

Dec. 5, 1944.

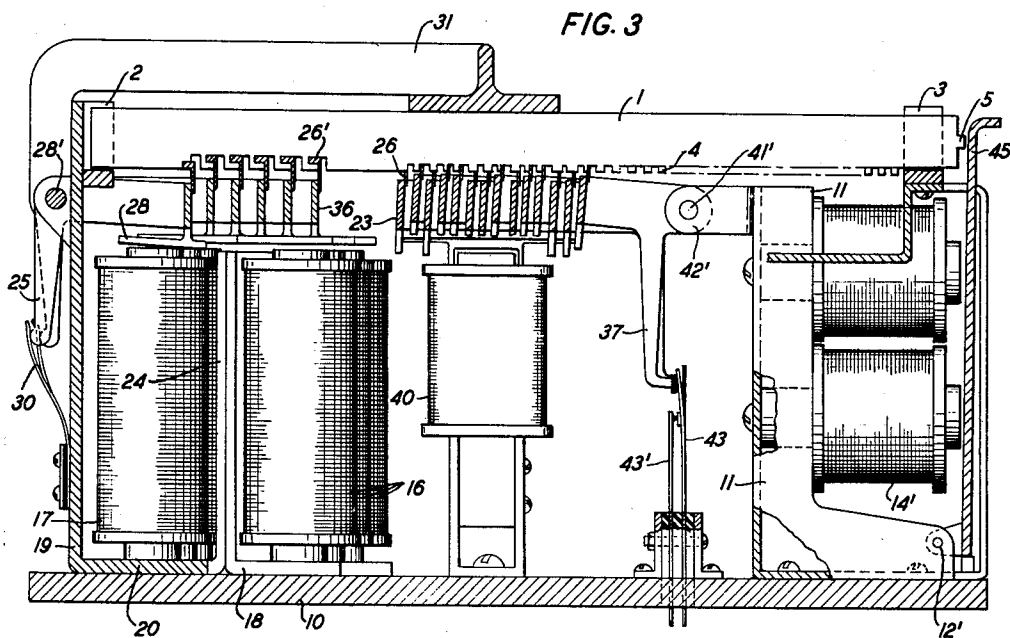
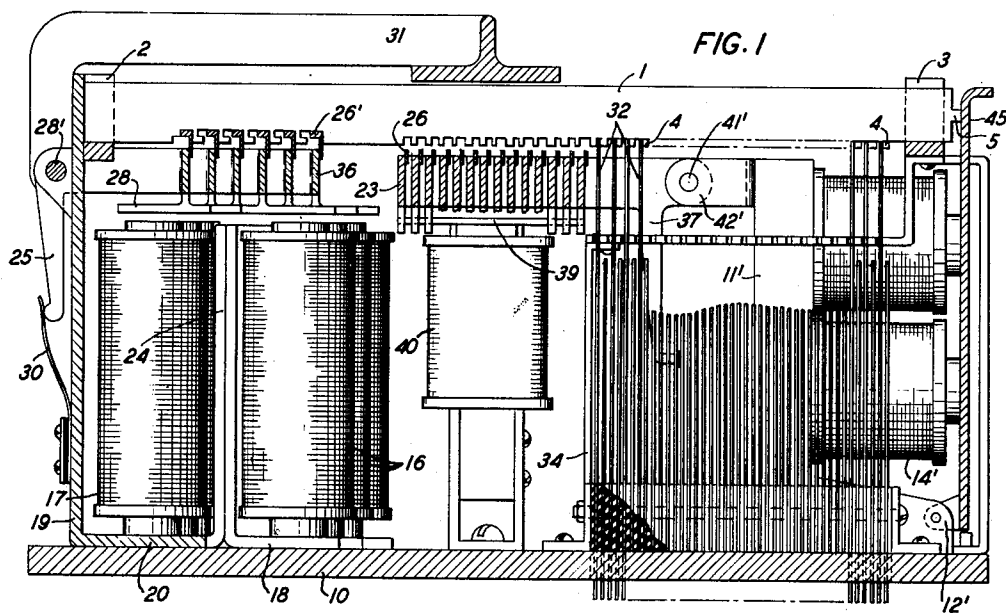
F. A. HUBBARD

