

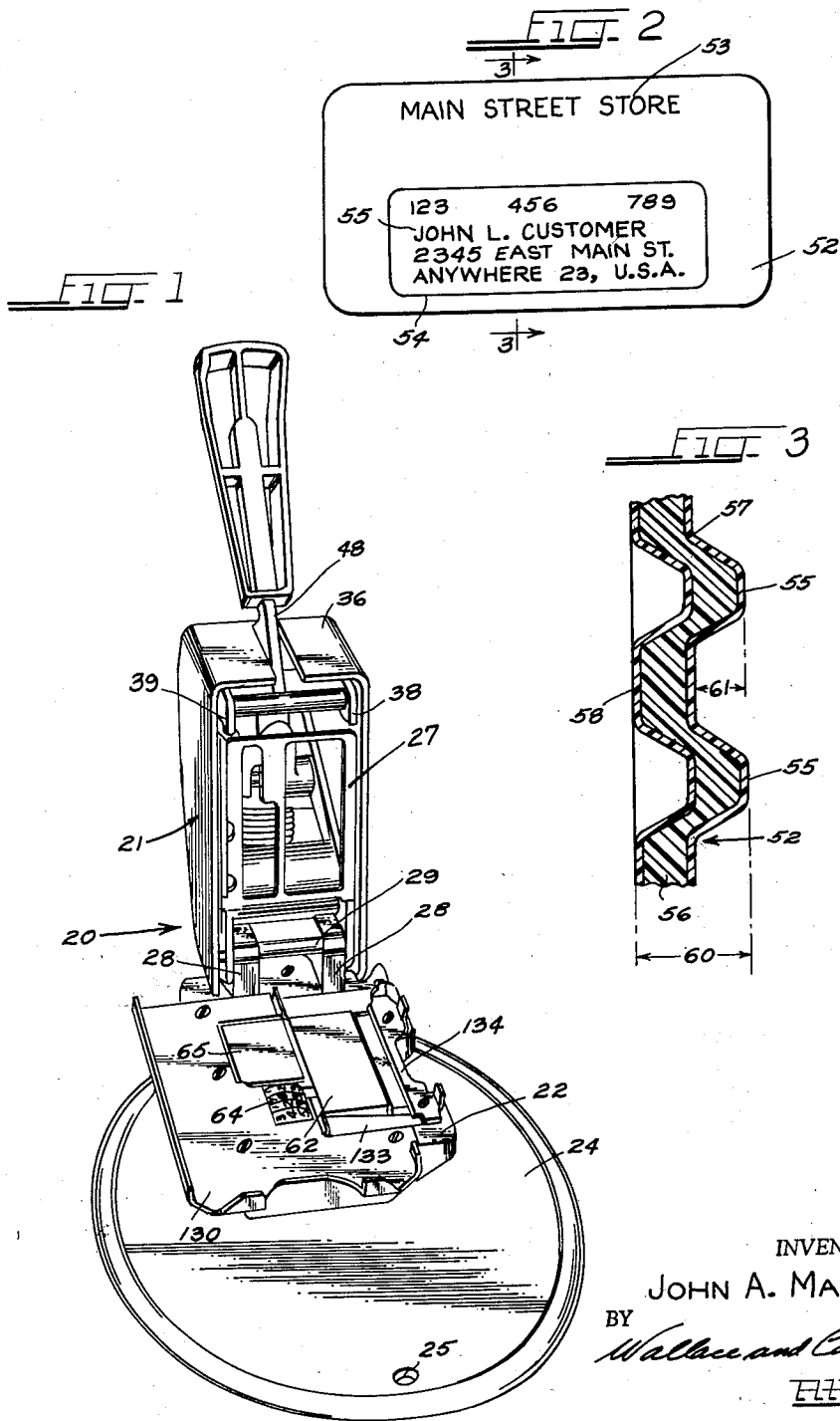
Oct. 27, 1959

J. A. MAUL
PRINTING MACHINES

2,909,998

Filed July 17, 1957

4 Sheets-Sheet 1



INVENTOR.
JOHN A. MAUL
BY *Wallace and Cannon*
ATT'YS.

Oct. 27, 1959

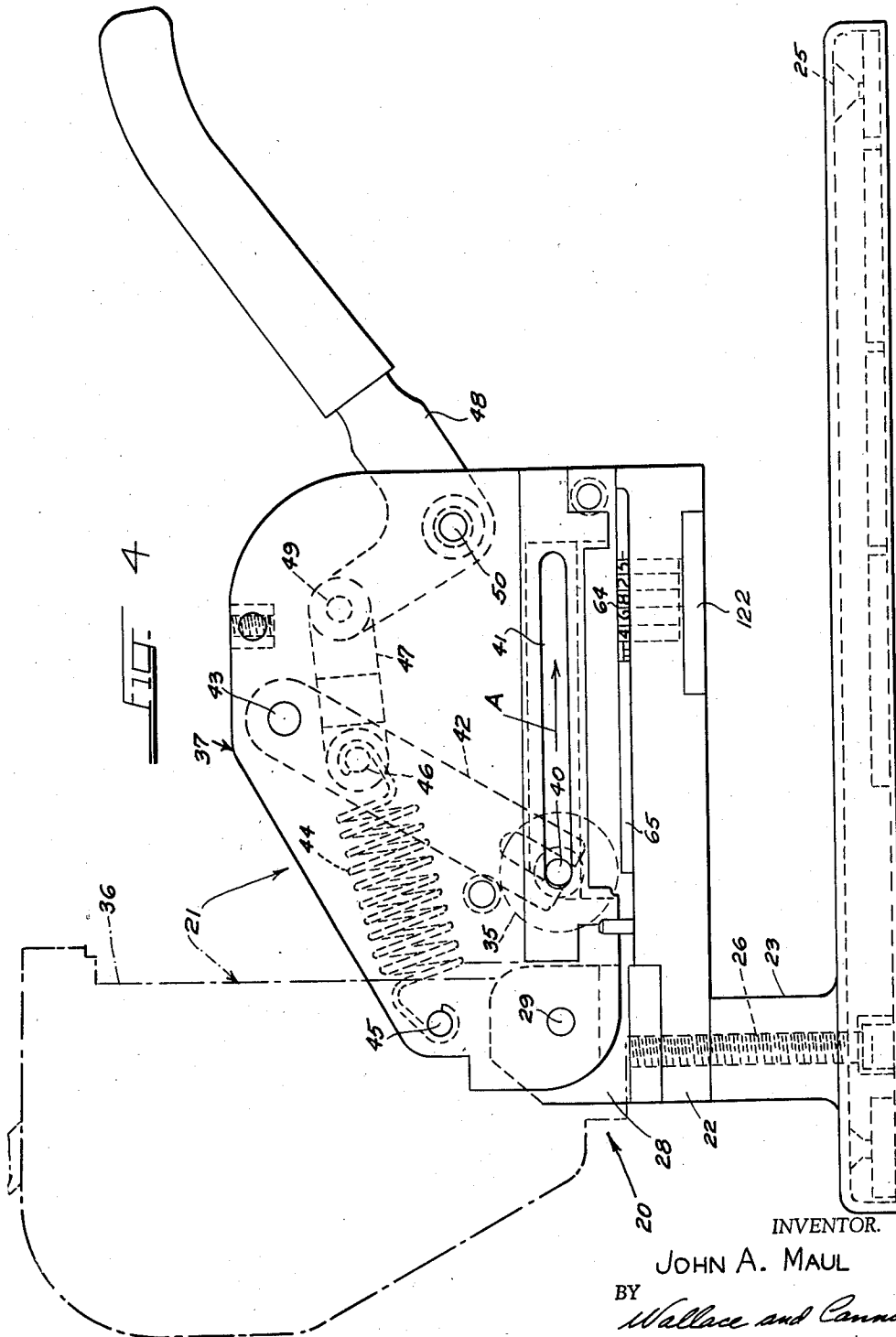
J. A. MAUL

2,909,998

PRINTING MACHINES

Filed July 17, 1957

4 Sheets-Sheet 2



INVENTOR.

JOHN A. MAUL

BY

BY
Wallace and Cannon
ATTYS.

HH'LS.

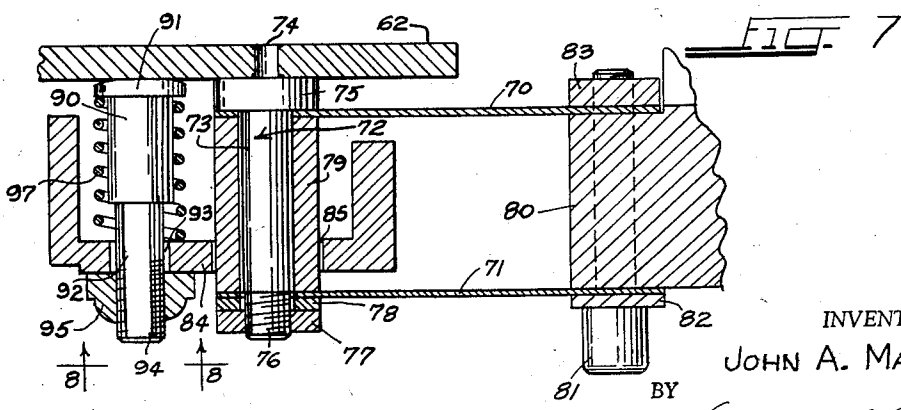
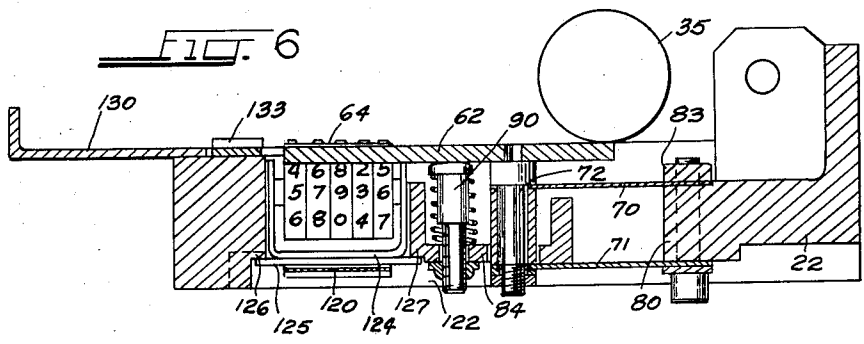
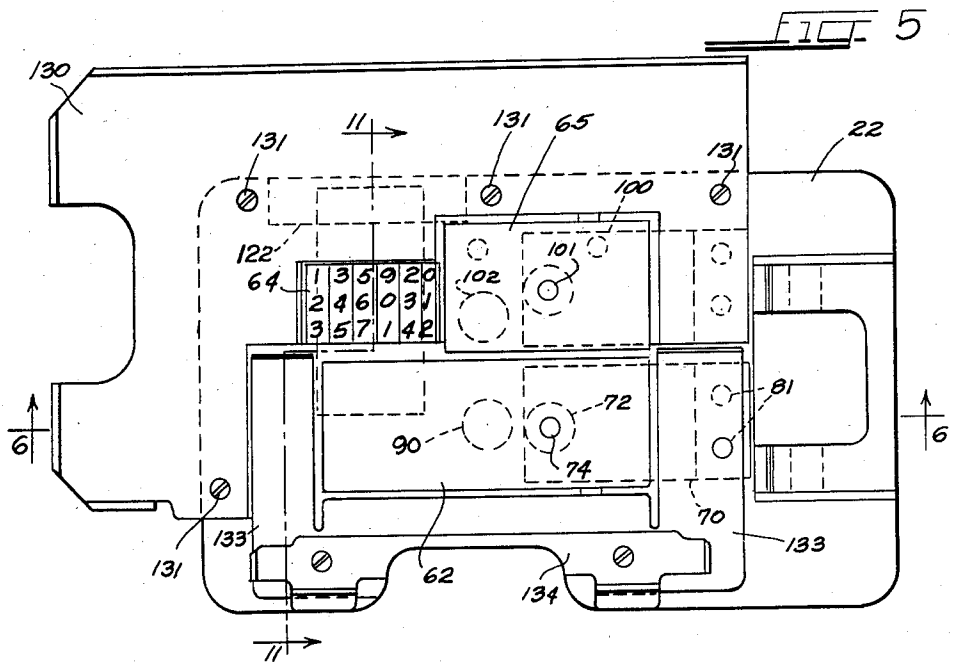
Oct. 27, 1959

