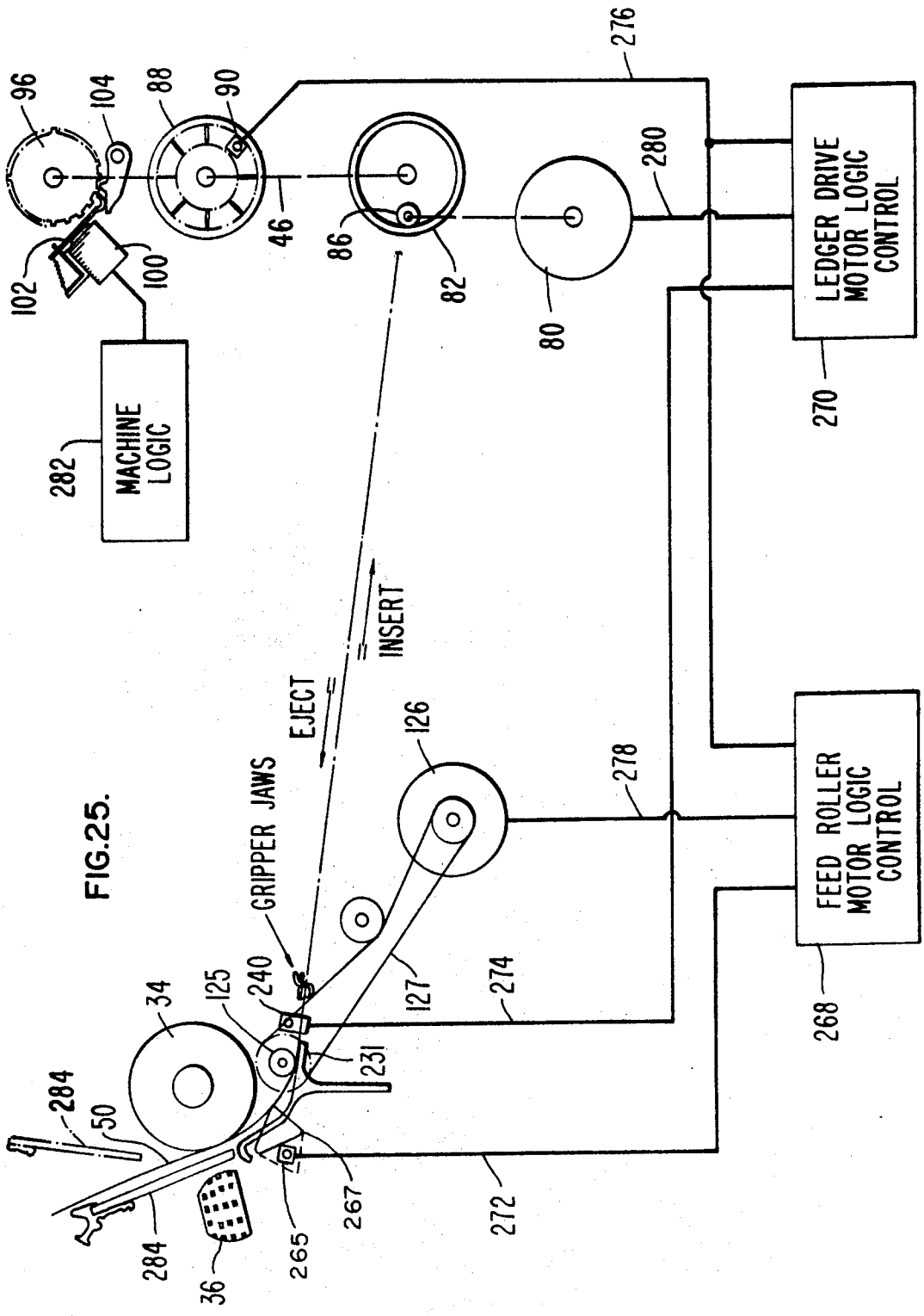


FIG.23B




96
104
88
90
276
102
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46
86
82
80
280
LEDGER DRIVE MOTOR LOGIC CONTROL
270
MACHINE LOGIC
282
INSERT
EJECT
126
278
GRIPPER JAWS
240
125
34
127
274
231
FEED ROLLER MOTOR LOGIC CONTROL
268
284
50
267
272
284
265
36

FIG.25.

DOCUMENT TRANSPORT SYSTEM

BACKGROUND OF THE INVENTION

This invention is directed to that field of art pertaining to the feeding or transporting of unit records or documents in business machines and the like and more particularly to the reciprocal movement of such records with respect to transducing mechanism for machine recording and reading of portions of the document.

Various ways for accomplishing such control over document feed have been suggested in the past, and exemplary of apparatus having a reciprocal document transport system are the U.S. Pat. Nos. 3,348,027 and 3,510,629 of common ownership herewith. In the past, as illustrated by these patents, it has been the usual practice to move a document into and out of the machine by the use of rollers which grippingly engage the document. By the direction of rotation of such rollers the document could be moved in the insertion direction into the machine and reversely in the ejection direction out of the machine. Such roller control provided generally satisfactory results where precise movement and alignment of the documents were not necessary and where the velocity of the document movement need not be carefully controlled.

SUMMARY OF THE INVENTION

An important object of the invention is to provide improved apparatus for controlling the movement of sheet material such as unit records and business forms.

Another important object of the invention is to provide a sheet transport mechanism having improved means for positively gripping sheet material and for moving the same precisely along a prescribed path at an accurately controlled velocity.

Another important object of the invention is to provide improved apparatus which although gripping one marginal portion of sheet material for effecting movement in both directions nevertheless maintains the sheet material in taut unslackened condition throughout all its movements.

Another important object of the invention is to provide improved apparatus for data processing systems having machine means for transducing data either onto or from a document introduced into the system which maintains positive, accurate control over the document throughout its travel in the system.

Another important object of the invention is to provide improved apparatus for controlling the reciprocal movement of business forms and documents so that each document is maintained taut in both directions of its motion and so that it is undeviatingly held to a prescribed path regardless of its direction of motion.

The present invention contemplates an improved transport system for the controlled movement of unit records or documents which positively grips such records and guides them along a defined track. More specifically, the invention contemplates such a transport system for business machines in which the leading edge of each such unit record or document is positively gripped and moved into the machine and in which during its presence in the machine the document is moved in various directions in such a precise manner that machine readable and writable portions thereof are accurately sensed or recorded upon by the machine.

A feature of the invention is the provision for maintaining the document in taut condition throughout its movement in the business machine. Gripping instrumentalities clamp onto the leading edge of the document inserted into the machine and hold onto the document throughout all of its movement in the machine. The grippers pull the document into the machine and later push the document in ejection direction out of the machine. To maintain the document in taut condition throughout all movement while in the machine, the invention provides document engaging rollers whose direction and speed of rotation are so controlled that when the document is pulled into the machine the rollers assert a retarding action on the movement of the document and when the document is pushed in ejection direction the rollers are rotated in the same direction but at peripheral speed exceeding that of the gripping devices pushing the document.

Other features of the invention relate to the specific construction and operation of the jaws of the gripper devices which engage the leading edge of the inserted document and to a cable system for bi-directionally moving the gripper devices in the same direction and at the same rate of speed thus avoiding the usage of edge guides and other supplementary devices for guiding the document. A further feature of the invention is the provision of an accurate line-find device forming part of the transport drive mechanism and serving to locate the next available line and other lines for printing on the document.

Other objects, advantages and meritorious features of the invention will become more fully apparent from the following specification, appended claims and accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of an electronic data processing machine in which the invention is incorporated;

FIG. 2 is a rear perspective view of the machine illustrated in FIG. 1;

FIG. 3 is a perspective view of the transport system of the machine illustrated in FIGS. 1 and 2 and including the drive mechanism therefor;

FIG. 4 is a top plan view of the transport system illustrated in FIG. 3;

FIG. 5 is a side view of the transport system of FIGS. 3 and 4 illustrating its mounting relationship with respect to the entrance throat of the machine and its printing platen;

FIG. 6 is an enlarged side view of the cable operating device of the transport system taken along line 6—6 of FIG. 4;

FIG. 7 is a front view of the cable drive mechanism of FIG. 6 taken along line 7—7 thereof;

FIG. 8 is an enlarged top plan view of one of the document gripping carriages employable in the transport system of the present invention;

FIG. 9 is a vertical sectional view taken through the carriage of FIG. 8 along line 9—9 thereof;

FIG. 10 is a vertical sectional view taken along line 10—10 of FIG. 8;

FIG. 11 is a front view of the gripper carriages shown in FIG. 8;

FIG. 12 illustrates manner in which a document transported by the system is positioned for proper alignment with the magnetic transducing head assembly;

FIGS. 13 and 14 are similar fragmentary sectional views of the gripper assembly, FIG. 13 illustrating the jaws in opened condition and FIG. 14 the jaws in closed document gripping position;

FIG. 15 is a topside perspective view of a modified form of document gripping assembly in accordance with the present invention;

FIG. 16 is an underside perspective view of the gripper assembly of FIG. 15;

FIGS. 17 and 18 are fragmentary sectional views of the gripper assembly of FIGS. 15 and 16, Fix. 17 illustrating the gripper jaws in closed document gripping position and FIG. 18 the jaws in open condition;

FIG. 19 is a fragmentary perspective view showing the provision for self-operating the gripper jaw assembly illustrated in FIGS. 15 to 18;

FIG. 20 is an enlarged vertical sectional view of the document positioning control mechanism taken along line 20—20 of FIG. 4 and showing the parts at one extreme travel position of the gripper carriages;

FIG. 21 is a fragmentary view of certain elements of FIG. 20 but showing the same in a different position thereof;

FIG. 22 is a view similar to that of FIG. 20 but showing the position of the elements of the control mechanism at the other extreme travel position of the gripper carriages;

FIGS. 23A and 23B are in detailed views illustrating the shock absorbing and tooth straddling actions of the tooth engaging elements at the time of the stoppage of the gripper carriages at a selected printing line position;

FIG. 24 is an enlarged detailed view of a provision for adjusting the level of the gripper jaws at their document receiving position in the machine; and

FIG. 25 is a diagrammatic view of the control circuitry associated with the moving parts of the document transport system illustrated herein.

DESCRIPTION OF A PREFERRED EMBODIMENT

The invention is illustratively embodied in a relatively small size electronic data processing system shown generally at **30** in FIGS. **1** and **2**. The illustrated machine includes a keyboard **32** in the front side thereof before which an operator may be seated for controlling the machine. The top of the machine contains a lengthwise extending cylindrical roller or platen **34** (shown in FIG. **5**) having associated therewith a single element spheroidal printing head **36** of well known construction movable parallel to the platen and adjustable to bring a selected type into printing position. The platen is rotatably adjustable about its axis and an external circular control knob **37** illustrated on the right side of the machine may be provided for providing manual adjustment thereof. The illustrated machine is enclosed by front, rear and side panels, and the whole machine may be mounted on casters **38** for convenient maneuverability.

The document transport system of the present invention is generally illustrated in FIGS. **3**, **4** and **5** and is mounted on the upper portion of the machine of FIGS. **1** and **2** so as to extend rearwardly away from the platen **34**. This system, in general, comprises two similar elongated parallel extending assemblies generally indicated at **40—40** in FIGS. **3** and **4** and extending from a position adjacent to the throat of the machine in the area of the plate **34** to a position remote therefrom and generally in the plane of the rear panel **42** of the machine. Each assembly **40** includes an elongated bar **44** forming a track member and the rearmost portion of each bar is supported upon a drive shaft **46** extending parallel to the platen which shaft is exposed for part of its length in FIG. **2**. Movable along the underside of each track assembly **40—40** is a carriage generally indicated at **48** whose travel therealong is controlled by the direction of rotation of the shaft **46** either toward or away from the throat and platen **34**.

As will be described in more detail hereinafter, each carriage **48** has a gripping device for clamping onto an edge portion of a unit record or document **50** which may be a ledger or other type of business form having, in this instance, one or more elongated narrow machine readable and machine recordable areas thereon. The forward ends of the carriages contain jaw elements for engaging the leading edge **52** of the document after it has been inserted into the throat of the machine which will pull the document therewith as the two carriages move in unison rearwardly of the machine toward the shaft **46**. During the operations which may be performed upon the document **50**, the two carriages continue to grip the document and under the control of the shaft **46** the document may be moved line by line towards the throat by the carriages and may be reversely moved one or more times before all operations with respect to the document are completed. When no further use is needed of a particular document, the carriages still gripping the document will push the latter in ejection direction toward the throat and, as herein later described in detail, release the document for removal from the machine when it has arrived in ejection position in the throat. FIG. **4** illustrates in full and dotted outline two positions of a ledger **50** under the control of the carriage and drive shaft **46**. At the upper portion of the Figure, the ledger shown at the level of its insertion with the leading edge thereof between the jaws of the two carriages **48—48** preparatory to being clamped thereby. The lower dotted position of the ledger in FIG. **4** shows a substantially inserted condition of the ledger in the machine with the two carriages still in gripping engagement therewith. FIG. **5** illustrates in dotted and full line conditions two positions of the carriage associated with one of the track assemblies, the dotted position showing the carriage adjacent to the machine throat and the full line position showing an intermediate position.

FIGS. **3** and **4** illustrate positions of a typical machine readable and recordable document or ledger **50**. In the business machine illustrated herein, the ledger contains a pair of parallelly extending magnetic stripes **54—54** along one side margin thereof which during the course of the movement into and out of the machine pass by a stationary transducer assembly **56** having magnetic heads therein capable of both reading the magnetic data on the stripes and of recording new data thereon. Ledger cards of this character are described in detail in the aforesaid referenced patent and further description thereof and the operation of a suitable magnetic transducing device is not therefore believed to be needed. It is to be understood that other ways of machine reading and recording may be utilized, such as optical, and that the present invention is not limited to the magnetic transducing operations illustrated herein.

As will be described in more detail hereinafter, the movements of the two carriages **48—48** are so controlled that they move in unison toward and away from the throat of the machine so as to move the document or ledger **50** along a precisely defined path in either direction of its motion in the machine. In this manner, the magnetic stripes **54—54** of the document are accurately conveyed by the stationary magnetic transducing device **56** in both directions of the motion of the document.

This uniform to and fro motion of the two carriages **48—48** is accomplished in the herein illustrated embodiment of the invention by means of a cable system associated with each bar or track member **44**. The cable system for each track may be considered as composed of two sections **58** and **59** mutually connected at a common end to the associated carriage **48** and having their opposite ends helically wound about the shaft **46** in opposite directions. More specifically, each track member **44** terminates in a widened end section **60** overlying the shaft **46** which may form a separate member secured by bolts **61—61** to the upper side of the track member. The end section **60** carries on its opposite side a pair of side plates **62—62** each containing a roller bearing assembly **64** as shown in FIG. **5** for journaling the track member upon the shaft **46**. This provides a support for one end of each track assembly while allowing the shaft to rotate freely with respect thereto.

Within the space enclosed by the side plates **62—62** of each track member are two helically grooved members or wheels **66—66** of similar construction with are fixed to a hub **68** which in turn is keyed to the shaft **46** to receive driving torque therefrom. One section of each cable system, such as indicated at **58**, has its end section adjacent to the shaft helically seated within the grooves of one of the wheels **66**. The other end section **59** of the cable system likewise has the end section thereof adjacent to the shaft seated in the grooves of the other wheel **66** but wound therearound in the opposite direction to the cable section **58**. The wound ends of such cable sections are pinned or otherwise secured to the wheels such as in the manner indicated at **69** in FIG. **7**.

The two cable sections **58** and **59** of the cable system constitute a single strand which is secured intermediate its length to the underside of the carriage **48** movable on the track member with which the cable system is associated. Preferably, cable section **58** extends alongside its track member and is visible in FIGS. **3** and **4**, whereas cable section **59** extends underneath its track member and is therefore not exposed to view in FIGS. **3** and **4**. Affixed to the extremity of each track member **44** adjacent to the throat of the machine is a pulley **70**

rotatable about an axis perpendicular to the track and about which cable section **58** is trained. For this purpose, this extremity of the track member may be provided with a lateral extension or ear **72** to offset the pulley with respect to the track in order to bring its cable section **58** substantially into alignment with its grooved wheel **66** on the shaft **46**.

Secured to the underside of each track member **44** adjacent to the drive shaft is a grooved idler wheel **74** shown in FIGS. **6** and **7** over which the cable section **59** is trained before winding around its grooved wheel **66**. The idler wheel is suspended under its track member by an inverted U-shaped metallic strap **76** secured by the bolts **61—61** and carries a fixed stub shaft **78** upon which the wheel is both free to rotate and to shift axially therealong as the cable winds or unwinds on its helically grooved wheel **66**.

The drive shaft **46** is driven by an electric motor **80** shown at the left of FIGS. **3** and **4**, the driving connection being formed in the illustrated embodiment of the invention by a friction clutch generally indicated at **82**. The clutch includes a cup shaped member **84** pinned through its associated hub to the drive shaft **46** in an overlapping relation to a small wheel **86** on the end of the motor shaft as shown in FIG. **4**. The internal side of the cup shaped member **84** of the clutch has a frictional surface engaging the outer periphery of the wheel **86**. The motor is of the reversible type for rotating the drive shaft in opposite directions. The angular position of the shaft **46** is herein determined by means of a slotted disk **88**, the slots extending radially of the disk in angular spaced apart relation about the axis of shaft **46** as indicated in FIG. **3**. These slots are sensed in any suitable manner as the disk rotates, such as by means of a light sensitive photocell housed in a casing **90** positioned on one side of the slotted disk to receive light through the slots from a light source within a casing **92** on the opposite side of the disk. Leads **94** (FIG. **4**) extend from the photocell to a counter (not shown) which counts the passage of the slots thereby thus keeping track of the angular position of the shaft as rotated by the motor **80**.

Mechanism for physically controlling the extent of movement of the gripper carriages **48—48** on their respective tracks as well as for accurately positioning the same at different locations therealong is located, as shown in FIGS. **3** and **4**, between the motor **80** and the track assemblies **40—40** and is specifically illustrated in FIGS. **20–23**. In general, the control mechanism comprises a sprocket type wheel **96** mounted on a hub **98** fixed to the shaft **46** for joint rotation therewith, and in addition includes a solenoid **100**, its armature or clapper **102** shaped to engage the teeth of the sprocket wheel, a pawl **104** operatively associated with the clapper and likewise engageable with the teeth of the sprocket wheel, and a partial Geneva wheel **106** rotatably mounted in offset relation to the sprocket wheel and engageable with a part thereof for limiting the extent of travel of the gripper carriages to the lengths of their respective tracks.

The extreme forward and rearward positions of the gripper carriages **48—48** on their respective tracks is determined by the configuration of the Geneva wheel **106**. With specific reference to FIGS. **20–23**, the Geneva wheel is rotatably mounted on a shaft **108** extending in offset parallel relationship to the drive shaft **46** and supported by suitable brackets associated with the control mechanism. The Geneva wheel has two deep radial indentations **110—110** and two shallow indentations **112—112** into which a pin **114** projecting from one side of the sprocket wheel **96** is sequentially receivable. In the operation of the Geneva wheel the pin **114** will revolve about the axis of the shaft and will successively enter the deep radial indentations **110** as it imparts rotation to the Geneva wheel before entering and abutting one or the other of the shallow recesses **112** at either of which times the pin's revolution will be stopped, thus discontinuing further rotation of the sprocket wheel and the shaft. FIGS. **20–22** illustrate successive positions of the sprocket wheel pin **114** and the Geneva wheel as the two revolve from one pin abutting position in FIG. **20** to the opposite pin abutting position in FIG. **22**. The hub **98** is cut out as at **121** to allow the toothed projections associated with the deep indentations **110—110** to escape thereby during rotation of the Geneva wheel in the manner shown in FIG. **21**. The shape of the Geneva wheel is so designed for this particular operation that it will allow the shaft **46** to revolve several times before the two gripper carriages **48—48** traverse the full length of their respective tracks and to stop further movement of these carriages at the extreme forward and rearward positions on the tracks. The Geneva wheel thus serves the purpose of limiting the travel of the gripper carriages to substantially the length of the track members **44—44**.

For accurately positioning the gripper carriages **48—48** at different intermediate locations along their respective tracks and thus position a document gripped thereby in any one of a plurality of printing line positions, the clapper **102** of the solenoid **100** cooperates with the pawl **104** to engage a tooth of the sprocket wheel **96** and stop the same and the shaft **46** at the prescribed location of the carriages. To this end, the sprocket wheel **96** carries equally spaced apart square shaped teeth **115**, and interengageable therewith is the free end of the clapper **102** which is inwardly bent as at **116** for entry into the notch between any adjacent pair of teeth on the sprocket wheel. The opposite end of the clapper **102** is pivotally mounted on the body of the solenoid **100** and a coiled spring **117** yieldingly urges the clapper to pivot in the direction to introduce its bent end **116** between the teeth on the sprocket wheel. In the unenergized condition of the solenoid the clapper will be rocked by the spring **117** to introduce its free end into the space between adjacent teeth of the sprocket wheel; in its energized state the solenoid will attract the clapper withdrawing the free end thereof from out of the path of movement of the sprocket teeth thereby freeing the sprocket wheel and the shaft **46** for rotation by the motor **80**.

The pawl **104** is shaped with a projection indicated at **118** for interposition between any adjacent pair of teeth on the sprocket wheel and is yieldingly urged in such direction by means of a coiled spring **119** attached at one end to the pawl and at the other end to a fixed supporting bracket of the shaft control mechanism. The pawl carries an extension **120** which overlaps the free end **116** of the clapper in such close proximity thereto that when the clapper is retracted by energization of the solenoid it also rocks the pawl away from the sprocket wheel withdrawing the projection **118** from out of the path of travel of the sprocket teeth.

The function of the pawl is to serve as a back-up stop initially preventing reverse rotation of the sprocket wheel after its rotation in a given direction has been stopped by the clapper **102** and then cooperating with the free end **116** of the clapper to bestride a tooth and thereby releasably lock the sprocket wheel and shaft **46** from rotation in either direction. The normal spacing of the clapper's inturned end **116** from the pawl projection **118** is slightly greater than the width of a tooth on the sprocket wheel thereby enabling these two elements to straddle a tooth and thus restrain the sprocket wheel from rotation in either direction. Each tooth **115** on the sprocket wheel **96** represents a line on the document in the machine upon which printed matter may be or has already been entered thereon by the print head **36** of the machine. It is apparent that by the means of the clapper and pawl the gripper carriages can be controlled to stop the document at any selected line thereof.

To soften the impact upon the clapper **102** at the time it functions to stop rotation of the sprocket wheel and shaft at a selected line position on the document in counterclockwise direction as viewed in FIGS. **20–22**, its pivoted end is slotted to receive the extended free end of a flexible metallic blade **122** which has its opposite end secured to the solenoid body by a bracket **123** to which the clapper spring **117** is attached. This form of pivotal mounting enables the clapper to yield slightly in the plane of its longitudinal dimension when struck by a tooth of the sprocket wheel rotating counterclockwise, thereby enabling the spring blade **122** to absorb the kinetic energy of the sprocket wheel and all moving members as-

sociated therewith as well as to reduce the noise resulting therefrom. FIG. 23A illustrates in a slightly exaggerated degree the flexible action of the spring blade **122** as it absorbs the energy of an abutting tooth. As this action occurs, the projection **118** of the pawl enters the notch on the other side of the abutting tooth so that when the sprocket wheel bounces back from the resilient action of the spring blade it is instantly stopped by this projection and trapped as shown in FIG. **23B** between the same and the free end of the clapper which by this time has returned to its normal position toward which it is urged by the spring blade. In this manner, acting through the sprocket wheel **96** and the drive shaft **46** the two document gripping carriages **48—48** are stopped on their respective tracks thus halting movement of the document gripped thereby at a selected line position.

In the embodiment of the invention illustrated herein, the document transport system functions similarly to that described in the aforesaid referenced U.S. Pat. No. 3,348,027. The introduced document may be in the form of a ledger bearing a machine readable and writable portion thereon which in the instance illustrated herein comprises a pair of magnetic stripes **54—54** extending in the direction of motion of the document in the machine. The transport system pulls the document fully into the machine in the insert direction and during this motion the magnetic stripes are sensed by the transducer **56** and information sensed thereon, including line find position, is stored in the machine. After the document has been fully received in the machine its direction of motion is reversed to move the document toward the throat and stopping the same at the print line position read from one of the stripes which is usually the first available line on the document for printing. During accounting or other operations performed in connection with the inserted document one or more printing lines may be typed thereon, the document being moved incrementally from line to line in the ejection direction after each line of printed information is entered thereon. At the conclusion of the accounting operation with respect to the document, it is then moved in the insert direction to the full extent of travel in the machine before it is then reversed and returned to the ejection position in the throat of the machine. During its last traveling motions in the machine, new information is written on the magnetic stripes, including the print line position to which the document is to be automatically moved when next inserted into the machine.

In such a document transport procedure as applied to the illustrated embodiment of the invention herein, the cooperation of the clapper **102** and the pawl **104** for stopping the document at a selected printing line will occur when the document is moved in the ejection direction, i.e., in the direction away from the shaft **46** and toward the throat of the machine. Accordingly, when the document is moved in ejection direction the solenoid **100** is energized to retract the pawl and clapper out of engagement with the sprocket teeth and the sprocket wheel and shaft are driven in counterclockwise as viewed in FIGS. **20–22**. To stop the document at the desired printing line position, the radial slots of the disk **88** are counted until the desired print line position is reached at which time the solenoid **100** is deenergized and the clapper and pawl are released to straddle the tooth corresponding to this print position on the sprocket wheel. For effective long usage of these parts, it is highly desirable to employ the provision herein previously described for absorbing the kinetic energy of the moving parts as the tooth straddling operation is performed.

When the sprocket wheel **96** and the shaft **46** rotate in the clockwise direction as viewed in FIGS. **20–22**, the gripper carriages pull the document in the insert direction, i.e., in the direction toward the shaft **46** and away from the throat of the machine. During the transport of the document in this direction, the solenoid **100** is energized to retract the clapper and pawl, and the gripper carriages **48—48** are moved uninterruptedly to the rear limit of their travel on the tracks at which time the pin **114** will abut the Geneva wheel and the parts of the control mechanism will assume positions shown in FIG. **22**. During document insert motion as well as ejection motion, the radial slits of the disk **88** are counted by the photocell circuit so that every line position of the document is kept track of, and this information is utilized in the positioning of the document at the proper location for receiving printed impressions.

Although the illustrated embodiment of the invention operates with this document transport procedure, it is possible to modify the system so that the document may be stopped at the selected line position when it is moved in the insert direction and before the gripper carriages reach their rearward limit of travel. This may be accomplished, for example, by providing a dual set of teeth straddling members represented by the clapper **102** and the pawl **104** and associated operating mechanisms and by disposing the two sets with respect to the sprocket wheel so that one set operates on the teeth thereof when the wheel is rotated in clockwise direction and the other set operates on the teeth when the wheel is rotated in counterclockwise direction. In this manner, it is possible to stop the gripper carriages intermediate the two extreme positions of their travel regardless of whether they are moving in insert or ejection direction on their respective tracks. It is therefore apparent that the document transport procedure described for the illustrated embodiment of the invention need not necessarily be practiced for the type of equipment illustrated herein, and accordingly it is to be understood that the scope of the invention is not to be limited in this respect.

At the opposite end of the transport system adjacent to the throat of the machine is a shaft **124** carrying, in this instance, a plurality of document engaging rollers **125** axially spaced therealong. The roller shaft is driven from a motor **126** through the intermediary of a driving belt **127** which as shown in FIG. **3** is coupled by means of a pulley to the roller shaft adjacent to the right side of the machine. The motor is reversely operable to drive the shaft **124** and mutually its rollers **125** in one or the other direction about the axis of the shaft. Additionally, as will be described in more detail hereinafter, the motor is controlled so as to drive the rollers in one or the other direction depending on the direction of the motion of a document **50** in the machine. For example, in that mode of machine operation when the gripper carriages **48—48** push the document in ejection direction, the motor **126** will exert torque to drive the rollers not only in the same direction but at a peripheral speed slightly exceeding that of the carriages **48—48**. By virtue of this provision, the faster driving force applied to the document by the rollers **125** maintains the document in taut condition while being gripped and moved by the carriages **48—48** in the ejection direction. Moreover, as more fully described hereinafter, when the gripper carriages **48—48** operate to pull a document into the machine, the motor **126** will be controlled so that the rollers **125** will impose a drag on the document thus causing it to be maintained in taut condition when moved in insert direction.

The dimensional relationship of the parts of the transport system to the record medium which it controls is such that when a document is pulled into the machine to the fullest extent, the trailing edge portion never leaves contact with the rollers **125** even though this edge may have been drawn into the throat sufficient to expose the platen **34** to printing impressions from a printing mechanism such as shown at **36**. FIG. **5** illustrates a side elevation of one of the track assemblies **40** and in full line an intermediary position of its gripper carriage **48** and in dotted outline the closest position of the carriage to the throat for receiving a document into or ejecting a document from the jaws thereof.

