Oct. 11, 1966 J. A. MAUL ETAL 3,277,822

PRINTING MACHINES

Filed July 1, 1964 6 Sheets-Sheet 1

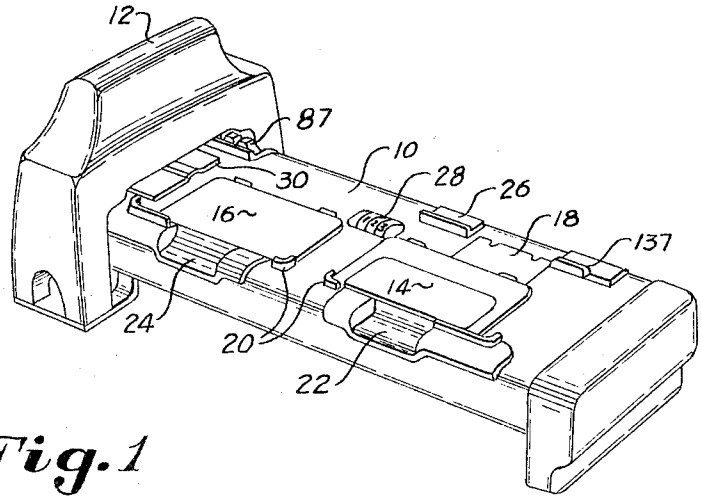

Fig. 1

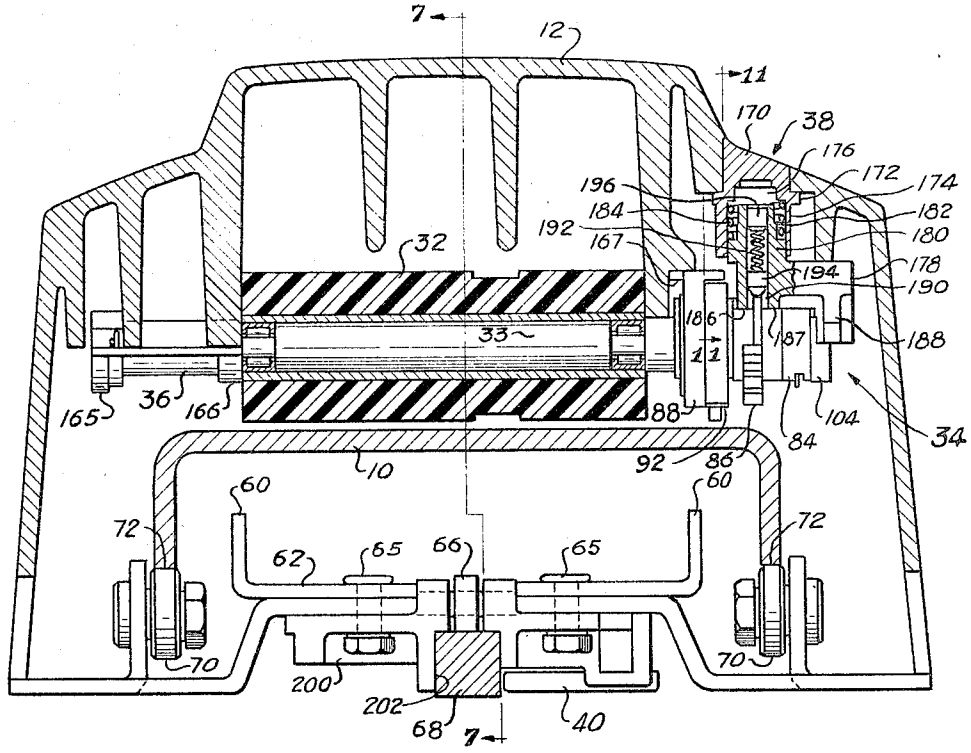

Fig. 2

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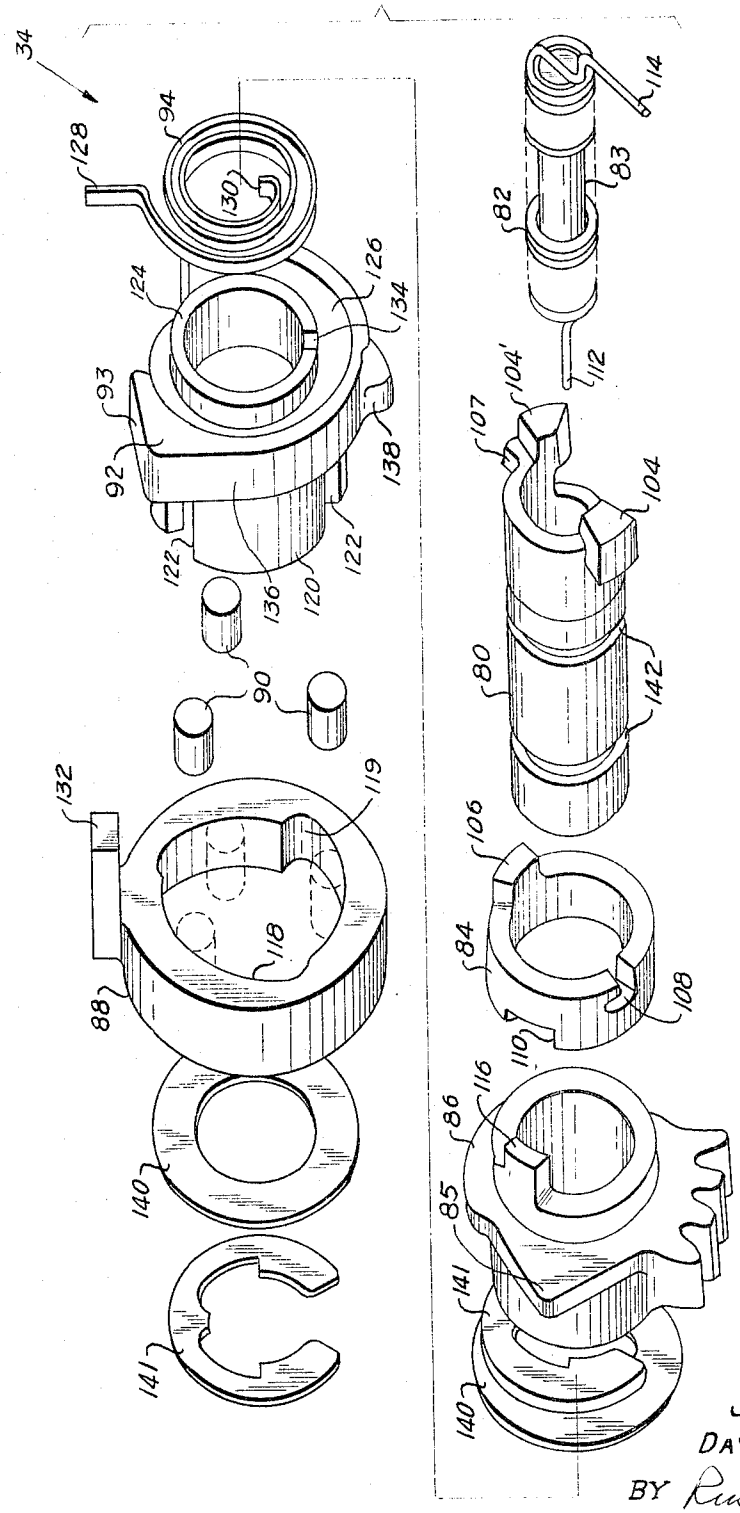

Fig. 5

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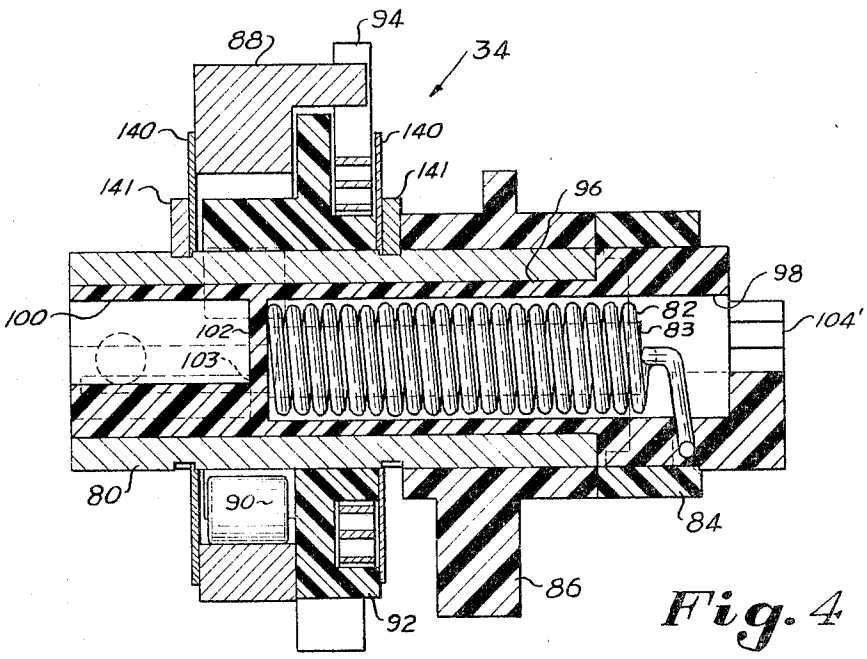

Fig. 4

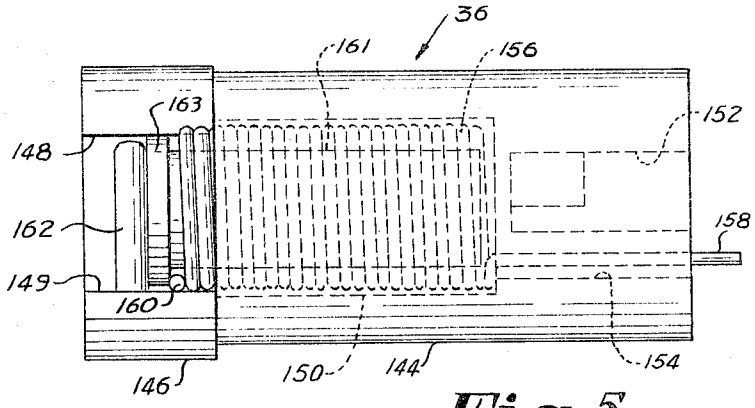

Fig. 5

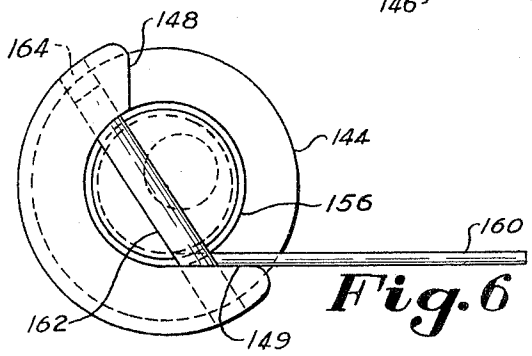

Fig. 6

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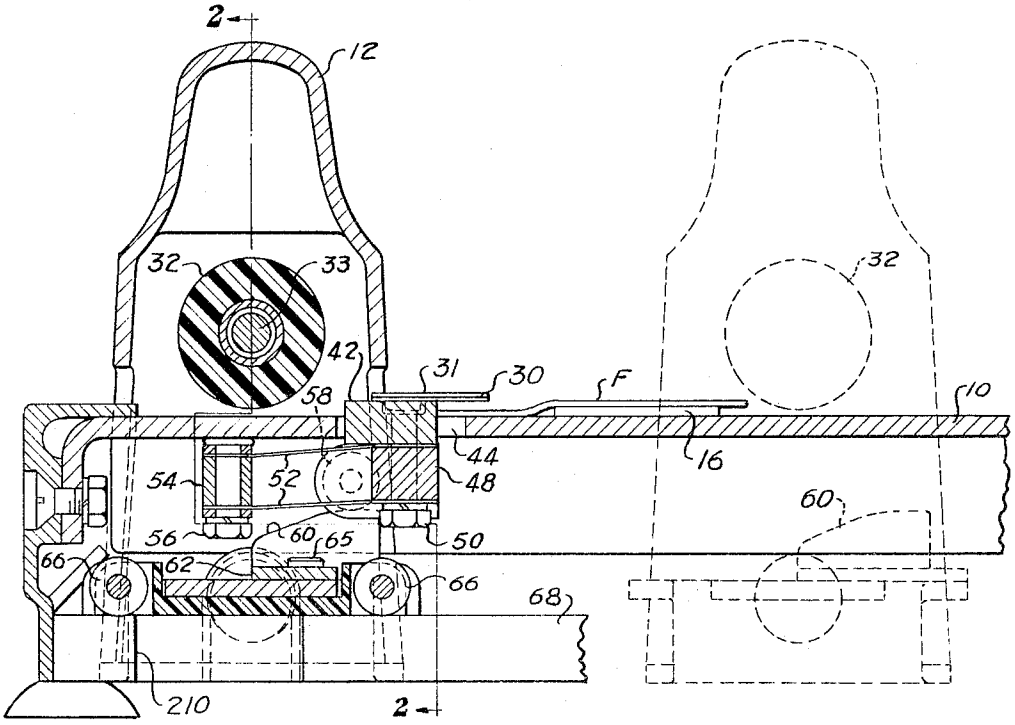

Fig. 7

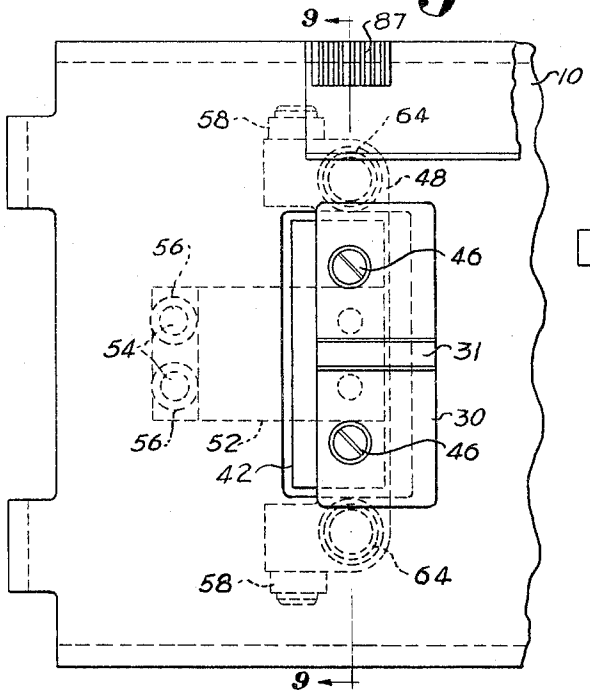

Fig. 8

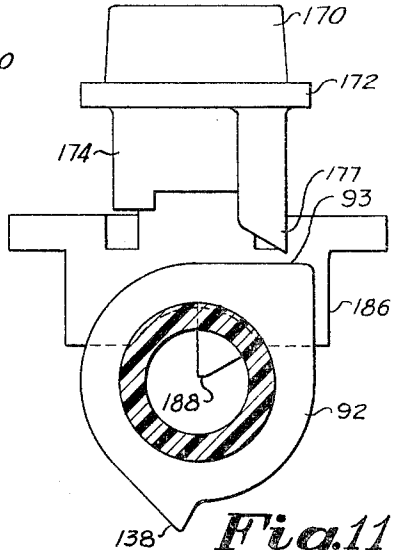

Fig. 11

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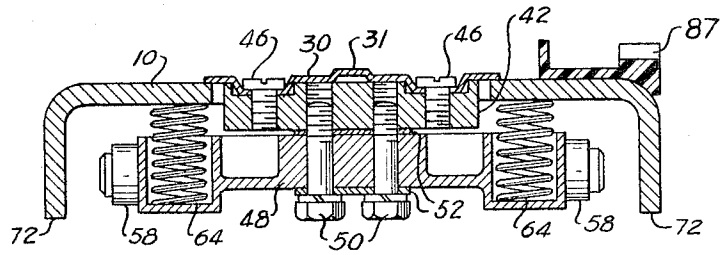

Fig. 9

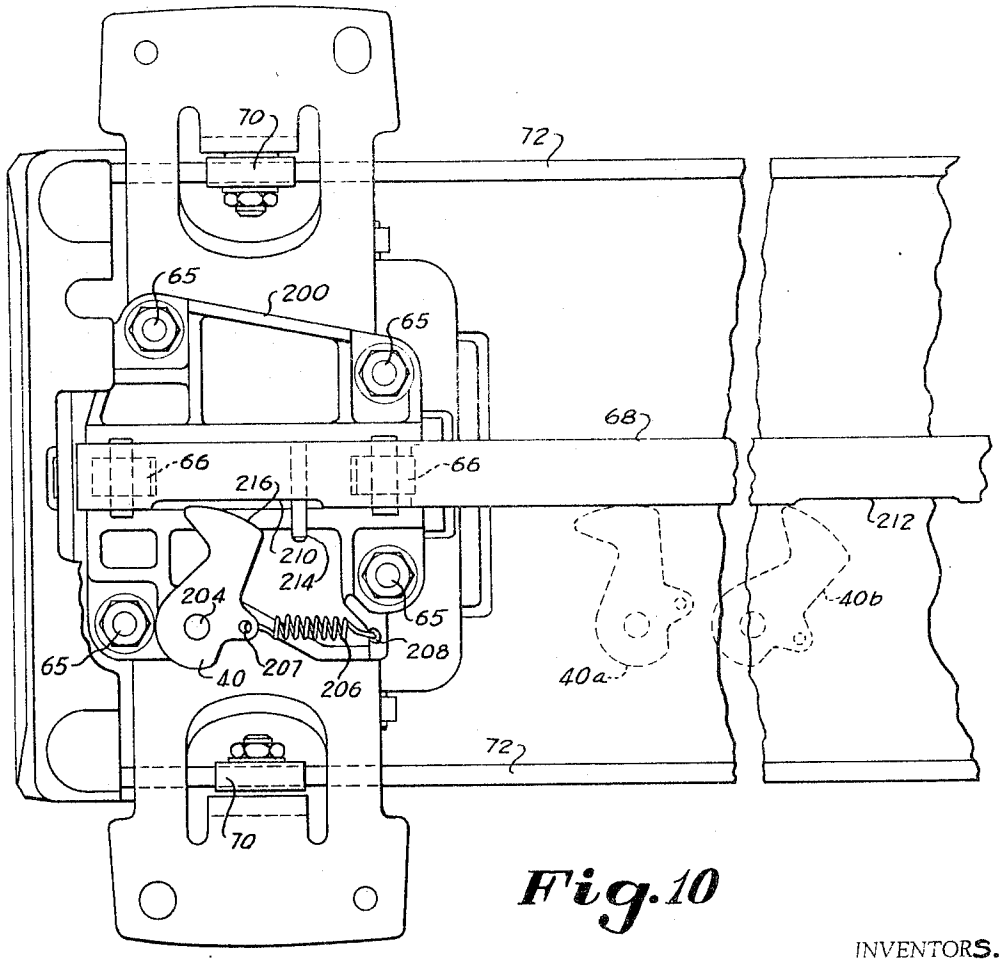

Fig. 10

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Filed July 1, 1964 6 Sheets-Sheet 6

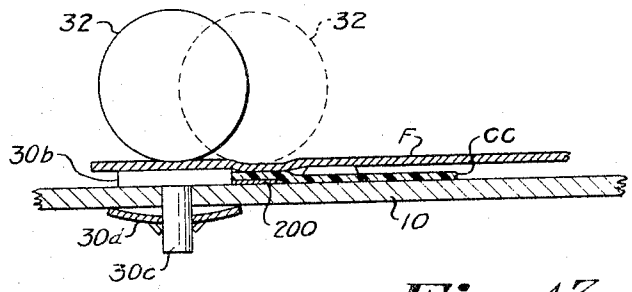

Fig. 13

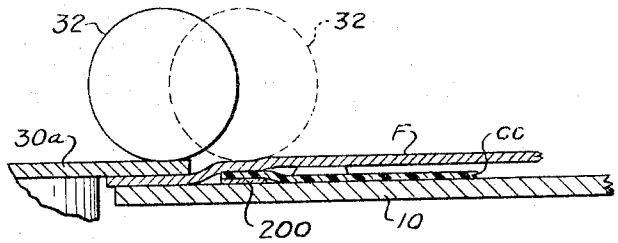

Fig. 12

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United States Patent Office 3,277,822 Patented Oct. 11, 1966

3,277,822

PRINTING MACHINES

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Filed July 1, 1964, Ser. No. 379,554
15 Claims. (Cl. 101—269)

This invention relates to a printing machine and in particular to a machine of this kind wherein impressions are produced by rolling a platen across the face of a sheet which is placed over the upwardly disposed face of a printing plate or other printing means bearing type characters.

Hand operated printing machines wherein impressions are produced from printing plates of relatively small size and bearing type characters have a wide variety of uses in connection with oil station services, library transactions, travel accommodation services and the like, and in most instances the machine is equipped with other printing means such as a validating plate embossed with the address of the station, settable dater wheels bearing raised numerals, route plate embossed with travel accommodation data, and so on. A printing machine of the character referred to is shown and described, for example, in U.S. Patent No. 3,018,725. To the extent that it assists in understanding the description of the invention to be set forth in detail hereinbelow, the disclosure in the patent is hereby incorporated herein.

It will be appreciated that in recording certain types of business transactions, numerous copies are required for inventory and other bookkeeping purposes. These copies can represent a substantial thickness especially in view of interleaved carbon sheets where these are present together with a tabulating card and an opaque or bond top sheet. In other instances, fewer copies are required, so that the thickness of the form set may vary. Moreover, the height of the type characters afforded by the printing means may also vary under some circumstances. Therefore, various approaches have been taken to construct a machine of the kind involved in such a manner that clear and legible impressions can be obtained on the copies regardless of the variations in the thicknesses of the forms or printing plates.

Some of these prior art devices utilize a compensating anvil which is spring loaded to permit movement of the anvil away from the platen roller as a result of the pressure applied to the anvil by the platen during an imprinting operation. Still other devices provide a compensating platen roller such that the axis of rotation of the platen roller can be manually adjusted to accommodate variations in type height or different thicknesses of forms or sheets to be printed. While these compensating devices are quite suitable in some instances, the spring loaded anvil machines can provide only a limited amount of compensation and machines incorporating a compensating platen required manual adjustment of the platen for each different thickness range of forms or sheets to be imprinted. Accordingly, it is an object of the present invention to provide a more flexible machine than those of the prior art devices.

It is a further object of this invention to provide a printing machine incorporating means to automatically compensate for different thicknesses of embossed cards or forms being imprinted, or both.

A still further object of this invention is to provide self-compensating means for a printing machine wherein a sensing device is effective to gauge the thickness of the embossed card or of the form positioned in the machine, or of both, and to automatically adjust the height of the

platen roller above the printing anvil to accommodate the sensed thickness.

A further object of the invention is to provide a mechanism which will permit release of the mechanism in the event of a jam due to overloading the machine with a combination of forms and printing plates having a total thickness of more than the maximum compensating limit of the device.

Another object of the invention is to provide a manually operative control to restore the platen roller to non-printing position in the event the machine is overloaded during an attempt to imprint with an excess number of thicknesses beneath the platen.

Another object of the invention is to provide friction means to prevent retrograde movement of the platen carriage during an imprinting operation to prevent damage to any of the drive members of the machine and to insure completing the imprinting of the form. Means are also provided for automatically releasing the friction means on completion of an imprinting operation to permit the platen carriage to be returned to its starting position.

The present invention provides a data recorder capable of imprinting clear and uniform impressions on a wide variety of business forms having substantial variations in the thickness of the form sets.

These and other objects and advantages of the invention will become more apparent from the following description and drawings wherein:

FIG. 1 is a perspective view of a printing machine constructed in accordance with the present invention;

FIG. 2 is a section taken on the line **2—2** of FIG. 7;

FIG. 3 is an exploded view on an enlarged scale showing a sensing cartridge in perspective with the parts approximately in starting position.

FIG. 4 is a detail section on an enlarged scale showing the sensing cartridge;

FIG. 5 is a side view of a return cartridge used to restore the platen to start position;

FIG. 6 is an end view of the return cartridge;

FIG. 7 is a section taken on the line **7—7** of FIG. 2;

FIG. 8 is a partial top plan of the bed of the printing machine showing a form holding clamp,

FIG. 9 is a section taken on the line **9—9** of FIG. 8;

FIG. 10 is a partial bottom plan of the machine, partially broken away, showing a friction pawl and associated mechanism to prevent retrograde movement of the platen carriage during an imprinting operation;

FIG. 11 is a detail elevation showing the operation of the release button and taken substantially on line **11—11** of FIG. 2;

FIG. 12 is a diagrammatic section showing an arrangement for positioning the roller platen at the proper printing level for varying thicknesses of printing plates or printing plates and forms; and

FIG. 13 is a view similar to FIG. 12 but showing an alternate arrangement.

A machine incorporating platen compensating means for use with forms of varying thickness is shown in FIG. 1 of the drawings, and comprises a bed or anvil **10**, a platen carriage **12** carrying a roller platen **32** shown in FIG. 2 freely rotatable on a shaft **33** carried by the carriage **12**, embossed printing plates **14** and **16** and an embossed station or auxiliary printing plate **18**. Printing plate **14** may be plastic, for example, and embossed with an individual's name, address, account number and the like as is customary in the case of conventional credit cards. Plate **14** is retained in the machine by means of retracting spring loaded gauges mounted on the bed of the machine such as shown at **20**. A recess **22** is also provided in the bed of the machine to permit easy removal of the plate from the machine. Plate **16** is substantially the same as plate **14** as far as size, shape, thick-

ness and material are concerned. However, the data embossed on plate **16** are of a different nature in that they relate to data other than personal identification data such as appear on plate **14** as will be explained hereinafter. Plate **16** is also retained in the machine by means of gauges such as **20** and a recess **24** is also provided in the bed of the machine to facilitate removal of the plate from the machine.

The bed of the machine is further provided with gauges such as **26** which are used to locate a form set to be imprinted, as well as manually settable date imprinting wheels **28**. The anvil **10** provides a support surface for the plates and the forms, and the gauges **20** and **26** define a printing station for the plates and the forms respectively extending from one end of the anvil adjacent the position of the platen carriage **12** as shown in FIGURE 1 to the opposite end of the anvil. Station plate **18** is embossed with data identifying the office issuing the particular form being imprinted and an impression from the station plate is made on the form set at the time the form is imprinted with data from plates **14**, **16** and dater **28**. A form holding clamp **30** adapted for controlled movement is also included in the bed assembly as will be explained hereinafter.

The machine of the present invention, while suitable for a wide variety of applications, will be described in connection with the issuance of passenger travel tickets and, specifically, with the issuance of airline passenger tickets. In this regard, printing plate **16**, sometimes termed route plate, is embossed with data indicating the origin and destination of a flight, name of the airlines or carrier, fare basis, amount of fare, tax, total amount of fare including tax and route code. All this information is imprinted from the plate **16** onto a carbon paper interleaved form set to produce a completed passenger ticket which can subsequently be processed on automatic scanning equipment. As mentioned above, the information from plate **16** is imprinted on the form set simultaneously with the imprinting from plates **14**, **18** and dater **28**, all this being accomplished by making one pass of the platen carriage **12** across the bed of the machine, from left to right as view in FIG. 1.

In a typical application for issuing airline passenger tickets, the customer presents his credit card to the clerk at the ticket office desk and informs the clerk as to his desired destination. This destination, of course, may be a direct flight, or it may include intermediate stops which require transfer to other carriers. With this information the clerk selects from a file of pre-embossed plates a suitable plate to meet the customer's requirements. This plate, along with the customer's plate, is placed in the machine, the ticket form set is placed over the plates and the form set is imprinted by traversing the bed of the machine with the platen carriage.

To facilitate selection of the route plate from the file, the plate is embossed near its uppermost edge with an alphabetical code. However, since these code data are not to be imprinted on the form set, the platen roller is provided with an annular peripheral groove in a position opposed to the line of code embossures on the route plate.

An important feature of an application of this kind is to be able to obtain sharp, legible impressions on the form set, particularly since one copy of the form set is adapted to be machine read. Since the ticket forms frequently vary in thickness, depending upon the amount of travel or the route represented, it is desirable to be able to provide a machine which will accept forms of different thickness and print them with uniform quality without the operator's having to make any adjustments.

The foregoing requirements are achieved in the present invention by means of a relatively simple arrangement which can be incorporated in various types of data recorders. For purposes of this specification, the novel arrangement is described as being incorporated in a machine such as disclosed in the aforementioned patent.

The basic elements of this invention are shown in FIGS. 1 and 2 and include form holding clamp **30**, roller platen **32**, sensing cartridge assembly **34**, return cartridge **36**, release plunger **38** and friction pawl **40**.

Form holding clamp **30** is best shown in FIGS. 7, 8 and 9 in the form of a rectangular member made of thin sheet metal or the like and having a raised portion **31** on its upper surface. The clamp **30** is attached by screws **46** to a member **42** which projects upwardly through a cut-out section **44** provided in the bed **10**. Member **42** is attached by screws **50** to a die cast element **48** positioned on the underside of the bed. Element **48** also retains one end of a pair of flat springs **52**, one intermediate the member **42** and the top surface of element **48** and the other on the underside of element **48**. The springs **52** are held in place by screws **50**. The other ends of springs **52** are attached to projections **54**, affixed to the underside of bed **10** as by spotwelding, by screws **56** as shown in FIGS. 7 and 8. The springs **52** thus floatingly support the clamp **30** from the bed **10** of the machine and guide its movement as will be explained below.

Element **48** is further provided with rollers **58** which engage cams **60**. Cams **60** are integral with a bar **62** attached to the carriage housing **12** by screws **65** as shown in FIG. 2. With the rollers **58** engaged with the high portion of the cams **60**, form clamp **30** is displaced vertically to its inoperative position which is slightly above the top surface of bed **10** and parallel therewith. Element **48** also houses a pair of compression springs **64** (FIG. 9) which engage the underside of bed **10** and exert a downward pressure against element **48**. Accordingly, when the cam rollers **58** are permitted to move downwardly along the cams **60**, as the platen carriage **12** moves to the right (FIG. 7) for an imprinting operation, springs **64** are effective to lower form clamp **30** to sense the thickness of the form to be imprinted and to clamp the form in place as will be explained hereinafter.

The platen roller carriage housing **12** is best shown in FIGS. 2 and 7 and is similar in many respects to the carriage disclosed in the aforementioned patent. In this regard, platen roller **32** is rotatably supported in housing **12**, the carriage is guided and supported for movement by a pair of central rollers **66** (FIGS. 2 and 10) engaging a central guide rail **68** and a pair of side rollers **70** engaging and running along the rail surfaces at the sides **72** of bed **10** as shown in FIG. 10, all of which is disclosed in the above mentioned patent. The novel aspects of the carriage of the machine in the present invention relate to the inclusion of the sensing cartridge assembly **34**, return cartridge **36**, release plunger **38** and friction device **40**. Each of these individual features will be described in detail hereinafter.

The sensing cartridge assembly indicated generally at **34** in FIG. 2 is best shown in FIGS. 3 and 4 and comprises a hollow eccentric journal **80**, yield spring **82**, spring support pin **83**, a spring driving collar **84**, gear sector **86** and a clutch unit made up of a clutch housing **88**, rollers **90**, roller retainer **92** and a clock spring **94**. The hollow journal **80** comprises a liner **96** molded or press fitted in place and provided with a concentric bore **98** at one end, and an eccentric bore **100** at its other end, the two bores being separated by a partition **102** having a hole **103** therethrough. The eccentric bore **100** is provided with a flat which in association with a flat on the platen roller shaft **33** is effective to prevent relative rotation between the shaft and the journal **80**. The other bore **98** is used to house the yield spring **82**. A core pin **83** is floatingly positioned within the spring **82** and serves to support the spring and prevent it from tilting or collapsing during operation. The liner **96** also carries a pair of projecting lugs **104**, **104'** and a stop surface **107** adjacent the open end of the bore **98**.

Positioned on the outer body of journal **80**, and up against the end faces of lugs **104**, **104'** is a spring driving collar **84**. The face of the collar **84** which engages the

lug 104 and stop surface 107 is provided with a projection 106 and a bayonet slot 108. The other face of the driver has a notch 110 therein. Torsion yield spring 82 has an extension 112 at one end and an extension 114 at its other end. Spring 82 is positioned in the bore 98 so that the extension 112 enters the hole 103 in partition 102 and extension 114 is engaged in slot 108 in the collar 84. The spring is stressed so that extension 114 urges collar 84 in a direction to move projection 106 against stop surface 107. Preferably the extension 114 is so bent as to cross the axis of spring 82 and thereby retain the core pin 83 against accidental displacement.

Next positioned on journal 80 and up against driver 84 is gear sector 86. The sector is provided with a lug 116 which engages with lost motion in notch 110 in driver 84 to impart rotation from the sector 86 to the spring driver 84. Section 86 coacts with a rack 87 affixed to the bed of the machine as shown in FIGS. 1, 8 and 9.

The clutch assembly of the sensing cartridge 34 comprises a clutch housing 88 having a shaped opening 118 therethrough. Positioned between the periphery of the opening 118 and the exterior surface of the journal 80 is a set of rollers 90. The rollers 90 are held in angularly spaced position about the journal axis by roller retainer 92 which has a neck portion 120 adapted to enter the opening 118. The neck 120 is provided with openings 122 which receive the rollers 90 and maintain their spacing while the clutch unit is operating. The side opposite the neck 120 of the roller retainer 92 is provided with a hub 124 and a recess 126, and positioned around the hub and in the recess is the clock spring 94. Spring 94 has an extension 128 at one end and an extension 130 at the other end. Extension 128 engages a projection 132 on clutch housing 88 and extension 130 engages a notch 134 cut in the hub 124 of roller retainer 92. The spring 94 is stressed in a direction tending to rotate housing 88 counterclockwise relative to retainer 92 as seen in FIG. 3, tending to maintain the rollers locked in active clutching position. Intermediate the hub 124 and neck 120 of retainer 92 is an enlarged flange 136 having a raised portion 138 thereon. This raised portion functions to disengage the clutch as will be explained later. The clutch unit comprising members 88, 90, 92 and 94 is positioned on journal 80 by means of conventional retaining means such as washers 140 and retainers 141. Retainers 141 for example may be "C" washers which engage grooves such as 142 provided in the periphery of journal 80. The normal operation of the clutch assembly is to prevent the journal 80 from rotating in a clockwise direction, as viewed from the right side of FIGS. 3 and 4, for the purposes to be disclosed hereinafter.

Return cartridge indicated at 36 in FIG. 2 is shown in detail in FIGS. 5 and 6. The cartridge 36 is mounted on the end of the platen roller shaft 33 opposite the sensing cartridge assembly 34 and is made up of a cylindrical member having an extended body portion 144 and a slightly larger diameter but shorter head section 146. The periphery of the head 146 is provided with a cut out section indicated by the margins 148 and 149 and, extending inwardly from the head 146, the body 144 is provided with a concentric axial bore 150 which bottoms a short distance beyond the center of the body 144. The end of the body 144 opposite the head 146 has an eccentric bore 152 which stops short of the bottom of bore 150 and, also, a hole 154 which breaks through the bottom of bore 150. The bore 152 is provided with a flat section which in association with a corresponding flat on the platen roller shaft 33 is effective to prevent relative rotation between the shaft and cartridge 36.

Positioned within the bore 150 is a torsion spring 156 which is weaker than yield spring 82 and which has an extension 158 at one end and an extension 160 at the other end. Extension 158 enters hole 154 in the body 144 and extension 160 is retained by the margin 149 of the cut out section provided in the head 146. A floating pin having a body section 161 and a head 163 is provided to support the spring 156 and to prevent it from tilting or collapsing during operation of the return cartridge. The body 161 of the pin is smaller in diameter than the inside diameter of the spring and substantially the same length as the spring. The body of the pin is positioned within the spring and the head 163, being larger in diameter than the inside diameter of the spring, prevents the spring from riding off the pin. Also, the underside of the head 163 provides a supporting surface for the end of the spring having extension 160 thereat. To keep the pin and the spring in place within the bore 150 of the cartridge, a roll pin 162 is pressed into a hole 164 provided in the head 146 of the cartridge.

The function of the return cartridge 36 is to provide an eccentric journal portion for the other end of shaft 33 and to provide spring power to return this journal and shaft 33 to start position, as will be further explained hereinafter.

The shaft 33, the platen roller 32 thereon, and the cartridges 34 and 36 make up an assembly which is held against suitable downwardly-facing bearing surfaces on the carriage housing 12 by means of bearing straps suitably secured to the housing. Two of these are illustrated at 165 and 166 in association with the return cartridge 36. A similar arrangement (not shown) is also provided for supporting the sensing cartridge 34. In this connection it is also noted that projection 132 on the clutch housing 88 engages in a suitable keyway 167 formed in the carriage housing 12 to immobolize the clutch housing relative thereto. The arm 160 of return spring 156 is, of coures, trapped against a portion of the supporting structure, for example the bearing strap 165, in such a way as to hold it against motion and thereby wind the spring 156 whenever cartridge 36 rotates in a counterclockwise direction as seen from the right in FIGS. 2 and 5.

The release plunger is shown at 38 in FIGS. 2 and 11 and comprises a push-button 170 provided with a shoulder 172, an extended body section 174 having a stepped axial opening 176 therein, and an actuating projection 177, (FIG. 11). This plunger 38 is supported on a bracket member 178 suitably affixed to the housing 12 and having at one end a bearing section 180 adapted for sliding movement within the large diameter of the stepped opening 176, and a reduced diameter extended portion 182 which acts as a pilot for a compression spring 184. The latter urges the plunger upwardly into a mating opening in the carriage 12 as far as permitted by shoulder 172. The lower portion of the bracket 178 has a pair of spaced apart semi-circular guides 186 and 187 which form a half-bearing for sector 86. Depending from one end of bracket 178 is a stop projection 188 which coacts with lugs 104, 104' (FIG. 3) of journal 80, respectively, to determine the two limiting positions of the journal.

The bracket 178 (FIG. 2) is further provided with a hole 190 in line with a camming surface 85 (FIG. 3) of sector 86. A spring 192 and detent 194 are positioned within the hole 190, with the detent engaging surface 85 on sector 86 and the spring 192 compressed between the detent and a pin 196 which is press fitted into the hole 190. The spring loaded detent 194 and camming surface 85 in the machine of the present invention serve to return the sector to a position ready for meshing with rack 87 after ratcheting thereover on a return stroke in a manner similar to that disclosed in the aforementioned patent.

The release plunger 38 functions as a manually operated safety mechanism used to restore the platen roller to its inoperative position in the event a form set and printing member association having a combined thickness in excess of that for which the platen level is set occurs at the printing location. In operation, depression of button 170 causes the actuator 177 to engage surface 93 of the clutch roller retainer 92. This engagement imparts a

rotary motion to roller retainer **92** in a counterclockwise direction, as viewed from the right in FIG. 2, releasing or unlocking the rollers **90** from engagement with the journal **80** by disposing the rollers in the recesses **119** of the shaped opening **118**. Release of the clutch permits rotation of the journal **80**, sector **86** and the driver **106** in a clockwise direction, thus allowing the spring of the return cartridge **36** to unwind and restore the platen roller to its raised or inoperative position. Release of the button **170** permits the roller retainer **92** to rotate to its neutral position by means of the spring **94**.

During a printing cycle, i.e., when the platen carriage **12** is moved from a home position to an actuated position, or from left to right as viewed in FIG. 1, the platen carriage is prevented from any movement in a leftward direction by means of the friction pawl **40** and guide bar **68**, FIG. 10. This is required in order to prevent any damage to the sector **86** or to lugs **116** or **106**. It will now be noted that the sector is interlocked with spring driver **84** and the spring driver is engaged with a stop face **107** on journal **80**, and since the clutch unit prevents clockwise rotation of the journal, the sector **86** will in most cases be barred from a full clockwise movement. Accordingly, if left hand movement of the platen carriage **12** were attempted the sector **86** will be found to be in a jamming relation to the rack **87** and, the mechanism would probably be damaged due to the mass and inertia of the carriage.

The friction pawl arrangement to prevent damage to the machine is shown in FIG. 10. As shown therein and in FIG. 2, a molding **200** is mounted to the underside of the platen carriage **12** by means of screws **65**. The molding is provided with a groove **202** which embraces the guide bar **68** and guides the movement of the carriage as it is moved along the bar by means of the rollers **66**. Friction pawl **40** is pivoted at **204** and spring biased to a normal centered position, as viewed in FIG. 10, by a spring **206**. The spring is extended between a hole **207** in the pawl and a slot **208** in the molding **200**. In its normal position with the carriage **12** at its starting location, a surface **216** of the pawl enters an opposed recess **210** in the bar **68**. A pin **214** is also provided in the bar and projects outwardly from the end of recess **210** into the path of the pawl.

In operation, as the platen carriage **12** is moved to the right for an imprinting cycle, pawl **40** engages pin **214** tripping the pawl and tending to rotate it in a counterclockwise direction about pivot **204** and against the bias of spring **206**. As the pawl disengages from the pin, spring **206** is effective to bring the pawl to its operating position. However, once the pawl passes the pin the pawl is no longer opposed to the recess **210**. Therefore, the surface **216** of the pawl frictionally engages the guide bar **68**. In this position, shown in dotted lines at **40***a*, the platen carriage is free to move in a rightward direction with the pawl sliding along the bar, but any attempt at moving the carriage to the left is prevented since the pawl surface **216** is so designed that such movement causes the pawl to wedge between its pivot and the bar **68**.

After the form is imprinted and the carriage reaches actuated position at the right hand end of the machine, raised portion **138** (FIGS. 3 and 11) of roller retainer **92** strikes a projection **137** (FIG. 1) on the form set gauge affixed to the bed of the machine, releasing the clutch and restoring the platen to its start position. After the release of the clutch, surface **216** of pawl **40** enters another recess **212** in guide bar **68** causing the pawl to be further rotated in a clockwise direction by spring **206**. In this position, the pawl is so disposed as to trip in the opposite direction when leaving the recess **212**, thereby to assume a position as shown in dotted lines at **40***b* such that movement of the platen carriage leftwardly to its start or home position is permitted with no interference between the pawl surface **216** and the guide bar **68**. When the pawl strikes pin **214** on its leftward travel, the pawl merely idles over the pin and is restored to its normal position i.e., opposed to recess **210** with the surface **216** entering slightly the recess **210**. At this point, all mechanism has been completely restored and the machine is conditioned for another printing operation.

The overall operation of the novel form sensing and of the present invention will now be described. With the printing plates **14** and **16** and a form set F positioned on the bed of the machine, the platen carriage **12** is grasped and moved in a rightwardly direction as viewed in FIG. 1. Movement of the platen carriage also moves the camming surfaces **60** of the cam **62** out of engagement with the rollers **58**, see FIG. 7. With the rollers **58** clear of the cams, compression springs **64** are effective to lower the form holding clamp **30** against the form set F to be imprinted. As can be seen in FIG. 7, the final level of the clamp **30** is determined by the thickness of the form being used. If the thickness of the clamp element itself were made equivalent to the thickness of a printing member such as an embossed credit card, then the overall thickness which the platen level must handle will be the same as the distance from the top of the bed **10** to the top of raised portion **31**. Of course the clamp thickness should be slightly less than the standard printing member to provide appropriate interference and consequently the desired printing pressure. In the present machine, provisions are made to accommodate forms varying in thickness from minimum form thickness to .050 inch.

Continued movement of the platen carriage engages sector **86** with rack **87**, thereby rotating the eccentric ournal **80**, shaft **33**, and finally winding spring **156** of the return cartridge **36** and driving platen roller **32** down and into engagement with the raised portion **31** of form clamp **30**. This downward movement of the platen roller is effected by the sector's imparting rotation to the eccentric journal **80** through the spring driver **84** and the comparatively stiff yield spring **82**. As the platen roller contacts the form holding clamp **30**, **31** its lowering motion stops. However, the sector continues to be driven by the rack so that spring **82** yields and the sector is permitted to run off the rack and, it is this yielding action of spring **82** that allows sensing various thickness forms or cards. When the sector leaves the rack, the yield spring returns to its initial condition, returning lug **106** to contact with surface **107**. The eccentric journal, however, continues to be held or locked in its adjusted position and prevented from any clockwise rotation by the clutch unit. The thickness of the form set has now been sensed and the platen roller has been lowered and locked at the proper level above the bed or printing anvil to effect an imprinting operation when the carriage is moved further to the right.

During the imprinting of the form, while the platen carriage is being moved toward the right, friction pawl **40** is riding on guide bar **68** and, as mentioned above, prevents any leftward movement of the platen carriage. If, however, the platen roller jams for any reason on the form set because of excessive thickness at the printing point (possibly due to two credit cards being stacked on the bed by mistake) the platen roller can be freed, i.e., raised to its up position by depressing release plunger **38**. As explained earlier, operation of the release plunger is effective to disengage the clutch from the eccentric journal and permit restoration of the platen roller to its raised start position through the nwinding of the spring in the return cartridge. With the platen roller raised, the carriage is moved to the extreme right to disengage the friction pawl and allow return movement of the platen carriage to the left hand side of the machine.

Under normal circumstances, (i.e., where the platen roller does not jam on the form set), the carriage is moved toward the right until the raised portion **138** on roller retainer **93** strikes the projection **137** on the bed of the machine and releases the clutch. After the release of the clutch, pawl **40** enters recess **212** in the guide bar **68**.

With the clutch released from gripping engagement with the eccentric journal through the above mentioned striking action of the roller retainer and projection, the platen roller shaft **33** and journal **80** are rotated by means of return spring **36** and restored to their start positions. At the same time that journal **80** returns to start position, of course, spring **82** returns driver **84** to start position, and, via notch **110** and lug **116**, sector **86** as well. The latter is now in a position to idle over the teeth of rack **87** on the return pass, this idling movement being permitted by lost motion in the connection **110**, **116**. On the return pass, as the sector leaves the rack the detent **194** pressing on a portion of projection **85** lowers the sector sufficiently to be in position ready to mesh with rack **87** on the next pass. The platen and related parts are thus conditioned for another imprinting operation.

In the event the thickness of the embossed credit card is changed for a particular application, the platen compensating means of the machine of the present invention can be quickly and easily altered to accommodate the new thickness by removing the screws **46** and replacing the form holding clamp with another clamp of a different thickness.

It will be appreciated, proper printing pressure is determined by the thickness of the form set and the thickness of the embossed card. With the form holding clamp bearing a predetermined relation to the thickness of the card, i.e., about .012 inch thinner than an embossed card, the platen roller is automatically positioned at the proper level by sensing the top surface of the clamp when the latter is in its down position and contacting the form set. That is, the combined thickness of the form set and holding clamp is approximately equivalent to the thickness of the form set and the embossed card, less an interference value of about .012 inch to provide proper printing pressure. In the event that a form with a binder stub is used (as in airline tickets) the thickness of the holding clamp is further reduced approximately by the thickness of the binder strip. This produces the same platen position as if no binder strip were used.

The foregoing description has been directed primarily to a device designed to accommodate and automatically adjust for forms of different thickness since many applications will have only standard thickness credit cards or printing member available. The principles disclosed, however, can also be applied to devices which can accommodate printing members or credit cards of different thickness, or situations in which the thickness of both credit cards and forms may vary, and the subsequent comments will describe examples of such devices.

One alternate form of the device is illustrated diagrammatically in FIG. 12 which is to be understood as being in most respects identical with the device of FIGS. 1 to 11. The primary difference is that the range of engagement between the rack **87** and sector **86** is slightly shifted to the right so that the platen roller **32** is not relieved of the lowering influence of the rack until a moment after it passes the end of form sensing clamp and the form sensing clamp thickness is differently selected than in the previous arrangement.

This arrangement comprises a bed **10**, embossed plate CC, form F, roller platen **32**, spacer **200** and form sensing clamp **30***a*. The form F is placed over the credit card and one end of the form is clamped against the bed by the form holding clamp **30***a*.

As the platen roller **32** is moved to the right to the position shown in full lines in FIG. 12, it is lowered first into engagement with the form holding clamp **30***a*. The form clamp in this instance is selected to be slightly thicker than the unembossed thickness of the thickest card CC expected to be sensed but less than the total thickness of the card and the embossed characters thereon and, as the platen is lowered against the clamp it is, in effect, sensing the combined thickness of the form and the maximum basic credit card. As the platen roller is moved further to the right, to the position shown in dotted lines in FIG. 12, it leaves the clamp **30***a* and contacts the end of the form overlying the marginal edge of the card outside of the embossed area. This operation is essentially the same as that described in connection with FIGS. 1 to 11 with the exception that the sector in the arrangement of FIG. 12 does not disengage from the rack as it leaves the clamp but rather, it finally disengages from the rack while the platen is positioned over the edge of the card. The operation of locking the platen at the proper printing level as a result of the sector **86** leaving the rack **87** is the same as earlier described, and continued rightward movement of the platen accomplishes imprinting of the form. A spacer **200** may be provided under the edge of the card at the sensing position in order to select the desired degree of imprinting pressure.

It has become almost standard practice to emboss credit cards to a height of .016–.018 inch above the credit card surface, and any embossing machine will produce characters of about this height. The height is virtually the same in all cases and is not much affected by the basic thickness of the card being embossed in the embossing machine. While this entire amount of thickness could be allowed as provision for printing interference, the pressure thus generated would be excessive for some applications. Therefore the provision of spacer **200** is suggested, adding perhaps .004 inch to the thickness of the stack at the sensing location and reducing the interference to about .012 to .014 inch, and reducing the printing pressure correspondingly.

As is now apparent, the operation of the device of FIG. 12 involves, as the carriage is moved towards the right, first lowering the roller **32** against the surface of holding clamp **30***a* to effect a preliminary approximate sensing operation. Then when the roller leaves the clamp **30***a* it will be permitted to lower a few thousandths more and thereby conduct a final sensing operation. While it can be understood that this two step sensing might not always be required, it has a definite mechanical advantage. The reason for this is that the margin of the card outside the embossed area is usually quite restricted, so that the target area in which the roller **32** must strike to make its final thickness reading is extremely small. If the equipment were designed with a rate-of-descent for the roller **32** great enough to enable it to strike the target or test area accurately every time, deleterious effects related to inertia of the parts could be introduced. By making the preliminary approximate adjustment, the roller **32** can test within the permissible margin space allotted and still employ the same deliberate rate-of-descent design shown is the device of FIGS. 4 to 6.

FIG. 13 illustrates a device in many respects like that of FIG. 12 but illustrating the point that the card thickness approximating element at the preliminary sensing station need not be a clamp for the form, but (if clamping of the form is not desired or at least not required) the element may take the form of a block or sensing pad underlying the form margin as shown at **30***b* in FIG. 13. In this case, of course, the clamp supporting and operating mechanism **48** to **60** may be dispensed with. Such a sensing pad **30***b* may be attached to the bed **10** in any suitable manner as by being provided with downward projections such as **30***c* projecting through matching openings in the bed and each locked in place by a spring fastener **30***d*. The pad **30***b* is also slightly thicker than the basic thickness of the thickest credit card expected.

The operation in all significant respects is like that explained in connection with FIG. 12.

It will also be understood that if desired, when clamping of the form is not needed, an arrangement similar to sensing pad **30***b* can also be embodied in the device of FIGS. 1 to 11, using, of course, a pad thickness adapted to that particular application.

It can be seen from the foregoing description that the thickness which must be determined by the device is the combined thickness of the form F and printing member **16**

or CC, or more specifically, some thickness value related to that combined thickness value by a proper printing interference difference. For the purpose of convenience and clarity this latter value will be referred to hereinafter generally as "interference modified combined printing member-form thickness."

It will also be recognized that the "interference modified combined printing member-form thickness" is read by lowering the platen roll against superimposed portions of these elements to sense their thickness, or against a portion of the form plus a stand-in element for the printing member which bears a certain relation to the thickness thereof. In order to discuss these arrangements in a generic way, the parts which the platen roll approaches and which represent the thicknesses in question, whether they be parts of the form or printing member, or are substitutes therefor, will be defined as "thickness exhibitors," e.g. "superimposed form and printing member thickness exhibitors."

From the foregoing, it will be recognized this invention provides a simple to operate and efficient apparatus for imprinting documents of varying thicknesses. It also provides features for automatically compensating for the card and/or form thickness range by positioning the platen roller at the proper level above the printing anvil in preparation for the printing stroke. Further, the unit provides safety features to prevent damage to the machine in the event an attempt is made to move the platen carriage in a direction opposite to the imprinting direction during a printing cycle, as well as a manually operative release control to restore all mechanism to a neutral position at any time during a printing cycle.

While preferred embodiments of the invention have been described and illustrated, it is to be understood that these are capable of variation and modification. Accordingly, the aim in the appended claims is to cover all such variations and modifications as may fall within the true spirit of the invention.

What is claimed is:

1. A printing machine for printing form sets by means of printing members, in which either the form sets or the printing members or both can vary in thickness, an anvil defining a support surface for receiving the printing members and form set in superposed relationship; a form set and printing member gauge means for defining a printing station on the anvil; said station having a first and a second end; a roller platen having an axis; carrier means supporting the roller platen above the anvil, said carrier means movable to drive the platen axis laterally across the anvil between a home position adjacent said first end of said printing station and an actuated position adjacent said second end of said printing station; lowering means for moving the platen towards the support surface adjacent said home position during and in response to initial motion of the carrier from home position; sensing means for determining the interference modified combined printing member-form thickness on the support surface, and giving an indication thereof; and lock means responsive to the indication given by said sensing means for terminating the lowering action of said lowering means and holding the same at the point where the platen is at a height above said support surface corresponding to the interference modified combined printing member-form thickness during movement of the platen to the actuated position.

2. A printing machine for printing form sets by means of printing members, in which either the form sets or the printing members or both can vary in thickness, an anvil defining a support surface for receiving the printing members and form set in superposed relationship; a form set and printing member gauge means for defining a printing station on the anvil, said station having a first and a second end; a roller platen having an axis; carrier means supporting the roller platen above the anvil, said carrier means movable to drive the platen axis laterally across the anvil between a home position adjacent said first end of said printing station and an actuated position adjacent said second end of said printing station; lowering means for moving the platen towards the support surface adjacent said home position to a thickness sensing position during and in response to initial motion of the carrier from home position; sensing means including the platen and anvil surfaces for determining the interference modified combined printing member-form thickness on the support surface, and giving an indication thereof, said platen and anvil surfaces being arranged to grasp between them superposed form and printing member thickness exhibitors; and lock means responsive to the indication given by said sensing means for terminating the lowering action of said lowering means and holding the same at the point where the platen is at a height above said support surface corresponding to the interference modified combined printing member-form thickness during movement of the platen to the actuated position.

3. A printing machine as set forth in claim 2 in which the means for terminating platen lowering and holding the platen at its printing level comprises a resilient yielding connection in the lowering means, together with a uni-directional clutch between the lowering means and the platen carrier.

4. A printing machine for printing form sets by means of printing members, in which either the form sets or the printing members or both can vary in thickness, an anvil for receiving the printing member and form set in superposed relationship; a roller platen; carrier means supporting the roller platen above the anvil and movable to move the platen across the anvil between a home position and an actuated position; means for lowering the platen at a thickness sensing position during and in response to the initial motion of the carrier from home position; means including the platen and anvil surfaces for sensing the interference modified combined printing member-form thickness, and giving an indication thereof, said platen and anvil surfaces being arranged to grasp between them superposed form and printing member thickness exhibitors; and means responsive to the indication given by said sensing means for terminating the lowering action of said lowering means and holding the same at a platen level suited to the printing of the form on the anvil by the given printing member; said last named means comprising a resilient yielding connection in the lowering means, together with a uni-directional clutch between the lowering means and the platen carrier; means for releasing the clutch; and resilient means for returning the platen to raised position when the clutch is released.

5. A printing machine as set forth in claim 4 in which the means for releasing the clutch includes a manually actuable member coactable with the clutch at the will of the operator in any position of the platen carrier.

6. A printing machine as set forth in claim 4 in which the means for releasing the clutch includes an abutment effective to actuate the clutch as the platen carrier approaches actuated position.

7. A printing machine as set forth in claim 6 in which means is provided for preventing retrograde motion of the platen carrier until after it has reached actuated position so that the clutch has been released and the platen raised.

8. A printing machine for printing form sets by means of printing members, in which either the form sets or the printing members or both can vary in thickness, an anvil for receiving the printing member and form set in superposed relationship; a roller platen; carrier means supporting the roller platen above the anvil and movable to move the platen across the anvil between a home position and an actuated position; means for lowering the platen at a thickness sensing position during and in response to the initial motion of the carrier from home position; means including the platen and anvil surfaces for sensing the interference modified combined printing member-form thickness, and giving an indication thereof, said platen and anvil sur-

faces being arranged to grasp between them superposed form and printing member thickness exhibitors; and means responsive to the indication given by said sensing means for terminating the lowering action of said lowering means and holding the same at a platen level suited to the printing of the form on the anvil by the given printing member; said form thickness exhibitor is provided by a margin of the form to be printed; and the printing member thickness exhibitor is a substitute element connected with the printing machine adjacent the intended location of the form margin closest to the home position of the platen.

9. A printing machine as set forth in claim **8** in which the printing member thickness exhibitor is a clamp member movably connected with the anvil; and which includes means to actuate the clamp in response to initial platen carriage movement to clamp the form margin to the anvil.

10. A printing machine as set forth in claim **9** in which the clamp member is mounted on resilient means urging the same towards the anvil, and in which means activated by the platen carrier holds the clamp away from the anvil when the platen carrier is in home position.

11. A printing machine as set forth in claim **2** wherein the form thickness exhibitor is provided by a margin of the form to be printed, and the printing member thickness exhibitor comprises a margin of the printing member to be used in printing the form.

12. A printing machine for printing form sets by means of printing members, in which either the form sets or the printing members or both can vary in thickness, an anvil for receiving the printing member and form set in superposed relationship; a roller platen; carrier means supporting the roller platen above the anvil and movable to move the platen across the anvil between a home position and an actuated position; means for lowering the platen at a thickness sensing position during and in response to the initial motion of the carrier from home position; means including the platen and anvil surfaces for sensing the interference modified combined printing member-form thickness, and giving an indication thereof, said platen and anvil surfaces being arranged to grasp between them superposed form and printing member thickness exhibitors; and means responsive to the indication given by said sensing means for terminating the lowering action of said lowering means and holding the same at a platen level suited to the printing of the form on the anvil by the given printing member; said form thickness exhibitor is provided by a margin of the form to be printed, and the printing member thickness exhibitor comprises a margin of the printing member to be used in printing the form; said printing member exhibitor also includes a spacer attached to the anvil surface and underlying the margin of the printing member, which spacer has a thickness equal approximately to the height of the type above the printing member surface less the printing interference measurement desired.

13. A printing machine as set forth in claim **11** comprising in addition a preliminary platen height adjustment station between the home position and the thickness sensing position, said adjustment station being defined by a thickness member adjacent the home position; said thickness member representing a height above the anvil surface slightly in excess of the thickest unembossed printing member to be utilized, but less than the total thickness of the printing member and the embossed characters thereon, said thickness member being arranged to have a lapping relationship with a margin of the form to be printed when the same is in printing position.

14. A printing machine as set forth in claim **13** in which the thickness member is a clamp overlying the margin of the form to be printed and holding the same in place.

15. A printing machine as set forth in claim **14** in which means is provided for automatically opening and closing the clamp in response to platen carrier positioning.

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