United States Patent

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[54] IMPRINTING APPARATUS

10 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **101/269,** 101/282
[51] **Int. Cl.** **B41f 3/04**
[50] **Field of Search** 101/269, 252, 264, 282; 308/6

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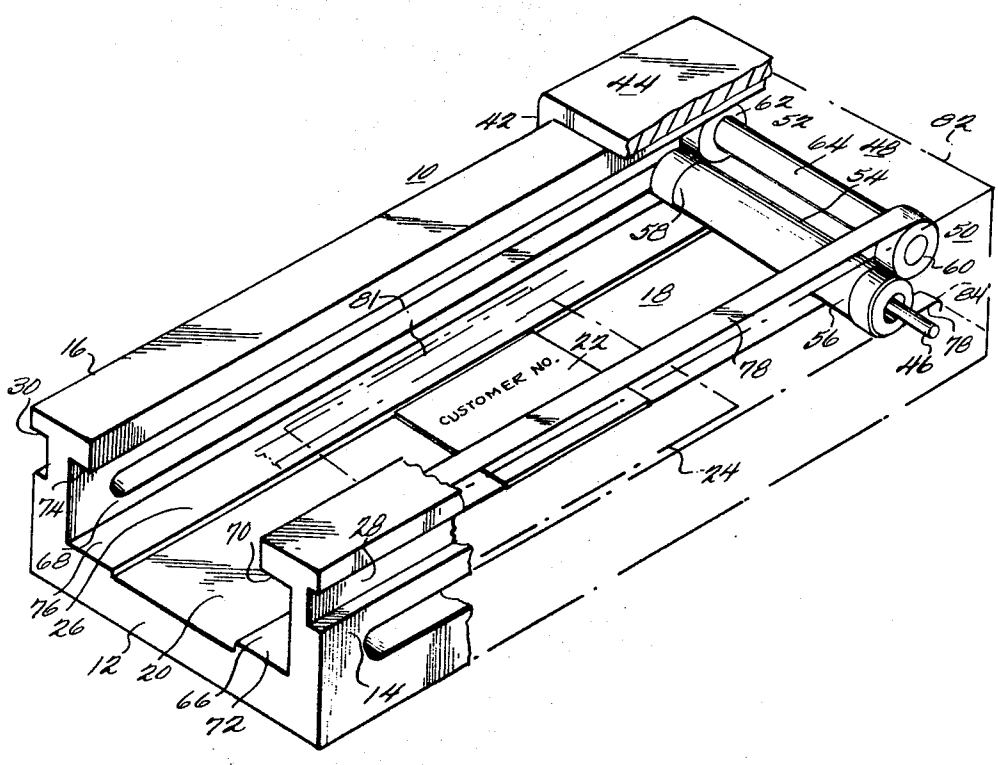
ABSTRACT: An imprinting device is disclosed wherein the imprinter roller assembly is loosely connected to the assembly carriage, the imprinter roller being supported at each end thereof by a roller cluster. Each roller cluster is supported by a flexible metal band, the band being fixedly connected at one end of the imprinter and adjustable connected at the other end thereof, each band being confined at the top and bottom thereof by suitable tracks disposed along the imprinter length. Each band passes over and around one of the rollers of its associated roller cluster and then around and under the other roller of its associated cluster. The corresponding rollers of each cluster are connected together by appropriate means. The points where the bands are fixedly connected to one end of the imprinter are disposed immediately above the print bed level, this end of the imprinter corresponding to the start position of the imprinter head. The print bed is provided with a recess, the depth of which is slightly greater than the card body thickness, this recess receiving the printing plate or card prior to the imprinting operation. A document or invoice is placed over the printing plate and onto the print bed. The document is held in place during the imprinting operation by the bands which are drawn over the invoice as the imprinting operation takes place. Thus, no movement of the document occurs during imprinting. The imprinting head is then returned to its initial position, a second imprinting operation occurring during this return stroke. The document remains securely in place with respect to the position in which it was held during the first imprinting stroke since the bands are withdrawn as the second imprinting operation occurs. With the head returned to its initial position, the document and printing plate can be removed.



