

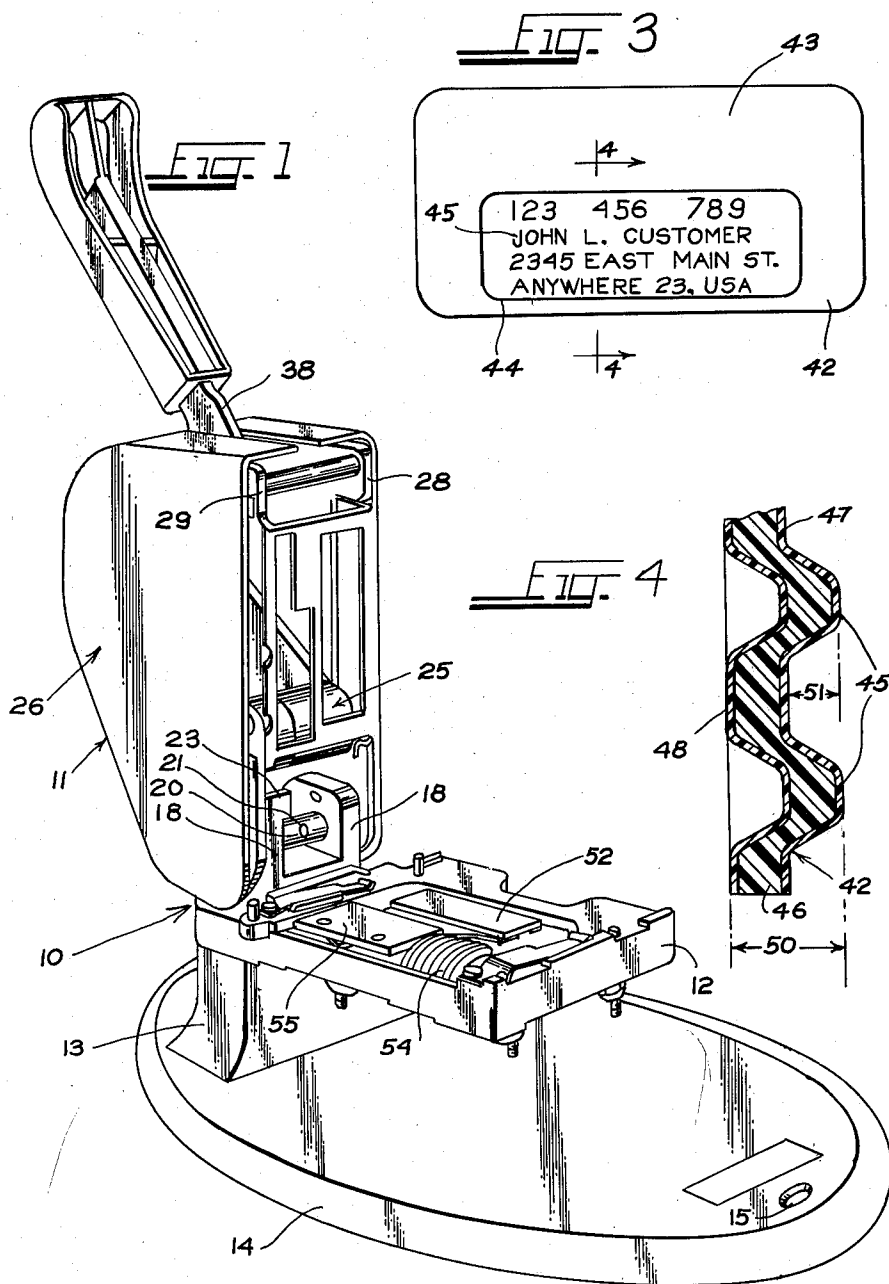
May 2, 1961

J. A. MAUL
PRINTING APPARATUS

2,982,205

Filed Aug. 30, 1956

4 Sheets-Sheet 1



INVENTOR.
JOHN A. MAUL
BY
Wallace and Cannon
ATTY'S.

