April 29, 1958 G. W. PROSSER 2,832,611

BUSINESS MACHINE FORM

Filed May 9, 1955

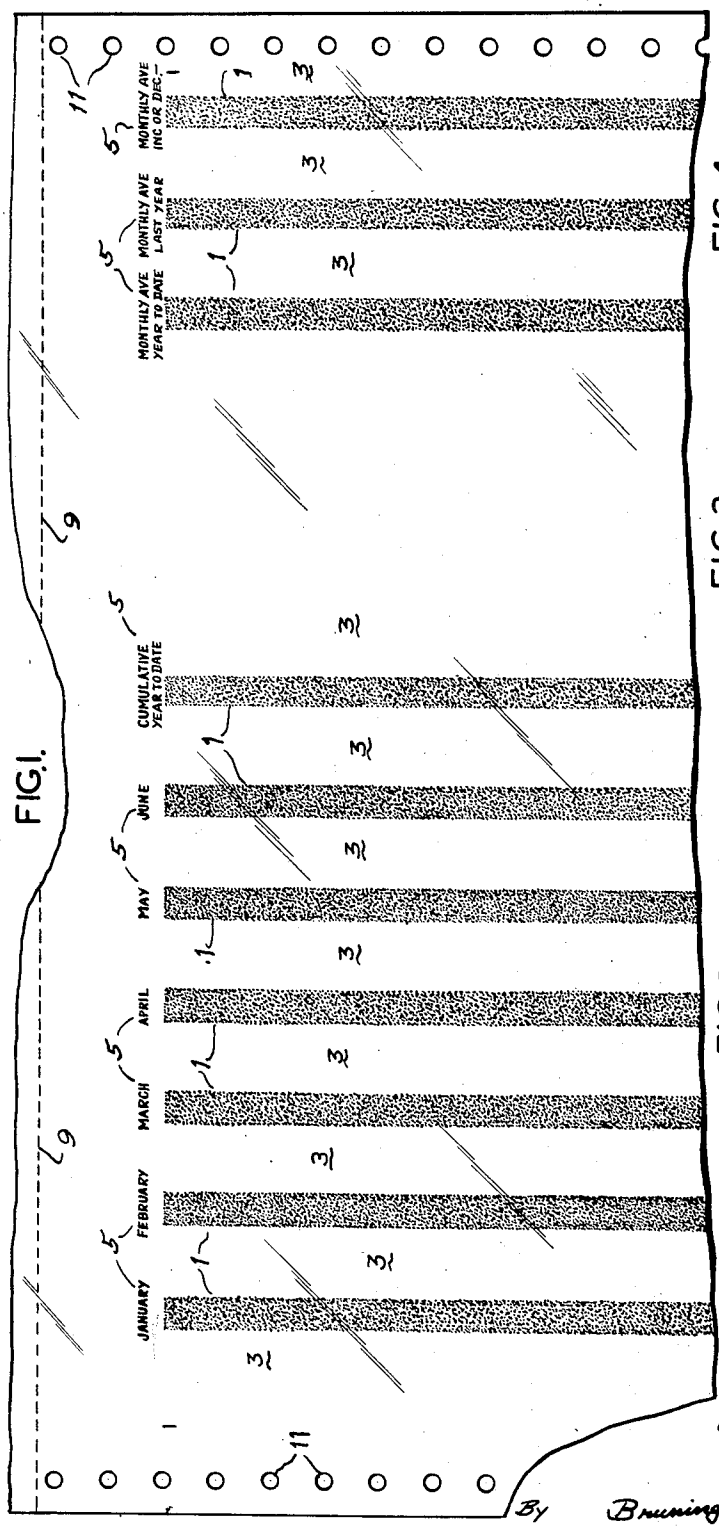


FIG. 1.

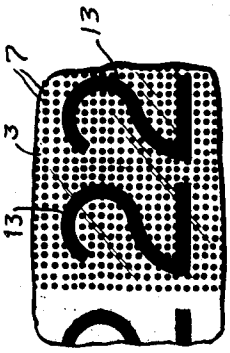


FIG. 4.

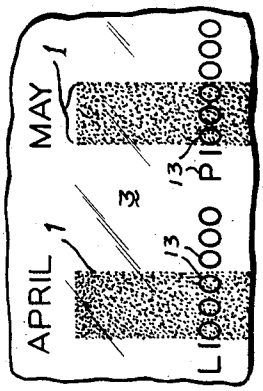


FIG. 3.

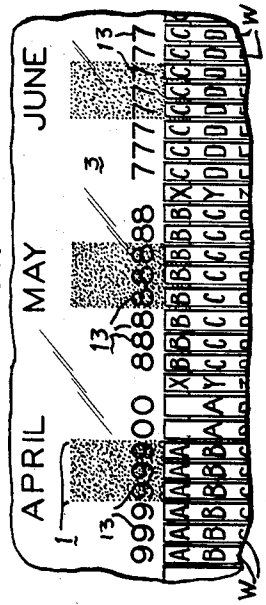


FIG. 2.