As previously mentioned, the remote or rear end of each track assembly **40** is supported upon the drive shaft **46** by means of its journal bearing **64**. In the illustrated embodiment of the invention, the forward end of each track assembly is adjustably supported in order to set the inclination of each track so that the mouth formed by the jaws of the gripper device associated with the track is precisely aligned with the path of

movement traversed by the leading edge of a document **50** entering the throat of the machine. For this purpose the forward end of each track assembly is suspended from an overhead support **128** extending along the rear side of the platen **34** and secured at its opposite ends to appropriate supporting structure on the upper portion of the machine **30**. As best shown in FIG. **9**, there is secured to the top surface of the forward end of each rail member **44** a bracket member **130** of L-shaped configuration having its vertical leg portion **131** disposed in overlapping relation to the vertical section of a right angle bracket member **132**. The horizontal section of the latter carries a cylindrical body **134**, which may be formed of a hardened plastic material having an inherent lubricity. The body **134** is dimensioned to slidably fit between the upper and lower surfaces of a rearwardly opening slot or recess **136** of the frame member **138**.

To provide the variation in the height of the jaws of each gripper assembly, overlapping portions of the two bracket members **130** and **132** in each assembly are adjustably connected together in the manner illustrated in FIGS. **9** and **24** by a bolt assembly generally indicated at **138** having the capability of varying the extent of the overlapping relationship of these two portions and thus the inclination of the track member **44** suspended thereby. As illustrated in FIG. **24**, this is accomplished by providing a bolt **140** threaded into the leg **131** of bracket member **130** and carrying a rotatably adjustable bushing **142** having an eccentric part **144** fitting a circular hole formed in the overlapping vertical position of bracket member **132**. Before the bolt is fully threaded home the bushing may be rotatably adjusted thereon to vary the overlapping relation of the two bracket members and in this manner change the height of the suspended end of the track assembly so that the opened jaws of its gripper carriage are at the proper level to receive the leading edge of an introduced document.

The two track assemblies **40—40** are underlaid by appropriate plate-like members such as indicated at **146** and **148** to provide a protective shield for the underside of the documents handled by the pair of track assemblies. It is apparent, therefor, from this mounting relationship that the inclination of the two track assemblies may be adjusted in unison about the axis of the drive shaft **46** in order to present the gripper jaws in precise position to receive or eject a document **50** inserted into the machine.

Two forms of document gripper carriages are disclosed in the illustrated embodiment of the invention. One form is illustrated in FIGS. **8** to **14** inclusive and the other in FIGS. **15** to **19** inclusive. Both forms of the gripper carriages are designed so as to precisely and undeviatingly follow a prescribed path along the rail members **44—44** of the document transport system. In so doing, their continued grip of a document throughout their travel on the rail members will assure similar controlled movement of the document past the transducing device **56**.

With respect to gripper carriage **48** illustrated in FIGS. **8** to **14** inclusive, each carriage has for its main supporting element a base plate **150** which as shown in FIG. **9** underlies the associated rail member **44**. The plate **150** carries on one side of the rail member a pair of rollers or wheels **152—152** and a single wheel **154** on the other side thereof. The wheels are individually journaled about upstanding studs **156** fixed to the plate member. Each wheel carries a peripheral flange **158** and the flanges of the wheels ride in straight line grooves **160** formed in the opposite sides of the rail member **44** and extending substantially for the full length thereof. Interlocked with the rail member in this manner, the three flanged wheels carry the carriage plate **150** in suspended relation immediately below the rail member **44** as they roll in either direction therealong. The forward end of each carriage plate is jogged to form a downwardly turned wall as at **162** terminating in a forwardly projecting nonyielding step **164**. This step carries frictional material so as to serve as the lower jaw of a pair of jaws for gripping the leading edge of a record unit or document. The upper jaw of the pair is indicated at **166** and is provided with serrations on the underside thereof improving the grip of the jaws on the leading edge of the document.

As earlier mentioned herein, the jaws **164–166** are only opened at the throat position of each gripper carriage to either receive the leading edge of a document inserted into the machine or to release a document that has already been operated upon in the machine. FIG. **9** illustrates the open position of the two jaws, and in this condition the downwardly bent wall portion **162** of the lower jaw functions as a stop against which the leading edge of the document **50** abuts when it is fully inserted between the jaws. When the gripper carriage moves rearwardly away from its throat position illustrated in FIG. **9**, the upper jaw **166** is forced down into engagement with the leading edge of the document and the latter is clamped between the two jaws as illustrated in FIG. **14**. Movement of the upper jaw **166** to opened and closed position is accomplished by means of a small roller **168** forming part of the carriage assembly and capable of vertical bodily movement at the extreme forward end of the rail member to raise and lower the upper jaw.

The roller **168** of each gripper carriage assembly rolls along a straight rail of its track member **44** for all of the distance thereof except for a small section at the forward end thereof where, as best shown in FIGS. **13** and **14**, the rail for the roller is upwardly inclined as at **170**. Spring means associated with the carriage yieldingly urges the roller to follow its rail including the inclined portion thereof. For this purpose, the roller **168** is pressed against its rail by a rockable member **172** which is pivoted about an axis formed by a pin **174**. Two pairs of overlapping ears **175** carried by carriage plate **150** and rocking member **172** support the pivot pin rearwardly of the jaw end of the carriage. The upper jaw **166** is secured to the forward extremity of a flexible member **176** formed for example of spring steel lying between the rockable member **172** and the plate **150** and extending rearwardly below and past the pivot pin **174**.

As shown in FIGS. **8** and **11**, the step of the gripper carriage forming the document abutting wall **162** and the lower jaw **164** thereof has a wider extent than the upper jaw **166** and the roller **168**. The wall **162** is provided with an opening **178** intermediate its length through which the flexible member **176** carring the upper jaw extends. In this manner the movable upper jaw is brought into position over the unyielding lower jaw **164**. The flexible jaw carrying member **176** is, in turn, provided with an aperture **180** which receives the roller **168** and the journal mounting therefor carried on the extremity of the rocking member **172**. This member is provided with an upturned lip **173** over which, as shown in FIGS. **13** and **14**, the upper jaw carrying member **176** extends. The lip is in continuous contact with the underside of member **176** and when the rocking member **172** pivots as the roller rides on the inclined surface **170** the upper jaw is either lifted or lowered with respect to the lower jaw depending in the direction of the rocking movement.

Resilient means is contained in each gripper carriage for rocking the member **172** and thus the upper jaw **166** to open position when the roller **168** rides up the incline **170**. For this purpose, a second flexible member **182** of spring steel or the like is interposed between the carriage plate **150** and the rocking member **172** and is secured at one end to the former and bears against the latter rearwardly of its pivotal axis **174**. The flexible member **182** is biased to yieldingly urge the rockable member to rotate in clockwise direction around its axis as viewed in FIGS. **8**, **13** and **14** thus tending to raise the upper jaw when the roller **168** reaches the inclined section **170** of the rails upon which the roller **168** travels. Throughout the remainder of its travel the roller **168** is depressed by its rail against the resilient force of the biased spring member **182** bringing the upper jaw down against the lower jaw in the absence of a document therebetween or into firm clamping engagement with the leading edge of a document if such has been introduced therebetween.

The two cable sections **58** and **59** are actually one long continuous strand, as previously explained, which passes between the base plate **150** of each gripper carriage and the track member **44** upon which it travels. For clamping the cable to the carriage there is provided a member **184** (see FIG. **9**) threaded in the base plate **150** and provided with a transverse hole through which the cable extends. The threaded member can be drawn down against the plate **150** clamping the cable thereto and thus rigidly securing the cable to the gripper carriage.

The second form of gripper assembly illustrated in FIGS. **15** to **19** inclusive is like that previously described in its operating characteristics but employs a different combination of elements. The assembly includes a main or base plate **190** carrying three rollers like that described in connection with the previous form of gripper assembly which engage opposite sides of the track member **44** with which the carriage is associated. Two such wheels are shown at **192—192** in FIG. **15**; the third wheel being concealed from view in the Figure. In the underside view of the carriage in FIG. **16**, the axes of the two wheels **192—192** are illustrated by their respective stub shafts **194—194** and the axis for the single wheel on the other side is represented by the stub shaft **196**. The opposite sides of the track member are slightly concave throughout their extent to receive the wheels **192** which are crowned to ride in the concave track and thereby suspend the plate **190** under the track member. The jaws of this assembly are shown at **198** and **200**, the former being immovable and corresponding to the lower jaw **164** of the previously described embodiment and the latter jaw being vertically movable and corresponding to the movable jaw **166** previously described. The lower jaw **198** is stepped to provide a vertical wall section **202** against which the leading edge of the document abuts at the time it is introduced between the open jaws of the carriage assembly.

The jaw opening and closing movements are accomplished by a self-operable provision carried on the under side of the plate **190** and comprising a reciprocably movable member **204** extending in a plane perpendicular to the plate **190** and urged by a coiled spring **206** in the forward direction of the mechanism. At its forward end, as illustrated in FIGS. **17** and **18**, it is connected through a pivoted link in a form of a crank arm **208** which in turn carries the upper jaw **200**. The crank arm is pivoted in one end section about a fixed axis in the mechanism represented by the pin **210** and is coupled at its other end section to a lateral extension **212** of the reciprocable member **204** by means of a pin **214** riding in a vertical slot **216** (FIG. **19**) forming a loose connection therewith. FIGS. **17** and **18** show two positions of the upper jaw controlling member **204**, the former showing the jaw **200** in clamping engagement with a document **50** and the latter showing the jaw **200** in opened condition.