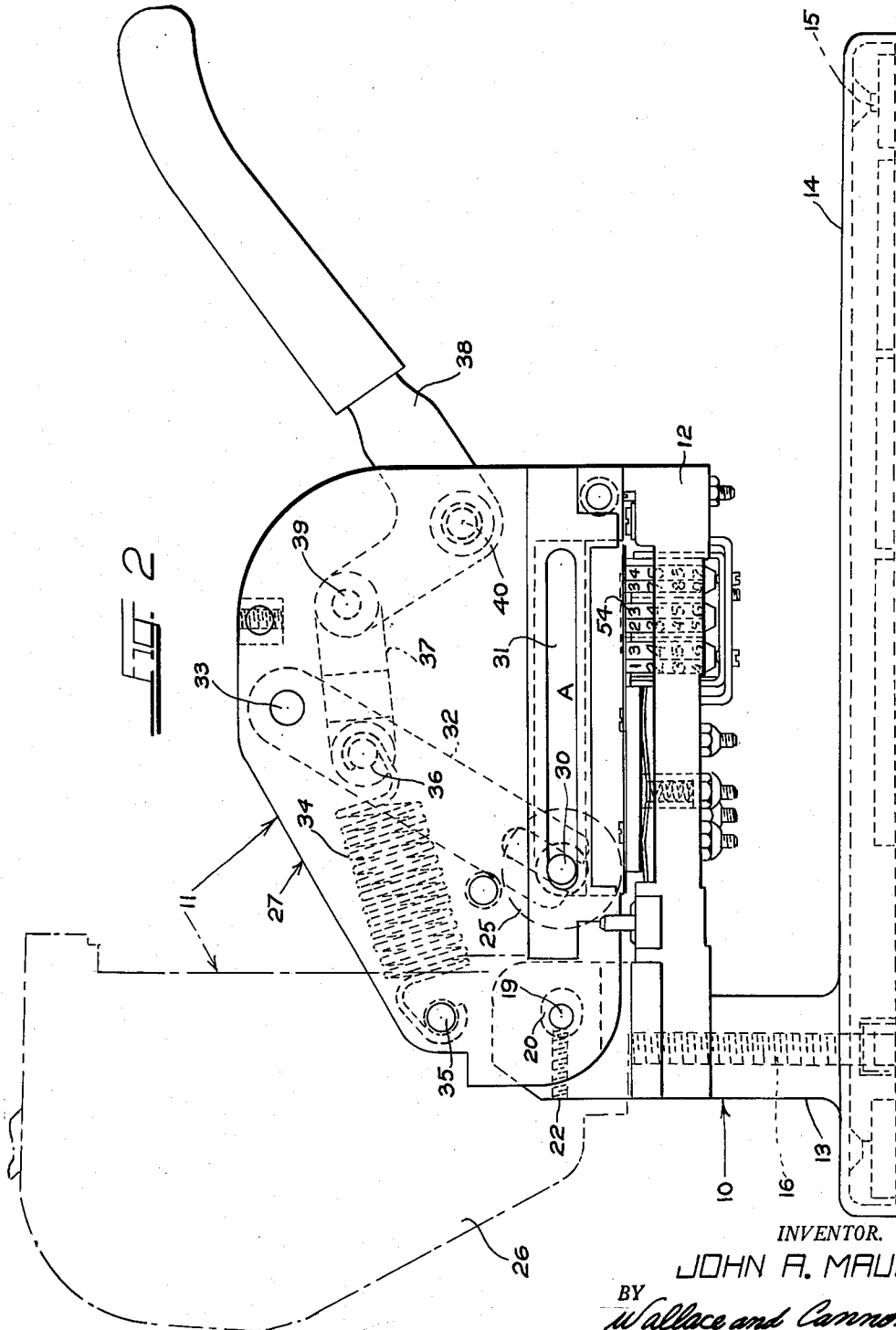
May 2, 1961

J. A. MAUL
PRINTING APPARATUS

2,982,205

Filed Aug. 30, 1956

4 Sheets-Sheet 2



INVENTOR.

JOHN A. MAUL

BY
Wallace and Cannon

Att'y's.

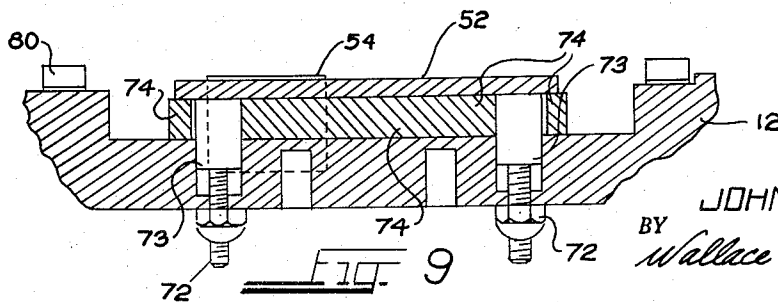
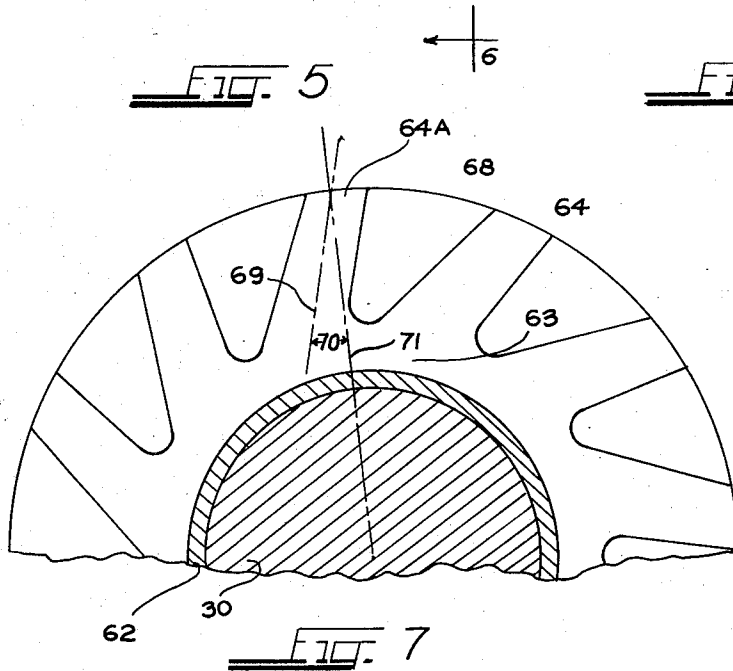
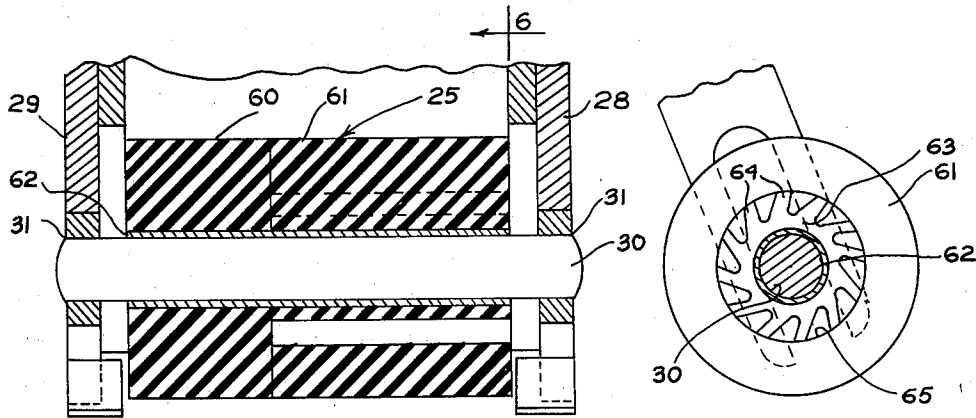
May 2, 1961