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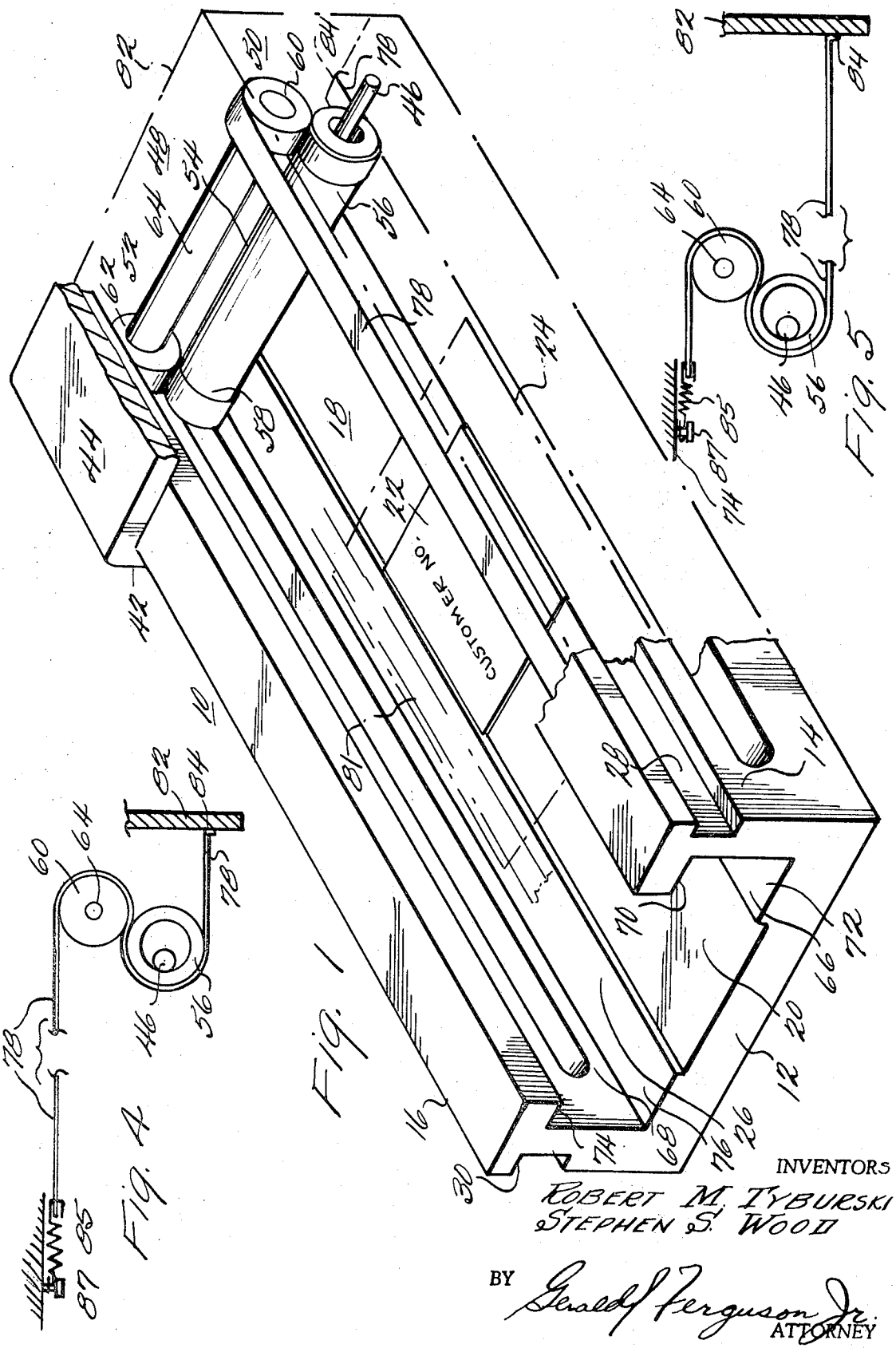