J. A. MAUL
PRINTING MACHINES

2,909,998

Filed July 17, 1957

4 Sheets-Sheet 3



INVENTOR.
JOHN A. MAUL
BY
Wallace and Cannon
ATT'YS.

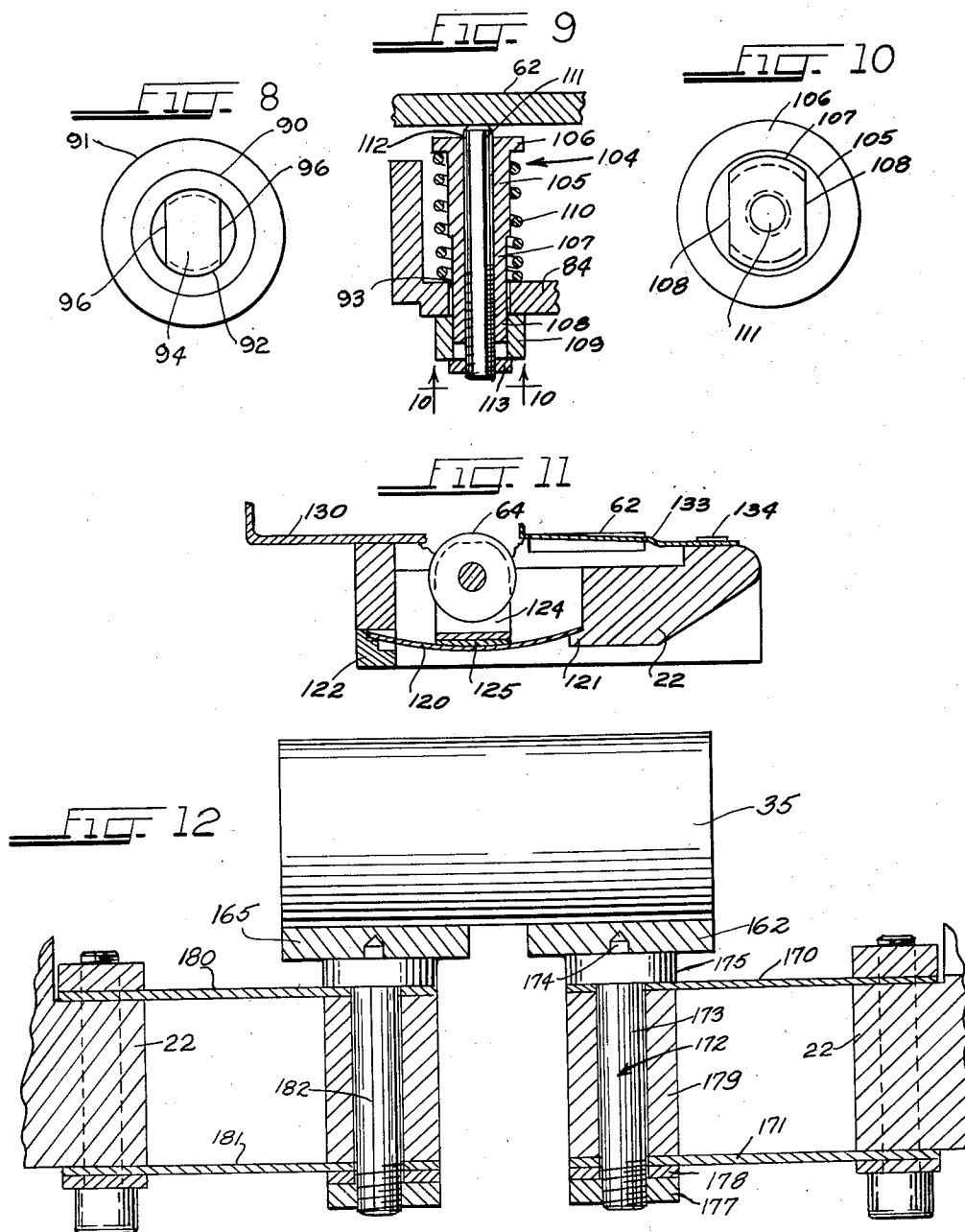
Oct. 27, 1959

J. A. MAUL
PRINTING MACHINES

2,909,998

Filed July 17, 1957

4 Sheets-Sheet 4



INVENTOR.

JOHN A. MAUL

BY

Wallace and Cannon

ATT'YS.

1

2,909,998

PRINTING MACHINES

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

Application July 17, 1957, Serial No. 672,455

12 Claims. (Cl. 101—269)

This invention relates to printing machines and particularly to printing machines constructed and arranged for operation with printing devices which may vary materially in their dimensional characteristics.

Hand-operated printing machines have come into widespread use in relation to credit transactions in retail stores and in analogous business situations where it is desirable to reproduce accurately and rapidly information identifying the parties involved in a given transaction or other data concerning the transaction. In a typical credit-verification system, each customer of a given store or group of stores is issued a printing device embossed with the name, address, and other information pertaining to the customer, such as an account serial number. Each time the customer makes a purchase, the printing device is positioned in a small hand-operated printing machine and is employed to imprint the embossed information upon a sales slip, contract, or other business record. The hand-operated printing machines customarily employed for this purpose each include means for supporting the printing device 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 platen is then moved across the opposite surface of the sheet in pressure contact therewith to imprint the sheet with the information embossed into the printing device. 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-verification and other systems of the kind outlined above utilize embossed metal printing device for identification purposes. More recently, embossed plastic printing plates have been employed. Different manufacturers of printing devices have selected varying thicknesses of plastic material from which to fabricate the individual printing plates. Moreover, it has been found that it is somewhat more difficult to maintain uniform thickness in the plastic printing devices as compared with metal plates. The printing machines heretofore employed in credit-verification and similar systems, however, do not always give completely satisfactory results when required to operate with printing plates which vary substantially in thickness. Frequently, the variations in thickness of the plates lead to smeared, distorted, or otherwise unsatisfactory copy. 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, thereby inhibiting the use of plates from more than one source in a given machine.

A principal object of the present invention, therefore, is a new and improved printing machine which operates satisfactorily with printing plates which vary substantially in thickness.

Another object of the invention is a new and improved printing machine which follows standardized construction

2

insofar as possible but which can accommodate and function properly with printing devices of greatly differing thickness.

A specific object of the invention is a new and improved hand-operated printing machine which employs a conventional platen construction but which includes a printing anvil that automatically compensates for variations in thickness of printing devices utilized in the machine.

A corollary object of the invention is a new and improved hand-operated printing machine which may be constructed at a cost competitive with previously known machines yet which effectively compensates for variations in printing device thickness.

A printing machine constructed in accordance with the invention comprises a base and a pair of resilient cantilever arms which are affixed to the base and extend therefrom in spaced relation to each other. A printing anvil is supported by the cantilever arms in spaced relation to the base; this anvil is utilized to support a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed. The printing machine further includes a platen, preferably an ink-impregnated roller platen, and means for moving the platen across the opposite surface of the sheet in pressure contact therewith to imprint the sheet in accordance with the relief design on the printing device. In addition, a guide member is mounted intermediate the two cantilever arms, preferably being rigidly affixed to the anvil; this guide member is employed to maintain the anvil in predetermined alignment with respect to the base and the platen of the printing machine.

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, shows preferred embodiments of the present invention and the principles thereof and what is now considered to be the best mode for applying those 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 purview of the appended claims.

In the drawings:

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

Fig. 2 is a plan view of a typical printing device which may be employed in the printing machine of Fig. 1;

Fig. 3 is a fragmentary sectional view of the printing device of Fig. 2 taken along line 3—3 therein;

Fig. 4 is an elevation view of the printing machine of Fig. 1 with the cover for the printing head removed and the printing head disposed in its lowered or printing position;

Fig. 5 is a plan view of the printing platform or base of the printing machine of Figs. 1 and 4;

Fig. 6 is a longitudinal sectional view of the printing base, taken along line 6—6 in Fig. 5;

Fig. 7 is an enlarged detail sectional view of a printing anvil and support therefor constructed in accordance with the invention;

Fig. 8 is a detail view taken along line 8—8 in Fig. 7;

Fig. 9 is a detail sectional view showing a portion of another embodiment of the invention;

Fig. 10 is a detail view taken along line 10—10 in Fig. 9;

Fig. 11 is a transverse sectional view of the printing base taken along line 11—11 in Fig. 5; and

3

Fig. 12 is a sectional view of another embodiment of the invention including a modified spring suspension arrangement for the printing anvils.

One embodiment of a printing machine constructed in accordance with the present invention is illustrated by the printing machine 20 shown in Figs. 1 and 4. The printing machine 20 is of the kind frequently used in connection with "credit plates" or similar small identification printing devices and which are usually embossed with the name, address, and other information relating to a given customer. In a typical credit system, the printing machine 20 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.

The printing machine 20 includes a movable printing head 21 which is mounted for vertical pivotal movement relative to a stationary platform or printing base 22. The printing base 22 is employed to support the charge plate or other printing device in printing position in the machine as is described more fully hereinafter. The platform 22 is supported by a vertical column 23 preferably formed as an integral part of a relatively large mounting base 24. The mounting base 24 may be provided with a countersunk opening 25 or other suitable means for mounting the printing machine 20 upon a counter or the like; on the other hand, the weight of the machine itself may in some instances be relied upon to give it the necessary stability. The printing base 22 may be mounted upon the column 23 by any suitable means such as the relatively long bolt 26 which, in the illustrated embodiment, extends from the mounting base 24 through column 23 and into the rear portion of the printing base 22 to connect the printing base rigidly to the column 23 as indicated in Fig. 4.

In the illustrated embodiment, the printing head 21 is pivotally supported upon a pair of spaced upstanding support lugs 28 which may be formed as an integral part of the printing platform 22 and which extend upwardly from the rear portion of the printing platform. The pivotal connection between the printing head 21 and the support lugs 28 is afforded by a pin 29 journaled in the two support lugs. The printing head 21 includes means for mounting a platen roller 35 within the printing head and for suitably moving the platen roller to carry out the printing operation as is described more fully hereinafter; in Fig. 4, the cover 36 of the printing head is removed in order better to illustrate the platen mounting arrangement. As indicated therein, the printing head includes a hollow frame 37 comprising a pair of side walls 38 and 39 (see Fig. 1). The platen roller 35 of the machine is mounted upon a shaft 40 and the two ends of the shaft are engaged in a pair of longitudinal guide slots 41 in the two opposed side walls of the frame structure 37. The shaft 40 is also engaged by two bifurcated lever arms 42, only one of which is shown in Fig. 4, the two lever arms being pivotally mounted within the frame 37 by means of a pin 43. The platen operating levers 42 are biased toward a normal or inactive position by means of a spring 44, one end of which is connected to a pin 45 extending from the frame 37 and the other end of which is connected to the levers 42 as by means of a pin 46. A pair of connecting links 47, only one of which is seen in the drawing, are connected to the pin 46, the opposite ends of the connecting links 47 being pivotally coupled to an operating handle 48 as by means of a pin 49. The handle 48 is pivotally mounted upon the frame 37 as indicated at 50.

Before considering the operation of the printing machine 20, it is desirable to consider the construction and configuration of the printing devices with which the machine is employed. A preferred form of printing device or plate is illustrated in Fig. 2 in the form of a credit plate or credit-identifying device 52. The printing device 52 may include printed information as indicated at

4

53 relating to the store or other business establishment issuing the identification plate. The printed information 53 may also indicate terms and conditions for credit rendered and other like information. In addition, a relatively restricted area 54 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 55. The relief pattern comprising the type characters 55, may for example, indicate the name and address of a customer or other person involved in the transaction to which the printing device 52 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, and other similar information.

Fig. 3 shows a preferred construction for the printing device 52 in enlarged fragmental cross section. As indicated therein, the printing device 52 may comprise a base or foundation element 56 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 53 in Fig. 2 is applied to the base member 56 and is subsequently covered with a transparent plastic film 57; the reverse side of the printing device 52 may also be covered with a transparent film 58, particularly if this side of the identification plate is also employed to carry printed information. Preferably, the embossed or otherwise deformed areas 55 of the printing device are formed after the transparent films 57 and 58 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 device construction described hereinabove and illustrated in Figs. 2 and 3; rather, it may be employed with other plastic printing device structures known in the art and may also be utilized interchangeably with metal printing plates. The essential and distinguishing feature of the invention may be said to reside in the fact that it is adapted to use printing plates of varying composition which exhibit substantial differences in overall thickness, yet employs a conventional platen construction. The thickness 60 of the plastic printing devices 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 of approximately 0.025 inch to 0.06 inch, of which approximately 0.015 to 0.02 inch usually represents the height 61 of the embossures 55. The remainder of the overall printing device thickness represents the thickness of the plastic plate or other printing device before embossing. Consequently, in order to function properly with the wide variety of printing devices presently employed in credit-verification and similar systems, the printing machine 20 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 in thickness by as much as 0.03 inch.

The printing machine 20, as thus far described, is essentially conventional in construction, and cooperates with the printing plate 52 in a manner well known in the art. Thus, when it is desired to place the printing machine in operation, the printing device 52 is mounted upon a printing anvil 62 supported upon the platform 22 as is described more completely hereinafter. A sheet of paper, usually a sales slip or similar business instrument, is then placed over the printing plate 52 and the handle 48 is pulled downwardly. The biasing force exerted by the spring 44 (Fig. 4) is made such that the initial movement of operating handle 48 brings the printing head 21

of the machine to the printing position indicated in Fig. 4 without moving the platen roller 35 from its normal or initial position as shown in that figure.

After the printing head 21 is moved to the position shown in Fig. 4, continued downward movement of the operating handle 48 overcomes the biasing force exerted by spring 44 and pulls the platen operating levers 42 forwardly in the printing head, moving platen roller 35 in the direction indicated by arrow A. Consequently, the platen roller engages the paper or other sheet to be imprinted on the surface thereof opposite the printing device 52 in rolling pressure contact and thus imprints the information represented by the relief design 55 on the paper. A mask 27 (Fig. 1) may be utilized in known manner to limit the pressure upon the printing device and prevent damage thereto, particularly when only one embossed character on the device is engaged by the platen. The imprinted material may be made visible by the use of carbon paper or an inked ribbon or other similar means in accordance with techniques well known in the art. Preferably, however, the platen roller 25 itself constitutes the ink source. A preferred form of ink-impregnated platen roller 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, the platen being fabricated from a porous rubber-resin composition of the kind described in detail in application Serial No. 335,084, filed February 4, 1953, now U.S. Patent No. 2,763,208. Self-inking platens of this type may be employed for literally tens of thousands of individual impressions with relatively uniform results and without damaging the platen. 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 64 may be mounted on the printing platform 22, as indicated in Figs. 1 and 4. In addition, a second or fixed printing device 65 may be supported on the printing base 22 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 readily replaceable printing device similar to the printing device 52 may be used in conjunction with plate 52; a system of this type is described and claimed in the aforementioned Erickson application.

The versatility of the printing machine 20 with respect to printing device thickness, permitting operation of the machine in conjunction with a wide variety of different printing plates, is achieved primarily by the unique means employed to support the printing anvil 62 upon the printing base 22. This construction, which is best illustrated in Figs. 5-8, affords a means for resiliently supporting the printing anvil 62 in the printing base of the machine and at the same time restricts the movement of the printing anvil and maintains the anvil in a predetermined alignment with respect to the base 22 and the roller platen 35. In effect, the inventive structure prevents angular displacement of the anvil 62 with respect to the base 22 but permits vertical displacement of the anvil. This construction effectively eliminates virtually all of the difficulties encountered in previously known printing platform structures due to variations in thickness of the printing devices such as the identification plate 52.

As indicated in Figs. 6 and 7, a pair of cantilever arms 70 and 71 are affixed to the printing machine platform 22 at the rear portion thereof and extend forwardly in parallel spaced relation to each other. The two cantilever arms are of resilient construction in order to permit limited vertical movement of the printing anvil as is described more fully hereinafter. Preferably, the cantilever arms 70 and 71 comprise relatively stiff leaf springs constructed from some suitable material such as conventional clock spring steel. Excellent results have been achieved using clock spring steel having a thickness of 0.015 inch; equally good results have been obtained with

a .015 inch pre-tempered steel having a Rockwell hardness of 39-42, C scale manufactured by the Wallace Barnes Company. In the illustrated embodiment the cantilever arms 70 and 71 are approximately 1.75 inches in length and approximately 0.875 inch in width and should be flat within 0.005 inch.

The two cantilever arms 70 and 71 are utilized to support the printing anvil 62. In the preferred embodiment shown in detail in Fig. 7, the mounting of the anvil on the cantilever support arms is effected by means of a guide member 72 which also serves to maintain the anvil in predetermined alignment with respect to the base 22 and the platen 35 of the printing machine. The guide member 72 comprises a guide stud 73 which is rigidly affixed to the printing anvil 62. In the preferred construction, an upwardly projecting extension 74 of the stud 73 is fitted into and welded into a suitable aperture in the printing anvil. A shoulder 75 on the stud 73 engages the undersurface of the printing anvil and also engages the upper surface of the cantilever arm 70, whereas the body portion of the stud extends through a suitable aperture in the spring 71. The lower portion 76 of the guide member stud 73 is threaded to receive a nut 77; one or more washers or spacers 78 may be interposed between the nut 77 and the cantilever spring arm 71. In addition, the guide member 72 includes a bushing 79 which is mounted in encompassing relation to the medial or body portion of the stud 73 and which engages both of the cantilever spring arms 70 and 71. Consequently, the clamping means comprising the spacer 78 and the nut 77 maintains the stud 73, the bushing 72, the cantilever arms 70 and 71 and the anvil 62 in fixed position with respect to each other.

As indicated hereinabove, the cantilever arms 70 and 71 are rigidly secured to the printing platform 22. In the illustrated embodiment, this is accomplished by engaging the two spring arms with the opposed surfaces of a shoulder 80 which forms a part of the printing platform 22. The two cantilever arms may be clamped against the surfaces of shoulder 80 by any suitable fastening means. In the illustrated arrangement, this fastening means comprises a pair of screws 81 which engage a spacer or washer 82 in contact with the lower surface of spring 71 and a double nut 83 into which the screws are threaded and which engages the upper surface of the cantilever arms 70.

It may also be desirable to afford a further guide member 84 comprising a transversely extending portion of the printing base or platform 22 which engages the guide member 72 to limit angular displacement of the guide member. In this instance the guide member 84 is provided with an opening 85 through which the bushing 79 extends and which limits angular movement of the member 72.

The printing anvil support structure described immediately above affords excellent operating results over a wide range of printing device thicknesses. When the printing machine is placed in operation as described hereinbefore, and the platen 25 is moved transversely of the printing anvil 62, it of course exerts a substantial downward force upon the printing anvil. If substantial angular displacement of the printing anvil were permitted, as in previously known resiliently supported anvils, the quality of the printed impressions would vary substantially for printing devices of different thicknesses, since the degree of inclination of the printing anvil would be different for each different thickness of printing device. The dual cantilever arm support structure of the invention, however, effectively minimizes any tendency toward angular displacement of the anvil 62 and maintains it in the desired horizontal alignment with respect to the printing base or platform 22. Consequently, the pressure exerted by the platen 35 as it traverses the printing anvil may be made substantially uniform, affording a good, legible imprint. The anvil moves downwardly to a greater or lesser

7

extent, depending upon the thickness of the printing device, but does not change its desired horizontal alignment even though the printing devices may vary over a wide range of thickness. Consequently, the printing machine 20 affords excellent printing characteristics even with printing devices which differ in thickness by as much as 0.03 inch.

Preferably, a second guide member comprising a spring stud 90 is mounted upon the base 22; this guide member is utilized to determine the initial height of the anvil 62 and to afford a controlled contact pressure between the anvil 62, the credit plate 52, and the platen 35 when the platen is in printing position. The spring stud 90 includes an upper shoulder portion 91 which engages the undersurface of the printing anvil 62 and a reduced-diameter lower portion 92 which extends through an aperture 93 in the transverse portion 84 of the base 82, terminating in a threaded portion 94. An elastic stop nut 95 is threaded onto the extension portion 94 of the spring stud 90. As indicated in Fig. 8, the lower portions 92 and 94 of the spring stud 90 are not circular in cross section; rather, this part of the guide member is provided with opposed flat surfaces 96 which engage corresponding flat surfaces in the aperture 93 to guide the member 90 and restrict it to substantially vertical movement. A biasing spring 97 is mounted in encompassing relation to the second guide member 90 and urges the spring stud into engagement with the anvil 62. Thus, the compression spring 97 provides the requisite force urging the anvil 62 against the platen 35 in the printing operation.

To adjust the anvil 62 to a higher level than illustrated in Fig. 7, it is only necessary to unscrew the nut 95, thereby permitting the spring 97 to elevate the guide member 90 to a greater extent than previously and raising the printing anvil. On the other hand, the initial position of the printing anvil may be lowered by tightening the nut 95 to the desired extent to move the guide member downwardly and permit the printing anvil 62 to move downwardly. In operation, of course, when the roller platen of the printing machine is moved across the printing anvil 62, the guide member 90 is able to move downwardly to the extent necessitated by the pressure applied to the anvil from the platen. As soon as the printing operation has been completed, the spring 97 acts to return the guide member 90 and the anvil 62 to their initial position as shown in Fig. 7.

The auxiliary or fixed anvil 65 of the printing machine 20 is supported upon the platform 22 in essentially the same manner as the main printing anvil 62. Accordingly, the support arrangement for the auxiliary anvil has not been shown in detail in the drawings. The cantilever arms supporting the auxiliary anvil are generally indicated in Fig. 5 by the dash line 100 and the main guide member for this anvil is indicated at 101. It will be understood that the guide member 101 may be essentially similar in construction to the previously described guide member 73. The second guide member for the auxiliary anvil is generally indicated in Fig. 5 by the dash outline 102. Guide member 102 may be essentially similar in construction to the guide member 90 described in connection with Fig. 7. The two guide members 101 and 102 preferably extend through suitable apertures in the transverse guide portion 84 of the printing base 22 in essentially the same manner as the guide members for the main printing anvil.

In some instances, it may be highly desirable to afford a means for adjusting the biasing force exerted by the biasing spring for the second guide member independently of the means for varying the overall height of that guide member. This may be achieved by the preferred second guide member construction shown in Figs. 9 and 10. The second guide member 104 illustrated in Figs. 9 and 10 includes a hollow stud 105 having an upper shoulder portion 106 and a reduced diameter lower portion 107. As indicated in Fig. 10, the lower portion 107 of the stud 105 is

8

provided with planar or flat surfaces 108 which engage corresponding flat surfaces on the guide aperture 93 in the base section 84 of the machine. These flat surfaces extend to the lower extremity of the hollow stud 105. The lower portion of the stud section 107 is threaded to accept a suitable nut 109 which engages the undersurface of base portion 84. Thus, adjustment of the position of nut 109 on the stud member 104 may be employed to vary the biasing force exerted by the spring 110 mounted in encompassing relation thereto and in engagement with the stud shoulder 106 and the base portion 84.

The guide member 104 further includes an anvil height adjusting pin 111 which extends through a central aperture 112 in the hollow stud 104 and which is threaded into the lower portion 107 thereof. A clamp nut 113 is threaded onto the lower extremity of pin 111 and engages the nut 109 to maintain the various parts of the guide member in fixed position with respect to each other. It is the pin 111, rather than the hollow stud 106, which engages the undersurface of anvil 62 and determines the initial height of the anvil. Consequently, the effective height of the guide member 104 may be adjusted by turning the pin 111 independently of the spring bias adjustment afforded by the nut 109.

It may also be desirable to afford a resilient mounting for the dater 64 of the printing machine; a suitable mounting arrangement is illustrated in Fig. 11. As indicated therein, a leaf spring support member 120 is incorporated in the printing machine base, being suspended between a shoulder 121 on the base member 22 and a spring support member 122 which is secured to the base 22. The dater 64 is suspended from a mounting bracket 124 which in turn is mounted upon a mounting plate 125 supported upon the spring 120. The mounting plate 125 extends into engagement with a pair of shoulders 126 and 127 formed in the printing base 22, as shown in Fig. 6, to determine the initial height of the dater.

The printing machine 20 may also be provided with a suitable guide or gauge member 130 which is secured to the printing base 22 as by the screws 131. The gauge 130 affords a means for establishing the sales slip or other business record to be imprinted in predetermined position upon the printing base 22 and therefore assures location of the printed material in the desired position on the printed sheet. In addition, suitable guide or gauge members 133 and 134 may be secured to the printing base 22 to afford a means for maintaining the printing device 52 in predetermined position upon the main anvil 62. The several guide or gauge members 130, 133 and 134 may of course be varied in configuration and in dimensions to correspond to the particular printing devices and the sales records or other business instruments with which the printing machine is to be employed. In this connection, it should be noted that the guide 133 is preferably disposed at a slight angle with respect to the surface of anvil 62, as indicated in Figure 11; this arrangement has been found to assist materially in accurate positioning of the printing device.

Figure 12 illustrates, in somewhat simplified form, another embodiment of the invention employing a slightly modified suspension arrangement for the two anvils of the printing machine. As indicated in this Figure, the main anvil 162 of the modified printing machine is supported upon a pair of cantilever arms 170 and 171 which are affixed to the printing machine platform 22. In this instance, however, the cantilever arms are secured to the side portion of the platform 22 rather than to the rear portion thereof. As in the case of cantilever support members 70 and 71, the arms 170 and 171 are of resilient construction and preferably comprise relatively stiff leaf springs constructed from clock spring steel or other similar material. Mounting of the anvil 162 on the cantilever support arm is afforded by a guide member 172 which maintains the anvil in alignment with respect to the platform 22 and the platen 35 of the machine.

The guide member 172 is essentially similar in construction to the guide 72 of the previously described embodiments. Thus, the guide member 172 comprises a stud 173 which is rigidly affixed to the anvil 162; an upwardly projecting extension 174 of the stud 173 is fitted into a suitable aperture in the printing anvil. In this instance, however, the shoulder 175 on the stud is projection welded to the anvil. This construction affords some advantages in production of the printing machine. The lower surface of the shoulder 175 engages the upper surface of the cantilever arm 170 and the body portion of the stud extends through suitable apertures in the two spring arms. The lower portion of the stud 172 is threaded to receive the nut 177, which may be spaced from spring 171 by one or more washers 178. In this connection, should be noted that washer 178, and the washer 78 of the previously described structure, may be of the counter-sunk type to facilitate assembly of this portion of the printing machine. The guide member 172 further includes a bushing 179 which encompasses the stud 173 and engages both of the cantilever spring arms 70 and 71.

The embodiment illustrated in Figure 12 further includes an auxiliary anvil 165 supported upon a pair of resilient cantilever arms 180 and 181 which are secured to the platform member 22 and extend transversely of the direction of movement of the platen 35. A guide member 182 which is essentially similar in construction to guide member 172 is employed to mount the auxiliary anvil on the spring arms 180 and 181 and also serves to maintain the auxiliary anvil in alignment with the platen 35. Anvils 162 and 165 are also preferably provided with suitable guide members which determine the initial height of the anvils. These second guide members may be essentially similar in construction to the guide members 90 and 104 shown in Figures 7 and 9 respectively and accordingly have not been illustrated in Figure 12.

The construction shown in Figure 12 operates in essentially the same manner as that of Figures 6 and 7 and affords materially improved operating results, as compared with previously known devices, with printing devices which vary substantially in thickness. The anvils are maintained in their pre-determined alignment with the platen; as a consequence, the pressure exerted by the plate 35 as it transverses the printing anvils is held substantially uniform and affords a legible imprint despite substantial variations in thicknesses of the printing devices. The anvils may move downwardly to a greater or lesser extent, depending upon the thicknesses of the printing devices, but do not change from the desired horizontal alignment.

Hence, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that these are 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. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in spaced overlapping relation to each other; a printing anvil, supported at a predetermined location by said cantilever arms in spaced relation to the base, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet to imprint the sheet in accordance with the printing device relief design; and a guide member, mounted intermediate the two cantilever arms and in alignment with said support location on said anvil, for maintaining the anvil in

predetermined angular alignment with respect to the base and the platen.

2. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in spaced overlapping relation to each other; a printing anvil, mounted on one of said cantilever arms at a point where said one arm overlaps the other of said arms and in spaced relation to the base, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, longitudinally of said cantilever arms, to imprint the sheet in accordance with the printing device relief design; and a guide member, mounted intermediate the two cantilever arms and rigidly affixed to the anvil, for maintaining the anvil in predetermined angular alignment with respect to the base and the platen.

3. A printing machine comprising: a base; a pair of resilient cantilever arms, each comprising a leaf spring affixed to the base, extending from the base in parallel overlapping spaced relation to each other; a printing anvil, mounted adjacent the free end of one of said cantilever arms, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a roller platen; means for rolling said platen in pressure contact across the opposite surface of said sheet to imprint the sheet in accordance with the printing device relief design; and a guide member, mounted intermediate the overlapping portions of said two cantilever arms and affixed to the anvil, for maintaining the anvil in predetermined angular alignment with respect to the base and the platen.

4. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms adjacent the free end thereof for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet to imprint the sheet in accordance with the printing device relief design; and a vertical guide member, mounted in fixed position intermediate the two cantilever arms in engagement with the anvil, for maintaining a constant spacing between the cantilever arms to effectively limit the anvil to vertical movement.

5. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in spaced overlapping relation to each other; a printing anvil, mounted on one of said cantilever arms in spaced relation to the base, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a roller platen; means for rolling said platen in pressure contact across the opposite surface of said sheet, longitudinally of said cantilever arms, to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted in fixed position intermediate the overlapping portions of said two cantilever arms and rigidly affixed to the anvil, for maintaining the anvil in predetermined angular alignment with respect to the base and the platen; and a further guide member, affixed to the base and extending into engagement with the first guide member, for limiting angular displacement of said first guide member.

6. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base and extending beyond the end of the cantilever arms, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet

11

to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted intermediate the two cantilever arms, for maintaining the anvil in predetermined alignment with respect to the base and the platen; and a second guide member, resiliently supported on said base for vertical movement with respect thereto and extending into engagement with the extension portion of the printing anvil, for determining the initial height of the anvil.

7. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base and extending beyond the end of the cantilever arms, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted intermediate the two cantilever arms, for maintaining the anvil in predetermined alignment with respect to the base and the platen; a second guide member, supported on said base for vertical movement with respect thereto and extending into engagement with the extension portion of the printing anvil, for determining the initial height of the anvil; and resilient biasing means, engaging the base and the second guide member, for biasing the second guide member toward engagement with the anvil.

8. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base and extending beyond the end of the cantilever arms, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, longitudinally of said cantilever arms, to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted intermediate the two cantilever arms and rigidly affixed to the anvil, for maintaining the anvil in predetermined alignment with respect to the base and the platen; a second guide member, resiliently supported on said base for vertical movement with respect thereto and extending into engagement with the extension portion of the printing anvil, for determining the initial height of the anvil; and means for adjusting the effective height of the second guide member.

9. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted intermediate the two cantilever arms, for maintaining the anvil in predetermined alignment with respect to the base and the platen; a second guide member, supported on said base for vertical movement with respect thereto and extending into engagement with the printing anvil, for determining the initial height of the anvil; a biasing spring, mounted

12

in encompassing relation to the second guide member, for biasing the second guide member toward engagement with the anvil; and means for independently adjusting the effective height of the second guide member and the biasing force exerted by the biasing spring.

10. A printing machine comprising a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base and for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, to imprint the sheet in accordance with the printing device relief design; and a guide member for maintaining the anvil in predetermined alignment with respect to the base, said guide member comprising a stud affixed to the anvil and extending downwardly therefrom through said cantilever arms, a bushing mounted in encompassing relation to the medial portion of the stud and engaging the two arms to maintain a predetermined spacing therebetween, and clamping means engaging the stud and at least one of the cantilever arms to retain the stud, the bushing, the cantilever arms, and the anvil in fixed position with respect to each other.

11. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base, for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, transversely of said cantilever arms, to imprint the sheet in accordance with the printing device relief design; and a guide member, mounted intermediate the two cantilever arms, for maintaining the anvil in predetermined alignment with respect to the base and the platen.

12. A printing machine comprising: a base; a pair of resilient cantilever arms affixed to the base and extending therefrom in vertical spaced relation to each other; a printing anvil, mounted above the upper one of said cantilever arms in spaced relation to the base for supporting a printing device in position to have a relief design on the device engaged by one surface of a sheet to be printed; a platen; means for moving said platen in pressure contact across the opposite surface of said sheet, transversely of said cantilever arms, to imprint the sheet in accordance with the printing device relief design; a first guide member, mounted intermediate the two cantilever arms, for maintaining the anvil in predetermined alignment with respect to the base and the platen; and a second guide member resiliently supported on said base for vertical movement with respect thereto and extending into engagement with the printing anvil, for determining the initial height of the anvil.

References Cited in the file of this patent

UNITED STATES PATENTS

685,833	Grall	Nov. 5, 1901
1,588,410	Gouldbourn	June 15, 1926
1,801,595	Dugdale	Apr. 21, 1931
1,829,004	Howard	Oct. 27, 1931
2,039,072	Dugdale	Apr. 28, 1936
2,277,884	Robbins	Mar. 31, 1942