J. A. MAUL
PRINTING APPARATUS

2,982,205

Filed Aug. 30, 1956

4 Sheets-Sheet 3



INVENTOR.
JOHN A. MAUL
BY *Wallace and Cannon*
Attys.

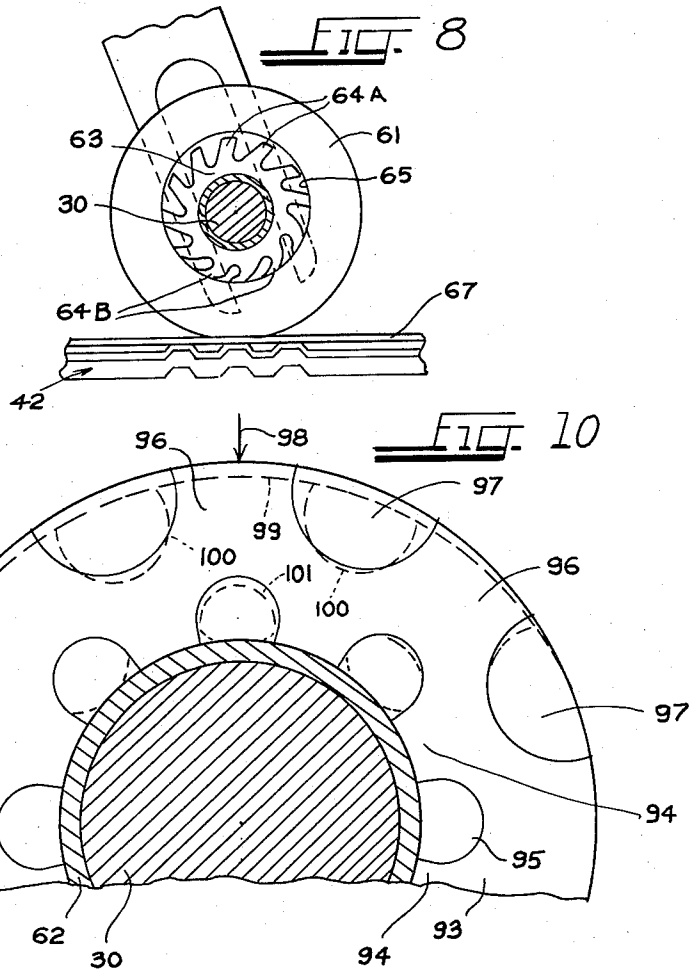
May 2, 1961

J. A. MAUL
PRINTING APPARATUS

2,982,205

Filed Aug. 30, 1956

4 Sheets-Sheet 4



INVENTOR.
JOHN A. MAUL
BY
Wallace and Cannon
Attys.

1

2,982,205

PRINTING APPARATUS

John A. Maul, Euclid, Ohio, assignor to Addressograph-Multigraph Corporation, Cleveland, Ohio, a corporation of Delaware

Filed Aug. 30, 1956, Ser. No. 607,102

10 Claims. (Cl. 101—269)

This invention relates to printing apparatus and more particularly to printing apparatus which is constructed and arranged for operation with printing plates which may vary substantially in overall thickness.

Printing apparatus, usually in the form of relatively small hand-operated printing machines, has come into widespread use in the field of credit transactions in retail stores and in analogous business situations where it is desirable to reproduce accurately and rapidly information relating to the party or parties involved in or other data relative to a given transaction. Typically, in credit-verification systems, each customer of a given store or group of stores may be issued an identification printing device which is embossed with the name, address, and other identifying information relating to the customer, such as an account serial number. Each time the customer makes a purchase under the account identified by this device, the device is positioned in a printing machine and employed to imprint the embossed information upon a sales slip, contract, or other business paper. The printing is usually accomplished with relatively small hand-operated printing machines each of which includes a means for supporting the identifying printing plate in a position in which the relief design on the plate may be engaged by one surface of a sheet of paper such as the sales slip or the like. A roller platen is then rolled across the opposite surface of the sheet in pressure contact therewith to imprint the sheet with the information carried by the relief design in the identification plate. An inked ribbon may be utilized in the machine to render the imprinted pattern visible and relatively permanent upon the paper; preferably, however, an ink-impregnated roller platen is utilized for this purpose.