FIG. 1

FIG. 2

FIG. 3

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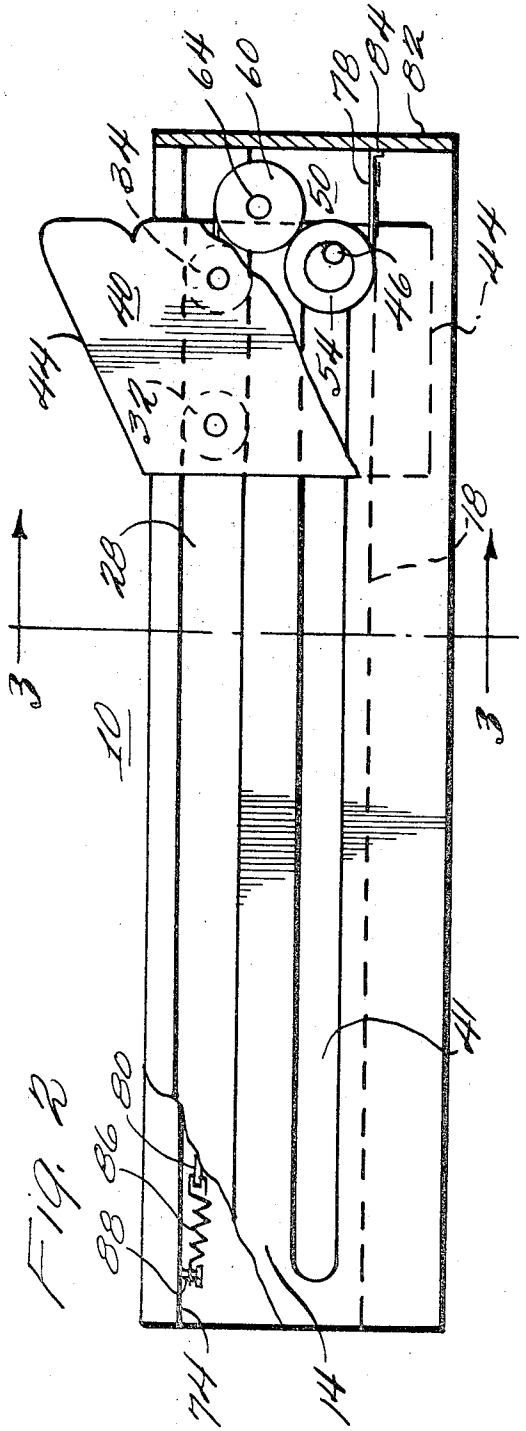

FIG. 2

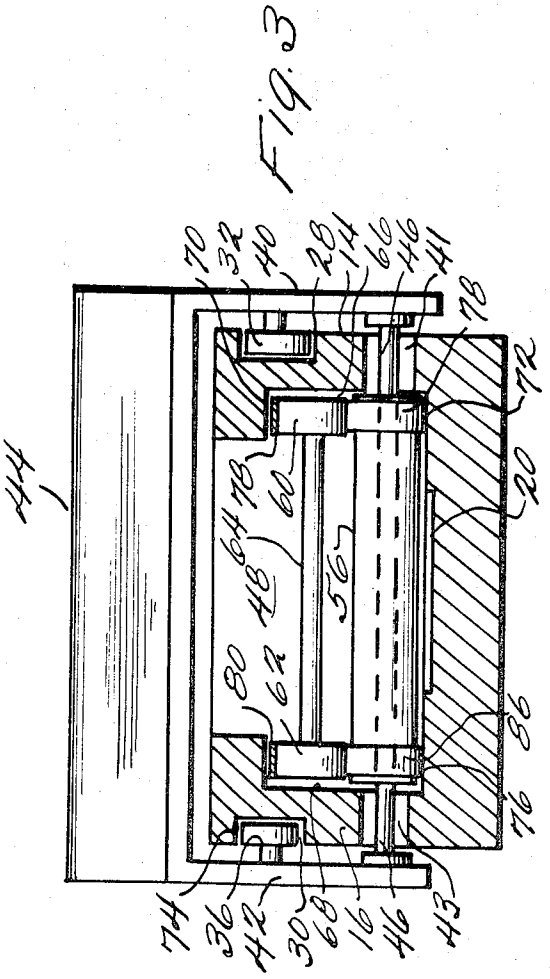

FIG. 3

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IMPRINTING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to imprinters and, in particular, to an improved imprinter for use with printing plates such as credit cards and the like. The basic mechanical principle utilized in this invention is described in an article in Machine Design, Nov. 9, 1967, pages 44—48. Heretofore, in the imprinter field, there has been a significant effort to provide automatic, simple, effective compensation of varying document, embossing, and card thicknesses, which invariably deteriorate print quality inasmuch as the heaviness of the print obtained from a new credit card or the like, for example, is usually heavier than that obtained from a well used card. This, in turn, renders the automatic machine reading of these characters more difficult in that the print quality is not optimum.

Thus, it is important object of this invention to provide an improved imprinter incorporating the mechanical principle described in the above-mentioned article.

Further, another problem of import in this field arises because of the amount of force required to effectuate an imprint. Needless to say, the strength of the operators of imprinters varies significantly. Thus, in department stores and the like lady operators may find it quite difficult to operate the imprinter if the imprinter is so adjusted to accommodate a card of average thickness and if a new card is used, the thickness of the embossing thereof generally being thicker than the average.

Thus, it is another important object of this invention to provide a improved imprinter wherein the amount of force required to create an imprint is substantially lessened.

Another problem in the imprinting field arises from the fact that it is necessary to fixedly connect a roller platen assembly to the carriage therefor, the operator normally pulling or pushing the carriage together with its associated imprinter roller assembly across the print bed to effectuate an imprint. However, because of the number of manufacturing tolerances that must be dealt with, the roller platen assembly generally is skewed to some degree with respect to the carriage. Hence, as the roller is moved across the document on the print bed, it tends to also skew the document thereby causing the characters printed on the document to also be skewed. This is another factor which tends to deoptimize the machine reading efficiency.

Thus, it is another important object of this invention to provide an improved imprinter incorporating the mechanical principle discussed in the above article wherein the imprinter roller assembly is loosely connected to the carriage thereby minimizing the above-mentioned effect of manufacturing tolerances.

Another problem which arises because of the fixed connection between the carriage and imprinter roller assembly is that operators of different strengths can cause varying printing densities. Further, different print densities can arise depending on whether the imprinting head is pulled or pushed across the imprint bed. In gas stations, the location of the imprinter is such that quite often it is pulled across, while in department stores, they tend to be pushed across.

It is a further important object of this invention to provide a loose connection of the above-mentioned typed between an imprinter roller assembly and its carriage thereby lessening the undesirable effect on print density caused whenever a fixed connection exists between these components.

Further, because of the loose connection between these components, manufacturing costs are lessened since the number of tolerances that usually have to be dealt with is reduced.

In conventional imprinters, it is necessary to provide anvils to support a printing plate such as a credit card. Further, it is necessary to shim an anvil to appropriately adjust the height thereof with respect to the imprinter roller.

Anvils and, in particular, the need for adjusting the height thereof can be eliminated in accordance with this invention.

In many conventional imprinters, an imprint is effected by moving the imprint head over the invoice and printing plate in a first stroke, the imprinter roller assembly being raised from the print bed during the return stroke of the head. Thus, the roller assembly has acted upon the document only one time. Hence, it quite often turns out that the quality of the imprint may not be as good as possible because of voids or the like within the character strokes. Of course, it would be possible to move the imprint head over the document again to thereby effect a double imprint, however, the document is normally shifted during the first imprinting operation so that it is not in the same place during the second operation as it was in the first. Hence, the printed characters resulting from the second operation would be displaced with respect to those created by the first operation. Also, there are other imprinter types wherein an imprint is created when the head is moved in a first direction and another imprint is created when the head is moved in the opposite direction. However, these imprinters are also subject to the above difficulty whenever a double imprint is attempted.

It is thus a further important object of this invention to provide an improved imprinter wherein double imprints can be effected without significantly changing character stroke widths and where the document is maintained rigidly in the same place for both the first and second imprints.

Another problem with conventional imprinters is the smudging of the documents in the imprint area whenever an imprinting operation occurs. This quite often results whenever the imprinter roller undergoes pressure contact with the unembossed surface of a plate or card. Preferably contact of the roller platen should be made only with the embossed or raised characters on the card.

It is a further object of this invention to provide an improved imprinter wherein pressure contact of the roller platen is made only with the embossed or raised characters on the printing plate or card to thereby eliminate smudging in the imprint area.

Another problem with conventional imprinters arises because documents tend to move during an imprinting operation. The problem was discussed above with respect to double imprinting. However, the emphasis here is one of noting that, even if a double imprint is not attempted, the shift or movement of the document during the single imprint operation will result in smudging and/or distorted character stroke widths.

Hence, it is another object of this invention to provide an improved imprinter wherein the documents are held securely in place during imprint or return cycles.

Other objects and advantages of this invention will become apparent upon reading the appended claims in conjunction with the following detailed description and the attached drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an isometric illustration of an illustrative embodiment of the invention.

FIG. 2 is a front, elevation view of the FIG. 1 embodiment.

FIG. 3 is a cross section taken on line 3–3 of FIG. 2.

FIGS. 4 and 5 are diagrammatic views illustrating the principle operation of the invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. 1, the imprinter is generally indicated at 10 having a base 12 with sidewalls 14 and 16, the base 12 is provided with a print bed area generally indicated at 18 which is recessed as indicated at 20 to receive a printing plate, credit card or the like indicated at 22. As will be explained in more detail hereinafter, the depth of the recess 20 is slightly greater than the thickness of the card body. Disposed over the credit card and indicated in phantom lines is an invoice 24. The invoice extends generally across the print bed area as shown in FIG. 1, the reason for this to be described in more detail

hereinafter. The base 12 and sidewalls 14 and 16 form an opening 26 at the end of the imprinter, the card 22 and the invoice 24 being typically inserted through this opening. The card 22 and invoice 24 could also be inserted through openings in the side of the imprinter if so desired; however, such openings are not shown in this embodiment of the invention.

The sidewalls 14 and 16 are provided with channels 28 and 30, as can best be seen in FIG. 3. Channel 28 receives a pair of wheels or roller bearings 32 and 34 as can best be seen in FIG. 2. Channel 30 receives a corresponding pair of wheels or roller bearings 36 and 38, only one of which is shown at 36 in FIG. 3. The wheels or roller bearings 32—38 are rotatably connected by appropriate means to the side legs 40 and 42 of roller platen assembly carriage or handle 44. Also connected between the legs 40 and 42 is a shaft 46 which may be either rotatably or fixedly connected to the legs 40 and 42; however, it is preferably that it be rotatably connected to the legs. The shaft 46 extends through longitudinal extending apertures 41 and 43 disposed in sidewalls 14 and 16, respectively.

Shaft 46 is employed to transmit linear motion from handle 44 to a roller platen assembly generally indicated at 48. The roller platen assembly comprises a pair of roller clusters generally indicated at 50 and 52. The roller platen is indicated at 54 and preferably comprises an aluminum hollow sleeve through which shaft 46 is loosely inserted. Roller platen 54 includes end portions 56 and 58. Idler rollers 60 and 62 are connected by idler shaft 64. The above-mentioned roller cluster 50 thus comprises idler roller 60 and end portion 56 of platen 54, the end portion being considered a distinct roller for purposes of this invention. The second roller cluster pair 52 comprises idler roller 62 and end portion 58. Idler rollers 60 and 62 are preferably steel ball bearing rollers. It will, of course, be appreciated by those of ordinary skill in this art that an ink roller can be provided about sleeve 54 whenever the imprint is not effected by carbon transfer.

The side plates 14 and 16 include a second channel pair 66 and 68, channel 16 having an upper track 70 and a lower track 72 integral with the upper surface of the print bed. Channel 68 has an upper track 74 and a lower track 76, track 76 also being integral with the print bed upper surface. Respectively disposed within channels 66 and 68 are bands 78 and 80. Preferably these bands are flexible and made from a material such as steel, beryllium, or copper. Bands 78 and 80 are of the exact same construction and are connected to the imprinter in exactly the same way. Thus, unnecessary duplication of the description of the construction and operation of these bands will be avoided whenever possible. Both of the bands are fixedly connected to end plate 82, the connection of band 78 being shown in FIGS. 1 and 2. Further, each of these bands are adjustably connected at their other end, the details of the connection of band 80 being shown in FIG. 2 at the broken away section of the imprinter. Spring 86 is connected at one end thereof to band 80 and at the other end thereof to a post 88 which extends downwardly from track 74.

Referring to FIG. 4, band 78 is shown extending from plate 82 under and around roller platen sleeve 56 and then over and around idler roller 60 and thence to spring 85, which corresponds to spring 86 of FIG. 2. The spring is connected to post 87. As can be seen from FIG. 2, band 78 is confined from below by track 72 and from above by track 70. Further, band 80 is confined from below by track 76 and from above by track 74.

Having now described the structure of the invention, the operation thereof will now be described. Referring to FIG. 4, the imprinter head or, in particular, the roller platen assembly is shown in its initial position. Note that in this position the length of band 78 disposed adjacent the print bed is minimal. In FIG. 5, the roller platen assembly is shown after a first imprint has been effected. Note that the band is now withdrawn against the upper surface of the print bed, this being indicated at 81 in FIG. 1 where a portion of the band 80 indicated in phantom lines is shown disposed over the edge of the invoice 24 to thereby secure it to the upper surface of the print bed. Hence, as long as the width of the document is such as to extend across the print bed 18 as indicated in FIG. 1, the bands 78 and 80 will secure the document in place. Further, as long as the imprint head is at the position indicated in FIG. 5, the document cannot be removed and will remain in a fixed position preparatory to a second imprint operation. The imprint head is then removed back to its initial position shown in FIG. 4, at which time a double imprint is effected to thereby insure that maximum carbon is transferred without unduly widening the character stroke widths.

As stated above, bands 78 and 80 are drawn over the edges of the document during the first imprinting stroke. These bands are then withdrawn from the document during the second imprinting stroke. It is only in this withdrawn position that a document can be positioned within the print bed.

Movement is imparted to the roller platen assembly 48 from handle 44 via shaft 46 which is loosely inserted within the roller platen sleeve. Thus, as the handle is moved over the print bed area, the shaft 46 presses against the inside of the sleeve 54 to impart linear motion thereto. In order to minimize friction between shaft 46 and sleeve 54, shaft 46 is rotatably mounted with respect to handle 44. Rotational movement is imparted to platen sleeve 54 because of the action of the bands in accordance with the mechanical principle discussed in the before-mentioned article.

Further, sleeve 54 is capable of thereby introducing compensation for varying card, document, and embossing thicknesses. This vertical movement results from the spring loading of bands 78 and 80 by springs 85 and 86. Thus, whenever a particularly thick area is traversed by platen sleeve 54, the springs will expand to allow the platen to raise from the print bed. The springs are so chosen that all loads exerted thereon operate over the linear portion thereof to maintain constant printing pressure regardless of the variation in thicknesses of documents, cards, or embossings.

As stated before, the shaft 46 is loosely connected to the roller platen sleeve 54. In order to effectuate an imprint operation, the handle 44 is moved thereby forcing the shaft 46 against the interior wall of the sleeve and thus imparting motion thereto. Since shaft 46 rotates, friction between the shaft and the sleeve is minimized. Preferably the internal diameter of the sleeve should be approximately twice the diameter of the shaft although these relative dimensions are not critical. Because of the loose connection between the shaft 46 and the sleeve 54, the skewed relationship between the roller platen and the carriage usually found in present imprinters is avoided. Also, it is evident that the number of manufacturing tolerances is significantly reduced as a result of this loose connection and the cost of manufacture is also reduced.

As stated before, the depth of the recess 20 is slightly greater than the thickness of the printing plate or card body. The total card thickness of the printing plate or card body. The total card thickness is equal to the thickness of the raised characters plus the thickness of the card body where the characters may be raised from the card body either by etching or embossing. The depth of the recess is slightly greater than the card body thickness but less than the total card thickness. Further, the roller platen 56 is displaced immediately above the print bed surface. Thus, the roller platen coacts only with the raised characters and no smudging occurs in the print area.

Numerous modifications of the invention will become apparent to one of ordinary skill in the art upon reading the foregoing disclosure. During such a reading it will be evident that this invention provides a unique imprinting apparatus for accomplishing the objects and advantages herein stated.

We claim:

1. Printing apparatus comprising:

a print bed;

a carriage having at least two rollers disposed at opposite sides thereof and cooperating with opposite sides of said printing apparatus for movement of said carriage over said print bed;

a roller platen;

means loosely connected between said carriage and said roller platen for moving said roller platen whenever said carriage is moved;

first and second channels respectively disposed at two sides of said printing apparatus;

first and second roller pairs respectively disposed and connected to opposite ends of said roller platen and respectively disposed within said first and second channels, one of said rollers of said first roller pair being connected to one of the rollers of said second roller pair and the other roller of said first roller pair being connected to the other roller of said second roller pair;

first and second flexible bands respectively disposed within said first and second channels, each band being connected at one end of said printing apparatus at the top of its associated channel and at the other end thereof at the bottom of its associated channel and each band passing from its connection at said one end of the imprinting apparatus over and around one roller of its associated roller pair and then around and under the other roller of its associated roller pair and thence to said connection at the other end of said printing apparatus; and

whereby an imprint is created whenever said roller platen is moved across said print bed.

2. Apparatus as in claim **1** where the bottom of said first and second channels are coplanar with the upper surface of said print bed whereby said first and second bands clamp said document onto said print bed during a printing operation and prevent the removal thereof until the roller platen is returned to an initial position.

3. Printing apparatus as in claim **1** where said roller platen is

a sleeve and said means for moving said roller platen includes a shaft disposed within said sleeve and connected between vertical legs of said carriage, said shaft engaging the inner surface of said sleeve whenever the motion is imparted to said carriage.

4. Apparatus as in claim **3** where said shaft is rotatably mounted with respect to said carriage.

5. Apparatus as in claim **4** where the inner diameter of said sleeve is approximately 2 times the diameter of said shaft.

6. Apparatus as in claim **1** where said first and second bands are respectively movably connected with respect to said one end of said imprinting apparatus whereby variations in thicknesses of documents, printing plates and/or embossings may be compensated.

7. Apparatus as in claim **6** including two springs respectively connected between the ends of said bands and said one end to thereby effect said movable connection.

8. Printing apparatus as in claim **1** where said print bed is provided with a recess for receiving a printing plate, the depth of which is greater than the thickness of said plate and where said roller platen is disposed immediately above said print bed whereby only the roller platen and the raised characters coact during a printing operation and not the body of the plate to thereby eliminating smudging originating from the plate body.

9. Apparatus as in claim **8** where the depth of said recess is approximately 0.005 inch greater than the thickness of said plate body.

10. Apparatus as in claim **1** including an ink roller disposed about said roller platen.