Reciprocable movement of member **204** for moving the upper jaw is accomplished by means of a cross arm **218** pivotable about a fixed axis represented by the pin **220** best shown in FIG. **16**. The cross arm **218** lies in a plane perpendicular to that of the reciprocable member **204** as shown in FIG. **19**. The two are loosely coupled together by means of a pin and slot connection shown at **222** in FIG. **19**. The opposite end of the cross arm from its pivotal connection is reduced in width to form a tongue indicated at **224** which projects out from the side of the carriage as indicated in FIGS. **15** and **16**. As the gripper carriage nears its throat position, the tongue **224** engages a fixed part of the track member assuming an edge of a downwardly turned flange **226** of a part **228** (FIG. **15**) secured to an upper bracket member **230** corresponding to the bracket member **130** of the previously described form of gripper assembly. It will be apparent that when the extremity **224** of the cross arm **218** abuts the edge of flange **226** as the gripper carriage reaches the termination of its forward movement, the cross arm's bodily motion with the carriage will be retarded and will cause it to pivot about its axis **220** and thereby hold back the upper jaw operating member **204** against the resistance of its spring **206** thereby rocking the crank arm **208** a distance to raise the upper jaw to admit or release the edge of a document.

It is evident from a comparison of the two forms of document gripper assemblies illustrated respectively in FIGS. **8** to **14** and FIGS. **15** to **19** that although they are quite different from one another they have one primary common feature. In both forms means is provided which is effective to open the gripper jaws of each carriage assembly when the carriage is at the throat of the machine so as to either receive or release a document, but otherwise the gripper jaws are maintained in closed document gripping condition throughout all of the remaining movements of the carriages along their rail members. In the first described gripper assembly illustrated in FIGS. **8** to **14**, resilient means in the form of a flat spring member **182** yieldingly urges the roller carrying member **172** to rock in an upward jaw opening direction and accomplishes this action only when the roller **168** rides on the short inclined section **170** is at the end of the rail member adjacent to the throat. On the other hand, in the gripper assembly illustrated in FIGS. **15** to **19**, resilient means in the form of a coiled spring **206** yieldingly urges the reciprocable movable member **204** in a forward jaw closing direction and accomplishes this action throughout the movement of the carriage on its respective rail member except when adjacent to the throat of the machine. As the gripper carriage reaches the end of its movement in the direction of the throat, the tongue **224** of the cross arm **218** abuts a fixed part of the rail assembly and retracts the reciprocable member **204** relative to the carriage and against the tension of the spring thereby rocking the crank arm **208** carrying the upper jaw **200** and in this manner opening the jaws to receive or release the edge of a document.

It is further evident from the mounted arrangement of the gripper carriages **48—48** on their respective rail members **44—44** as viewed in FIG. **5** that they provide a document transport path which is suspended from above in the machine. As earlier pointed out herein the rear end of each track member **44** is supported on the drive shaft **46** and the forward end thereof is suspended from the supporting frame **128** adjacent to the machine throat. The two carriages **48—48** are mounted in underslung relationship to their respective rail members and in operation draw in and eject a document **50** whose path of movement underlies the rail members. In other words, the document is supported and moved to and fro by the transport system in suspended relationship with respect to the rail members and specifically by the grip of the carriages on the leading edge of the document and by an appropriate guide chute **231** which, as shown in FIG. **5**, underlies the feed rollers **125** and supports a rearward portion of the document. The chute **231** has a slight clearance with respect to the feed rollers, preferably in the amount of approximately 0.050 inch, and is so disposed as to impart a slight curvature to the document as it bends around the rollers. With such construction, it is possible to use the machine as a front load accounting machine without employing the ledger transport system disclosed herein. This is accomplished by moving the two gripper carriages **48—48** to the rear of the machine and parking them adjacent to the drive shaft. For this purpose a special "-parking" key may be provided on the keyboard **32** which when actuated will cause this rearward movement and positioning of the carriages at the drive shaft following which the document transport system will be automatically turned off.

As earlier mentioned herein a transducing assembly generally indicated at **56** is provided for automatically reading and writing encoded data on the document and particularly in this instance for reading from and recording on the two magnetic stripes **54—54** of a business ledger. The transducing assembly is illustrated in FIGS. **8**, **10**, **11** and **12** and as shown in FIGS. **8** and **11** it is mounted along side of the forward end of one of the track assemblies **40**, the left one as viewed in FIG. **4**. Any suitable supporting connection between the track member **44** and the transducer assembly may be utilized, and in the illustrated embodiment of the invention such supporting means comprises a main bracket member **232** of general U-

shaped formation in which is cradled the electrical components for performing the transducing operation. This bracket may form a lateral extension of the top plate **130** of the track member which is utilized to suspend the forward end thereof from the overhead support **128**.

Referring specifically to FIGS. **8** and **11**, the bracket **232** has a vertical connecting portion **234** on one side thereof integrally joined to the plate **130** and is provided on the other side thereof with a side wall portion **236**. The bracket forms a supporting cradle for a magnetic transducer subassembly including one or two bodies **238** each carrying a magnetic head and also for a light control subassembly generally indicated at **240** for sensing the leading edge of a document **50** as it is fed to the jaws of the gripper carriages. It is understood that as many magnetic head carrying bodies **238** are provided as there are magnetic stripes on the documents to be sensed and recorded thereon. However, for purpose of clarity only one such instrumentality **238** is shown in the accompanying drawings, but space is provided for a companion one in the supporting cradle.

Each body **238** of the transducing assembly assumes the formation shown in FIGS. **10** and **11**, the magnetic head **242** being carried in the forward end of the body in close proximity to the path of movement of the document while the rear end of the body is elevated and is pivotally connected by means of a shank **244** and a clamp **246** to a cross pin **248** journaled in the rear portion of the bracket member **232**. As a result of this mounting arrangement, the body **238** can be swung in an upward arc about the pin **248** from the position shown in FIGS. **10** and **11** in order to visually inspect and, if necessary, to clean or otherwise maintain the magnetic head. Normally, the magnetic transducer subassembly assumes the position shown in FIGS. **10** and **11**, and is yieldingly urged downwardly toward the path of movement of the document by means of a spring blade **250** acting upon an arm **252** depending from the body **238** for this purpose. As shown, the blade **250** enters an opening **253** in the arm **252** and presses against the lower edge of the opening to yieldingly urge the magnetic transducer in a downward direction. Underlying the forward end of the body **238** and the magnetic head **242** contained therewithin is a lateral extension **254** of the side wall **236**, the upper surface of which is coated with material forming a wear resistant pad **255** over which the documents are passed as they move to and fro in the machine. It is evident that when each document is properly introduced into the machine, either its single or pair of magnetic stripes **54—54** will pass over the wear resistant surfacing of the lateral extension **254** and under its associated magnetic head **242**.

The light detecting subassembly **240** for sensing the leading edge of a document **50** is stationarily mounted in the transducer assembly **56** as shown in FIG. **10** just forward of the magnetic head **242** on slightly vertically spaced apart supporting elements providing a clearance for accommodating the magnetically stripped portion of the document therebetween. The lower one of the two such supporting elements is shown as the horizontal portion of an L-shaped bracket **256** secured to the side wall **236** of the main supporting bracket as a forward extension thereof. Secured to the underside of this element is a photocell **258** or other light sensitive electrical means. The upper element of the pair is formed by an upturned metallic plate **260** pinned to the vertical portion of the L-shaped bracket **256** as shown in FIG. **11** and carried on the upper side thereof is a housing **262** containing a light source. Aligned apertures (not shown) are provided in the two elements for projecting light from the light source across the document accommodating space between the elements to the photocell.

In the operation of the transport system, an introduced document will be fed through the throat of the machine and toward the open jaws of the gripper carriages and the mouth of the transducing assembly represented by the upturned lip **260**. The document is so guided at the time of its insertion into the throat of the machine that the stripped marginal portion thereof introduced into the transducer assembly will not contact the side wall **236** of the bracket supporting the transducer assembly. This is evident by the slight clearance **264** shown in FIG. **12**, between the edge of the document **50** and the side wall **236**. In other words, a side edge guide for the transported document is not needed and preferably not employed. Complete reliance is placed on the gripper jaws of the two carriages **48** for precise bi-directional guiding movement of the document throughout the time it is being operated upon in the machine. To avoid the unwanted contact between the document and any side wall portion of the machine, such as represented by the vertical wall **236** of the transducing bracket, the conventional form guides illustrated at **266** in FIG. **1** are properly positioned so that the edge of the stripped portion of the inserted document clears any adjacent portion of the transport path, such as represented by the side wall **236** of the transducing assembly. This feature of the invention will be further mentioned in connection with the operation of the system.

A second light detecting assembly for sensing the entrance of the leading edge of a document into the throat of the machine is indicated in FIG. **25** at **265** adjacent to the path of travel of the document. Included with this assembly is a vane **267** which is pivotally mounted for movement from a full line position in FIG. **25** where it intersects the path of travel of the document to a dotted position where it intercepts the path of light of the light detector **265**. As the leading edge of the document is introduced into the throat of the machine it will engage and swing the vane **267** to its dotted position thus blocking its light beam thereby electrically signaling the entrance of the document.

After the document has signaled its presence to the light detector **265**, it is slightly curved by the chute **231** and fed under and in surface contact with the feed rollers **125**. At the time the leading edge of the document is sensed by the detector **265**, the motor **126** is set into operation to drive the feed rollers **125** in the direction to advance the document further into the machine. Although the feed rollers make frictional contact with the document for moving it in either direction, this frictional engagement is relatively light so that the rollers may at times slip continuously with respect to the document when rotating in one or the other direction or when stationary and the document is pulled thereby. Moreover, as indicated in FIGS. **3** and **5** and also in the diagrammatic view of FIG. **25**, the rollers on shaft **124** act alone on the document. That is to say, no opposing surface is provided for cooperation with the rollers for pinching the document therebetween in order to enhance the drive exerted by the rollers. In other words, the usual provision of complementing idling rollers in cooperative association with the feed rollers for gripping or pinching the document therebetween is not a necessary requirement in the present invention. Instead, the slight frictional engagement obtained by the partial curvature of the document about the feed rollers is sufficient to cause the introduced document to be advanced at approximately the peripheral velocity of the rollers unless stronger forces acting on the document compel it to advance at a different rate or remain stationary. To provide the desired slippage of the feed rollers relative to the document, it has been found that a soft, resiliently compressible substance provides a highly satisfactory medium for this purpose, and a desirable material out of which to make the rollers is foam urethane. The advantages of such material are its resilient yield coupled with its long wearing property and its ability to act on documents without marking, dirtying or otherwise impairing the surface characteristics thereof.