2,364,446

CARD TRANSLATOR

Filed Jan. 18, 1944

5 Sheets-Sheet 1



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CARD TRANSLATOR

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5 Sheets-Sheet 2

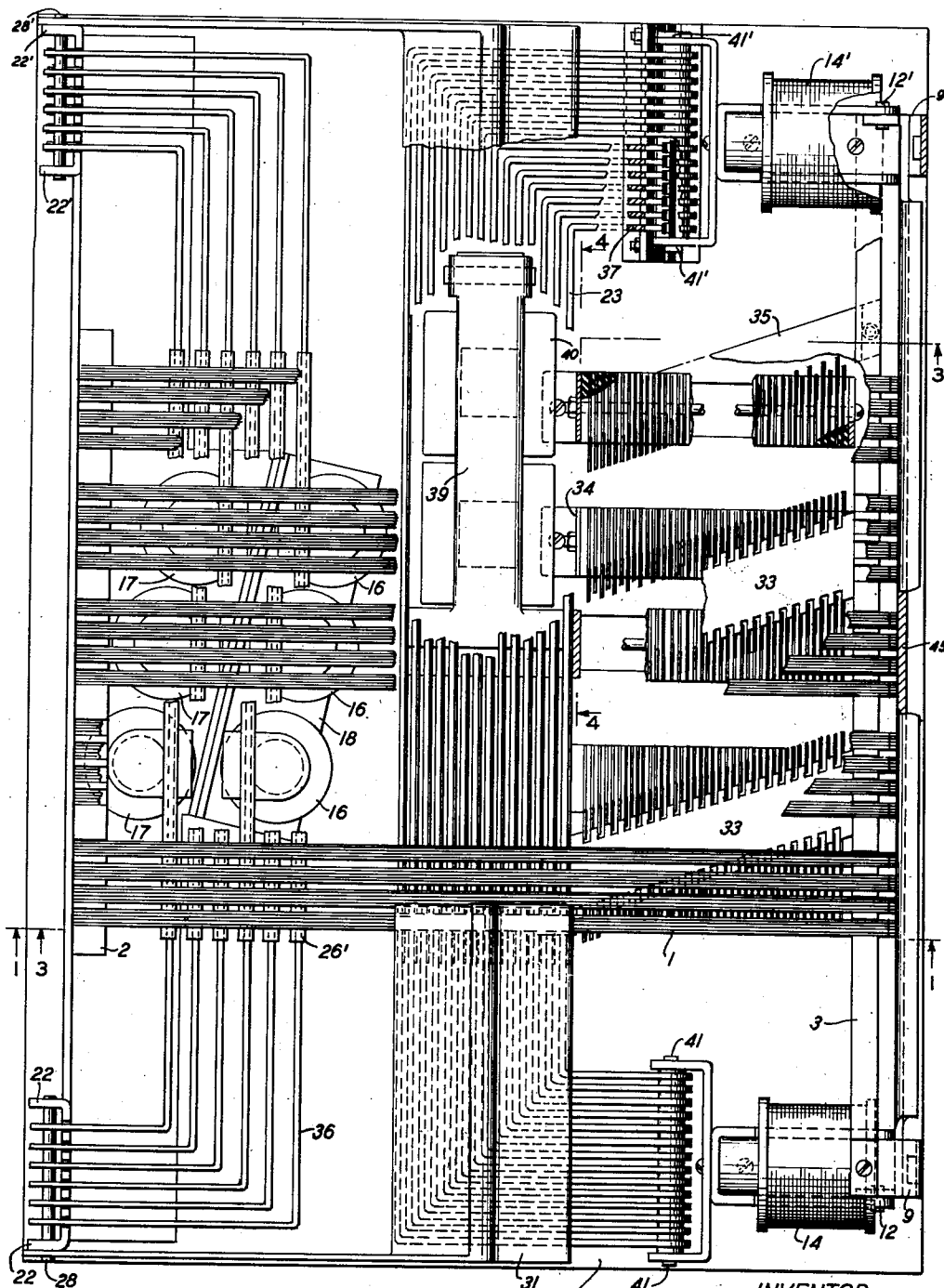


FIG. 2

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CARD TRANSLATOR

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5 Sheets-Sheet 3

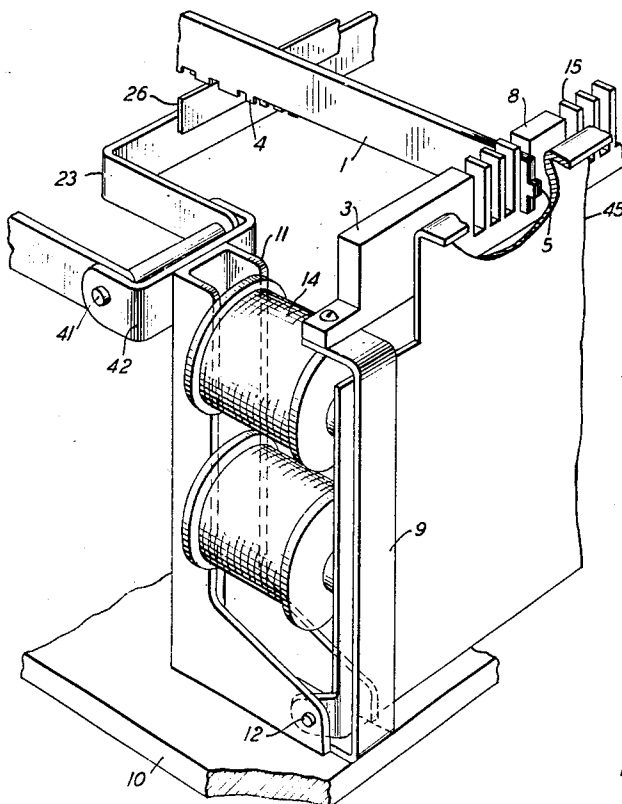
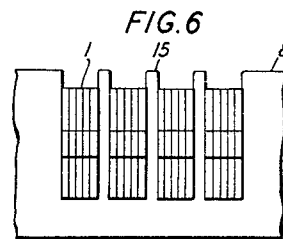
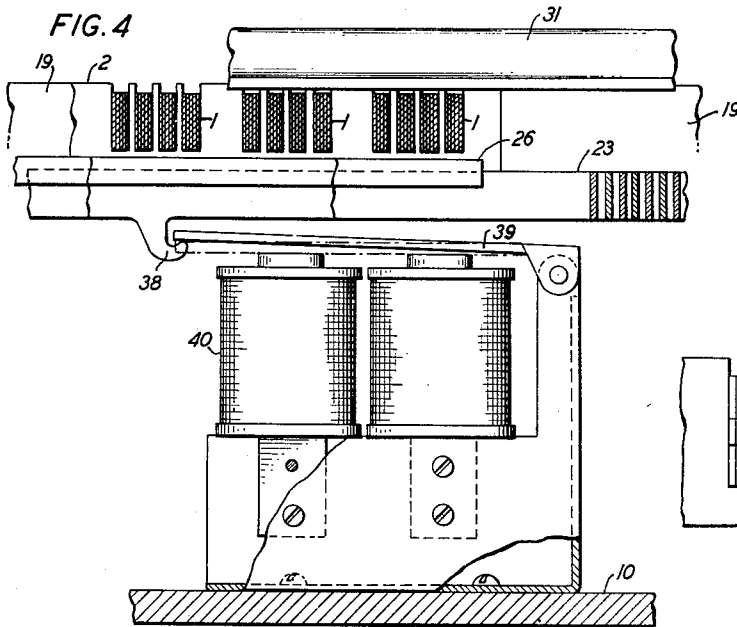


FIG. 5B

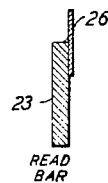
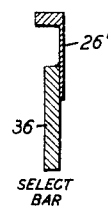


FIG. 5A



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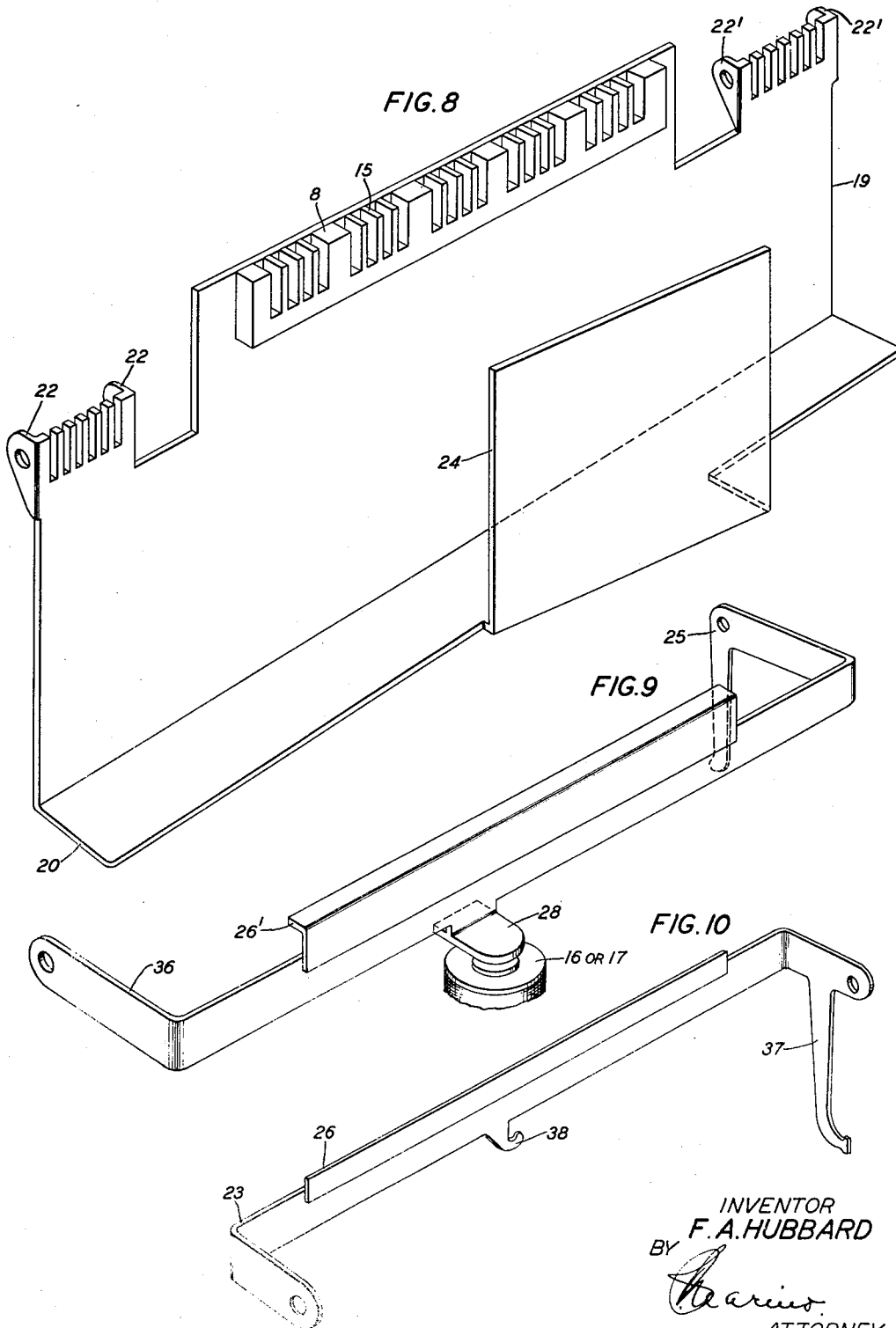
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CARD TRANSLATOR