Many credit identification and similar systems of the type outlined above have been placed in operation using metal identification plates embossed with the requisite information. With metal plates, it has generally been possible to maintain relatively close dimensional tolerances with respect to overall thickness of the printing plate, thereby permitting accurate and readable reproduction of the information carried by the plate. In recent instances, however, embossed plastic printing plates have been employed in systems of this general type. For various reasons, different manufacturers have selected different thicknesses for the plastic material from which these individual printing plates are fabricated. Moreover, it has been found that it is relatively difficult to maintain uniformity of thickness in the plastic printing plates as compared with metal plates. The printing machines heretofore employed in systems of this type have not given particularly satisfactory results when required to operate with a series of printing plates which vary greatly in thickness. Moreover, it has been found extremely difficult to employ printing machines designed for use with plastic identification plates of one thickness in conjunction with plates of a substantially different thickness.

The principal object of the present invention, there-

2

fore, is to enable a printing apparatus or machine to operate satisfactorily using printing plates which vary substantially in thickness.

Another object of the invention is to afford a printing apparatus which follows standardized construction insofar as possible but which can accommodate and function properly with printing plates of greatly differing thickness.

It is a corollary object of the invention to provide a new and improved roller platen structure which inherently compensates for variations in thickness of printing plates with which the platen is employed.

Accordingly, the invention is directed to a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed. The inventive structure includes a platen comprising a cylindrical printing element of relatively hard but nonetheless somewhat resilient material supported upon a core of relatively resilient material. This core comprises a cylindrical section having a plurality of projections extending therefrom to engage the printing element at spaced points around the inner surface of said element; these core projections define a series of longitudinal spaces into which the resilient material of the core projections may be deflected when the printing element is subjected to external pressure. In addition, means are provided for rolling the platen in pressure contact across the opposite surface of the sheet to imprint the sheet in a pattern determined by the aforementioned relief design of the printing plate.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the preview of the appended claims.

In the drawings:

Fig. 1 is a perspective view of a printing machine constructed in accordance with the present invention, the printing head of the machine being disposed in an elevated position;

Fig. 2 is an elevation view of the printing apparatus shown in Fig. 1 with the casing covering the printing head removed and the printing head disposed in lowered or printing position;

Fig. 3 is a plan view of a typical printing device or plate which may be employed in the printing apparatus of Figs. 1 and 2;

Fig. 4 is a fragmentary sectional view of the printing plate of Fig. 3 taken along line 4—4 therein;

Fig. 5 is a longitudinal sectional view of a platen roller constructed in accordance with the inventive concept;

Fig. 6 is an end view of the platen roller of Fig. 5 taken along line 6—6 therein;

Fig. 7 is an enlarged sectional view of a portion of the platen roller;

Fig. 8 is a view corresponding to Fig. 6, showing the inventive platen roller in operation;

Fig. 9 is an enlarged sectional view of the plate-positioning arrangement employed in the printing machine of Fig. 1; and

Fig. 10 is an enlarged sectional view, similar to Fig. 7, of another embodiment of a roller platen constructed in accordance with the invention.

One embodiment of a printing machine constructed in accordance with the present invention is illustrated by

printing apparatus 10 in Figs. 1 and 2. Printing machine 10 is of the type frequently used in connection with "charge plates" or similar small identification printing plates which are usually embossed with a name, address, and other information; in a typical credit system, printing machine 10 is utilized to print the information carried by the charge plate upon sales slips or similar paper instruments in department stores, automotive service stations, and like businesses. Printing machine 10 comprises a movable printing head 11 which is mounted for vertical pivotal movement relative to a stationary platform 12 which serves to support a charge plate or similar printing plate in a printing position in the machine as will be described more completely hereinafter. The printing platform 12 is supported by a vertical column 13 which is preferably formed as an integral part of a relatively large base 14. Base 14 may be provided with a countersunk opening 15 or other suitable means for mounting printing machine 10 upon a store counter; on the other hand, the weight of the machine itself may be relied upon to give it the necessary stability in use. Platform 12, column 13, and base 14 may conveniently be fabricated as a single casting; on the other hand, it may be desirable to cast column 13 and base 14 as one unit and to mount platform 12 upon that unit as by means of a relatively long bolt 16 extending from base 14 through column 13 and into the rear portion of platform 12 to rigidly connect the printing platform to the base structure as shown in Fig. 2.

In the illustrated embodiment, printing head 11 is pivotally supported in a pair of spaced upstanding support lugs 18 which may be formed as an integral part of printing platform 12 and which extend vertically upward from the rear or base portion of the printing platform. The pivotal connection between printing head 11 and support lugs 18 may be afforded by a pin 19 which is journaled in the two support lugs and an eccentric sleeve 20 mounted in encompassing relation to pin 19. Sleeve 20 is locked to pin 19 by a set screw 21, as indicated in Fig. 1. A second set screw 22 is threaded into the back 23 of printing platform 12 and may be utilized to hold sleeve 20 and pin 19 in any set position. Thus, the longitudinal position of printing head 11 may be varied slightly with respect to printing platform 12 by rotating pin 19 and eccentric sleeve 20 to bring portions of the eccentric sleeve of varying thickness into engagement with set screw 22 and set screw 22 can then be tightened to hold the pivotal mounting in the desired position.

Printing head 11 includes means for mounting a platen roller 25 within the printing head and for suitably moving the platen roller to carry out the printing operation, as will be described more completely hereinafter; in Fig. 2, the covering 26 of the printing head has been removed in order better to illustrate the platen mounting arrangement. As indicated in Fig. 2, the printing head of the machine includes a hollow frame 27 including a pair of side walls 28 and 29 (see Fig. 1). The platen roller 25 of the machine is mounted upon a shaft 30, and the two ends of the shaft are engaged in a pair of longitudinal guide slots 31 formed in the two opposed side walls of frame structure 27. Shaft 30 is also engaged by a pair of bifurcated lever arms 32, only one of which is shown in Fig. 2, the two lever arms being pivotally mounted within frame 27 by means of a pin 33. The platen operating levers 32 are biased toward a normal or inoperative position as by means of a spring 34, one end of which is connected to frame 27 by means of a pin 35, the other end being connected to levers 32 by means of a pin 36. A pair of connecting links 37, only one of which is shown in the drawing, are connected to pin 36 on the two operating levers, the opposite ends of the connecting links being pivotally connected to an operating handle 38 as by means of a pin 39, the

handle 38 being pivotally mounted upon frame 27 as indicated at 40.

Before considering operation of the printing machine 10 as generally described above, it is desirable to consider the construction and configuration of the printing plates with which the machine may be employed. A preferred form of printing plate is illustrated in Fig. 3 in the form of a charge plate or credit identifying device 42. Printing plate 42 may include printed information as indicated at 43 relating to the store or other business establishment issuing the identification plate; the printed information may also indicate terms and conditions for credit rendered and other like information. In addition, a relatively restricted area 44 of the printing plate is embossed or otherwise suitably deformed to establish a relief pattern which in most instances comprises a series of type characters 45. The relief pattern comprising type characters 45 may, for example, indicate the name and address of a customer or other person involved in the transaction to which printing plate 42 is directed and may also carry information relating to the account number of the customer, the period during which credit privileges are to be extended, or other similar information.

Fig. 4 shows a preferred construction for printing plate 42 in fragmental cross section; as indicated therein, plate 42 may comprise a base or foundation element 46 fabricated from some plastic which is dimensionally stable over a relatively wide temperature range. Vinyl chloride has been found to be satisfactory for this purpose, although other plastics may be equally suitable. Preferably, the printed information indicated at 43 in Fig. 3 is applied to base member 46 and is subsequently covered with a transparent plastic film 47; the reverse side of printing plate 42 may also be covered with a transparent film 48, particularly if this side of the identification plate is also employed to carry printed information. Preferably, the embossed or otherwise deformed areas 45 of the printing plate are formed after the transparent films 47 and 48 have been applied to the plate. The preferred plastic printing plate structure is described in detail in the co-pending application of Donald L. Erickson, Serial No. 615,170, filed October 10, 1956.

It should be understood that the invention is not restricted to use with the particular printing plate described above and illustrated in Figs. 3 and 4; rather, it may be employed with other plastic printing plate structures known in the art and may also be used interchangeably with metal printing plates. The essential and distinguishing feature of the invention may be said to reside in the fact that it is adaptable to use with printing plates of varying composition which exhibit substantial differences in overall thickness. Thus, the thickness 50 of the plastic printing plates currently in commercial use is not standardized or uniform; indeed, the very opposite is true. The overall thickness of these devices may vary over a range from approximately 0.025 inch to 0.06 inch, of which approximately 0.015 to 0.02 inch represents the height 51 of the embossed information 45 and the remainder of the overall thickness constitutes the thickness of the plastic plate before embossing. Thus, to function properly with the wide variety of cards presently employed in credit verification and similar systems, printing machine 10 must be adapted to afford substantially uniform results with printing plates having at least a 2:1 variation in thickness; expressed differently, the machine must accept and operate to produce legible printed information with printing plates which vary by as much as 0.03 inch in thickness.

Printing machine 10, as thus far described, is essentially conventional in construction, and co-operates with printing plate 42 in a manner well known in the art. Thus, when it is desired to place the machine in operation, printing plate 42 is mounted upon an anvil 52 which forms a part of the printing platform 12 in a

5

manner to be more completely described hereinafter in connection with Fig. 8. A sheet of paper, usually a sales slip or similar business instrument, is then placed over printing plate 42 and handle 38 is pulled downwardly to set the printing machine in operation. The biasing force exerted by spring 34 (Fig. 2) is made such that the initial movement of handle 38 brings head 11 to the printing position indicated in Fig. 2 without moving platen roller 25 from its normal or initial position as shown in that figure.

After printing head 11 is moved to the position shown in Fig. 2, however, continued downward movement of handle 38 overcomes the biasing force exerted by spring 34 and pulls the platen operating levers 32 forwardly in the printing head, moving platen roller 25 in the direction indicated by arrow A in the drawing. Consequently, the platen roller engages the paper or other sheet to be imprinted on the surface opposite the printing plate in a rolling pressure contact so that the information represented by relief design 45 on the printing plate (see Fig. 3) may be imprinted on the paper. The imprinted material may be made visible by the use of carbon paper or an inked ribbon in accordance with techniques well known in the art; preferably, however, platen roller 25 itself constitutes the ink source as will be described more completely hereinafter in connection with Figs. 5-7. The same rolling pressure contact of the platen roller with the sheet to be imprinted may be utilized to print other information upon the sheet; for example, a conventional dater 54 may be mounted in printing platform 12, as indicated in Figs. 1 and 2, in the usual manner; moreover, a fixed printing plate 55 may be incorporated in the printing platform to afford a means for applying repetitive information to each sales slip or other document processed in the printing machine. In some applications, a second removable printing device similar to plate 42 may be used in conjunction with plate 42; a system of this type is described and claimed in the aforementioned Erickson application.

The versatility with respect to printing plate thickness requisite for operation of printing apparatus 10 in conjunction with a wide variety of different printing plates is achieved by means of the unique platen structure illustrated in Figs. 5-8 in conjunction with a fixed printing plate anvil, a typical construction for which is shown in Fig. 9. Thus, in Fig. 5 the roller platen 25 is shown in cross section, an end view of the same platen structure being provided in Fig. 6. As indicated in Fig. 5, the platen structure includes the axle shaft 30 which is employed to support the platen within guide slots 31 in the two sides 28 and 29 of the printing head frame. This particular embodiment of the platen structure includes two cylindrical printing elements 60 and 61, both of which are preferably formed from a relatively hard but nonetheless resilient porous material which is impregnated with ink. A preferred material from which the two printing elements may be fabricated comprises powdered or finely divided individual rubber particles bonded together with powdered or finely divided resin; preferably, the resin employed is of the thermosetting type. The printing elements are preferably formed under heat and pressure from the two powdered constituents to afford a material which exhibits both the resilient characteristics of the rubber and the hardness or rigidity of the resin and which includes a multiplicity of extremely fine capillary passages. This hard porous resilient material is then impregnated with ink and, when brought into contact with paper or any other suitable material to be imprinted, exudes the ink evenly by capillary action under even extremely light printing pressures. A self-inking platen of this type, which is described in the co-pending application of John H. Gruver and Lester F. Mitchell, Serial No. 404,368, filed January 15, 1954, now abandoned, can be employed for literally tens of thousands of individual impressions with relatively uniform results; the platen is not brittle, does not chip, and is extremely

6

strong due to the internal resin bond. A preferred method of obtaining a porous rubber-resin composition of this type is described in detail in application Serial No. 335,084, filed February 4, 1953, now U.S. Patent No. 2,763,208, and reference is herein made to that application for the various methods and specifications for compounding the printing element material. It should be noted that the term "rubber" as used hereinabove and elsewhere in this specification may include either natural rubber or a synthetic elastomer such as the Buna-N or Buna-S rubbers. Preferably, the material from which printing elements 60 and 61 are formed should exhibit a Shore A durometer hardness of approximately 60 to 100 with a porosity of the order of 5 to 75 percent.

Cylindrical printing element 60 is affixed to a metal sleeve 62 which, in turn, is mounted upon shaft 30 for rotational movement with the shaft. In this respect, section 60 of roller platen 25 is essentially similar to the platen structure described and claimed in the aforementioned Gruver-Mitchell application. Section 60 of the roller platen cooperates with the fixed printing plate 55 and the dater 54 (see Fig. 1) to reproduce repetitive information in the printing operation and accordingly is not required to compensate for the variations in overall height of the type characters or other relief design which may occur with printing plates 42. The other cylindrical printing element or platen section 61, however, is substantially different in basic construction; it is this portion of the roller platen which is utilized to print from the interchangeable printing plates and which must therefore accommodate itself to operation with relief designs having relatively widely different effective heights.

As indicated in Fig. 6, the internal diameter of cylindrical printing element 61 is made substantially larger than the external diameter of the sleeve 62 encompassing shaft 30, and a resilient fluted core 63 is employed to support printing element 61 upon the metal sleeve. Core 63 is fabricated from an elastomer or other similar resilient material, preferably having a durometer hardness of the order of 65; the material selected is not critical but should not swell unduly when immersed in a liquid such as ink. The core structure is generally cylindrical in configuration but is not continuous at its outer peripheral surface. Rather, the core comprises a plurality of skewed projections 64 which contact the inner surface 65 of printing cylinder at 61 at spaced points to support the printing cylinder upon axle 30. The unique construction of supporting core or bushing 64, with its resilient characteristics and skewed fluting construction, permits printing cylinder 61 to move vertically with respect to shaft 30 without distorting the peripheral configuration of the printing element. Consequently, the printing element may effectively accommodate printing plates such as plate 42 of substantially different thicknesses without distorting the image reproduced by the roller platen upon the sheet of paper or other material to be imprinted.

Fig. 7 affords an enlarged view and shows a preferred construction for the mounting bushing or core 63 of the second printing element 61. As shown in that figure, a series of longitudinal slots 68 are formed in the surface of core member 63, thereby affording the requisite series of skewed projections 64. As indicated in Fig. 7, the skew angle of projections 64 is relatively small; in the embodiment illustrated, the angle between the approximate center line 69 of projections 64A forms a skew angle 70 of approximately 10° with a radius 71 drawn through the center of the peripheral surface of the projection. The angle is not extremely critical but may vary over a substantial range; preferably, the skew angle should not be less than 5° nor more than 20° and will depend to some extent upon the resiliency of the particular material selected for the printing element core.

Fig. 8 illustrates, in a view similar to Fig. 6, the platen roller structure of Figs. 5-7 in operative pressure contact with a sheet of paper 67, the opposite surface of the

sheet of paper being of course in contact with the printing plate 42. As indicated in this figure, during operation of the printing machine, the downward pressure asserted upon roller platen printing element 61 is sufficient to distort the configuration of its supporting core 63 to a substantial extent. The projections 64A at the top of the lower platen core may instantaneously be relieved from engagement with the internal surface 65 of printing element 61, whereas the downwardly extending projections 64B are deflected from their original positions. In this connection, it should be noted that one of the important features of the invention is based upon the fact that distortion of the core projections is achieved primarily by deflection thereof and that the pressure asserted during the printing operation does not compress the core projections to a substantial degree. The importance of this feature is clearly apparent if it is considered that it is much more difficult to obtain a material capable of withstanding repeated distortion by compression and expansion as compared with materials capable of withstanding bending or deflection distortion over a series of repetitious operations.

Some printing machines similar to apparatus 10 (Fig. 1) have been equipped with anvils corresponding to anvil 52 which are resiliently supported upon the printing platform 12. In this manner, the anvil structure has been employed to compensate for some variations in overall thickness of the printing plates utilized in operation of the machines. In fact, certain constructions of this type have proved to be of considerable advantage in compensating for variations in plate thickness, as exemplified by the anvil support structure described in the copending application of John H. Gruver and Lester F. Mitchell, Ser. No. 404,368, filed January 15, 1954. Where extremely large variations in plate thickness are encountered, however, it has been found that a fixed anvil, used in conjunction with the above-described platen structure, affords even greater improvement in uniformity of printing than obtained in the printed material where a floating or resiliently mounted anvil is employed. Consequently, and as indicated in Fig. 9, it is preferred that a fixed or rigid anvil structure be employed. Thus, in a machine in which the anvil structure is removably mounted on the printing platform 12, anvil 52 may be fixedly mounted in the printing platform as by means of a plurality of bolts 72 which are threaded into extensions 73 of the anvil. The height of the anvil with respect to printing platform 12 may be determined by means of a spacer element 74 separating the anvil from the printing platform and the height of the anvil may be adjusted by changing the thickness of the spacer elements. The effective overall height of the type characters on dater 54 may vary somewhat with respect to the upper surface of anvil 52; in all instances, however, the type characters on the dater should extend somewhat above the level of the upper surface of anvil 52, as indicated in Fig. 9, in order to minimize the differential in height between the top of the relief design on the printing plate when mounted on the anvil and the top of the dater type characters. The printing plate 42 may be mounted on anvil 52 by any suitable means which permits ready insertion and removal of the plate; in the illustrated embodiment, the plate mounting means comprises a pair of clips 80 disposed at opposite sides of the anvil.

Of course, since the thickness of the printing plate may vary over a substantial range as indicated hereinbefore, it is not possible to fix the height of the dater at the same level for each of the many printing plates which may be employed in the machine. Generally speaking, it is preferable that the dater type characters be slightly lower than the height of the relief design on the thinnest of cards to be used in the machine in order to prevent the dater from deflecting the roller platen out of contact with the relief portions of the printing plate. Thus, for

example, the overall height of the dater type characters may be established at a level of the order of 0.01 inch lower than the relief surface of the thinnest printing plate to be employed in the machine. This precaution is not necessary, however, if printing element 60 is made to correspond in structure to printing element 61 so that the first printing element is also resiliently mounted upon shaft 30. Thus, it should be understood that the entire platen roller may be constructed in the manner described above for section 61 without departing in any sense from the invention.

It will of course be apparent to those skilled in the art that many of the structural details of the basic printing machine 10 may be varied substantially. For example, it is not necessary that the printing anvil 52 be made removable from platform 12; rather, the printing anvil may be constructed as an integral part of the printing platform of the machine. Moreover, the machine may be modified to accommodate a ribbon or other ink-supplying device in which instance a non-impregnated platen roller otherwise corresponding in construction to that described for roller 25 may be employed. Other auxiliary devices similar to dater 54 may be utilized in the machine and any of a wide variety of operating linkages and mounting arrangements may be employed for the platen roller as desired.

Fig. 10 illustrates, in a view similar to Fig. 7, an alternate embodiment of a core member adapted for use in a roller platen structure constructed in accordance with the inventive concept. As in the previously described embodiment, the platen core is supported upon an operating shaft 30 and may be affixed to a sleeve 62 which is removably mounted upon the shaft. The core 93 is similar to the previously described core member 63 in that it is generally cylindrical in configuration and is fabricated from a resilient material, preferably one which does not exhibit undue swelling when contacted with a liquid such as the inks frequently employed in printing machines of the type described above in connection with Fig. 1. The internal surface of core 93 is not continuous; rather, it comprises a series of internal projections 94 which define a series of longitudinal spaces 95. Moreover, the exterior or outer portion of core 93 comprises a further series of external projections 96 which engage the inner surface of a cylindrical printing element such as printing element 61 (not shown in this figure). External projections 96 define a further series of longitudinal spaces 97.

In operation, the core construction of Fig. 10 functions in much the same manner as that of Figs. 5-8. Thus, when pressure is applied to the core through the cylindrical printing element supported thereon, as indicated by arrow 98, the configuration of the core is altered substantially as indicated by dash lines 99, 100, and 101. As in the previously described embodiment, however, the principal effect of application of pressure to the roller platen embodying core 93 is to deflect the individual projections 94 and 96 into the corresponding spaces 95 and 97 interposed between those projections. Thus, the construction of this alternative embodiment also affords a means for confining the principal distortion of the compensating core to one of bending or deflection rather than compression.

A printing machine constructed in accordance with the inventive concept and using the platen roller construction described in detail in connection with Figs. 5-8 or the alternative embodiment of Fig. 10, although similar in many respects to previously known devices, can nevertheless accommodate a far greater range of printing plate thicknesses than heretofore possible and still afford clear, sharp reproduction of the desired information. Consequently, printing plates manufactured by different suppliers may be utilized in a single printing machine, and the variations in thickness which are far more prevalent in plastic plates than in metal plates no longer afford a serious problem. Of course, it goes

9

without saying that the machine may also be utilized with metal plates of varying thickness.