The schematic diagram of FIG. **25** illustrates the overall control exercised by the transport system illustrated herein. The three sensing devices for controlling the transport system comprise the document presence detector **264**, the document position detector **240** and the document position read-out device **90**. These three sensing devices provide signals to two logic control components identified as the Feed Roller Motor Logic Control **268** and the Ledger Drive Motor Logic Control **270**. The first detector **265** communicates by channel **272**

with the motor logic control **268**. The second detector **240** communicates by line **274** with the motor logic control **270**. The third detector **90** communicates by branches of line **276** with both motor logic controls **268** and **270** as indicated in FIG. **25**. The logic units **268** and **270** control the operation and direction of rotation of their respective electrical motors **126** and **80** over channels represented by the lines **278** and **280** in accordance with control signals transmitted thereto by the three sensing devices. The sprocket wheel **96** associated with the document or ledger drive shaft **46** is primarily used to stop moving parts of the system at a selected line on the document for printing. This stoppage is determined by the state of the solenoid **100** which controls the action of the clapper **102** and the pawl **104** in straddling a tooth of the sprocket wheel to lock the same against rotation in either direction. As previously described, when the solenoid is energized it frees the sprocket wheel for rotation, but when deenergized it allows the clapper and pawl to move into tooth engagement to stop further rotation thereof. The operation of the solenoid is controlled from machine logic generally identified by the block **282**. It should be noted that when the transport system is shut down, the solenoid is deenergized and the clapper and pawl are then self-operable to straddle a tooth and lock the sprocket wheel and the drive shaft from rotation in either direction.

Certain instrumentalities associated with the platen assist in guiding and holding a document as it is introduced into the machine and positioned for printing. These may include the front form guides **266**, a form aligning table or sight bar **284**, the lower pressure rolls (not shown) which cooperate with the platen to hold the document when it is printed upon. When the machine is ready to receive a document, the form aligning assembly, including the sight bar **284**, is in the lower position as shown in FIGS. **5** and **25** and the lower pressure rolls are spaced from the platen and therefore in open position. When the machine is in condition to print, the form aligning assembly is raised causing the sight bar to assume the position such as is shown in dotted outline in FIGS. **5** and **25** and the pressure rolls cooperate with the platen to hold a document interposed therebetween.

OPERATION OF THE ILLUSTRATED EMBODIMENT

An initial condition for operating the illustrated embodiment of the invention calls for the gripper carriages to be in their forward position adjacent to the throat of the machine with the gripper jaws opened and for the moving parts of the system to be stationary. Under these initial conditions, the operator inserts a document into the throat of the machine utilizing the form guides **266** at the top of the machine for guiding the insertion thereinto. The form guides are positioned relative to the platen **34** and any side edge guides or walls associated with its path of travel in the machine, as the wall **236** illustrated in FIG. **12**, such that the document is guided throughout its movements in the machine without making any contact therewith. The precise control exercised by the transport system avoids the necessity of side edge guides and the resulting wear and abrading action caused thereby.

As the document is inserted into the throat of the machine it trips the vane **267** of the light detector **265** which transmits a signal to the motor logic control **268** for causing the motor **126** to rotate the feed rollers **125** in the insert direction of the machine. At the same time the motor **80** is caused to rotate the drive shaft **46** in the direction to move the gripper carriages **48—48** in the ejection direction of the document to insure that the carriages are "home" at their forward positions on their respective track members. The document is now fed under power of the feed rollers **125** to the opened gripper jaws of the carriages and as the document approaches the jaws it interrupts the light beam of the document position detector **240** immediately forward of the jaws producing a signal which causes the transport system to start its cycle of operation. The feed rollers **125** continue to advance the document into the open jaws until the leading edge thereof abuts both limit stops of the gripper carriages represented by the jogs **162—162** or **202—202** in the lower jaws of the two types of carriage assemblies illustrated herein. If the document should be introduced into the throat in an askewed condition, certain of the feed rollers will urge the retarded portion of the document until spaced portions of its leading edge are brought into abutment with both limit stops of the carriages thus squaring the document.

After a short time delay, the ledger drive control **270** of the transport system now takes over the control of the document and the carriage drive motor **80** is operated to run in the document insert direction. This will reverse the rotation of shaft **46** and cause the gripper carriages to commence to move rearwardly on their respective tracks and as they do so their jaws will begin to close and tightly grip the leading edge of the document. During this time, the feed rollers continue to rotate in the document insert direction and continue to urge the leading edge of the document against the limit stops formed by the lower jaw of each carriage, the peripheral speed of the feed rollers being such as to urge the document to move at a greater speed than the carriages so that the leading edge of the document is continually abutting the limit stops on each jaw. It will require the displacement of approximately one-sixth to one-third of an inch of the cable system in the rearward direction to cause the upper jaws to clamp down on the document.

As the transport system moves the document further into the machine, the logic control **268** for the feed rolls causes the latter to act as a drag on the moving document. This can be accomplished by discontinuing the drive to the rollers such as by stopping the motor **126**. The drive motor **80** for the carriages, however, continues to operate drawing the carriages **48—48** further into the machine and pulling the document therewith, and for the balance of the insertion movement of the document the feed rollers do not rotate and therefor impose an intentional drag on the document as it passes thereby with the result that the document is kept in taut condition throughout its movement in insert direction. The gripper carriages quickly accelerate up to a stable velocity just prior to the sensing of the first information recorded on the one or more magnetic stripes on the ledgers by the magnetic heads of the transducer assembly **56**. The ledger continues to move into the machine to its extreme rearward position determined by the full travel of the cable drive during which the magnetic heads read the magnetic stripes on the document and transmit signals to the machine which are representative of the information derived from the stripes.

When the cable system reaches the end of its displacement in the rearward direction, the pin **114** of the sprocket wheel **96** abuts one end of the partial Geneva wheel **106** and further driving torque from the motor **80** is made ineffectual thus stopping the shaft **46** and the movement of the carriages in the insert direction. During its inward motion, the information read from the document included the line find position to which to move the document for printing a line thereon. When the gripper carriages reach their fully inserted positions as determined by the Geneva wheel, the stoppage of the slotted disk **88** for a programmed short interval of time will cause the logic control **270** to stop the drive motor **80**. Recognizing that the disk has reached its maximum count this logic control will cause the drive motor to reverse its direction of rotation. This will place the transport system in eject mode and initiate operation of the motor **126** for driving the feed rollers **125** in the eject direction at a peripheral speed slightly greater than the document with the result that the document motion is quickly reversed for line find operation.

As mentioned previously, the line find position is read from one of the magnetic stripes during the initial movement of the document into the machine. In the line find mode, the document is moved in the eject direction until the desired count from the ledger position read-out transducer **88** is reached

corresponding to the print line position read by the read-write head of the transducer **56** from the magnetic striped portion of the document. When the desired count is reached, the Machine Logic **282** is advised and the solenoid **100** is deenergized causing its clapper **102** to be interposed into the path of movement of the tooth on the sprocket wheel **96** corresponding to the print line position with the result that the tooth abuts the clapper and is resiliently retarded and stopped thereby thus halting further movement of the gripper carriages and the document. At this time, as previously explained herein, both the clapper **102** and the pawl **104** straddle the tooth releaseably holding the same and the sprocket wheel from rotation in either direction.

Upon stoppage of the document at the proper line for printing, the form aligning assembly including the sight bar **284** is closed and the two motors **80** and **126** are turned off thus stopping all movement of the transport system. The print head **36** now may commence printing a line on the document at the end of which, if further printing is to be performed, the Machine Logic **282** will "jog" the motor **80** and the platen **34** for one-line advancement causing the document to be moved therewith to the next line and positioned for further printing thereon. When the printing operation is concluded the form aligning assembly is opened and the document drive motor **80** is again activated by the logic control **270** for moving the carriages **48—48** and the document gripped thereby in the insert direction or toward the drive shaft **46**, the solenoid **100** being concurrently energized to retract its clapper and the pawl from the sprocket wheel in order to allow shaft **46** to rotate.

During this time the motor logic control **268** cuts the current to the motor **126** thus causing the feed rolls **125** to apply a drag to the document. When the document reaches the fully inserted position, the motor **126** and document drive motor **80** are operated in the eject mode in the manner previously described and after a predetermined line count, for example four counts, the magnetic transducer commences to record up-dated information on the one or more magnetic stripes as the document moves in the eject direction toward the throat of the machine. The magnetic recording on the document continues until the stored information is magnetically written thereon. Upon reaching their extreme forward position the gripper carriages open their respective jaws for the first time since receiving the document at the time of its insertion into the machine. Moved to their opened position the jaws now release their clamping pressure on a document. During movement in eject direction, the feed rollers are also operated in eject direction but at a peripheral velocity greater than that of the carriage movement with the result that the document is maintained in taut condition for magnetic recording thereon even though the carriages seemingly apply a pushing force on the document. A desirable peripheral velocity for the feed rollers is approximately 25 per cent greater than the speed with which the carriages are moved on their rails.

After the gripper carriages reach the limit of movement in the forward direction and the jaws open, the feed rollers continue to rotate in eject direction and move the ledger to a position beyond the jaws where the rollers are no longer active thereon. At this point the document is in eject position capable of being removed from the machine by the operator. When the operator removes the document, the absence of the document in the machine throat is sensed by light detector **265**. This produces a signal which, depending on programmed conditions in the machine, may be used to stop the feed roller motor or to reverse it so that the feed rollers run in the "insert" direction ready for the next document.

A programmable option is to control the feed roller motor so that after the feed rollers have moved the document out of the gripper jaws, a signal from the document position detector **240** causes the feed roller motor **126** to be reversed after a fixed time interval. This time interval is such that the document is moved out of the gripper jaws to a point where the rollers are no longer active. After the time interval has elapsed, the feed roller motor **126** is reversed so that the feed rollers run in the "insert" direction, even though the document has not been removed from the machine by the operator. In this case, the document can be tapped inwardly for a verifying rerun of the information recorded on the magnetic stripes.

While particular embodiments of the invention have been shown, it will be understood, of course, that it is not desired that the invention be limited thereto since modifications may be made, and it is, therefore, contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A machine for automatically handling and sequentially operating upon flexible nonself supporting unit records each having a machine readable portion thereof, the machine including, in combination:

a. an insertion throat,

(b) at least one guide track leading away from the insertion throat,

c. gripper means mounted for travel along said guiding track and operable to grip the leading edge of a flexible nonself supporting unit record introduced into the throat,

d. means for moving the gripper means along its respective guiding track both away from and toward the insertion throat thereby to pull a gripped unit record therewith away from the throat along a prescribed path of travel extending parallel to said track and to push the gripped leading edge of the record unit toward the throat,

e. transducer means positioned adjacent to the path of travel of a unit record gripped and moved by said gripper means and operable to read the machine readable portion thereof as it is moved thereby, and

f. means acting on the unit record as it is gripped and moved by said gripper means to maintain the unit record in taut condition when either pulled or pushed by the gripper means.

2. A machine for automatically handling and sequentially operating upon unit records each having a machine readable portion thereof, the machine including, in combination:

a. an insertion throat,

b. at least one guide track leading away from the insertion throat,

c. gripper means mounted for travel along said guiding track and operable to grip the leading edge of a unit record introduced into the throat,

d. means for moving the gripper means along its respective guiding track both away from and toward the insertion throat thereby to move a gripped unit record therewith along a prescribed path of travel extending parallel to said track,

e. transducer means positioned adjacent to the path of travel of a unit record gripped and moved by said gripper means and operable to read the machine readable portion thereof as it is moved thereby,

f. a roller having its axis extending transverse to the guiding track and positioned adjacent to the path of travel of the unit record so as to engage a unit record gripped and moved by the gripper means, and

g. means for operating said roller so that its peripheral speed differs from the linear speed imparted by the gripper means to the unit record.

3. A machine for automatically handling and sequentially operating upon unit records each having a machine readable portion thereof, the machine including, in combination:

a. an insertion throat,

b. at least one guiding track leading away from the insertion throat,

c. gripper means mounted for travel along said guiding track and operable to grip the leading edge of a unit record introduced into the throat,

d. means for moving the gripper means along its respective guiding track both away from and toward the insertion throat thereby to move a gripped unit record therewith along a prescribed path of travel extending parallel to said track,

e. transducer means positioned adjacent to the path of travel of a unit record gripped and moved by said gripper means and operable to read the machine readable portion thereof as it is moved thereby,

f. means mounting one or more rollers on a common axis adjacent to the insertion throat of the machine for engaging a unit record inserted thereinto and with their common axis extending transversely to the path of travel of a unit record moved by said gripper means, and

g. means for rotating said one or more rollers so as to urge a unit record engaged thereby in the same direction as the record is moved by said gripper means but at a rate of speed exceeding that of the gripper means.

4. A machine for automatically handling and sequentially operating upon unit records each having a machine readable portion thereof, the machine including, in combination:

a. an insertion throat,

b. at least one guide track leading away from the insertion throat,

c. gripper means mounted for travel along said guiding track and operable to grip the leading edge of a unit record introduced into the throat,

d. means for moving the gripper means along its respective guiding track both away from and toward the insertion throat thereby to move a gripped unit record therewith along a prescribed path of travel extending parallel to said track,

e. transducer means positioned adjacent to the path of travel of a unit record gripped and moved by said gripper means and operable to read the machine readable portion thereof as it is moved thereby,

f. said means for moving the gripper means including a drive shaft extending transversely to the guiding track, and

g. means providing an operative connection between the gripper means and the shaft for moving the gripper means in one or the opposite direction along the guiding track depending upon the direction of rotation of the shaft.

5. A machine as defined in claim 4 characterized in that the guiding track is formed on a member having a slidable connection to the drive shaft for axial adjustment therealong.

6. A machine as defined in claim 4 characterized in that the guiding track is formed on a member pivotally and slidably connected to drive shaft for both angular movement about the axis thereof and for axial movement therealong.

7. A machine for automatically handling and sequentially operating upon documents each having a machine recordable and readable section thereof, the machine comprising:

a. an insertion throat,

b. a pair of parallelly extending rail members leading from the insertion throat,

c. a gripper guided on each of said rail members for movement therealong and being operable adjacent to the insertion throat to grip the leading edge of a document introduced thereinto,

d. stationary transducer means positioned adjacent to the insertion throat and operable to record upon or to read said section of an inserted document as it is moved thereby,

e. a drive shaft extending traversely to the pair of rail members adjacent to the ends thereof remote from said insertion throat, and

f. means rendering each gripper responsive to the rotation of the shaft and including a loop of flexible material connected to each gripper and so trained about the shaft and a part of the rail member upon which the gripper moves that when the shaft is rotated in one direction is causes the grippers and a document gripped thereby to move away from the throat at the same rate of speed and when rotated in the opposite direction it will cause the grippers and a document gripped thereby to move toward the throat at the same rate of speed.

8. A machine as defined in claim 7 characterized in that roller means is provided adjacent to the path of travel of the unit record and so as to engage a document gripped and moved by the grippers, and further characterized in that power means is provided for rotating said roller means at a peripheral speed which is greater than that imparted by the grippers to the document when the same is moved in the direction toward the insertion throat.

9. A machine as defined in claim 7 characterized in that a roller is positioned adjacent to the insertion throat of the machine for engaging a document inserted thereinto and having its axis extending transversely to the path of travel of a document moved by said grippers, and further characterized in that means is provided for rotating said roller so as to urge a document engaged thereby in the same direction as the document is moved by said grippers but at a peripheral velocity slightly exceeding the linear velocity of the gripping means.

10. A machine as defined in claim 7 characterized in that the ends of the rail members remote from the insertion throat are journalingly mounted on the drive shaft for support therefrom.

11. A machine for automatically handling unit records having a narrow machine readable section thereof, the machine including, in combination:

a. a throat into which the leading edge of unit records are individually introduced and removed from the machine,

b. a pair of parallelly extending rails leading away from the throat in the direction of the introduction of each unit record into said throat,

c. a reciprocable carriage guided for travel along each of said rails,

d. a pair of opposing gripper jaws forming part of each said carriage and similarly arranged for receiving and gripping laterally spaced apart portions of the leading edge of a unit record introduced into the throat,

e. a transducer positioned adjacent to the throat and operable to read the narrow machine readable section of a unit record as it is moved thereby, and

f. a reversely rotatable shaft common to said rails and their respective carriages having means coupled to the carriages for moving the carriages in the same direction and at the same speed along their respective rails both away from and toward the throat whereby the narrow machine readable section of a unit record gripped by the jaws of said carriages is accurately conveyed past the transducer in either direction of movement thereof.

12. A machine as defined in claim 11 characterized in that means is effective to open the gripper jaws of each carriage only when the carriages are at the throat otherwise the gripper jaws are maintained in closed sheet gripping condition in all other positions of the carriages on their respective rails.

13. In precision sheet feeding apparatus, the combination comprising:

a. a sheet insertion entrance,

b. a supporting frame member extending generally perpendicularly away from aid insertion entrance and forming a straight track,

c. gripping means mounted on the supporting frame member for reciprocal travel along its track toward and away from the insertion entrance and including jaw-like elements for gripping the leading edge of a flexible sheet inserted into the entrance,

d. means effective to open the jaw-like elements only at the insertion entrance position of the gripping means otherwise the jaw elements are maintained in closed sheet gripping condition in all other positions of the gripping means during its travel along the track,

e. means for causing the gripping means to travel along the track first away from the insertion entrance while pulling a sheet gripped by its jaw elements and then thereafter returning the gripping means to the insertion entrance where a sheet gripped by the jaw elements is released, and

f. means adjacent to the sheet insertion entrance and engageable with the sheet as it is moved thereby, said last means being effective to maintain the sheet which it engages in taut condition during movement in either direction by the gripping means.

14. In precision sheet feeding apparatus, the combination comprising:
a. a sheet insertion entrance to the apparatus,
b. a straight track extending away from the sheet insertion entrance,
c. sheet gripping means mounted on the track for travel therealong from a terminal position adjacent to the sheet inserting entrance and including jaw-like elements for gripping the leading edge of a flexible sheet inserted into the entrance,
d. means effective to open the jaw elements of said gripping means only when at its terminal position adjacent to the insertion entrance in order to receive and grip the leading edge of a sheet introduced thereinto, otherwise the jaw elements are maintained in closed sheet gripping condition in all other positions of the sheet gripping means on the track,
e. means for causing reciprocable motion of the gripping means on the track first away from its terminal position at the entrance and then returning the same thereto at which time the jaw elements will open to release a sheet gripped thereby, and
f. means engageable with the sheet gripped by said gripping means and effective to maintain the sheet in taut condition throughout the time it is gripped by the gripping means.

15. Sheet feeding apparatus as defined in claim 14 characterized in that the track forms part of a straight bar and further in that the gripping means forms part of a carriage reciprocably movable along the track.

16. Sheet feeding apparatus as defined in claim 14 characterized in that the track is composed of two parallel rails and in that the sheet gripping means is composed of two such means individually mounted for travel on the rails.

17. Sheet feeding apparatus as defined in claim 16 characterized in that one of the rails is bodily adjustable with respect to the other to vary the spacing therebetween.

18. Sheet feeding mechanism for a business machine capable of operating upon record sheets having a machine readable portion and a human readable portion, comprising in combination:
a. a sheet insertion entrance,
b. a straight track having two terminal positions with one adjacent to the sheet insertion entrance and the other remote therefrom,
c. a carriage reciprocably movable along the track for travel between said two terminal positions and including normally closed jaw-like elements,
d. means effective to open the jaw elements only when the carriage is at the terminal position of the track adjacent to the sheet insertion entrance in order to receive and grip an edge of a flexible sheet inserted thereinto, otherwise the jaw elements are closed in sheet gripping condition in all other positions of the carriage on the track,
e. a reversible rotatable shaft operatively coupled to the carriage for causing reciprocating motion of the carriage along the track first away from the terminal position adjacent to the insertion entrance when rotated in one direction and thereafter returning the same thereto when rotated in the opposite direction at which time the jaw elements will open to release a sheet gripped thereby, and
f. means for stopping the rotation of the shaft at any one of a plurality of angular positions and thereby stop the travel of the carriage at different positions along the track intermediate said two terminal positions.

19. Sheet feeding mechanism for a business machine capable of operating upon a document having a machine readable portion comprising, in combination:
a. a pair of spaced apart parallelly extending rail members,
b. gripper means guided on each of said rail members for movement therealong between two terminal positions and operable adjacent to one terminal position to grip an edge of a document and move the same therewith,
c. a reversely rotatable drive shaft extending transversely to the rail members adjacent to the other of said terminal positions, and
d. an operative drive connection extending substantially the full length of each rail member and serving to couple to the gripper means thereon the drive shaft, each said drive connection responding to the rotation of the shaft in either direction by moving its respective gripper means in the same direction and at the same speed as the other gripper means thereby to move a gripped document undeviatingly along a prescribed path.

20. A machine as defined in claim 19 characterized in that each operative drive connection serving to couple the gripping means to the drive shaft comprises a flexible cable arranged in a loop extending substantially the full length of the rail member with which it is associated and coupled intermediate its end to the gripper means and at its opposite ends to the drive shaft.

21. A machine as defined in claim 20 characterized in that the opposite ends of each flexible cable are similarly reversely wound about the drive shaft.

22. A machine as defined in claim 19 characterized in that support means is provided for suspending the rail members in a generally horizontally extending plane.

23. A machine as defined in claim 22 characterized in that the gripper means associated with each rail member is guided therealong in underslung relationship thereto.

24. A machine as defined in claim 19 characterized in that a toothed wheel is jointly rotatable with said drive shaft, the teeth of which signify different positions capable of being assumed by the gripper means on their respective rail members, and in that a pair of detents are operable to engage the opposite sides of a selected tooth of the wheel and stop the rotation of the wheel and shaft and thus stop the gripper means at a position on their rail members corresponding to the tooth thus engaged.

25. A machine as defined in claim 19 characterized in that the rail members are connected to and receive support from the drive shaft.

26. A machine for automatically handling and sequentially acting upon flexible documents comprising:
a. a document insertion entrance,
b. at least one rail member extending generally away from the insertion entrance,
c. a carriage mounted on the rail member for reciprocal travel therealong toward and away from the insertion entrance and including a pair of opposing jaw-like elements for gripping the leading edge of a flexible document inserted into the entrance,
d. means effective to open the jaw-like elements of the carriage only at the insertion entrance position of the carriage to receive or release the leading edge of a document introduced thereinto, otherwise the jaw elements are maintained in closed document gripping condition in all other positions of the carriage during its travel along the rail member,
e. means for causing the carriage to travel along the rail member first away from the insertion entrance while pulling a document gripped by its jaw elements and then thereafter returning the carriage to the insertion entrance where the jaw elements release the document, and
f. means adjacent to the document insertion entrance effective to engage a document gripped by the jaw elements of the carriage and to maintain the document in taut condition while the leading edge of the document is gripped and moved by the carriage.

27. A machine as defined in claim 26 characterized in that the rail member extends in an approximately horizontal direction and in that the carriage is suspended relative to the rail member for travel along the underside thereof.

28. A machine as defined in claim 26 characterized in that the document engaging and taut maintaining means is a rotatable member having a resiliently yieldable periphery for

engaging the document and in that means is provided for rotating the member at a peripheral velocity exceeding the rate of travel of the document when the latter is moved toward the member by the carriage.

29. A machine as defined in claim 1 characterized in that said taut maintaining means comprises a roller having its axis extending transverse to the guiding track and positioned adjacent to the path of travel of the unit record so as to engage a unit record gripped and moved by the gripper means, and means for operating said roller so that its peripheral speed differs from that imparted by the gripper means to the unit record when the latter is moved thereby.

30. A machine as defined in claim 1 characterized in that said taut maintaining means comprises one or more rollers mounted on a common axis adjacent to the insertion throat of the machine for engaging a unit record inserted thereinto and with their common axis extending transversely to the path of travel of a unit record moved by said gripper means, and further characterized in that means is provided for rotating said one or more rollers so as to urge a unit record engaged thereby in the same direction as the unit record is pushed by said gripper means but at a peripheral speed exceeding the linear speed of the gripper means.

31. A machine as defined in claim 1 characterized in that said gripper moving means comprises a drive shaft extending transversely to the guiding track and further characterized in that an operative connection extends between the gripper means and the shaft for moving the gripper means in one or the opposite direction along the guiding track depending upon the direction of rotation of the shaft.

32. A machine as defined in claim 31 characterized in that the guiding track is formed on a member having a slidable connection to the drive shaft for axial adjustment therealong.

33. A machine as defined in claim 31 characterized in that the guiding track is formed on a member pivotally and slidably connected to the drive shaft for both angular movement about the axis thereof and for axial movement therealong.

34. Sheet feeding mechanism as defined in claim 18 characterized in that said shaft stopping means comprises a toothed wheel jointly rotatable with the shaft, the teeth of which signify different positions capable of being assumed by the carriage on the track, and further characterized in that means is operable to engage a selected tooth of the wheel and stop the rotation of the wheel and shaft and thus stop the carriage at a position on the track corresponding to the tooth thus engaged.

35. In precision sheet feeding apparatus, the combination comprising:

a. a sheet insertion entrance to the apparatus,

b. a straight bar extending away from the sheet insertion entrance and forming a track,

c. a carriage mounted on the track for travel therealong from a terminal position adjacent to the sheet inserting entrance to one or more positions remote therefrom and including sheet gripping means in the form of a pair of opposing jaw-like elements for gripping the leading edge of a sheet inserted into the entrance,

d. means effective to open the jaw elements of said carriage only when at its terminal position adjacent to the insertion entrance in order to receive and grip the leading edge of a sheet introduced thereinto, otherwise the jaw elements are maintained in closed sheet gripping condition in all other positions of the carriage on the track, and

e. means for causing reciprocable motion of the carriage on the track first away from said terminal position for pulling a gripped sheet therewith and then returning the carriage thereto at which time the jaw elements will open to release the gripped sheet at the insertion entrance.

36. Sheet feeding apparatus as defined in claim 35 characterized in that the track is composed of two parallel rails each individually mounting a carriage of the character aforesaid for travel therealong.

37. Sheet feeding apparatus as defined in claim 36 characterized in that one of the rails is bodily adjustable with respect to the other to vary the spacing therebetween.

38. Sheet feeding mechanism for a business machine capable of operating upon record sheets having a machine readable portion and a human readable portion, comprising in combination:

a. a sheet insertion entrance,

b. a track having two terminal positions with one adjacent to the sheet insertion entrance and the other remote therefrom,

c. a carriage reciprocably movable along the track for travel between said two terminal positions and including a pair opposing normally closed jaw-like elements,

d. means effective to open the jaw elements when the carriage is at the terminal position of the track adjacent to the sheet insertion entrance in order to receive and grip an edge of a flexible sheet inserted thereinto and thereafter effective to close the jaw elements onto the edge of the sheet to grip the same,

e. a reversible rotatable shaft operatively coupled to the carriage for causing reciprocating motion of the carriage and a sheet gripped by the jaw elements thereof first along the track away from the terminal position adjacent to the insertion entrance when the shaft is rotated in one direction and thereafter returning the same carriage and sheet to the insertion entrance when the shaft is rotated in the opposite direction at which time the jaw elements will open to release a sheet gripped thereby, and

f. means for stopping the rotation of the shaft at any one of a plurality of angular positions and thereby stop the travel of the carriage and a gripped sheet at different positions along the track intermediate its two terminal positions.

39. Sheet feeding mechanism as defined in claim 38 including means engageable with a sheet gripped by said pair of jaw elements and effective to maintain the gripped sheet in taut condition throughout its motion.

40. Sheet feeding mechanism as defined in claim 38 including one or more powered rollers located adjacent to the sheet insertion entrance with their axes extending transversely to the path of travel of a sheet gripped and moved by the jaw elements, said one or more rollers being powered to rotate at a peripheral speed different from the linear speed of the sheet gripped and moved by the jaw elements.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,663,010 Dated May 16, 1972

Inventor(s) Harold M. Frederick and Edward A. Nicol

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 2,	line 64,	change "Fix. 17 illustrating" to --Fig. 17 illustrating--.
Col. 3,	line 41,	change "plate 34" to read as --platen 34--.
Col. 4,	line 56,	change "with" to --which--.
Col. 10,	lines 43 and 44,	change "carring" to --carrying--.
Col. 18,	line 17,	change "(b)" to --b.--.
Col. 19,	line 67,	change "direction is causes" to --direction it causes--.
Col. 20,	line 54,	change "from aid insertion" to --from said insertion--.
Col. 22,	line 5,	delete "to", second occurrence;
	line 6,	change "thereon the drive" to --thereon to the drive--.

Signed and sealed this 5th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents