United States Patent [19]

Zofchak

[11] **3,756,151**

[45] **Sept. 4, 1973**

[54] **COMPENSATING PLATEN FOR PRINTING MACHINES**

[75] Inventor: **James T. Zofchak,** Wickliffe, Ohio

[73] Assignee: **Addressograph-Multigraph Corporation,** Cleveland, Ohio

[22] Filed: **Mar. 12, 1971**

[21] Appl. No.: **123,511**

[52] **U.S. Cl.** **101/269,** 101/282

[51] **Int. Cl.** **B41f 3/04**

[58] **Field of Search** 101/45, 269, 274, 101/284, 285, 282, 283

[56] **References Cited**

UNITED STATES PATENTS

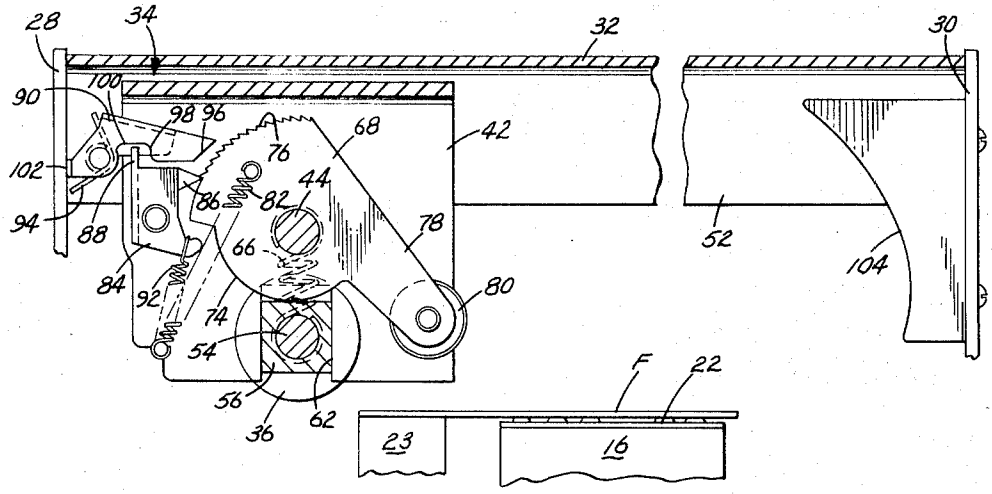
2,068,707	1/1937	Reardon	101/269
3,018,725	1/1962	Maul et al.	101/269
3,116,687	1/1964	Harding	101/269
3,138,091	6/1964	Maul	101/45
3,152,543	10/1964	Hanson et al.	101/269
3,277,822	10/1966	Maul et al.	101/269
3,481,269	12/1969	Brown	101/56
3,486,446	12/1969	Maul et al.	101/269
3,538,848	11/1970	Barbour	101/269

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—Eugene H. Eickholt
Attorney—Russell L. Root and Ray S. Pyle

[57] **ABSTRACT**

A printing machine which has a bed for supporting printing devices and a form to be imprinted, includes a carriage supporting a platen for movement between a raised position spaced from the form, and a lowered position in printing engagement with the form. The carriage is adapted to be moved from a home position across the bed to an actuated position to perform a printing stroke, and back to the home position in readiness for a subsequent printing operation. Means is provided for sensing the thickness of the form to be imprinted, and compensating means is provided for placing the platen at a printing position selected from a plurality of possible positions spaced from the bed as determined by the sensed thickness of the form. The platen is held at the selected printing position during a printing stroke and is restored to its raised position prior to return of the carriage to the home position.

4 Claims, 7 Drawing Figures



PATENTED SEP 4 1973

3,756,151

SHEET 1 OF 2

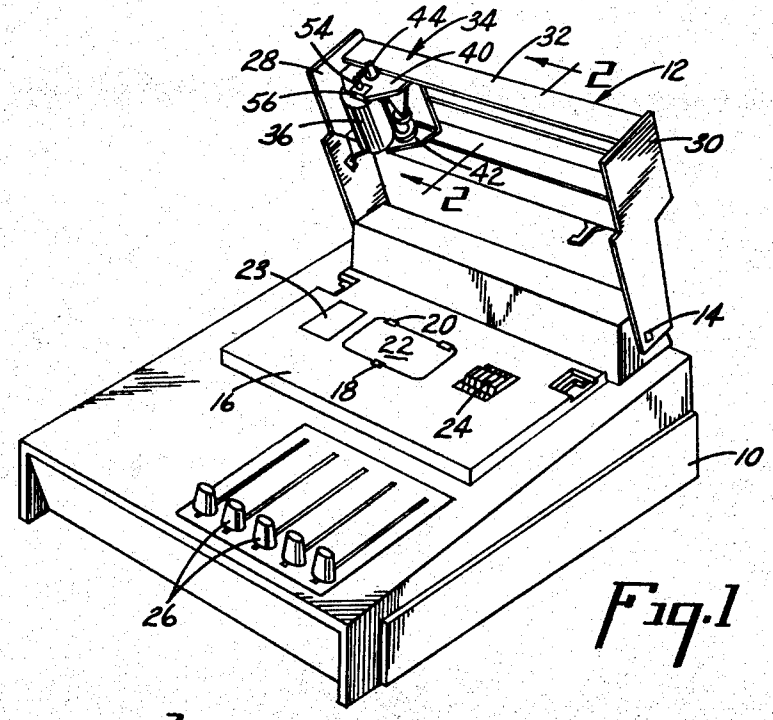


Fig. 1

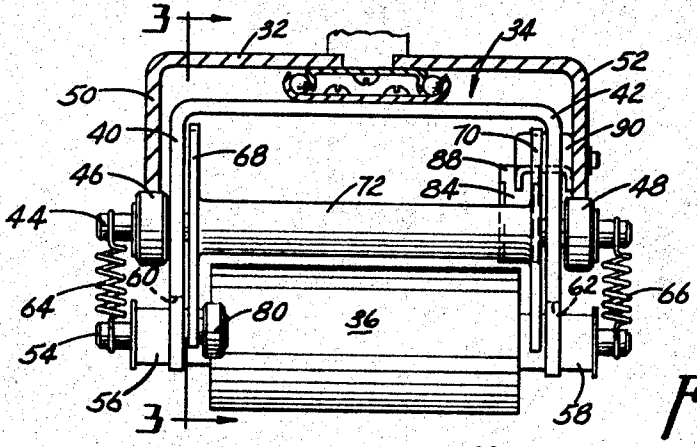


Fig. 2

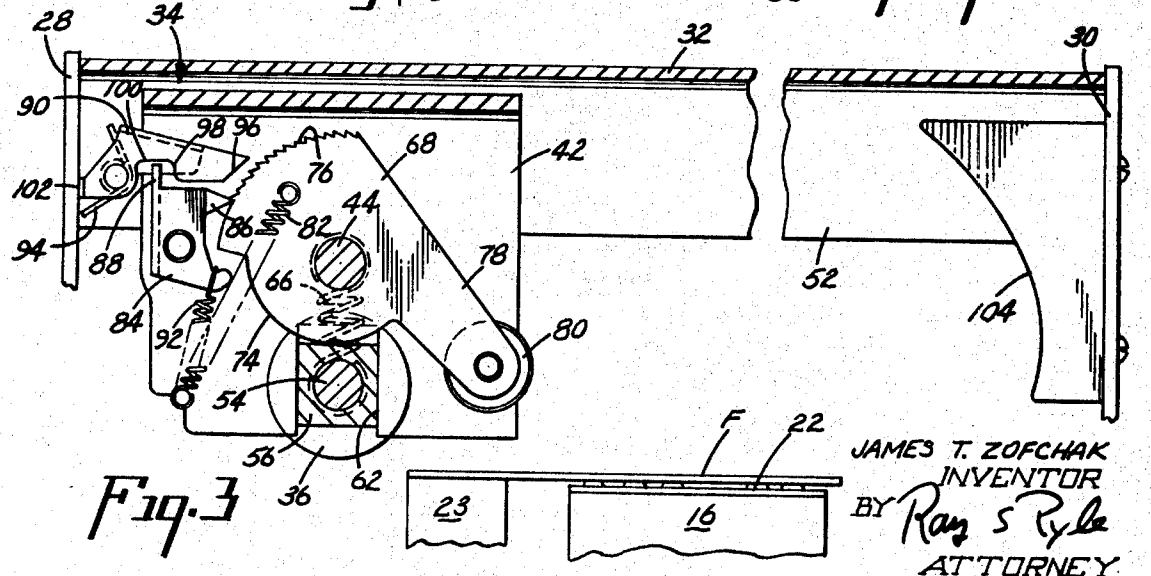


Fig. 3

JAMES T. ZOFCHAK
INVENTOR
BY Ray S Ryba
ATTORNEY

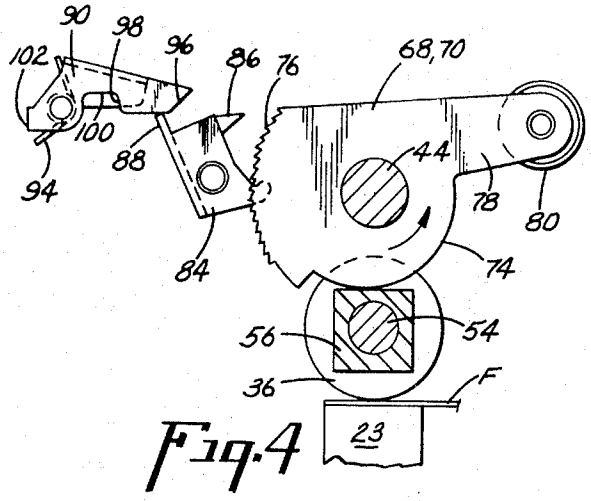


Fig. 4

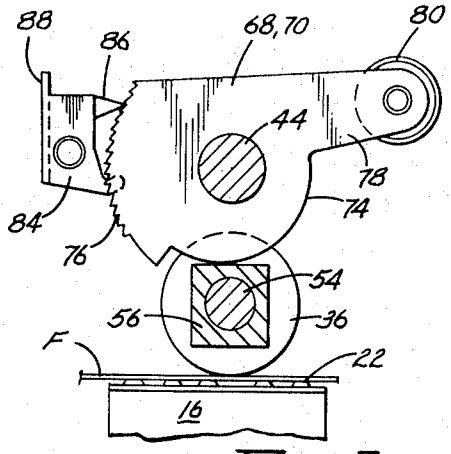


Fig. 5

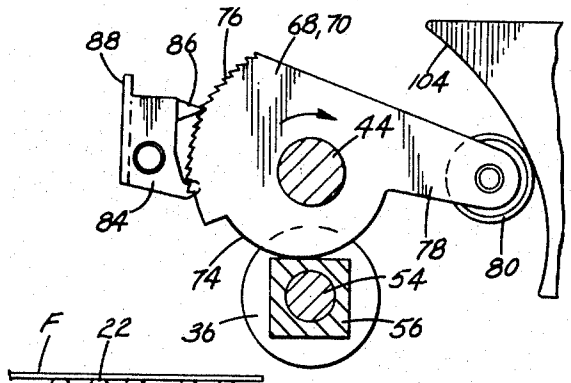


Fig. 6

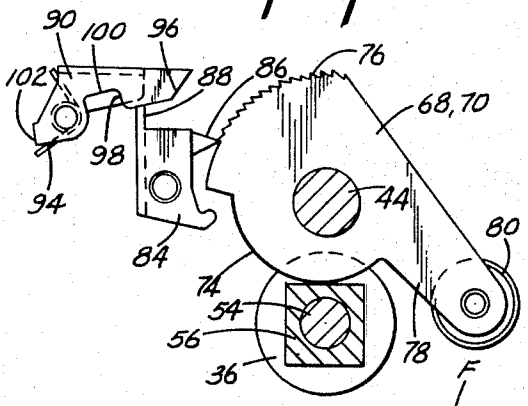


Fig. 7

JAMES T. ZOFCHAK
INVENTOR
BY Ray S Ryla
ATTORNEY

COMPENSATING PLATEN FOR PRINTING MACHINES

BACKGROUND OF THE INVENTION

Sales slips were once entirely handwritten with a carbon copy being made for the customer. Then the advent of the embossed metal plates for department store charge purposes eventually led to the more complete embossed plastic cards so widely known and used currently. Such cards are known generically as printing devices, and contain various information in addition to the customer's name. They are employed as source data in a data recorder which causes a roller platen to press an interleaved carbon form set against the embossed surface of the card. Other information is handwritten on the form before the transaction is completed.

Machines have been developed wherein a series of print wheels having a plurality of faces, each face carrying different indicia, are held in a group and aligned with the position in which the credit card is placed for printing. Thus, variable data, such as the money amount of the transaction, can be imprinted on the form along with the fixed data from the embossed card. The use of a variable printing unit along with fixed printing devices enables the printing of this necessarily exact information, in order to avoid errors due to illegible handwriting.

Although the present day data recorders are well suited to producing documents in a legible, accurate manner, so that the documents can subsequently be processed by data processing equipment, it has been found that a great variety of data recorders are required in order to meet the requirements of the many different applications. One of the major problems in attempting to provide a standarized data recorder for use in various applications is that the forms to be imprinted differ in thickness.

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. Accordingly, it is necessary to djust the platen to a selected printing position spaced from the bed for different thicknesses of forms in order to obtain dense, high quality printed impressions suitable for machine processing.

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 various thicknesses of the forms. Some of these prior art devices utilize a compensating anvil which is spring loaded to permit movement of the anvil away from the roller platen as a result of the pressure applied to the anvil by the platen during a printing operation. However, this arrangement can provide only a limited amount of compensation. Other devices provide a compensating roller platen such that the axis of rotation of the platen can be adjusted to accommodate different thicknesses of forms to be imprinted. In this case, it is necessary to manually adjust the platen for each different thickness range of forms to be printed. Another platen compensating arrangement, similar to the present invention in performance but different in construction and operation, is shown in Maul et al., U.S. Pat. No. 3,277,822.

SUMMARY OF THE INVENTION

The present invention provides a data recorder having a compensating means associated with the platen for placing the platen at a selected printing position spaced from the bed, as determined by the thickness of the form to be imprinted, and means for maintaining the platen at the selected position during a printing stroke.

It is an object of the present invention to provide a printing machine incorporating means for sensing the thickness of the form to be imprinted, and compensating means for establishing the selected printing position of the platen to accommodate the sensed thickness.

Another object of the invention is to provide catch means for locking the platen at the selected printing position during a printing stroke, and for unlocking the platen for movement to a raised position spaced above the bed a greater distance than the selected position for return movement of the carriage to the home position.

Another object of the invention is to provide compensating means for regulating the spacing of the platen in relation to the bed for various thicknesses of forms, which may be incorporated in various types of printing machines and data recorders.

A feature of the invention is to provide a printing machine capable of printing clear and uniform impressions on a wide variety of business forms having substantial variations in the thicknesses of the form sets.

Other objects, features and advantages of the invention will appear hereinafter as the description proceeds.

IN THE DRAWING

FIG. 1 is a perspective view of a printing machine with a compensating platen constructed in accordance with the present invention, showing the printing head in an open position;

FIG. 2 is a side elevation of the platen compensating means and the carriage as viewed on the line 2—2 of FIG. 1, but drawn to a larger scale;

FIG. 3 is a section taken on the line 3—3 of FIG. 2, with the printing head in a closed position, showing the compensating means and the relationship of the platen and the carriage mechanism to the bed of the machine;

FIG. 4 is a fragmentary front elevation showing the position of the compensating means as the carriage is moved away from the home position;

FIG. 5 is similar to FIG. 4 but shows the position of the compensating means during a printing stroke;

FIG. 6 is similar to FIG. 4 but shows the position of te compensating means when the carriage reaches the actuated position; and

FIG. 7 is similar to FIG. 4 but shows the position of the compensating means just prior to return of the carriage to the home position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention is applicable to various types of printing machines known in the art and to the general public. Therefore, to abbreviate the description, only the necessary elements of a standard printing machine are illustrated. For purposes of this disclosure, the inven-

tion will be described as it might be incorporated in a data recorder, for example, of the kind having a pivotally mounted printing head as shown in Maul U.S. Pat. No. 3,138,091. However, it is to be understood that the invention is equally applicable to fixed head data recorders, for example, of the kind shown in Maul U.S. Pat. No. 3,018,725.

As shown in FIG. 1, the data recorder comprises a base 10 and a printing head indicated generally by the reference numeral 12. The printing head is pivotally mounted at 14 on the base 10 for movement between an open position spaced from the base and a closed printing position against the base. The data recorder also includes a bed 16 provided with suitable guides such as 18 and 20 for holding an embossed card 22 containing data to be printed.

Still referring to FIG. 1, the machine illustrated has a variable data printing unit comprising a series of coded print wheels 24 mounted on the bed, which wheels are selectively settable under control of keyset levers 26. However, since such wheels are not essential to this invention, and are old and well-known, they need not be further detailed herein.

With further reference to FIG. 1, the printing head 12 includes a pair of side plates 28 and 30 held relationship in spaced apart reltionship by a U-shaped channel member 32. A carriage indicated generally by the reference numeral 34 is supported on the channel 32 for movement along the greater portion of the length of the channel. The carriage supports a roller platen 36 for movement transversely across the bed 16 from a home position shown in FIG. 3, to an actuated position shown in FIG. 6 to perform a printing stroke when the printing head 12 is in a closed position. This motion of the platen across the bed is effective to imprint the data onto a form F overlying the printing elements on the bed. On completion of a printing stroke, the printing head is caused to move to its open position and the carriage is returned to the home position.

As shown in FIG. 2, the carriage 34 comprises a U-shaped member providing a pair of depending side walls 40 and 42. A rod 44 is supported in the side walls and extends outwardly beyond the side walls. A pair of rollers 46 and 48 are mounted on the rod, one at each end, and are adapted to ride on the lower edges of flanges 50 and 52 respectively, of the channel member 32. The roller arrangement controls and guides the movement of the carriage and is fully disclosed in the above U.S. Pat. No. 3,138,091.

The roller platen 36 is mounted on a shaft 54 rotatably supported in a bearing block 56 at one end and in a bearing block 58 at the other end. The side wall 40 is provided with an opening 60 for slidably receiving the bearing block 56, and the side wall 42 is provided with a similar opening 62 for slidably receiving the other bearing block 58. As will be further explained, the roller plate 36 is adapted for movement between a raised position as shown in FIG. 3, and a lowered printing position selected from a plurality of possible positions spaced from the bed a distance less than the raised position, as shown in FIG. 4. The platen 36 is normally biased to the raised position by a pair of springs 64 and 66 connected to the ends of the rod 44 and the shaft 54.

With reference to FIGS. 2 and 3, there is shown a compensating mechanism comprising an actuating means including a pair of cam members 68 and 70 each secured to opposite ends of a sleeve 72 to provide an integral cam assembly. The cam assembly is positioned between the side walls 40 and 42, and the sleeve 72 is rotatably supported on the rod 44. The cam members 68 and 70 are each provided with a cam edge 74 adapted to act against the bearing blocks 56 and 58. Each cam member has a plurality of ratchet teeth 76 and an extension arm 78. Additionally, the cam member 68 is provided with a roller 80 supported on the arm 78.

As seen in FIGS. 3, 4 and 5, the cam edges 74 are eccentric with respect to their pivotal centers about the rod 44, with one area the least distance from the center of rod 44 designated a dwell portion, such that when the cams are in the position shown in FIG. 3 the dwell portion of each of the cam edges is in contact with the bearing blocks 56 and 58 and the platen 36 is held in the raised position by the springs 64 and 66. When the cams are rotated to the position shown in FIGS. 4 and 5, the lobe of each of the cam edges is in contact with the bearing blocks and the platen is in the lowered position. As viewed in FIG. 3, the cams 68 and 70 are normally urged in a counterclockwise direction under the biasing action of a spring 82 to thereby cause the lobe of each of the cam edges acting against the bearing blocks to drive the platen downwardly to the selected printing position. The use of two cams each acting against a separate bearing block provided at each end of the platen shaft 54 affords uniform raising and lowering motion of the platen without causing tilting of the platen or binding of the bearing blocks in their vertical sliding movement within the openings 60 and 62 in the side walls 40 and 42.

As best shown in FIG. 3, a catch member 84 is pivotally mounted on the side wall 42 of the carriage 34. The catch member includes a pawl 86 positioned to coact with the ratchet teeth 76 on the cam member 70. An ear 88 projects upwardly towards a trip member 90. As viewed in FIG. 3, the catch member 84 is normally urged in a clockwise direction by a spring 92 to maintain the pawl 86 in engagement with the ratchet teeth 76.

Still referring to FIG. 3, the trip member 90 is pivotally mounted on the inside face of the flange 52 of the channel 32, and is normally urged in a clockwise direction by a torsion spring 94. The trip member is provided with a nose portion 96, an edge 98 created by a recess 100 and a stop surface 102 which abuts the side plate 28 and prevents further clockwise pivotal movement of the trip member beyond the position shown in FIG. 3.

In operation, as the carriage 34 is moved from the home position shown in FIG. 3, towards the right to the actuated position shown in FIG. 6, the ear 88 of the catch member 84 strkes the edge 98 on the trip member 90. Because the point of the ear 88 with the edge98 is on the horizontal centerline of the pivot of the trip member 90, there is no pivotal motion imparted to the trip member 90 and the catch 84 is caused to pivot in acounterclockwise direction against the biasing action of the spring 92. This pivotal motion of the catch causes withdrawal of the pawl 86 from the ratchet teeth 76, thereby releasing the cams 68 and 70 for pivotal movement in a counterclockwise direction, under urging of the spring 82, to the position shown in FIG. 4. As the cams are thus pivoted, the lobe of each of the cam edges 74 drives the bearing blocks and the platen

supported thereby downwardly to a selected printing position in spaced relation to the bed. In this regard, the machine is also provided with an adjustable sensing pad **23** rigidly mounted in the bed **16.** A form to be imprinted is placed on the bed in overlying relation with the printing devices and the sensing pad as shown in FIGS. **3** and **4.** Thus, as the platen is driven downwardly it strikes the form and presses it against the sensing pad. Because the sensing pad is rigid, the downward motion of the platen, under urging of the spring **82,** is arrested with the form squee7e: between the platen and the sensing pad. Depending upon the thickness of the form, as sensed by the platen acting against the form and the sensing pad, the platen will be spaced a greater or lesser distance from the bed. However, in each case the platen will be at a proper printing position selected from a plurality of possible positions as established by the thickness of the sensed form.

The sensing pad is adjustable so that it may be positioned at a proper level with respect to the printing devices on the bed to provide an optimum condition for the platen sensing the form against the sensing pad to obtain dense, high quality impressions on the form. Once the sensing pad is properly positioned, it is locked in place and no further adjustment is required during machine operation.

During and in response to initial movement of the carriage from the home position the platen is lowered to the sensing position shown in FIG. **4.** Continued movement of the carriage allows the ear **88** of the catch **84** to pass by the trip member **90,** and the spring **92** pivots the catch in a clockwise direction to position the pawl **86** in holding engagement with the ratchet teeth **76** as shown in FIG. **5.** The pawl is effective to hold the cams in this position and the platen at the selected printing position during the remainder of the travel of the carriage through a printing stroke.

As thus defined the trip member **90** is a means for moving the catch **84** from the locked to the unlocked position shown in FIG. **4.** The preferred embodiment employs a physical lateral movement relationship to cause the catch to clear the trip member and return to the locked position shown in FIG. **5.** Although this may be defined as means for moving the catch from the locked to the unlocked position upon movement of the platen to the selected printing position, nevertheless electrical or other mechanical means may be employed to lock the actuating means and the platen prior to any actual further movement and, therefore, such device would also be considered a means for moving the catch means from unlocked to locked position upon movement of the platen to the selected printing position.

It should be understood that the pawl **86** is adapted to engage any one of the ratchet teeth **76** depending upon the position of the cams **68** and **70** as determined by the thickness of the form being imprinted. Thus, the spacing between adjacent ratchet teeth and the size of the teeth may be of any suitable dimensions. In practice, ratchet teeth in which movement between adjacent teeth produces either 0.001 or 0.002 inch movement of the platen has been found to be preferred.

When the carriage **34** reaches the actuated position as shown in FIG. **6,** the roller **80** on the cam **68** comes into contact engagement with a camming surface **104** affixed to the side plate **30.** Further movement of the carriage causes the roller to ride downwardly along the camming surface thereby pivoting the cam members **68** and **70** in a clockwise direction against the bias of the spring **82.** This pivoting motion of the cams presents the dwell of each of the cam edges **74** against the bearing blocks **56** and **58,** and the springs **64** and **66** urge the platen **36** upwardly to its raised position. Also, during the pivotal motion of the cams, the pawl **86** merely idles over the ratchet teeth **76** until it comes to rest in holding engagement with the first tooth of the ratchet as shown in FIG. **3.**

At this point the printing stroke is completed and the platen **36** is held in its raised position above the form for return movement of the carriage to the home position. If the data recorder is of the kind disclosed in the aforementioned U.S. Pat. No. 3,138,091, the printing head **12** is first moved to the open position on completion of the printing stroke and then the carriage is restored to its home position. In a fixed head data recorder as disclosed in the above U.S. Pat. No. 3,018,725, the carriage is returned to the home position with the platen in raised position to prevent double imaging or smudging of the form. In either case, the platen is restored to its raised position in response to completion of a printing stroke.

As the carriage **34** approaches the home position, the ear **88** of the catch member **84** abuts the nose portion **96** of the trip member **90** and pivots the trip member in a counterclockwise direction as viewed in FIG. **7.** The pawl **86** continues to be held in engagement with the ratchet teeth **76** under the influence of the spring **92,** and further movement of the carriage to the home position moves the ear **88** into the recess **100,** and the spring **94** pivots the trip member in the opposite direction to the position shown in FIG. **3.** In this position, the parts are in a neutral or start position in readiness for a subsequent printing operation.

From the foregoing, it will be seen that the present invention provides a novel platen compensating arrangement for imprinting high quality impressions on forms of various thicknesses. The compensating means positions the platen at the selected printing position in response to sensing the thickness of the form to be imprinted, and does not require independent operator adjustment of the platen printing position from one form to another form of different thickness. In addition to the operator convenience and the high quality printed impressions obtainable by the device of the present invention, it also offers the advantage of being readily incorporated in various types of existing printing machines.

What is claimed is:

1. A printing machine for printing a form by means of printing devices, in which forms of various thicknesses may be accepted, comprising:

a bed, means operatively associated with said bed projecting from the bed;

a carriage movable through a printing stroke across the bed from a first position to a second position;

a pad means in the bed for underlying a form in a printing position, said pad means having a reference surface related to the bed and the height of the printing characters projecting therefrom;

a platen and means supporting the platen in a nonprinting position on the carriage spaced from said pad means by a first distance;

said platen being movable from the nonprinting position to any one of a plurality of printing positions in which said platen is spaced from said pad means

by a distance which is less than said first distance and which is determined by the thickness of the form disposed on said pad means;

actuating means on the carriage for moving the platen towards the pad means to one of a plurality of printing positions, said platen in said one of said plurality of printing positions being disposed in engagement with a form disposed on said pad means;

catch means on the carriage movable between a first position retaining said platen against movement between the nonprinting and printing positions and a second position in which said catch means is ineffective to retain said platen against movement;

trip means operatively associated with said catch means for moving the catch means from its first position to its second position during initial movement of the carriage from the first position to thereby release said platen for movement from said nonprinting position to any one of said plurality of printing positions; and

means operatively associated with said catch means for moving the catch means from the second position to the first position when the platen is in one of said printing positions;

a baising means on the carriage for normally urging the platen to the nonprinting position; and

said actuating means comprising means for acting in opposition to the biasing means and for moving the bearing means toward said pad means when said catch means is in its second position to effect movement of said platen from the nonprinting position to any one of said plurality of printing position.

2. A printing machine for printing a form by means of printing devices, in which forms of various thicknesses may be accepted, comprising:

a bed, means operatively associated with said bed for establishing printing characters projecting from the bed;

a carriage movable through a printing stroke across the bed from a first position to a second position;

a pad means in the bed for underlying a form in printing position, said pad means having a reference surface related to the bed and the height of the printing characters projecting therefrom;

a platen and means supporting the platen in a nonprinting position on the carriage spaced from said pad means at a first distance;

said platen being movable from the nonprinting position to any one of a plurality of printing positions in which said platen is spaced from said pad means by a distance which is less than said first distance and which is determined by the thickness of the form disposed on said pad means;

actuating means on the carriage for moving the platen towards the pad means to one of the plurality of printing positions, said platen in said one of said plurality of printing positions being disposed in engagement with a form disposed on said pad means;

catch means on the carriage movable between a first position retaining said platen against movement between the nonprinting and printing positions and a second position in which said catch means is ineffective to retain said platen against movement;

trip means operatively associated with said catch means for moving the catch means from its first position to its second position during initial movement of the carriage from the first position to thereby release said platen for movement from said nonprinting position to any one of said plurality of printing positions; and

means operatively associated with said catch means for moving the catch means from the second position to the first position when the platen is in one of said printing positions;

said actuating means including a plurality of ratchet teeth, said catch means comprising a pawl;

and wherein a biasing means on said carriage normally urges the catch means to the first position for maintaining the pawl in engagement with the ratchet teeth;

whereby movement of the catch means to the second position withdraws the pawl from engagement with the ratchet teeth to release the actuating means, and movement of the catch means to the first position under the influence of the biasing means restores the pawl into engagement with the ratchet teeth to lock the actuating means during movement of the carriage.

3. A printing machine as set forth in claim **1** including means adjacent the end of the bed for moving the platen from said printing positions to said nonprinting position in response to movement of said carriage to its second position.

4. A printing machine as set forth in claim **2** further including means adjacent the end of the bed for moving the platen from said printing positions to said nonprinting position in response to movement of said carriage to its second position.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,756,151 Dated September 4, 1973

Inventor(s) James T. Zofchak

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

Column 5, line 11, "squee7e:" should read -- squeezed --. Column 6, line 54, after "bed" second occurence, there should be inserted -- for establishing printing characters --. Column 7, between lines 24 and 25, there should be inserted -- said platen supporting means comprising: bearing means movably mounted on the carriage for supporting the platen for movement between the non-printing position and printing positions; --; line 32, "position" should read -- positions --.

Signed and sealed this 1st day of January 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.