Hence, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of relatively hard material supported upon a core of relatively resilient material, said core comprising a plurality of projections engaging spaced points around the inner surface of said element, said projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

2. In a printing apparatus adapted for use with printing plates which vary substantially in thickness, a fixed anvil for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of relatively hard material supported upon a core of relatively resilient material, said core comprising a cylindrical member having a plurality of projections which engage spaced points around the inner surface of said element, said projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

3. In a printing apparatus adapted for use with printing plates exhibiting substantial variations in overall thickness and including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of hard, porous material comprising rubber particles bonded together by a resin and impregnated with ink, a resilient rubber core comprising a cylindrical member having a plurality of projections which engage said printing element at a series of spaced points around the inner surface thereof to support said element, said projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

4. In a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of relatively hard material supported upon a core of relatively resilient material, said core comprising a plurality of skewed projections engaging spaced points around the inner surface of said element, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

5. In a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a shaft structure of predetermined length, a first cylindrical element of relatively hard ma-

10

terial supported upon said shaft and extending along said shaft for a fractional portion of the length thereof, a second cylindrical element of relatively hard material having an axial length corresponding to a second fractional portion of said shaft length and having an internal diameter substantially greater than the external diameter of said shaft structure, and a core of relatively resilient material mounted upon said shaft structure and comprising a plurality of projections engaging the internal surface of said second printing element at spaced points to support said second printing element on said shaft structure at a location adjacent said first printing element, said projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

6. In a printing apparatus adapted for use with printing plates which may vary substantially in thickness and including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen structure comprising a first cylindrical printing element of relatively hard, resilient material having an interconnected capillary pore structure impregnated with ink, a platen shaft having a length substantially greater than the axial length of said first cylindrical printing element directly supporting said first printing element, a second cylindrical printing element of relatively hard, resilient material having an interconnected capillary pore structure impregnated with ink, a cylindrical core of substantially resilient material mounted on said shaft and having a plurality of projections engaging and supporting said second printing element at a plurality of spaced points around the inner peripheral surface of said second printing element said projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said second printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

7. In a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of relatively hard, resilient material supported upon a core of relatively resilient material, said core comprising a cylindrical member having a series of projections extending therefrom at a skew angle of the order of 10° to engage said printing element at spaced points around the inner surface of said element, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

8. In a printing apparatus including means for supporting a printing plate in a position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen structure comprising a shaft, a cylindrical core of relatively resilient material having a series of internal projections engaging spaced points around the external surface of said shaft and further having a plurality of external projections extending outwardly from said core, said platen structure further comprising a cylindrical printing element of relatively hard material supported upon said external projections of said core, each set of said core projections defining a series of longitudinal spaces into which the resilient material comprising said core projections may be deflected when said printing element is subjected to external pressure, and means for rolling said platen structure in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

9. In a printing apparatus adapted for use with printing plates which vary substantially in thickness, a fixed anvil for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a cylindrical printing element of relatively hard material supported upon a core of relatively resilient material, said core comprising a cylindrical member having a plurality of apertures extending longitudinally thereof and defining a series of longitudinal spaces into which the resilient material comprising said core may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

10. In a printing apparatus including means for supporting a printing plate in position to have a relief design on said plate engaged by one surface of a sheet to be printed, a platen comprising a shaft structure of predetermined length, a first cylindrical element of relatively hard material supported upon said shaft and extending along said shaft for a fractional portion of the length thereof, a second cylindrical element of relatively hard material having an axial length corresponding to a second fractional portion of said shaft length and having an internal diameter substantially greater than the external diameter of said shaft structure, and a core of relatively resilient material mounted upon said shaft structure and engaging the internal surface of said second printing element to support said second printing element on said shaft structure at a location adjacent said first printing element, said core having a plurality of apertures extending longitudinally thereof into which the resilient

material comprising said core may be deflected when said printing element is subjected to external pressure, and means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint said sheet in a pattern determined by said relief design.

References Cited in the file of this patent

UNITED STATES PATENTS

508,696	Giacomini	Nov. 14, 1893
1,343,684	Runyan	June 15, 1920
1,421,920	De Minico	July 4, 1922
1,436,155	Domy	Nov. 21, 1922
1,499,796	Wilkinson	July 1, 1924
1,606,190	Sharp	Nov. 9, 1926
1,863,816	Von Webern	June 21, 1932
1,869,022	Phare	July 26, 1932
1,914,035	Moeschlin	June 13, 1933
2,072,297	Damm	Mar. 2, 1937
2,145,320	Shaw	Jan. 31, 1939
2,166,138	Gundlach	July 18, 1939
2,176,371	Wahl	Oct. 17, 1939
2,303,355	Guth	Dec. 1, 1942
2,483,422	Larson	Oct. 4, 1949
2,528,540	Oldofredi	Nov. 7, 1950
2,603,267	Simpson	July 15, 1952
2,606,494	Vogt	Aug. 12, 1952
2,620,730	Gilbert	Dec. 9, 1952
2,663,257	Dudis	Dec. 22, 1953
2,715,024	Nydegger	Aug. 9, 1955
2,763,208	Rockoff	Sept. 18, 1956
2,795,186	Bach	June 11, 1957
2,804,968	Elliott	Sept. 3, 1957