Filed Jan. 18, 1944

5 Sheets-Sheet 5

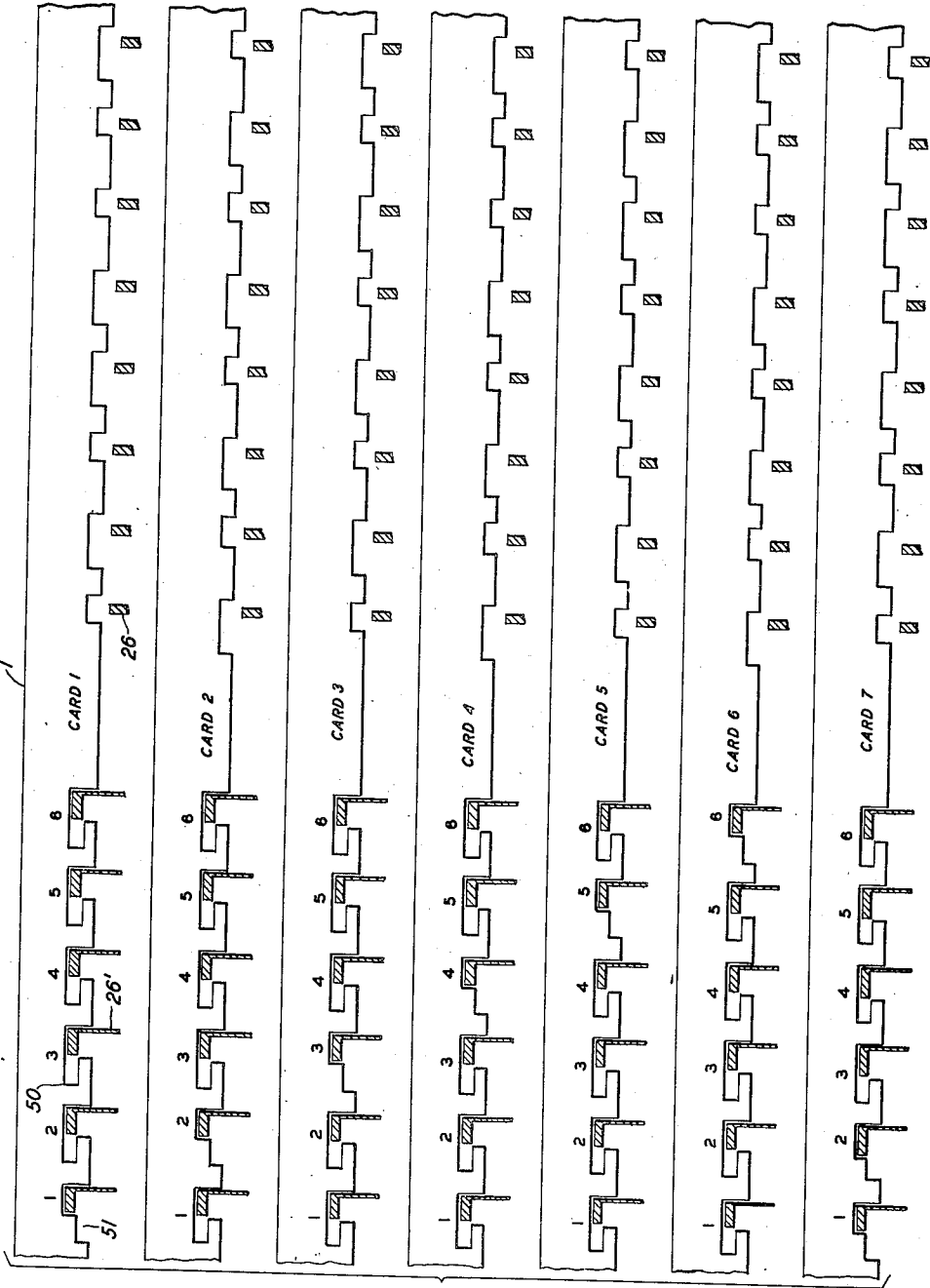


FIG. 11

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UNITED STATES PATENT OFFICE

2,364,446

CARD TRANSLATOR

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Application January 18, 1944, Serial No. 518,693

9 Claims. (Cl. 179—18)

This invention relates to improvements in "card" translators of the type disclosed in the copending application of R. F. Mallina, Serial No. 509,564, filed November 3, 1943.

One of the objects of the invention is to provide a card translator of the character described which will be comparatively simple in construction, easy in operation, compact in form and inexpensive to build, and which may be operated to select the different cards with less selecting apparatus than has heretofore been possible with translators of this kind.

Another object of the invention is a translator of the character described in which the cards to be selected have novel forms of "select" notches which, in cooperation with a novel form of "select" bar, make it possible to select the cards by a number of such select bars operated in simple permutations, each permutation individual to a card.

With the above-mentioned and other objects in view, the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawings and set forth in the claims appended hereto, it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claims may be resorted to without departure from the spirit of the invention or sacrificing any of the advantages thereof.

Referring to the drawings:

Figure 1 is a front view of the translator taken along the section line 1—1 of Fig. 2;

Fig. 2 is a plan view of the translator;

Fig. 3 is also a front view of the translator, taken along the section line 3—3 of Fig. 2, and shows the translator in an operated position subsequent to the selection of a card;

Fig. 4 shows a side view of the "read" magnet and the manner in which the "read" bars are hinged to the armature thereof;

Figs. 5A and 5B show cross-sections of preferred constructions of parts of the "select" and "read" bars, respectively;

Fig. 6 shows a cross-section of a part of the two card guides;

Fig. 7 isometrically shows the manner in which the read bars are mounted and the relation of the mounting means to one of the reset magnets and the right card guide;

Fig. 8 shows a perspective view of the left card guide, select bar and select magnet support;

Fig. 9 shows the construction of a select bar

and the relation of the bar to its controlling select magnet;

Fig. 10 shows the detailed construction of the read bar; while

Fig. 11 shows a number of cards illustrating, to the left thereof the select notches and cooperating select bars, and to the right the "read" notches and cooperating read bars.

Before proceeding with the detailed description of the present invention, it may be well to remark that the translator shown and described in the above-mentioned copending application of R. F. Mallina, comprises a structure adapted to support a plurality of cards each notched along the top edge thereof according to a code of paired wide and narrow notches to indicate a certain item of information which also identifies the card, and some arbitrary or actual translation of the information, also in a code of paired wide and narrow notches. The cards are stacked together in the same sense with the notches forming grooves of varying widths. Over each groove is disposed a controllable bar which is adapted for slidable intrusion into the narrow portion of the groove and further adapted normally to be within the groove. When it is desired to select a card, bars are selectively withdrawn from those grooves which are formed by the notches that denote the items of information which are determined by the wide notches on the information or "select" side of the card. Since the distribution of the wide notches along the information edge of the card is unique to the card, and since the bars are adapted to slidably enter the grooves formed by the narrow notches, it follows that the bars which are withdrawn from the grooves determined by the wide notches of a particular card will cause all cards to be locked against sidewise movement except the card whose wide notches determined the bars to be withdrawn, an operation which leaves this one card free to move sideways out of the stack by the difference between a wide and narrow notch. Means are provided for pulling the selected card partially out of the stack by the amount indicated, and this partial withdrawal of the card will cause the unnotched spaces between the narrow notches that comprise the "translation" record of the card thus selected to "cover up" the aligned narrow notches of the unmoved cards on each side of the selected card, while the wide notches which form part of the translation record of the displaced card will either reduce aligned wide notches on the other cards to the width of narrow notches or, if they are narrow notches in the

first instance, will leave their width unaffected. An attempt is then made to insert a controllable bar in each of the grooves formed by the translation records of the cards in the stack, but the only grooves that will be penetrated by the bars are those which are not blocked by narrow notches in the translation record of the card moved out; that is, those bars which are disposed over the grooves which include the wide notches in the translation record of the selected card. These bars, upon entering the grooves, each close a pair of contacts, and the combination of separate electric circuits closed there-through will provide the electrical equivalent of the arbitrary or correlated translation recorded by the wide notches on the translation record of the selected card.

In the translator of the present invention, the notches that constitute the select record of a card have two distinct patterns each one differing from the other and both differing from the wide and narrow notches that constitute the translation record. One type of "select" notch which is used merely to lock the card as described hereunder has an inverted L-shaped pattern having a roof as long as the width of a wide notch and an entry channel as wide as a narrow notch; the other type of "select" notch, used for selecting a card as described hereunder, is a shouldered notch having a base aperture equal in width to that of a wide notch and a surmounting narrower aperture equal in width to that of a narrow notch. The "select" bars, that is, the bars which are instrumental in selecting the various cards, are formed with a reverse L-shaped top edge, the edge being wide enough to pass through the entry channel of a locking notch, and since this entry channel is as wide as the narrow aperture of a select groove, the edge of the bar will also fit into the narrow aperture.

These select bars are normally inserted in the grooves formed by the locking and select notches that constitute the select codes, and since there is, for each card, one or more select notches unique to a card, the normal and full insertion of the bars into the grooves formed by the locking and select notches automatically locks all the cards in the stacked relationship. In selecting a particular card, the select bars in the grooves that include the select notch or notches of the card to be selected are pulled down to occupy the wide portion of the select notches, which wide portions correspond in position to the entry channel of the locking notches. Since the wide aperture in a select notch is as wide as a wide notch, and since each card is held locked by the bars against the tension of an individual spring, moving the bars in the grooves determined by the select notches on the card to be selected from the narrow aperture to the base aperture of these notches, frees the latter card to the pull of its own spring, which moves the card out of the stack by the difference between a wide and narrow notch and causes the bars which have not been moved to lock in the locking notches of the selected card. The partial withdrawal of the bars from the grooves that include the select notches of the card to be selected brings the edges of these bars into the entry channels of the locking notches in all the other cards having such notches in the grooves determined by the select notches of the selected card, so that unselected cards will be restrained from moving out along with the selected card.

A normally operated "read" magnet which

controls a "read" bar for each groove formed by the notches of the various translation records in all the cards is then released in an attempt to intrude each bar into its own groove and, of course, the grooves which have been covered up by the unnotched portion of the edge following each narrow notch in the selected card will block the entry of the associated bars, leaving only those bars free to enter which are disposed over the grooves determined by the wide notches in the translation record of the selected card. Each read bar is provided with a lever which, when the bar is fully inserted into its associated groove, operates to close a pair of contacts through which a working circuit may be closed, the number of such circuits, corresponding to the number of intruded bars being individual to each card as selected, indicating the translation recorded on the selected card.

In restoring a selected card back into the stack, the read bars are withdrawn from their respective grooves by the operation of the read magnet. A pair of reset magnets are then operated to push the selected card back into the card stack against the tension of its individual spring. The select bars previously and partially withdrawn from their respective grooves during the selection operation are then released for reinsertion therein, whereupon all the cards are then locked in their normal unselected position, the reset magnets remaining energized.

As will be readily understood, the size of the translator mechanism will depend upon the total number of cards to be accommodated thereby, the length of the cards and the number of notches required to form the select and reading codes. To illustrate the general principle of construction and operation exemplified by my invention, I have chosen to illustrate the same by a device adopted to accommodate one-hundred cards, each notched along one edge according to a permutation code for the selection of one out of an ultimate of a thousand cards, each permutation individual to the card designating the card itself. The code used for translation purposes is the "binary" code which is described and illustrated in the copending application of G. R. Stibitz, Serial No. 485,734, filed May 5, 1943, and comprises a pair of wide and narrow notches for each binary place, a wide notch followed by a narrow notch, for example, designating the binary digit 1 and a narrow notch followed by a wide notch designating the binary digit 0. In the present embodiment of the invention it is assumed that each translation may be represented by a two-digit decimal number ranging from 00 to 99. Each such number, therefore, will have its equivalent of seven binary digits, each such digit (0 and 1) being indicated along the edge of the card by a pair of wide and narrow notches according to the above assumed position of these notches. Thus each card will have a "select" code comprising a total of six locking and select notches to form, when the cards are stacked in the same sense, six "select" grooves, and a "translation" code of fourteen notches, wide and narrow according to the indicated binary number, to form fourteen translation or "reading" grooves.

The number which represents the "output" or translation record for a card will depend, of course, upon the character of the information to be translated and upon the number of binary digits required to represent this translation. In the present embodiment of the invention (and as

before stated) it is assumed that each item of information for each of the hundred cards may be designated by a two-digit decimal number and, therefore, requiring seven binary digits or fourteen pairs of wide and narrow notches to provide each of these translations. On the other hand, where the translation requires more than two decimal digits, corresponding increases in the binary code thereof will be required. It should be understood, therefore, that no limitation of any kind is intended by the illustrative example as to the number of cards that can be handled by the translator or the number of binary digits that should be used for the translation record except to note that, as the binary digits are increased and the grooves formed by the notches indicating these digits are correspondingly increased, additional read bars and controlling equipment therefor will be necessary.

Referring, now, to the various figures of the drawings, which show one specific structure embodying the principles of the invention as above outlined and in which the same reference numerals in each of the figures designate the same parts, a card, designated by the numeral 1 is a long metallic member, rectangular in form which is provided with a group of six permutatively arranged inverted L-shaped (locking) notches 50 and shoulder-shaped (select) notches 51 along the left bottom edge, and another group of fourteen wide and narrow notches along the right bottom edge, both groups of notches being separated from each other by an unnotched portion of the card. The left group of notches comprising a unique pattern for each card, designates the card itself, while the right group of notches comprising seven binary digits, designates the information or "translation" which the card is intended to convey. Further, each card is formed with a spring rest 4 on its lower edge to the right of the translation group of notches and with a lug 5 projecting outwardly from the middle of its right end, said lug serving as a butt for pushing the card back into the stack subsequent to its selection as more particularly described hereinafter.

As shown in Fig. 2, the hundred cards 1 are divided into five groups of twenty cards each, with each group further subdivided into four subgroups of five cards each. As shown more particularly in the other figures, each card is supported upon and within two card guides, the left card guide 2 and the right card guide 3. The left guide 2 is a long, rectangular box-like structure which is secured to, or made integral with, the upper end of the upright portion 19 of the support 20 (Fig. 8). The guide is provided with vertical, exposed compartments or slots, divided by the partitions 15 to form equally spaced groups of four, each group being separated by the block 8 and with each compartment capable of slidably accommodating five cards therein. The slots are slightly deeper than the width of the cards so as to cause the top edges of the latter to be clear of the tops of the slots.

The right guide 3 is supported at its two ends by the top of the two bracket members 9 and 9' (Figs. 2 and 7), each of the latter forming a part of the restoring magnet-supporting framework as explained hereinafter. The guide 3, like the guide 2, comprises four groups of compartments, or slots, which are divided off by partitions 15 spaced equally as those of guide 2 and similarly separated by the blocks 8. The slots of guide 3, however, differ from those of guide 2 in that they

are open at each end to permit the horizontal passage of the cards therethrough, the guide itself being simply a rectangular block secured by screws or other suitable means to the top of the bracket members 9 and 9'. Further, the groups of slots in guide 3 and the individual slots of the groups are so spaced that, when the guide 3 is secured to the brackets, corresponding slots on both guide 2 and guide 3 will be in horizontal and vertical alignment. The cards that rest in the slots will, therefore, be substantially "free" and the notches thereon will form aligned horizontal grooves. Thus when the cards 1 are inserted in the corresponding slots of the guides 2 and 3, they will form five card stacks separated from each other by the spaces between the separating blocks 8. Since the cards are all to be inserted in the various slots in the same sense with their respective notched edges on the bottom, and since the cards are pushed horizontally into the left guide 2 until their respective left edges abut against the closed end of said guide, it is evident that the cards will thus be arranged into five separate stacks of twenty cards each with the notches thereof forming aligned grooves that traverse the entire five stacks.

To the base member 10 are suitably secured a number of select magnets 16 and 17 which control an equal number of select bars 36 to effect a selection of any one of the cards in any one of the groups. As stated above, the quantity of select-controlling equipment provided for the translator depends upon the number of cards. When one thousand cards are used with each of said cards identified by one permutation in the summation of six select positions taken one at a time, only six select notch positions will be required to effect a selection of each card out of the thousand. Hence in the present embodiment of the invention which illustrates a translator using but one-hundred cards of the total one-thousand that might be used, six select magnets divide into two groups of three magnets each are provided. The three magnets 17 of one group are mounted within the support 19 in equally spaced relation with the cores thereof secured to the base 20, flush or substantially so, with the right flange 24, the support 19 being so mounted on the base 10 that the front and rear select bar supports or ears 22 and 22', respectively, will fall within the left edge of said base. Secured to the base 10 and in magnetic contact with the flange 24, is the L-shaped magnetic member 18 which is of the same length and height as flange 24. To the base of said member 18 are secured the three select magnets 16 of the second group. These magnets are equally spaced in relation to each other and to the magnets 17 so that corresponding magnets in each of the two groups will form horizontally disposed pairs of magnets 17-16 as shown in Fig. 2.

The upright 19 is provided at each of its upper ends with a pair of aligned apertured ears, namely, the front pair 22-22 and the back pair 22'-22'. These ear pairs are provided with apertures for the pivots that will support the select bars 36 in the manner indicated hereinafter, and the slotted space between each pair of ears, while equal for both pairs, is determined by the number of select bars provided which, in the present embodiment of the invention, is six.

Each select magnet 17 and 16 controls a U-shaped select bar 36 (see Fig. 9) which, at the end of one cross member (the rear cross member in the present embodiment of the invention)

is formed with a downwardly extending lever portion 25, a hole being provided at the juncture of the cross member and the lever, and a similar aligned hole being provided at the end of the forward cross member. Each select bar 36 is formed with an armature 28 having a rounded portion to engage the core of its controlling magnet 17 or 16 and a rectangular portion to engage the top edge of the magnet supporting member 24 or 18. The location of the armature along the main member of the bar and whether the curved portion thereof will be disposed to the right or the left of said main member will depend, of course, upon whether the controlling magnet is located upon the member 20 or the member 18, as will be apparent from Figs. 1 and 2. Welded or otherwise suitably secured to the upper edge of each bar 36 is the inverted L-shaped channel member or detail 26' which is coextensive in length to the aligned grooves formed by the five separate stacks of cards 1. The side of the detail 26' which is secured to the bar is of thin rigid metal while the "head" is relatively thick and adapted to slide freely into the overhanging aperture of a locking notch 50. This head should also be made wide enough to just slide freely through the entry channel of a locking notch 50, and since this channel is as wide as the narrow aperture of a select notch 51, said head will also pass freely and fit into said aperture.

The bars 36 of which six are provided in the present embodiment of the invention, are of progressively diminishing dimensions, the largest, for control by the last magnet of the outer row of select magnets 16, having its main and two cross members proportioned so that said cross members will fit within the extreme front and rear slots encompassed within the pairs of ears 22—22 and 22'—22', with the aligned holes in said cross members in alignment with the holes in said ears. With the outer bar 20 adjusted between the two slots, the main member of the bar will be related to the last or sixth groove (counting from the left in Fig. 1 or 3) formed by the last select notch in each of the cards so that the head of the detail 26' moves directly between the two sides of the entry channel of the locking notches 50 in the groove and the right side of the select notches 51 in said groove.

On the other hand, the smallest bar 36 which will be controlled by the first or frontmost select magnet 17 of the inner row of three magnets will have its main and two cross members proportioned so that the latter will lie within the innermost slots of the pair of ears 22—22 and 22'—22', with the holes thereof in alignment with those of the ears, and with the main member thereof related to the first groove (counting from the left in Fig. 1) formed by the first select notch in each of the cards so that the head of its detail 26' is free to intrude into the groove. The remaining four bars, disposed between the outermost and the innermost bars, are proportioned for the location of their respective main members directly underneath the correlated grooves formed by the intermediate select notches on the cards, and for the location of the respective cross members in the allocated slots therefor between the pairs of ears 22—22 and 22'—22'. All of these bars 36 are freely supported by the pivot pins 28 and 28', the former pin traversing the aligned holes of the front cross bar members between ears 22—22, and the latter traversing the holes of the rear cross bar members between the ears 22'—22'.

The lever portion 25 of each of the select bars 36 is acted upon by a spring 30 individual to each

bar, each of said springs being secured by its bottom end to the outer surface of upright 19 and pressing upon the portion 25 so as to keep bar 23 under tension, thus applying to the latter a force tending to rotate it in the counter-clockwise direction. Now when the one-hundred cards 1 are grouped into the five stacks by placing them in their appropriate slots in the card guides 2 and 3 as above set forth, the select notches 50 and 51 on each card form select grooves, with each groove directly over the L-shaped head 26' of the select bar 36 allocated to the groove. Since the location of the card guides 2 and 3 (the former by its position in the upper inner side of upright 19 and the latter by the height of the bracket members 9 and 9') is determined with the view to providing but a slight clearance between the top edges 26' of the bars and the lower edges of the cards when the edges 26' have penetrated the full depth of the card notches, and since the bars are urged to move in a counter-clockwise direction by the action of their respective springs 30 (the heads 26' meanwhile being directly underneath their corresponding grooves), it follows that the head 26' of each bar, being slightly shorter than the width of the entry channel of a locking notch 50 and the narrow portion of a select notch 51, will pass through the entries of the aligned notches forming the grooves and come to rest against the upper surface of the groove. Moreover, since each card will have one or more select notches 51 in its own group of select notches, and since the heads 26' of the intruded bars are slightly less than the width of the narrow portion of these notches, it further follows that, with the heads 26 of the select bars 36 fully intruded into their corresponding grooves, each card will be locked against any sidewise movement.

To counteract the force of the bars 36 (applied thereto by the springs 30) in lifting the cards out of their respective slots in the card guides 2 and 3, a pressure pad 31 is provided which rests upon the top of the card stacks. This pad is a U-shaped element having an inverted T-shaped main member that runs at least the full length of the card stacks, and two cross members which are hinged on, and supported, by the pins 28 and 28' exteriorly to the outer pairs of ears 22—22 and 22'—22' by aligned apertures at the ends of said cross members. The pad 31 is thus adapted to swing counter-clockwise about the pins, the length of the pad's cross members being preferably such as to cause the main member thereof to rest upon the stack at the stack center, as shown in Figs. 2 and 3. The weight of the pad is such that, when resting upon the card stack, it will fully counteract the force of the select bars 36 attempting to lift the cards out of their guides 2 and 3.

If it is now desired to change or replace a card 1, the pressure pad 31 is lifted off the card stacks by swinging it to the left. Under these circumstances, it would be preferably desirable first to energize all the select magnets 16 and 17 and thereby withdraw all the select bars 23 out of their respective grooves and deenergize the reset magnets 14 and 14' so as to relieve the pressure of armature 45 against the cards. With the pressure pad off the card stack and the select bars withdrawn from their respective grooves, the cards may be removed from the stack by lifting them vertically out of their slots in the guides 2 and 3. The replacing cards may then be placed in the vacated positions, the pressure pad 31

swung to the right into position of rest upon the card stack and the select magnets thereafter de-energized to cause their respective bars 36 again to be fully intruded into the select grooves.

Mention has been made of the fact that each card 1 is provided with a lug 4 on its lower right edge beyond the group of notches forming the translation part of the card record. Each of these lugs controls the moving one of a pair of springs 32 individual to each card, each of said pair of springs being insulatedly clamped to the base plate 10 and protruding through suitable openings therein. The lugs 4 on the several cards in each group of twenty cards are progressively staggered to the right beginning with the first card in each group, and the spring pairs 32 individual to each card in a group of twenty are similarly staggered so as to bring the moving spring of each pair into engagement with its controlling lug on the card. The springs are staggered because the thickness of a card stack assembly is much less than the width of all the associated springs, and if the latter were to be horizontally aligned perpendicularly to the cards, there would be insufficient space to accommodate all the springs.

For each two groups of forty cards 1 there is provided a double-edged staggered slot guide 33 of insulating material, said guide being formed with twenty rectangular slots along its front edge and twenty rectangular slots along its back edge. The guide has a right vertical flange portion suitably apertured for attachment by screws to the underside of the right card guide 3, the left end of said guide being supported by screws upon the upright 34, which is secured to the base plate 10 by screws or the like, and is of sufficient depth to support the two full guides 33 and the half guide 35, each of the latter having only twenty slots along one edge for the twenty springs of the last or fifth group of cards, counting from the front. The tip of the moving spring of the pair 32 for each card normally rests against the left edge of the lug 4 and is tensioned to apply a force to the card that will tend to move the same to the right; that is, out of the stack. The spring passes through an aligned slot in the guide 33 (or guide 35) and is limited in its movement by the right edge of the slot which the spring will engage when, on the associated card being released for sidewise movement in the manner hereinafter described, the spring moves in the direction of the applied tension. Since the movement of the card out of the stack is controlled by the tension in the moving spring of the pair 32 and by the difference between the wide portion of a locking notch 50 and the narrow portion of the select notch 51 in the selection group of notches 25 reduced by the thickness of the detail 26', the width of the slots in the spring guides 33 is made no larger than this difference and the spring will be limited in moving the card out any further than the distance determined by this difference. When, therefore, the spring engages the right edge of the spring slot 33 (or 35), the card will cease to move. The stationary spring of the pair of springs 32 which is shorter than the moving spring (to cause the tip thereof to come below the guide 33) will then be engaged by the moving spring. An electric circuit completed through the two springs will indicate that the card controlled by the moving spring has been moved out of the stack; that is, that the card has been "selected."

The selection of a card from a stack may now

be advantageously described before proceeding to the description of the remaining elements of the translator, the manner in which the information recorded on a selected card is made available and the manner in which a selected card is restored back into the stack. In the normal condition of the translator, the cards 1 are all arranged in stacked groups to form as many "select" grooves as there are locking and select notches in the different cards, there being the same total number of such notches in each card, in this case, six. Considering more particularly Fig. 11 in which a portion of the first seven cards are spread out in aligned relation to show the correlation between the different select group of notches and also the different translation notches, each card is provided with a total of six selection notches of which one or more are select notches 51 located in various ones of the six positions according to that permutation of six positions which is individual to the card, and the rest are locking notches 50. Thus card No. 1 which may be assumed to be the first of the one-hundred cards which can be accommodated by the illustrated structure of the translator, has but one select notch 51 and is located in the first of the six selection positions on the card. Card No. 2 has its select notch 51 located in position 2, card No. 3 in position 4, and so on progressively advancing one selection position with each card, card 6 having its selection notch 51 located in the sixth position. Thus all the first six cards each will have a unique selection pattern of notches, and it is obvious that if the cards are stacked one in back of the other, six selection grooves will be formed each having a select notch 51 as part of the groove. In the same way, each card in the remainder of the one-hundred cards (or a thousand cards if the size of the holding structure of the translator is suitably increased), will have a unique selection pattern made up of select notches 51 and locking notches 50, each pattern for a card being a permutation of from one to six select notches distributed along the six selection positions, card 7, for example (as shown in Fig. 11) having the unique pattern of two selection notches 51 in the first two positions and four locking notches in the remaining four. Card 8, which is not shown, would, on the other hand, have a selection notch 51 in position 1, a selection notch in position 3 and a locking notch 50 in the remaining four notch positions. The one-thousand cards, each with its own unique pattern of select notches 51 and locking notches 50, when stacked together as an entire group or into a plurality of subgroups (as, for example, in subgroups of 20 as in the specific construction limited to one-hundred cards in the present embodiment of the invention) will form six select grooves each of varying entry widths ranging from the wide entry of the select notch 51 to the narrow width of the locking notch 50.

The "translation" notches on the cards, that is, the group of notches to the right of the select notches which designate the information records on the cards, also form grooves when the cards are arranged in stacked formation, there being as many translation grooves as there are notches, in this case, fourteen, since it has been assumed that the translation on each card may be designated by the binary representation of a two-digit number. The pressure pad 31 is resting upon the card stacks, and the select magnets 16 and 17 are deenergized. Under these conditions,

each of the select bars 36 is tilted upward by its individual spring 30 until the head of the detail 26' of each bar is fully intruded into the selection groove formed directly thereover. Since the length of the head is slightly less than the width of the upper portion of a select notch 51 and since each card has from one to six such notches permutatively distributed among the six selection notch positions, it is evident that, with the select bars 36 fully intruded into their respective select grooves, the cards will be "locked" against movement, and thereby restrained by the bars from responding to the force of their respective springs of the pairs of springs 32 individual to each card. To release any one of these cards so that the moving spring of its pair of springs 32 may impel it to move to the right, the select magnets 16 and 17 are then energized in the combination indicated by the bars intruded into those selection grooves which contain the select notch, or notches, 51 in the card to be selected and the reset magnets 14 and 14' are de-energized. The energization of the select magnets will attract their respective armatures 28 integral with the bars, and since the bars are hinged on the ears 22—22 and 22'—22' as before described, the bars will be rotated clockwise against the tension of their respective springs 30 until their respective details 26' are withdrawn partially from the narrow portion of the select notch, or notches 51, in the card to be selected and lodged in that space of the groove which is defined by the wide portion of these notches. The select bars which are now left in the grooves are only those which are determined by the locking notches 50 of the card to be selected, and since the number of these notches and their distribution in the group of six are unique to this card, the card will no longer be locked but will be free to move to the right out of the stack under the force of the moving spring of its spring pair 32 until the left edge of the narrow portion of each of its locking notches 50 engages the left edge of the head 26' of the intruded bar; that is, the card will be free to move to the right substantially by the difference between the wide portion of a select notch 50 and the narrow portion of the select notch 51, which is also the difference between the wide and narrow notches of the card's translation record. Some compensation will, of course, have to be made for the thickness of the vertical supporting edge of the detail 26' secured to the bar as, for example, by increasing the width of the wide notches of the translation record to double the width of a narrow notch plus the thickness of the edge. Otherwise, when a card is moved out upon selection, the unblocked selection grooves will not be as wide as a narrow notch and, therefore, will not provide sufficient clearance for the edge 26 of a translation bar 23 for entering the groove as shortly to be described.

The moving spring of the pair of springs 32, pressing on the left edge of lug 4 of the card traversed by select bars 36 which are left intruded into the locking notches 50 of the card to be selected, and those pulled down into the wide portion of the select notches 51 of this card by the energization of the magnets 16 and 17 controlling these latter bars, urges the card to the right, which moves out of its compartment in the card guide 2 and through the corresponding compartment in card guide 3, by a distance equal to the difference between a wide and narrow notch, at which time the moving spring of the pair of

springs 32 engages the right edge of its slot in the guide member 33 (or 35 depending on the stack from which the card is selected) and further engages the stationary spring of said pair of springs 32. The card thus moved out is in a "selected" position, the other cards remaining locked against displacement by their individual moving spring of their respective pairs 32 because the heads 26' of the select bars which are partially withdrawn are lodged in the entry channel of the locking notches 50 of the unselected cards, leaving said cards no margin of space that can be utilized by the moving springs of their respective individual spring pairs 32 to move the cards out of the stack.

As previously stated, the displacement of a card out of the stack by the difference between the wide portion of a locking notch 50 and the narrow portion of the select notch 51 causes the narrow notches of translation grooves of the displaced card to be "covered up," while those which include its wide notches will be reduced to the width of narrow notches. Now if an attempt is made to insert bars in all the translation grooves, the only ones that will get through will be those located below the grooves which include only the wide translation notches of the selected card, since the most that can happen to these grooves by the movement of the selected card will be the reduction of their respective widths to the widths of narrow notches. Since the translation record of a card is determined by the number and distribution of wide notches of its group of translation notches, a number and distribution which is unique to each card, it is obvious that the bars that would be inserted in the grooves determined by the wide notches of the selected card will designate its translation record.

For each translation groove there is a "read" bar 23, fourteen such bars being provided in the present embodiment of the invention because of the formation of fourteen translation grooves. Each of these bars is a U-shaped structure that has aligned apertures at the ends of its opposite cross arms and includes, on the rear cross arm, a downwardly extending lever 37. Underneath the main arm of the bar is a hooked portion 38 that catches in an eyelet under the armature 39 of the read magnet 40. The upper edge of a read bar carries a thin edge 26 (see Fig. 5) which is coextensive with the length of the aligned translation grooves formed by all the card stacks. The strip or edge 26 is welded or otherwise suitably secured to the bar and has a thickness which is slightly less than the width of a narrow notch on the cards. The strip 26 is secured to the bar so as to leave exposed a portion thereof which is slightly greater than the depth of the notch so that, when a bar 23 is lifted into the groove formed by a row of notches, this exposed portion will become fully and freely inserted into the groove. But the use of the strip 26 may be dispensed with and the top edge of the bar itself inserted in the groove if the thickness of the bar is itself made slightly less than the width of a narrow notch.

As in the case of the select bars 23, the read bars 36 are progressively dimensioned to fit freely in spaced relation each inside the other, all of the bars being secured by the pins 41 and 41', to the bar supports 42 and 42', respectively, which, in turn, are secured to the upper portion of the front and rear channel members

11 and 11' which support the reset magnets 14 and 14', respectively. Thus the bars are free to swing about these supports.

The read magnet 40 which controls the operation of all the fourteen read bars 23 is vertically mounted upon the base 10 with its longitudinal axis preferably in line with the center of the translation group of notches. The magnet has a pivoted armature 39 which is of sufficient width to provide an eyelet at its outer extremity for each of the hooks 38 in each of several read bars 23.

For each read bar 23 there is provided a pair of contact springs (see Fig. 3), a movable spring 43 and a stationary spring 43', each pair of said springs being vertically mounted upon the base member 10 to the right of the lever 37 of the associated bar and protruding for external wiring connections through a suitable opening in said base member. The springs are so mounted upon the base member 10 that each moving spring 43 can be moved in and out of engagement with its associated stationary spring 43' by the oscillatory movement of lever 37 as the associated bar 23 is turned about pins 41 and 41' by the operation of magnet 40.

In the normal condition of the translator, that is, prior to the selection of a card, the read magnet 40 is maintained in an energized condition. The armature 39, being drawn to the core of the magnet, acts upon the hooks 38 of each of the bars 23 suspended thereunder to turn said bars in a counter-clockwise direction about the pivot pins 41 and 41'. Each bar, in so turning, clears its top edge 26' from the associated translation groove formed thereover by the card stacks, and further causes its lever portion 37 to push spring 43 out of engagement with stationary spring 43' as above noted. Now after a card 1 has been selected in the manner heretofore described, and said card has been moved out of the stack by the difference between a wide and narrow translation notch, the circuit of the read magnet 40 is opened and its armature 39 is caused to release. This release action of the armature tends to cause all the read bars 23 to turn in a clockwise direction about the pins 41 and 41', but the only ones that will succeed in doing so will be those that are located under grooves which have not been covered up by the narrow notches in the translation record of the selected card, since these are the only grooves that will present no obstruction to the edges 26; that is, the grooves that will be entered by the edges 26 of the corresponding bars will be those determined by the wide notches of the selected card inasmuch as the bars under these grooves will have a clear space equal to the width of a narrow notch which the unnotched portion of the selected card will not have covered up. With the intrusion of a bar in the unblocked groove, the lever portion 37 turns away from spring 43 causing said spring to engage the stationary spring 43'. All the read bars 36 whose edges 26 thus succeed in penetrating their respective unblocked grooves will, therefore, cause their respective pairs of contact springs 43 and 43' to close, and since of the fourteen pairs of such springs the pairs that close have been caused to close by the intrusion of read bars 23 into grooves marked by the wide notches in the translation record of the selected card, it follows that the operated springs designate, in binary code, the information indication by the translation record of the selected card. It further follows that since the number and distribution of the wide notches

in the translation group of notches are unique for each card, the selection of the different cards in the manner above set forth thus cause a different combination of read bars 36 to be intruded into the grooves for each selected card, followed, in turn, by the operation of different combinations of the spring pairs 43 and 43'. Separate work circuits closed through each of said pairs of springs 43-43' will provide the information of the translation record. These circuits may then be utilized for the purpose of the translator.

It will be noted that secured to each of the L-shaped channel members 11 and 11' there is vertically mounted a reset magnet 14 and 14' respectively, the former magnet being located at the front and the latter magnet at the rear of the base plate 10. Hinged at apertures 12 and 12' in the bases of said channel members is the reset armature 45 which is substantially rectangular in shape except for the ends thereof which are reduced in width to clear the top cross members of brackets 9 and 9', said brackets extending outwardly sufficiently to provide a limited movement of said armature. The magnets 14 and 14' are normally energized, whereupon the top edge of the armature engages the row of lugs 5 formed by the ends of the card stack, pushes the cards in against the closed end of the card guide 2 and thereby relieves the pressure the cards would normally exert upon the select bars 23 by virtue of the tension in the springs of the individual spring pairs 32. Now when a card is to be selected, the select magnets 16 and 17 are selectively operatively in the required combination to cause the partial withdrawal of their associated bars 36 out of the select grooves. Thereafter, the reset magnets 14 and 14' are deenergized, leaving the armature 45 (which is free in its pivots) to be pushed out by the selected card as the latter moves out of the stack. When a selection operation is terminated and a selected card is to be drawn back into the stack, the read magnet 40 is reenergized to withdraw the intruded read bars 23 out of their respective grooves, in consequence of which the operated spring pairs 43 and 43' are disengaged to open the work circuits. The circuit for each reset magnet 14 and 14' is then closed by any suitable means, whereupon the armature 45 operates to press upon the lug 5 of the selected card, applying thereby a force that pushes the card back into the stack. Thereafter, the circuits of the operated select magnets 16 and 17 are opened, causing their respective select bars 36 to be acted upon by their restoring springs 30, which tilt their respective bars in the counter-clockwise direction and cause their heads 26 to become inserted in the select grooves thereover, thus locking the cards. With the selected card again drawn back into the stack, the moving spring of its pair of springs 32 is disengaged from its stationary spring, and the former building up tension to push the card out of the stack upon its next selection. The reset magnets 14 and 14' remain energized to relieve the pressure upon the bars 23 caused by the tension of the springs 32 urging the cards to the right. The selection of another card may then proceed as already described.

While I have described one specific embodiment of my invention, it is understood that various other embodiments thereof may be made by those skilled in the art without departing from the spirit of the invention as defined within the scope of the appended claims.

What is claimed is:

1. A translating device comprising a plurality of cards arranged in a stack, each of said cards being indented with a first group of two kinds of notches arranged in permutation to designate the card and with a second group of two other kinds of notches to record an item of information thereon, means controlled by the notches in said first group on all of said cards for selecting one of said cards, and means controlled by the notches in said second group on all of said cards for indicating the item of information recorded in said selected card.

2. A translating device comprising a plurality of cards arranged in a stack, each of said cards being indented with a first group of select and lock notches arranged in permutation to designate the card and with a second group of two other kinds of notches to record an item of information thereon, means common to all of said cards selectively operated in accordance with the number and distribution of the select notches in said first group which is individual to a card for selecting said card, and means controlled by the notches in said second group on all cards for indicating the item of information on said selected card.

3. A translating device comprising a plurality of cards arranged in a stack, each of said cards being indented with a number of inverted and reversed L-shaped notches and shouldered notches arranged in permutation to indicate the card, all of said notches on said cards forming a plurality of grooves when said cards are stacked, a bar normally disposed within each of said grooves, means for selectively operating said bars in accordance with the shouldered notches in one particular card whereby the operated bars are withdrawn into the wide portion of the shouldered notches in said card, said bars occupying the narrow portion of each L-shaped notch in the grooves of which said shouldered notches form a part, and means operative subsequent to the selective withdrawal of said bars for moving said card out of the stack a distance measured by the difference between the wide portion of a shouldered notch and the narrow portion of an L-shaped notch.

4. A slide card translator of the character described comprising in combination a plurality of cards each having one group of selective positions along one edge thereof permutatively notched to record a designation characteristic of the card and a second group of translation positions along the same edge notched by wide and narrow notches to record an item of translation individual to the card, a base, two parallel supports mounted on opposite sides of said base, a slotted guide for said cards mounted upon each of said supports for inserting said cards therebetween to form a stack, whereby corresponding notches in each of the cards form grooves of varying widths that traverse the stack, means individual to each card for drawing the different cards out of the stack, bars normally inserted in the grooves formed in the selection positions for keeping said cards in the stack against the action of said individual means, electromagnetic means individual to each bar for controlling the insertion and partial withdrawal thereof from the associated groove, whereby the operation of said electromagnetic means in designated combinations to partially withdraw bars from the grooves that include the selection notches of the designation characteristic of a card will cause

said card to be acted upon by said means individual to the card for withdrawal out of the stack within said guides by the difference between a wide and narrow notch of the translation record thereof, said card being restrained from further movement out of the stack by the bars retained in the selection grooves.

5. A slide card translator of the character described comprising in combination a plurality of cards each having along one edge thereof a plurality of inverted and reversed L-shaped notches among which are permutatively interspersed a plurality of shouldered notches to record a designation characteristic of a card, a plurality of wide and narrow notches along the same edge of the card to record an item of information individual thereto, a base, two parallel supports mounted on opposite sides of said base, a slotted guide for said cards mounted upon each of said supports for slidably holding individual cards in corresponding slots in each guide whereby said cards form stacks with grooves of varying widths traversing the stacks, said grooves being formed by the L-shaped and shouldered notches that record the designations characteristic of the cards and by the wide and narrow notches that record the items of translation individual thereto, means individual to each card for moving said card out of its stack, U-shaped select bars provided with a channeled edge adapted to pass through the narrow portion of an L-shaped notch and fit into the narrow portion of a shouldered notch, said bars being normally inserted in the grooves formed by said notches and preventing said cards from being acted upon by said individual means, each of said select bars being pivotally mounted on one of said supports and kept in the inserted position by a spring individual to each bar, and an electromagnet for each of said select bars secured to said base for controlling the insertion and partial withdrawal of its associated bar from a groove, said electromagnet including an armature integral with the bar, whereby the energization of said electromagnet causes the bar to be partially withdrawn from the groove into the wide portion thereof formed by a shouldered notch and into the narrow portion thereof formed by an L-shaped notch against the restraining action of the spring individual to the bar, and whereby the energization of said electromagnets in the combination indicated by the number of shouldered notches of the designation characteristic of a particular card and the consequent partial withdrawal of the associated bars out of their respective grooves leaves said card free to be acted upon by said means individual to the card for withdrawing the same out of its stack within said guides by the difference between a wide and narrow notch of the translation notches, said card being restrained against further displacement by the bars retained in the grooves.

6. A slide card translator of the character described comprising in combination a plurality of cards each having along one edge thereof a plurality of inverted and reversed L-shaped notches interspersed in a permutative order by shouldered notches to record a designation characteristic of a card, and along the same edge a plurality of wide and narrow notches to record an item of translation individual to the card, a base, a pair of parallel supports mounted on each side of said base, a slotted guide for said cards mounted upon each one of said supports for slidably holding said cards in a plurality of aligned stacks, said

cards forming grooves of varying widths traversing the stacks, said grooves being formed by the notches that record the designation characteristic of the different cards and the notches that record items of translation individual thereto, a spring for each card secured to said base, each of said cards holding its respective spring under tension when in a stack, U-shaped bars pivotally supported upon one of said supports normally inserted in the grooves formed by said inverted and reversed L-shaped and shouldered notches for keeping said cards from moving out of the stack under the tension of their respective individual springs, said bars being maintained in the inserted position by restraining springs individual to the bars and secured to the side of the support to which said bars are pivoted, and an electromagnet for each of said bars secured to said base for controlling the pivotal action of said bars in a limited movement within their respective associated grooves, said electromagnet including an armature integral with the bar, whereby the energization of said electromagnet causes the bar to be partially withdrawn out of the groove against the action of the restraining spring individual to the bar, and whereby the energization of said magnets in the combination indicated by the shouldered notches of a particular card and the consequent partial withdrawal of the associated bars out of their respective grooves leave said card free to be acted upon by the tension of its individual spring whereby said card is caused to be moved out of the stack within said guides by the difference between a wide and narrow notch of the translation record of said card, said card being restrained against further movement of the bars retained in the grooves which include said inverted and reversed L-shaped notches of its designation characteristic.

7. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of inverted and reversed L-shaped notches interspersed in a permutation code with one or more shouldered notches to record a designation characteristic of a card, and a plurality of wide and narrow notches to record an item of translation individual thereto, said wide notches being substantially as wide as said L-shaped notches and substantially twice the width of the narrow notches which are of the same width as the narrow portion of the shouldered notches and the narrow portion of the L-shaped notches, a base, a pair of parallel supports, one mounted on each side of said base, a slotted guide for said cards secured to each one of said two parallel supports for slidably holding individual cards between corresponding slots in said guides, whereby said cards are disposed in stacked formation to form grooves of varying widths traversing the stack formed by the L-shaped notches and shouldered notches that record the designation characteristics of the different cards and by the wide and narrow notches that record the items of information individual thereto, means individual to each card for displacing the card out of the stack, bars adapted to fit the narrow portion of the shouldered notch and pass through the narrow portion of the L-shaped notch normally inserted in the grooves formed by said notches on the different cards when stacked, electromagnetic means for partially withdrawing said bars out of the grooves in the combination indicated by the shouldered notches on a particular card

whereby said card is acted upon by said individual means for displacing said card out of the stack by the difference between a wide and narrow notch and restrained against further displacement by the bars in the grooves indicated by the L-shaped notches, said card in being displaced out of the stack by the indicated amount blocking with the narrow notches of its translation record the corresponding narrow notches of similar records in the two cards on either side thereof and reducing the wide notches on said cards to the width of narrow notches, a bar for each groove made by the wide and narrow notches of the translation records of said cards, an electromagnet for actuating said bars, the energization of said electromagnet causing said bars to be out of their associated grooves and the deenergization of said magnet causing only the bars associated with grooves unblocked by the selected card to be inserted in said grooves, and a set of springs for each bar secured to said base, said springs being adapted to close when the bar is in the groove and open when the bar is out of the groove.

8. A slide card translator of the character described comprising in combination a plurality of cards each having along one edge thereof a plurality of inverted and reversed L-shaped notches interspersed in a permutation order with one or more shouldered notches to record a designation characteristic of a card, and a plurality of wide and narrow notches to record an item of translation individual thereto, each of said wide notches being substantially twice the width of each of said narrow notches, the width of an L-shaped notch and the width of the narrow portion of a shouldered notch being substantially equal to that of a narrow notch, a base, a pair of parallel supports, one mounted on each side of said base, a slotted guide for said cards mounted upon each pair of said supports for slidably holding the individual cards between corresponding slots in each guide, whereby said cards form stacks with grooves of varying widths traversing the stacks, said grooves being formed by the notches that record the designation characteristics of the different cards and the notches that record the items of translation individual thereto, means individual to each card for moving the card out of the stack, bars of a thickness slightly less than the width of the narrow portion of a shouldered notch normally inserted in the grooves formed by the L-shaped and narrow shouldered notches, electromagnetic means for partially withdrawing said bars out of the grooves in the combination indicated by the shouldered notches in the designation characteristic record of a particular card, whereby said card is acted upon by said individual means to move said card out of the stack within said guides and restrained against moving more than the difference between a wide and narrow notch by the bars retained in the grooves indicated by the L-shaped notches in said card, said card in moving out of the stack by the indicated amount blocking with the unnotched spaces following the narrow notches of its translation record the corresponding narrow notches of similar records on the two cards on either side thereof and reducing the wide notches on said cards to the width of narrow notches, U-shaped bar for each groove made by the wide and narrow notches of the translation records on said cards, each of said bars having a hooked portion on its cross reach and a downwardly projecting arm formed integrally with

one of the cross members thereof, said bars being pivotally supported on one of said parallel supports, an electromagnet for actuating said bars, said electromagnet including an armature formed with an eyelet for each bar on its surface to engage loosely the hooked portion of the bar, whereby upon the energization of the magnet the armature presses fully on said hooked portion to keep the top edge of the bars clear of their respectively associated grooves and whereby upon the deenergization of the magnet all of said bars are tilted for insertion into their respective grooves, the bars underneath the unblocked grooves entering the same, and a pair of contact springs for each bar secured to said base and actuated by the projecting arms thereof, said contact springs being closed by said projecting arms when their respective bars enter their associated grooves and opened by said projecting arms when said bars remain outside of said grooves.

9. A slide card translator of the character described comprising in combination a plurality of cards each having along one edge thereof a plurality of inverted and reversed L-shaped notches interspersed in a permutative order with one or more shouldered notches to record a designation characteristic of a card, a plurality of wire and narrow notches to record an item of translation individual thereto, each wide notch being substantially twice the width of a narrow notch, the width of an L-shaped notch being equal to that of a wide notch and the width of the narrow portion of a shouldered notch being equal to that of a narrow notch, a base, a pair of parallel supports, one mounted on each side of said base, a slotted guide for said cards mounted upon each of said supports for slidably holding individual cards between corresponding slots in each guide, whereby said cards form stacks with grooves of varying widths traversing the stacks with the L-shaped and narrow shouldered notches that record the designation characteristics of the different cards and with the wide and narrow notches that record the items of translation individual thereto, means individual to each card for moving it out of its stack, select bars normally inserted in the grooves formed by the L-shaped and shouldered notches, an electromagnet individual to each select bar for partially withdrawing the same out of the grooves, said electromagnets upon energization in the combination indicated by the

shouldered notches of a particular card causing bars to be partially withdrawn from the grooves that include such notches of said card and thereby releasing said card for displacement out of the stack under the action of said means individual to the card and restrained from further displacement than the difference between a wide and narrow notch by the bars retained in the grooves indicated by the L-shaped notches, said card in being displaced out of the stack by the indicated amount blocking with the unnotched spaces following the narrow notches of its item of translation record the corresponding narrow notches of similar records on the two cards adjacent therewith and reducing the wide notches on said cards to the width of narrow notches, a U-shaped bar for each groove made by the wide and narrow notches of the translation record on each card, each of said bars having a hooked portion on its cross reach and a downwardly projecting arm formed integrally with one of the cross members thereof, said bars being pivotally supported on one of said parallel supports, an electromagnet for actuating all of said bars, said electromagnet including an armature with an eyelet for each bar on its under surface to engage loosely the hooked portion of each bar, whereby upon the energization of said magnet the armature thereof presses fully on said hooked portions to keep the bars clear of their respective grooves and whereby upon the deenergization of said magnet all of said bars are tilted upward for insertion into their respective grooves, the bars underneath the unblocked grooves entering the same, a pair of contact springs for each bar secured to said base and actuated by the projecting arm thereof, said contact springs being closed by said projecting arm when the associated bar enters its grooves and opened by said projecting arm when the bar is outside of the groove, and a pair of reset magnets mounted upon the one of said supports to which said U-bars are pivotally mounted, an armature for said magnet coextensive in width to that of the card stack and adapted to engage the end portion of a card when displaced out of the stack, whereby the operation of said reset magnets subsequent to the operation of said electromagnet causes said armature to push the displaced card back into the stack.

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