

Oct. 17, 1950

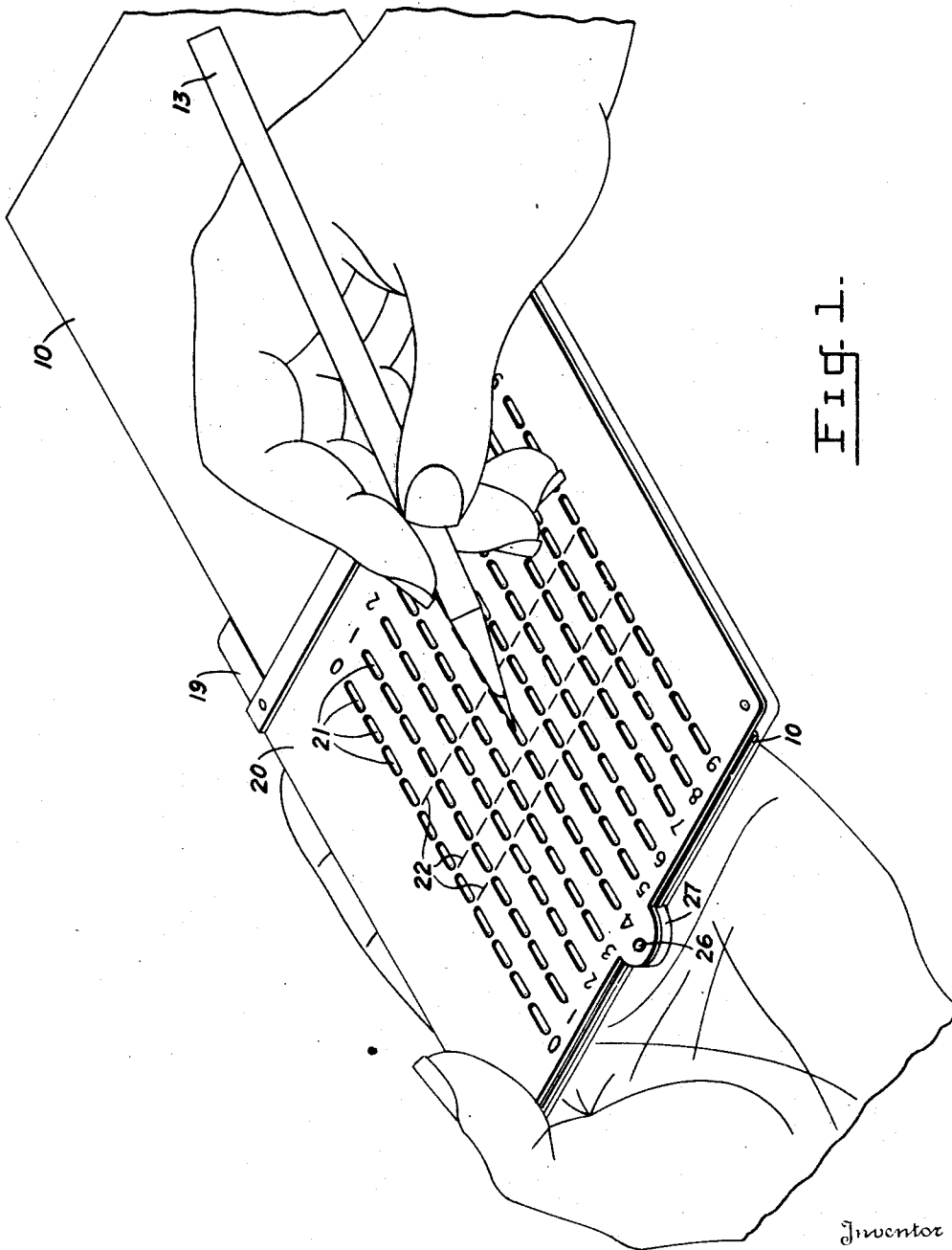
J. I. SIMPLAIR

2,525,837

MARK SENSING TEMPLATE FOR ELECTRICAL ACCOUNTING MACHINES

Filed Sept. 14, 1945

3 Sheets-Sheet 1



Fiq. 1.

Inventor

JOHN I. SIMPLAIR

By

By *J. H. Church & H. C. Philocean*
Attorneys

Attorneys

Oct. 17, 1950

J. I. SIMPLAIR

2,525,837

MARK SENSING TEMPLATE FOR ELECTRICAL ACCOUNTING MACHINES

Filed Sept. 14, 1945

3 Sheets-Sheet 2

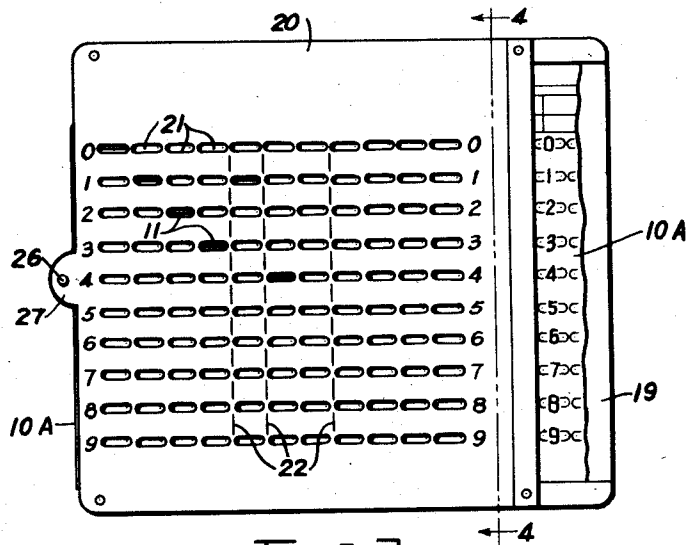


Fig. 2.

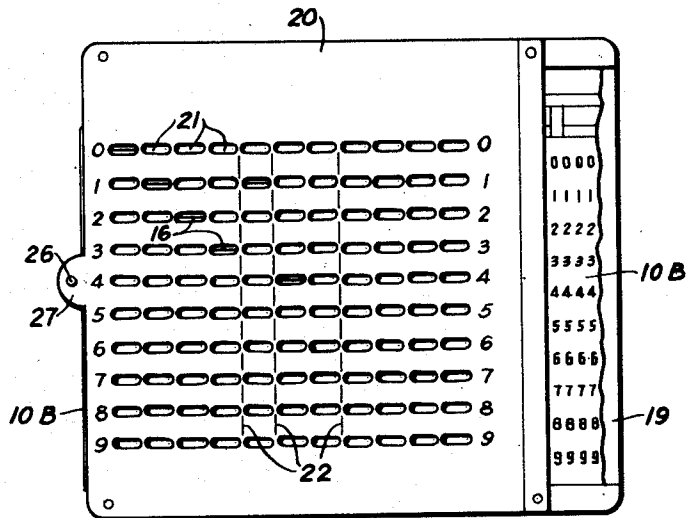


Fig. 3.



Fig. 4.

Inventor

JOHN I. SIMPLAIR

334

J. H. Church & A. E. Thibodeau

Attorneys

Oct. 17, 1950

J. I. SIMPLAIR

2,525,837

MARK SENSING TEMPLATE FOR ELECTRICAL ACCOUNTING MACHINES

Filed Sept. 14, 1945

3 Sheets-Sheet 3

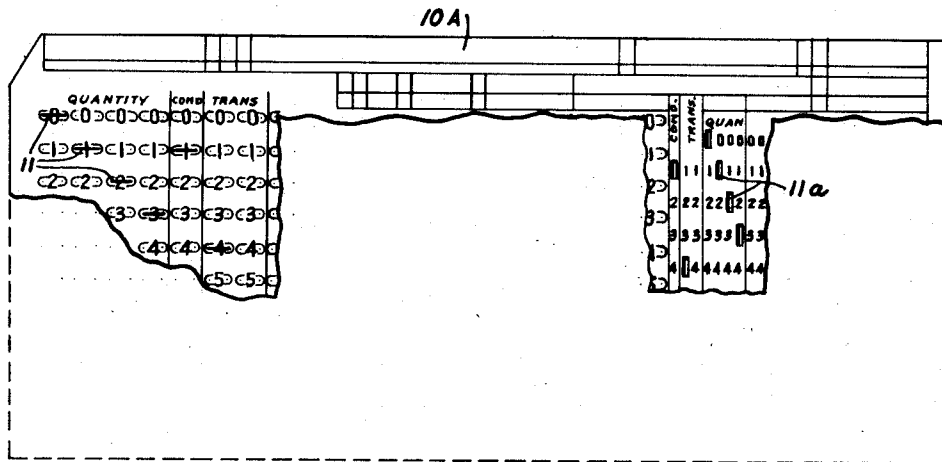


Fig. 5.

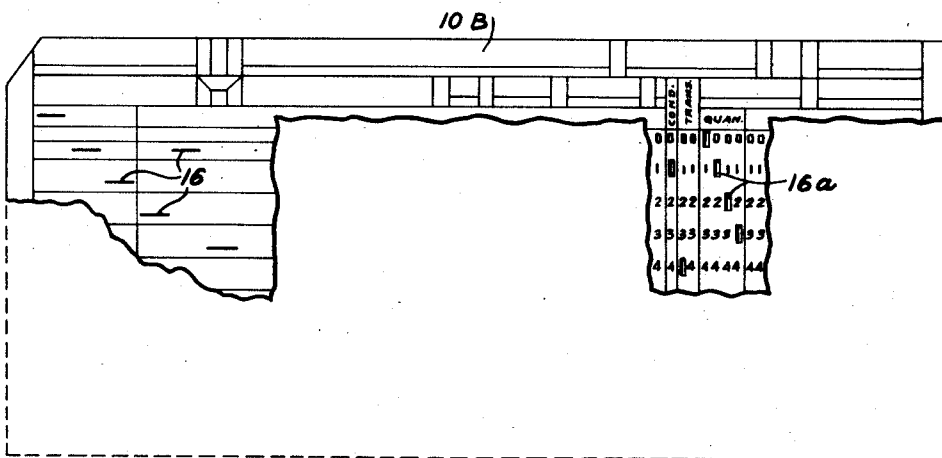


Fig. 6.

Inventor
JOHN I. SIMPLAIR

By

J. H. Church & A. E. Thebodeau
Attorneys

UNITED STATES PATENT OFFICE

2,525,837

MARK SENSING TEMPLATE FOR ELECTRICAL ACCOUNTING MACHINES

John I. Simplair, Philadelphia, Pa.

Application September 14, 1945, Serial No. 616,436

5 Claims. (Cl. 33—174)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to the mark sensing record cards used in electrically operated tabulating machines, and it has special reference to means for improving the efficiency of the mark sensing system of automatic data tabulation.

Broadly stated, the object of my invention is to provide means for assuring accurate and convenient placement of electrically conducting markings upon pre-designated areas of a tabulating card.

A more specific object is to eliminate errors resulting from failure to place the conducting markings in the card area fields that are essential to later completion of appropriate data recording circuits.

Another object is to make possible the use of mark sensing tabulation methods with any conventional type of tabulating card.

A further object is to increase the speed and decrease the skill and effort with which the sensitizing conducting materials may be applied to tabulating cards.

In practicing my invention, I attain the foregoing and other objects by providing a unique template having a specially perforated face and preferably being of pocket-like construction. In using this template, a machine tabulation card of conventional type is inserted within the pocket so that certain coded areas on the card enter into registry with the template perforations. To tabulate data, the user makes appropriate markings on the card through these perforations with a graphite or other electrical conducting material pencil.

One such mark is so placed on each of the card's "mark sensing" fields or coded areas that is identified with a specific value or item of information to be recorded. Subsequently, the card is fed through an automatic electric tabulating machine having conventional metallic brushes which scan the card's surface for conductive markings to complete electrical circuits sensitized thereby. The machine thus picks up electrical impulses from the marked card portions, amplifies them and ultimately records the data permanently by punching holes at specified positions elsewhere on the card.

Such use of my novel template substantially increases the ease, accuracy and reliability of conductive marking placement, as will be brought

2

out more fully, and it vastly extends the situations for which "mark sensing" becomes practical.

The advantages and utility of my novel device will become further apparent from the following description of one preferred construction thereof. Such an illustrative construction is shown by the accompanying drawings wherein:

Fig. 1 is a view in perspective of my new template illustrated as being held in one of the many possible positions in which the electrically conductive markings may be applied to the tabulation card through the perforations on the template's face;

Fig. 2 shows my unique template accommodating a Hollerith type machine tabulation card (fragmentary portion only shown) which is specially printed for "mark sensing" use;

Fig. 3 illustrates how my novel template enables mark-sensing techniques to be employed even with conventional "dual" type cards not originally designed for mark-sensing;

Fig. 4 is a view taken from line 4—4 of Fig. 2 to show the template's pocket-like construction plus the manner in which the card fits therein beneath the perforated face;

Fig. 5 depicts the result of automatic machine punch tabulation of data marked through my template on the left portion of the card of Fig. 2; and

Fig. 6 shows the result of automatic machine punch tabulation of data similarly marked on the left portion of the card of Fig. 3.

Machine tabulation methods of the prior art

The fast pace with which the arts and sciences have progressed within the past century has been matched by the growth of methods for automatically tabulating and sorting the wealth of data which is constantly being accumulated in all sorts of enterprises. One significant impetus to this development has been an electrically operated data tabulation system devised by Dr. Herman Hollerith prior to 1890 and still in use today.

Hollerith's plan involves the recording of facts of any given situation by punching holes, according to a definite pattern, in a separate card of standard size and shape for each combination of information items. The tabulation card now useable in carrying out the Hollerith plan may satisfactorily be of the type disclosed by Lake Patent 1,772,492. Such cards are shown at 10 in the drawings hereof, and each essentially comprises a paper or other insulating material sheet divided into a number of delimited areas, each characterized by its own number or symbol, all

of them being aligned in vertical columns and horizontal rows.

Each horizontal row of numbers has the same value all the way across. The top row is numbered 0, the next is 1 followed by 2 and so on to number 9 at the very bottom. These numbers may represent a multiple of the value indicated by the vertical column to which they belong. For example, the number "3" in the first column on the left of a group of four columns indicates "three thousand"; a "7" in the next column refers to "seven hundred," etc.

Typically, as many as 80 vertical columns are included in a card of the conventional type shown at 10, the total being subdivided by ruled lines into groups convenient for recording different items of information. Of these 80 columns, only 27 fields are customarily available for placement of electrical markings, since three vertical columns are ordinarily allotted to each "mark sensing" field, as will later be explained.

A pre-designated code assigns a definite meaning to each number or symbol on the card. A hole punched in any of the aforementioned areas or symbols causes electrically-driven mechanisms (not here shown) dealing with particular data represented by the area to function as adding or other devices, either singly or in unison with others, as may be required to obtain the result which is desired.

Briefly summarized, the major principle underlying operation of electric accounting machines of the Hollerith type is as follows: The tabulating card is carefully prepared to make it a non-conductor of electricity. Holes are first perforated to represent data in the manner just described. The thus perforated card is then passed through an interpreting machine (not shown) under individual metallic wire brush contacts (one for each vertical column) which permit an electrical circuit to be completed thru the card at the position of each punched hole. Upon such completion of each circuit at a definite time and from a fixed position on the card, various accounting steps are mechanically performed by the machine according to its intended function.

Prior art key punch machine

The initial perforations in the card are made by means of a conventional key punch machine (also not here shown). This apparatus has a keyboard by means of which the operator can cause a hole to be cut through any one of the symbols on the card. As soon as a hole is thus made the card is advanced automatically to the next column to be punched, and so on until the entire data to be recorded has been transcribed into permanent punched hole form.

In a manual entitled "Machine Methods of Accounting," under a section called "The Design of Tabulating Cards," the International Business Machine Company, present day successor to the early company founded by Dr. Hollerith, has this to say for the key punch procedure:

"The key punch operation is the only step in the tabulating machine method of accounting which is not fully automatic. It is, therefore, the only phase in which the rate of production is subject to variation. Anything which can be done to simplify the work of the operator will tend to increase the rate of punching and consequently reduce the time required * * * *"

Mark sensing facilities of the prior art

The prior art has found in the conventional "mark sensing" system a partial answer to the just quoted challenge that a substitute for the non-automatic key punching step be produced. By this conventional system it is now possible to mark records directly on a tabulating card—instead of on an accessory sheet of record—and have the data permanently transcribed by punched holes through an entirely automatic machine process.

The conventional mark-sensing method of operation is as follows: At specified coded locations on the tabulation card (10 of the drawings) a mark (corresponding to 11 of Figs. 2, 5 and to 16 of Figs. 3, 6) is made with an electrically conductive graphite pencil (corresponding to 13 of Fig. 1) to represent the particular data to be recorded. The thus marked cards are introduced into an automatic punching machine equipped with the mark sensing facilities. The feature of these facilities is that, unlike the individual wire brush contact (not shown) of the "conventional" method, each mark sensing brush consists of three regular brushes (not shown) indexed with three successive vertical columns on the tabulating card. The two outer brushes are in common connection, while the center one is connected to the main electrical circuit.

When either of the lateral brushes is made common to the center brush by means of the conductive pencil marks, an electrical impulse is supplied to the brush outlet. This impulse is greatly magnified by an amplifying unit to energize a punch that makes a tabulation hole at the corresponding recording position elsewhere on the card. In some cases, work-members other than punches may be energized by the same means. Examples of such work members are recording indicators, sorting devices, etc.

The customary "mark sensing" field, as represented on the card 10A of Figs. 2 and 5, employs three vertical columns on the card instead of the customary one, as indicated above, in order to allow room for a sufficient deposit of conducting material to complete the electrical circuit. In addition, the extra space affords opportunity for a mark to be placed which is clearly visible, enabling the clerk-tabulator to assure himself that the marking has been done in the correct tabular field.

Problem which my unique template solves

The advantages of the mark-sensing facilities and method of operation over that which requires use of the key punch machine are at once obvious. Mark sensing techniques permit the entry of data directly on the tabulating card by means of a simple pencil stroke. This eliminates the extra steps of compiling voluminous longhand and other records which subsequently have to be individually processed through the key punch machine operation. The making of card entries "on the job," needing no further manual preparation before tabulation, both simplifies and accelerates the work.

Mark-sensing as heretofore practiced has, however, been subject to a number of definite disadvantages, all of which my template overcomes. Some of these will now be mentioned. First, there is always the possibility that a mark will overlap onto an adjoining field, thereby causing an erroneous final punched-hole record. Second, the task of carefully entering marks in the small

delimited marking field is somewhat slow and painstaking due to the clerk's logical fear of overlapping fields or depositing an insufficient amount of conducting material to complete the electrical circuit. Third, the need for specially designed cards with mark sensing regions clearly indicated precludes the versatile use of the conventional dual type cards which normally have spaces for detailed descriptive information in those areas.

By means of my unique template, shown at 20 in the drawings, all three of the listed disadvantages as well as others not mentioned are avoided. As will be seen from the explanation of the method of operation which follows, this template is exceedingly easy to use. Moreover, it will be obvious that despite its simplicity my template 20 greatly enhances mark making accuracy, increases the speed with which the marks may be made and in fact greatly accelerates the entire recording and tabulating procedure.

Use of my unique template with card printed for mark sensing

Fig. 1 shows a conventional tabulation card 10 (printing thereon represented in later views) held in proper position within the pocket-like template 20, and a graphite pencil 13 held poised by a clerk preparatory to marking the card through the template stencil-like openings 21. Depending on the preference and convenience of the user, the template may optionally be held in one hand as shown or supported by other means during the marking operation. The tabulation card 10 so inserted into my new template 20 typically is of a standard size and shape determined by the manufacturer of the machine in which the card is used, and it is made of paper or other insulated material non-conductive to electricity.

Data tabulation cards for conventional "mark sensing" usage have this standard design but are of a specially printed type commercially available prior to my invention and exemplified by the card 10A of Figs. 2 and 5.

This illustrative card 10A shows the customary horizontal lines and vertical columns of coded areas. Identifying these areas are code numbers 0 to 9 which are to represent data to be tabulated. These numbers are spacedly located in vertical columns (customarily a maximum total of 80) and in horizontal rows across the face of the card. The mark sensing fields are shown on card 10A's left end. Each field spans three successive vertical columns in a single horizontal row; on card 10A of Figs. 2 and 5 each such field is designated by a central code number (0 to 9) flanked on either side by an arch-enclosed area.

Marks, such as indicated at 11 in Figs. 2 and 5, are made horizontally on card 10A with the graphite pencil 13 through template 20's stencil openings 21 previously described, across the three vertical columns of the appropriate field which bears the code number or symbol representing a particular item of information. The markings may satisfactorily be made by stroking with a pencil in the direction taken by the card upon being inserted into the template, the pressure of the pencil thus assisting in maintaining the card in proper register therein. In the template 20 of Figs. 1—2—3, such marking stroke would be made from right to left. Were the template card entrance to be on the left end instead of

on the right as shown, the marking stroke would best be made from left to right.

The so marked card 10A is now withdrawn from the template 20 and thereafter mark-sensing brushes of the machine contact each graphite marking to complete an electrical circuit. Such circuit completion relays an electrical impulse through an amplifying unit (also not shown), thereby operating a punch in the machine which makes recording holes 11a in corresponding tabular positions on the right end of card 10A (see Fig. 5).

Certain machines are arranged to punch the recording holes 11a at still other parts of card 10A's face. For example, some designs place the holes directly beneath the related marking fields, while further arrangements of brushes and punches may utilize other positions to suit particular needs.

Generally, a "mark sensed" card such as is shown at 10A in Fig. 2 will have tabular data columns in addition to those shown as being marked or punched. Normally, "static" data from "master" cards is punch-recorded in these further columns. Such data includes, for example, the total cost of an item, the unit price, quality, etc. In such situations mark-sensing may be used, as shown, for maintaining a running inventory thereafter.

In card 10A, therefore, the quantity, condition, transaction and item number being subject to continued change are all recorded and kept up to date by the mark-sensing procedure. Data will be treated as "static" or "fluctuating" depending on the individual circumstances applicable to the particular information to be recorded.

Use of my new template with card not printed for mark sensing

One significant advantage of my template 20 is that with it a conventional so called "dual" card of the type shown at 10B in Figs. 3 and 6 may be directly adapted for mark-sensing usage. This "dual" type of card was originally designated for use with machines not equipped for mark sensing. The "dual" card has, however, retained its usefulness in that it serves as a medium of reporting in writing the original information; and in addition provides fields to which this information may be transcribed by punching holes. On the left end of card 10B's face, a ruled section is generally reserved for making written descriptive entries; the balance or right portion of the card has tabular columns on which coded entries are made in the form of holes (such as indicated at 16a of Fig. 6) by a key punch machine.

Without my template such cards obviously cannot be used for mark sensing as no guide line or other indicia are present to indicate the limits of a particular mark-sensing field. However, with the aid of my template 20 the marking of this "dual" card 10B is no more complicated than to mark the specially printed "mark sensing" card 10A earlier described. Graphite or other electrically conductive marks are made on card 10B through the template face perforations 21 as shown in Fig. 3, and the mark sensing tabulation machine thereafter punches the holes 16a (see Fig. 6), following the process earlier outlined.

Illustrated and alternate template constructions

The illustrated template 20 may be made of any suitable material such as brass. In the

design shown, the perforated portion 20 takes the form of a face plate which is marginally attached to a base plate 19 in spaced relation to the body thereof to provide the pocket-like construction represented. The resulting assemblage is adapted accurately to hold standard size tabulation cards 10 in a fixed position of register against the inner surface of the template 20's perforated face (see Figs. 1 to 4).

The face plate of the template is perforated (as earlier described) with oblong shaped stencil openings 21 arranged in vertical rows and horizontal lines accurately positioned to match the alignment and spacing of the tri-column marking fields of the specially printed mark-sensing tabulation card 10A.

Preferably, the base plate 19 of the template is made somewhat longer than the face plate (see Figs. 1—2—3) a feature which serves to guide the card into the pocket-like space between them. Also facilitating this entry, and at the same time helping maintain the card in proper registry with the template face perforations, is the represented under cut recess in the base plate body (see Fig. 4). The width of this recess is substantially equal to that of the card but allows the card edges freely to slide along the recess edges. In the construction shown, the recess's depth is slightly greater than the card's thickness, as indicated by Fig. 4, and enables ready entry of the card into and removal thereof from the template assemblage. The overall depth of the resulting template pocket, however, is sufficiently small to assure that the card will be held in close contact with the inner wall of template's perforated face.

The base and face plates are riveted, welded or otherwise attached together along two of their opposite margins, leaving the remaining two unattached ends open to act as an entrance (at right of each of Figs. 1—2—3) and an opposite exit aperture, respectively. The exit opening (left of each of Figs. 1—2—3) permits the card's leading edge to emerge as shown in Figs. 1—2—3, thereby sweeping out excess graphite (or other foreign material) left in the template, which otherwise would accumulate to prevent ready entrance of the card therein. A rivet pin 26 also joins the tabs 27 of the template's plates beyond the exit aperture. This juncture serves as a barrier to stop the card at the point where the card's marking fields are aligned with the openings 21 in the template's face held there-against.

Although the illustrated template 20 is shown with the pocket-opening on the right end, such construction is, of course, entirely optional. Facilities for placing the tabulation card in accurate position of register against the perforated template face may assume many different forms. In the pocket-like construction here shown, the entrance may be on the left, top or bottom, so long as the template's openings 21 are arranged to register with the card's marking fields or coded areas. The pocket construction is, moreover, not always essential as other methods of fastening the card against the template face are readily possible.

Optionally, too, the template can be made of metals other than brass, or of plastic material, or of any other substance having requisite rigidity and strength. Even the openings 21 can be shaped or sized differently so long as they essentially follow the pattern of the card's mark sensing fields.

Identification aids engraved on template's face

To help the user select the proper marking field on the card that corresponds with the appropriate punch-hole recording columns, numbers 0 to 9 are engraved on the template's face at both ends of the respective horizontal rows of openings 21 from top to bottom. These numbers are spaced to match those on the tabulation card 10 which identify the marking fields thereon. Further assistance is given by engraved dividing lines 22 which set off the vertical columns into units capable of recording each type of information pertinent thereto. In the illustrated template 20 these dividing lines 22 are arranged so that the first and last four columns will record up to 9999, the single column a maximum of 9, while the two-column combination records up to 99.

The dividing lines 22 may of course be arranged in different fashion so that more or less vertical columns make up a unit, depending on the varying requirements. At the top or bottom of the respective columnar units, the identity of the particular information meant to be recorded there can be labelled, if desired. In the drawings hereof such labeling is not shown.

Summary

The foregoing description and accompanying illustrations have shown how my unique template has enhanced the usefulness of mark-sensing automatic tabulating devices. It will be evident that among desired attributes I have provided means for assuring accurate and convenient placement of electrically conducting markings upon pre-designated areas of a tabulating card; that I have made possible the elimination of errors resulting from failure to place the conducting markings in the card area field that are essential to later completion of appropriate data recording circuits; that I have made possible the use of mark-sensing tabulation methods with any conventional type of tabulating card; and that I have increased the speed and decreased the skill and effort with which the sensitizing conducting materials may be applied to tabulating cards.

My inventive improvements are therefore extensive in their adaption and are not to be restricted to the specific form here disclosed by way of illustration.

I claim:

1. In a mark-sensing template for aiding application of electrically conducting markings to selected coded areas on a data tabulation card, the combination of a pocket-like container for removably receiving and accurately holding said card in a fixed position of registry, a sheet member constituting for said container a wall against the inner surface of which said card bears when received as aforesaid and through which there are provided stencil opening perforations located and dimensioned to individually expose each of said coded card areas when the card occupies said registry position, and identifying designations on the outer surface of said perforated sheet member adjacent certain of said stencil openings for facilitating selection of the coded card areas upon which it is desired to apply conducting material markings through said openings and within the area limits which the opening boundaries define.

2. In a mark-sensing template for aiding application of electrically conducting markings to selected areas on a data tabulation card, the

combination of a base plate dimensioned and shaped to serve as a backing for the portion of said card upon which said markings are to be made, a mating face plate provided with stencil opening perforations located and dimensioned to individually expose each of said coded card areas when said card is fixedly held by said base plate against the inner surface of said face plate in a given position of register, fastening means marginally joining said base and face plates in spaced-apart relation to form a pocket-like container having an entrance aperture into which one edge of said card may be inserted for accurate guidance of the card into said position of register between said two plates and having an opposite exit juncture which stops said card exactly in said register position, and identifying designations on the outer surface of said perforated face plate adjacent certain of said stencil openings for facilitating selection of the coded card areas upon which it is desired to apply conducting material markings through said openings.

3. In a mark-sensing template for aiding application of electrically conducting markings to selected coded areas on a data tabulation card, the combination of a base plate dimensioned and shaped to serve as a backing for the portion of said card upon which said markings are to be made, a mating face plate provided with stencil opening perforations dimensioned and located to individually expose each of said coded card areas when said card is fixedly held by said base plate against the inner surface of said face plate in a given position of register, fastening means marginally joining said base and face plates in spaced-apart relation to form a pocket-like container having an entrance aperture into which one edge of said card may be inserted for accurate guidance of the card into said position of register between said two plates and also having an opposite exit aperture for enabling said advancing card edge to push out foreign material that may have been lodged between said plates prior to insertion of said card into the container, tab-like continuations from each of said plates projecting from the container's exit end, and means serving to fasten the free ends of said continuations to each other and further serving to stop said card exactly in said register position upon its introduction into said container whereby conducting material markings may then speedily and accurately be applied to selected coded card areas through said face plate openings and with the guiding assistance of the opening boundaries.

4. A mark-sensing template for aiding application of electrically conducting markings to selected areas on a data tabulation card, comprising a base plate provided with a notch or channeled portion in its upper face having a depth and width corresponding substantially to the thickness and width of the card and serving as a backing therefor, a mating face plate provided with stencil opening perforations located and dimensioned to individually expose each of said coded card areas when said card is fixedly held by said base plate against the inner surface of said face plate in a given position of register, fastening means marginally joining said base and face plate to thereby form a pocket-like container having an entrance slot into which one edge of said card may be inserted for accurate guidance of the card into said position of register between said plates, and means at the opposite end of said pocket-like container for stopping the tabulation card at the position of registry.

5. In a mark-sensing template for aiding application of electrically conducting markings to selected coded areas on a data tabulation card, the combination of base plate dimensioned and prepared to serve as a backing for the portion of said card upon which said markings are to be made, a mating face plate provided with stencil opening perforations dimensioned and located to individually expose each of said coded card areas when said card is fixedly held by said base plate against the inner surface of said face plate in a given position of register, fastening means marginally joining said base and face plates in spaced-apart relation to form a pocket-like container having an entrance aperture unto which one edge of said card may be inserted for accurate guidance of the card to said position of register between said two plates, said base plate being dimensioned to extend beyond the mouth of the pocket and thereby provide a guideway for a tabulation card being inserted into the pocket.

JOHN I. SIMPLAIR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,132,261	Heineck	Mar. 16, 1915
1,234,956	Streamberg	July 31, 1917
1,928,565	Kindig	Sept. 26, 1933
1,974,442	Baldwin	Sept. 25, 1934