

[54] **DISAPPEARING PUNCH**

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83/564, 83/693, 83/917, 234/48

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[58] Field of Search 234/48, 47; 83/917, 559, 564,
83/693, 451, 522, 556

[56] **References Cited**

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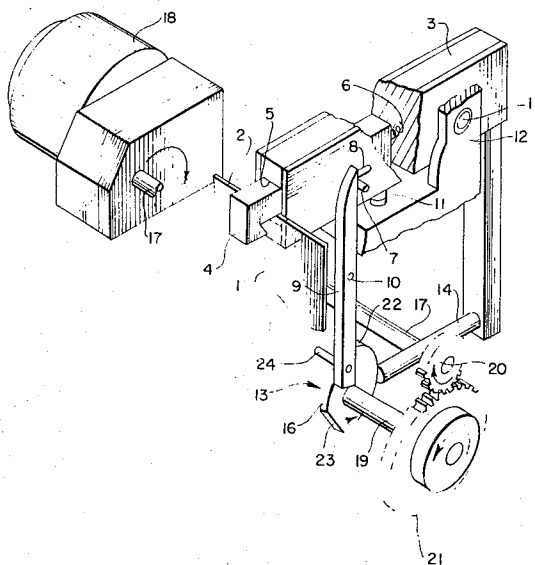
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[57] **ABSTRACT**

The invention relates to a punching device for punching notches in the edge of a card or the like. The punch is mounted in a housing and is moveable from a retracted position within the housing to an operating position to punch a notch in the edge of a card adjacent an outside surface of the housing. The punch may comprise a member which pivots downwardly from the retracted position to the operating position over an upper edge of the card.

7 Claims, 3 Drawing Figures



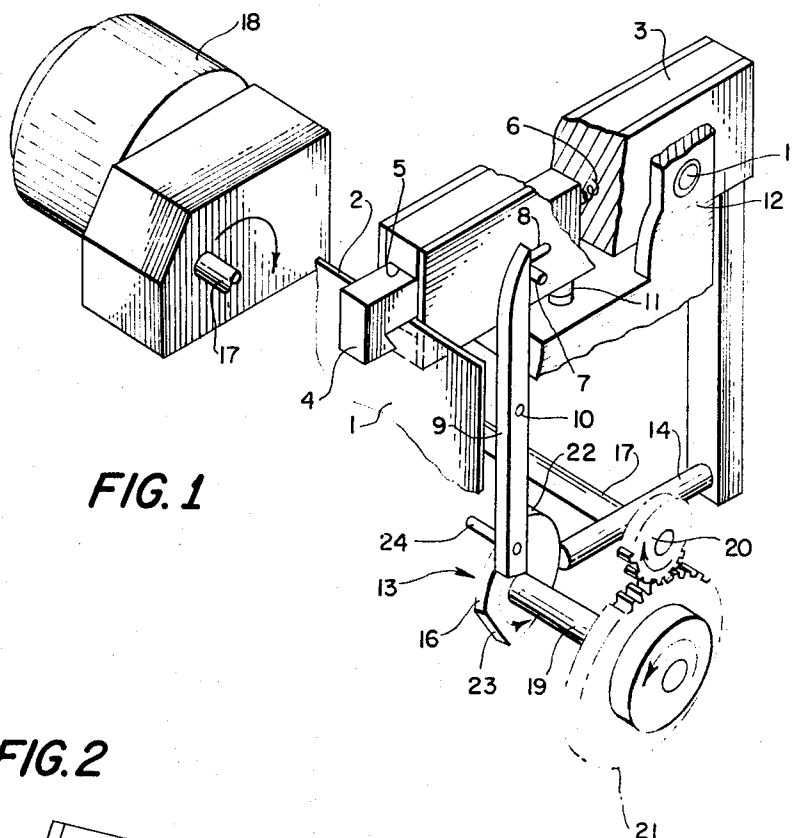


FIG. 1

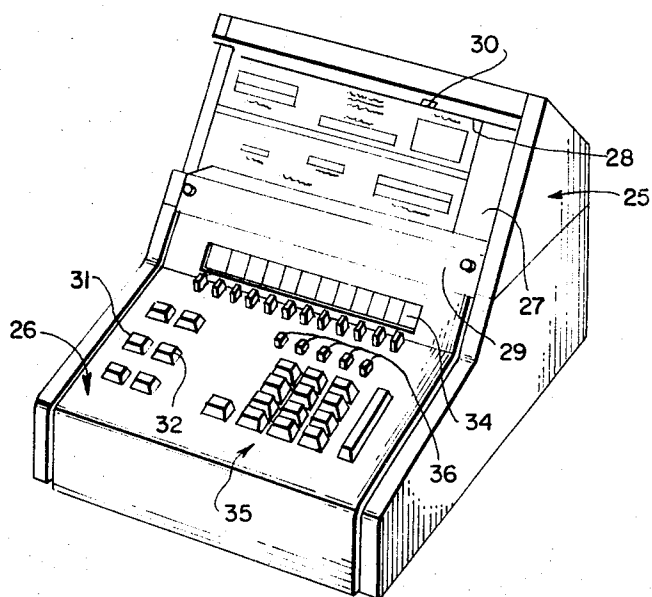


FIG. 2

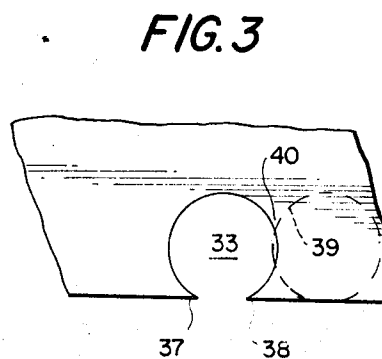


FIG. 3

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DISAPPEARING PUNCH

BACKGROUND OF THE INVENTION

This invention relates to a punching device. More particularly, the invention relates to a device for punching a notch in the edge of a card, sheet or the like.

Edge notched cards which are useful in information retrieval systems are well known. A typical system is described in copending application Ser. No. 811,826 the disclosure of which is incorporated herein by reference. Various cards, such as data processing, microfilm, aperture, microfilche, magnetic faced, address, and the like can be used.

It is frequently desirable to provide one or more notches in the edge of such cards. For example, edge notches may assist in the mechanical selection of certain cards having certain desired information from a stack of cards. In another instance, an edge notch may be used to assist in the physical movement of such cards. Edge notches serving both of these functions are disclosed in co-pending application Ser. No. 811,826. In most instances it is desirable to provide a notch at a precise location on an edge and information concerning its location may be printed at or near the edge. For example, the edge may bear indicia indicating one or more locations to be punched. The punching mechanisms commonly employed obscure the edge of the card thus rendering the obscured area essentially useless for the purpose of indicating areas to be punched. Thus, an area of the card which is ostensibly suitable for carrying information related to the location of notches in that edge is not useful for that purpose.

It is an object of the present invention to provide an edge-notching device in which the area of the card adjacent the edge to be punched is not obscured by the device thus enabling that area of the card to be useful for providing indicia relating to the location of a notch or notches therein.

BRIEF SUMMARY OF THE INVENTION

An edge notching device for punching notches in an edge of a card according to the invention comprises a housing, means for holding a card in an operable position adjacent an outer surface of said housing, a punch moveable between a retracted position within said housing and a punching position adjacent an edge of said card, means for actuating the punch in said punching position to notch the edge of a card held in said fixed position, and means for moving the punch between said retracted and punching positions. The device conveniently includes cam means for sequentially moving the punch into its operating position, actuating said punch, and moving the punch into its retracted position. The punch is preferably pivotally mounted in the housing.

DETAILED DESCRIPTION OF THE INVENTION

There follows a detailed description of a preferred embodiment of the present invention, together with accompanying drawings. However, it is to be understood that the detailed description and the accompanying drawings are provided solely for the purpose of illustrating a preferred embodiment, and that the invention is capable of numerous modifications and variations

apparent to those skilled in the art without departing from the spirit and scope of the invention.

FIG. 1 is a diagrammatic perspective view of an apparatus constructed in accordance with the features of the present invention;

FIG. 2 is a perspective view of an apparatus according to the present invention; and

FIG. 3 shows a preferred shape of notch formed in a card.

With reference to FIG. 1, a card 1 having an upper edge 2 to be notched is located adjacent the outer surface of a housing, not shown, in which the illustrated punching mechanism is located. The housing is shown in FIG. 2 and has been omitted from FIG. 1 for clarity. The punch comprises an elongate die member 3 and a cooperating punch member 4 moveable together from a retracted position within the housing into an operating position, shown in FIG. 1, in which the punch is in position to put a notch in edge 2 of card 1. The punch member 4 is moveable in a cavity 5 provided in die member 3 and the punch and die are of conventional configuration. The punch member is biased outwardly by a spring 6 acting against the bottom of cavity 5. Outward movement of punch member 4 is limited by means of pin 7 secured to punch member 4 which rides in a slot 8 in die member 3. Outward motion of punch member 4 is limited by engagement of pin 7 with the forward end of slot 8 under the influence of spring 6. The punch is actuated by arm 9 pivotally mounted in the housing for pivoting about spigot 10 fixed with respect to the housing and of conventional construction. The top portion of arm 9 is moveable from the position shown in the drawing rearwardly to actuate the punch to provide a notch in the top edge 2 of card 1.

Die member 3 is pivotally mounted on spigot 11 fixed with respect to the housing and of conventional type. The die member 3 is held in operating position by engagement with a support member, such as member 12, which is fixed relative to the housing, and by engagement of a cam 13 and cam follower 14 fixed to die member 3. Spigots 10 and 11 are conveniently mounted on support member 12. A spring 11 urges the die member 3 upwardly and upward pivotal motion is limited by engagement of cam follower 14 with cam surface 16 of cam 13. Cam 13 is rotated by means of drive shaft 17 of motor 18 operating cam shaft 19 through gears 20, 21 all mounted in a fixed position in the housing by conventional means. Cam surface 16 includes a raised portion 22 and a low portion 23 and when cam follower 14 engages low portion 23, die member 3 pivots upwardly about pivot 11 under the influence of spring 11. The upward motion of die member 3 is conveniently limited by engagement of cam follower 14 and surface 23 of cam 13, or by providing a stop (not shown) in the housing. In any event, the punch pivots upwardly a distance to retract the punch into the housing such that the punch assembly is located behind the housing surface to which card 1 is adjacent, and the upper edge 2 of card 1 is unobstructed. Further rotation of cam 13 will bring raised portion 22 of cam surface 16 into engagement with cam follower 14 causing die member 3 to pivot downwardly from its retracted position to the operating position shown in FIG. 1.

Arm 10 is moveable in the position shown in FIG. 1 under the influence of cam follower 24 engaging cam surface 16 of cam 13. Upon engagement with raised portion 22 of cam surface 16, the upper end of arm 10 is moved rearwardly which actuates punch member 4 in die member 3 to notch the upper edge 2 of card 1. Upon further rotation of cam 13, cam follower 24 will engage a lower portion of cam surface 16 thus allowing punch member 4 to move into the position shown in FIG. 1 in position to place a notch in a card edge.

The device is operated as follows: with die member 3 in retracted position, a card 1 is placed with its upper edge 2 in a position to be notched adjacent a surface of a housing for the device. Since the punch is retracted, the area adjacent the edge is unobstructed and indicia thereon can be used to locate the card relative to the punch such that the precise location to be punched is properly positioned. At this point, cam follower 14 is adjacent low portion 23 of surface 16 of cam 13, and cam follower 24 is disengaged from high portion 22 of cam surface 16 with punch member 4 fully extended in die member 3. To begin a punching cycle, cam 13 is rotated counter clockwise in the sense of FIG. 1 by means of motor 18 causing cam follower 14 to move rearwardly thus causing die member to pivot downwardly into the position shown in FIG. 1 with upper edge 2 of card 1 inserted between the active edges of the punch and die members. Continued rotation of cam 13 causes arm 10 to pivot which actuates punch member 4 in die member 3 to notch the edge 2 of card 1. Further rotation of cam 13 causes retraction of the punch into the housing and extension of the punch member 4 thus completing a cycle. Motor 18 is conveniently controlled by a timer or switch permitting one cycle of operation such as by permitting one revolution of cam 13.

With reference to FIG. 2, the punching device described above is provided within a housing 25 which is conveniently mounted adjacent or integral with a keyboard unit 26 to be described hereinafter. The punching device housing includes a surface 27 for holding the card in such a manner to present an edge 28 of a card to be notched. In this instance the card is held in a longitudinal slot formed between elongate member 29 the upper portion of which is spaced outwardly from surface 27 thus forming the slot. The punch and die members are pivotable into operating position through aperture 30 provided in surface 27 of the device and operate to punch a notch in the upper edge 28 of the card in the manner described above. The punch cycle is conveniently actuated by a key 31 on keyboard unit 26 mounted below the housing supporting the punch device. Keyboard 26 is conventional in structure and key 31 actuates an electric switch to activate electric motor 18 of the punching device in a known manner.

The keyboard conveniently includes a plurality of additional keys which actuate one or more punches engaging the lower edge of the card behind plate 29. These punches are preferably actuated by main key 32 which energizes the lower punches. In one embodiment, there are five solenoid-actuated punches which move stepwise longitudinally of the card in five adjacent areas along its lower edge. There are eleven steps in each area thus providing a total of 55 notch locations along the bottom edge. These notches are

preferably generally circular in configuration as shown in FIG. 3, a circular opening 33 being larger than a semicircle, preferably from 20 to 80 percent larger, and smaller than a full circle, preferably 10 to 40 percent smaller. The notches to be made on the bottom of the card are then made by depressing numbered keys 35 on the keyboard which can be of conventional configuration. In addition to numbered keys 35, the keyboard is provided with keys 36 to channel a keyed number to the appropriate punch solenoid to code the proper area of the edge. The keyboard is conveniently provided with a mechanical or electrical read out display 34 to permit the operator to verify the keyed code prior to actuating the punches. The proper code is displayed by actuating numbered keys 35 and, after verification, the card is punched by pressing main actuating key 32.

As shown in FIG. 2, the housing of the punch device includes a surface having a generally planar area adjacent which the card is placed for operation of the disappearing punch. The housing includes means to hold the card with an edge in position to be notched in a certain location by the disappearing punch. In the usual case, the card will be held at an angle to the horizontal so that an operator can easily visualize the card. Where the card is so inclined, it is preferred that the punching device is operable to punch the top edge of the card and, to this end, the punch is moveable generally downwardly from its retracted position into its operating position in adjacency with the upper edge of the card.

The card is easily aligned with the disappearing punch. For example, the area to be notched can simply be aligned with punch aperture 30 in the punch housing an edge of which aperture serves as an index registrable with indicia on an edge of the card. In some instances, it is desired that the notch in edge 28 is always in the same place relative to the card ends. In that instance, the card slot behind member 29 can be conveniently provided with a stop limiting lateral displacement, for example to the right, such that the card is always correctly positioned to receive a notch from a punch in aperture 30. This would also position the card correctly for notching in the lower edge. It is a feature of the present invention, however, that any desired area of the top edge of the card is easily aligned with punch aperture 30 without the necessity of obscuring the area adjacent the top edge of the card. Accordingly, the top edge 28 can be repeatedly notched at different precise locations simply by moving the card laterally. This motion, of course, can be effected automatically by conventional card advancing means actuated by suitable keys on keyboard 26 and this lateral motion is preferably synchronized with the punch cycle. In either event, an index, such as aperture 30, may be used to indicate correct lateral position of the edge by registering with indicia on the card.

In the device illustrated in FIG. 2, the card is held for punching in an inclined position of about 50° to the horizontal. An inclination of from 20° to 70° is preferred to facilitate visualization at normal desk top level and to assist in positioning the card adjacent surface 27.

As mentioned above, the bottom punches preferably make a generally circular hold 33 as shown in FIG. 3. These notches may cooperate with code bars of the

type more fully described in application Ser. No. 811,826 which enter the notches during card selection. The circular-type notches define a gap for the entry of the code bars which gap is defined by points 37 and 38. In order to provide capacity for several code bars per unit length of card — thus minimizing size requirements for a given number of notches — the gap defined by the notch should not be very much larger than the width of a code bar. In that event, if the notch is rectilinear, there is a relatively great likelihood that the frictional forces between a code bar and the side of a notch cavity will cause a card to rise relative to a code bar inserted into the notch. Where point contact is provided as in FIG. 3, this likelihood is reduced due to the reduced frictional forces that would be encountered. In addition, where adjacent notches are closely spaced, the circumferences may overlap as indicated by dashed line 39 in FIG. 3. Where overlapping circular notches are formed, a generally triangular tongue 40 is formed between adjacent notches which is structurally much stronger than the tongue formed between adjacent rectilinear notches having equally close gaps.

What is claimed is:

1. An edge-notching device for punching a notch at an area in an edge of a card comprising: a housing; means for holding a card in a fixed position adjacent an outer surface of said housing with the area of the edge of said card to be notched being unobscured by said housing; a punch moveable between a retracted position away from the edge of a card held in said operable position whereby said card edge is not obscured by said punch and a punching position adjacent an edge of said

card; means for moving the punch from said retracted position to said punching position; means for actuating the punch in said punching position to notch the edge of a card held in said fixed position; and means for moving the punch from said punching position to said retracted position.

2. An edge-notching device according to claim 1 further including cam means for sequentially moving the punch into its operating position, actuating said punch, and moving the punch into its retracted position.

3. An edge-notching device according to claim 1 wherein said punch comprises a die member pivotally mounted in said housing.

4. An edge-notching device according to claim 3 wherein the card holding means comprises means for positioning a card inclined with respect to horizontal and wherein said die member is pivotable downwardly from said retracted position in the housing to said operating position adjacent the upper edge of the card.

5. An edge-notching device according to claim 1 wherein said card holding means comprises means for holding a card at an angle with respect to horizontal.

6. An edge notching device according to claim 5 wherein said housing includes guide means permitting longitudinal movement of said card adjacent said outer surface of said housing.

7. An edge notching device according to claim 5 wherein said housing includes an index registrable with indicia on said card to indicate its position longitudinally with respect to said housing.

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