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BUSINESS MACHINE FORM

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Application May 9, 1955, Serial No. 507,028

1 Claim. (Cl. 283—66)

This invention relates to business machine forms, and more particularly to the forms used in high speed tabulating machines.

Business machines are employed to prepare accounting statements with many columns of figures. In high speed machines, the character of the printer is such as to print lines of predetermined limited length, hence the usual punctuation required in setting off the digits in a figure may seriously interfere with full utilization of the machine.

For example, the printer of such a machine may have a row of printing wheels, each of which has a peripheral selection of type for printing letters, numbers and punctuation. In preparing an accounting statement that has ten columns of eight-digit numbers, twenty spaces or wheels will be used for insertion of commas and decimal points, each number having two such characters: thus, 999,999.99. In preparing some accounting statements, the printer cannot handle all of the desired information in one pass of the form through the machine. On the other hand, it might be possible to print all of the necessary information in one pass, if the spaces required for punctuation were eliminated.

Accordingly, it is an object of the invention to provide a business machine form, which is pre-printed in a way avoiding loss of space heretofore required for punctuation and the like, without loss of emphasis. Briefly, this objective is achieved by preparing the form with pre-printed vertical bars, the width and placement of these bars being such as to underlie predetermined digits when the form is run through a business machine. For example, in a column of numbers like "999,999.00," the comma and decimal point together with the spaces therefor would be eliminated and a bar would underlie the unit, ten and hundred digits. These bars are of a color or value relative to the paper and the printing of the machine, such as permits easy reading of overprinted characters and provide a sharp distinction with the white paper.

It should be understood that the forms will normally have captions, which preferably are pre-printed when the bars are applied using the same ink. This practice raises problems, however, because an ink that is sufficiently light to permit legible printing over a bar tends to produce a caption which is not readily legible. Accordingly, the invention further contemplates that these bars will be formed by series of small dots, such as are produced by the half tone process. Offset printing is employed, and a medium size screen is preferred in producing the bars. For example, a screen having one hundred lines to the inch is satisfactory, the effective area of the printed dots being approximately equal to the unprinted white area between dots. A large screen is unsatisfactory because the edges of the bars would not be sharp and the overprinted characters might be obscured, whereas an excessively fine screen does not reproduce satisfactorily except on fancy coated paper. The percentage of dark or printed area is determined by the

darkness of the ink, which is in turn controlled by the printing of the captions.

Other features of the invention will be in part apparent from and in part pointed out in the following detail description taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a pre-printed business machine form embodying features of this invention;

Fig. 2 is a fragementary view of the form shown in Fig. 1 as it is passed through a business machine, the printing wheels thereof being shown in part;

Fig. 3 is a view similar to that of Fig. 2, but showing a different arrangement of machine printing; and

Fig. 4 is a detail view of the form with overprinted characters.

It will be understood that high speed business machines are often used in preparing accounting statements. The shifting-carriage type of machine (as in a typewriter) is relatively slow in comparison with the ability of other components of the machine to sort information and carry out necessary arithmetic computations. Accordingly, high speed machines have a printer which is adapted to print an entire line of type in one operation. For example, the printer may have a row of rotary printing wheels W, the number of which determines the length of the line that may be printed. The wheels, in turn, carry peripheral type for printing letters, numbers and punctuation, the space for each wheel being one-tenth of an inch wide.

The forms used with such a machine are a continuous type and are fed vertically or in a direction transverse to the row of wheels, hence the amount of information that can be printed in one pass of the form through the machine is predetermined. Some of the information to be printed by the machine is in the nature of legends, but most of this information will be columns of figures. If the statement is to have a large number of columns, the width of the printer may be insufficient to print all of the columns in the first pass through the machine, in which event, the form is shifted and rerun in order to print the additional columns.

For example, the form shown in Fig. 1 is designed to receive two columns of legends and ten columns of eight-digit figures. Normally, each eight-digit figure would require eleven spaces: thus 999,999.99, or a total of one hundred ten spaces for the ten columns. The illustrated form further is designed so that thirty spaces are used in printing legends, hence the total is one hundred forty spaces across the form. If the printer of the machine has only one hundred twenty wheels, it would be necessary to rerun the form in order to print the last two columns.

On the other hand, if the comma and decimal point are eliminated, each column requires only nine spaces and the ten columns would require a total of ninety spaces, thereby permitting the form to be finished in one pass through the machine having one hundred twenty wheels. It will be understood that these machines are quite expensive to use, hence the desirability of completing a form in one pass through the machine. Although the width of the printer could be increased, this is an expensive procedure.

While the above is described from the viewpoint of eliminating punctuation, the same problem arises where vertical lines are employed in place of the punctuation. A space must be provided for each such vertical line if the numbers are to be legible, a thin light-colored line without this space being unsatisfactory.

According to this invention, a paper form is preprinted in a way so as to permit elimination of the punctuation while preserving the necessary distinction between certain digits of a numeral. This is accom-

plished by printing a series of vertical bars **1** which are readily distinguished from the white background **3** of the paper, yet sufficiently light to permit legible overprinting. The bars are of a width and placement such as to correspond with the location of certain characters printed by the machine, the location and width of the digits being predetermined by the setup of the machine. Most commonly, the bars will be three characters or three-tenths of an inch wide and will be spaced at their edges by an integral factor of the character width, such as six-tenths of an inch.

A solid color bar is not entirely satisfactory, especially where captions **5** are also to be printed on the form, since these captions would be printed at the same time and with the same ink used in printing the bars. If the ink is of a character such that the captions stand out clearly, a solid bar tends to be dark and obscures the overprinting. Conversely, an ink which is sufficiently light to permit legible overprinting of a solid bar results in captions which are not sufficiently legible. On the other hand, a bar formed by stippling or dots **7** using the half tone process permits control over the darkness of the bars independently of the value or lightness of the ink.

It has been found that a medium size half tone screen is preferred. If the screen is coarse, the pattern in a bar tends to obscure the overprinting and forms ragged edges. On the other hand, an excessively fine screen requires fancy coated paper, whereas an offset type press and less expensive paper is preferred for this type of use. A screen of about one hundred lines per inch has been found to be satisfactory.

Another variation in this process is the amount of printed area or the size of the printed dots relative to the unprinted white area between the dots. This is controlled by the photographic exposure through the screen, and in turn determines the darkness of the area. For example, a relatively high percentage of printed area produces a dark bar. A fifty-fifty ratio has proved satisfactory for this purpose, since it permits use of an adequately dark ink for the captions without resulting in an excessively dark bar.

It will be understood that these forms are usually continuous. A web is printed with the bars **1** and captions **5**, and prior to use in a business machine, the web is provided with transverse tear lines **9** to facilitate separation after use in a machine. Marginal perforations **11** are also provided to facilitate feed through the machine and insure registry of the several sheets, when copies are made.

Fig. 2 illustrates how the bars are aligned with the printing wheels W as the form is fed, so that the overlying characters **13** printed thereby are registered with these bars. In Fig. 2, the arrangement is such as to show cents, and up to 999,999 dollars. Of course, other arrangements are possible. For example, Fig. 3 discloses how the form might be used to handle figures wherein the cents have been rounded off. Another variation is that of employing different colored bars, but this complicates the initial printing operation somewhat. A distinction between bars using the same ink might be achieved, however, by employing a different pattern for different bars.

From the foregoing description, it is apparent that those skilled in the art will understand the structure, function and mode of operation of the invention herein disclosed, and appreciate the advantages thereof. Although several embodiments have been disclosed in detail, it is to be understood that the invention is not limited thereto, but the drawings and description thereof are to be understood as being merely illustrative. For example, the photogravure rather than the half tone process could be used, although half tone off-set printing will be more economical. It is realized that many modifications and variations will present themselves to those skilled in the art without departing from the spirit of this invention or the scope thereof as set forth in the appended claim.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

A continuous form for use with high-speed printing apparatus of the type having a series of selectively changeable printing devices one for each character space in a line and arranged in a row to simultaneously print a complete line of type across the form between opposite side margins thereof; the form having a series of aligned feed-perforations along each of its opposite side margins and tear lines extending between said opposite side margins substantially parallel to said lines of type, pre-printed bars extending parallel to said series of aligned feed perforations and in predetermined spaced relationship from one another therefrom and thereby to maintain each of said pre-printed bars in alignment with predetermined ones of the series of printing devices as the form is moved in the direction of feed through the printing apparatus, said pre-printed bars being of a width equal to three character spaces of the printing apparatus thereby permitting elimination of punctuation and providing for the printing of more information across the form than would be possible if punctuation were present, said pre-printed bars being of a half-tone character so as to be lighter than a solid character overprinted by the high speed printing machine while permitting pre-printed solid characters printed with the same ink employed in printing the bars, thereby to permit simultaneous printing of the captions and the bars.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,832,611 April 29, 1958

George W. Prosser

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 45, for "thus 999,999.99," read -- thus _999,999.99, --; column 4, line 36, before "from" insert -- therefrom and --; same line, after "another" strike out "therefrom and".

Signed and sealed this 5th day of August 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents