Oct. 31, 1944. R. F. MALLINA 2,361,859

SLIDE CARD TRANSLATOR

Filed Nov. 9, 1943 4 Sheets-Sheet 1

FIG. 1

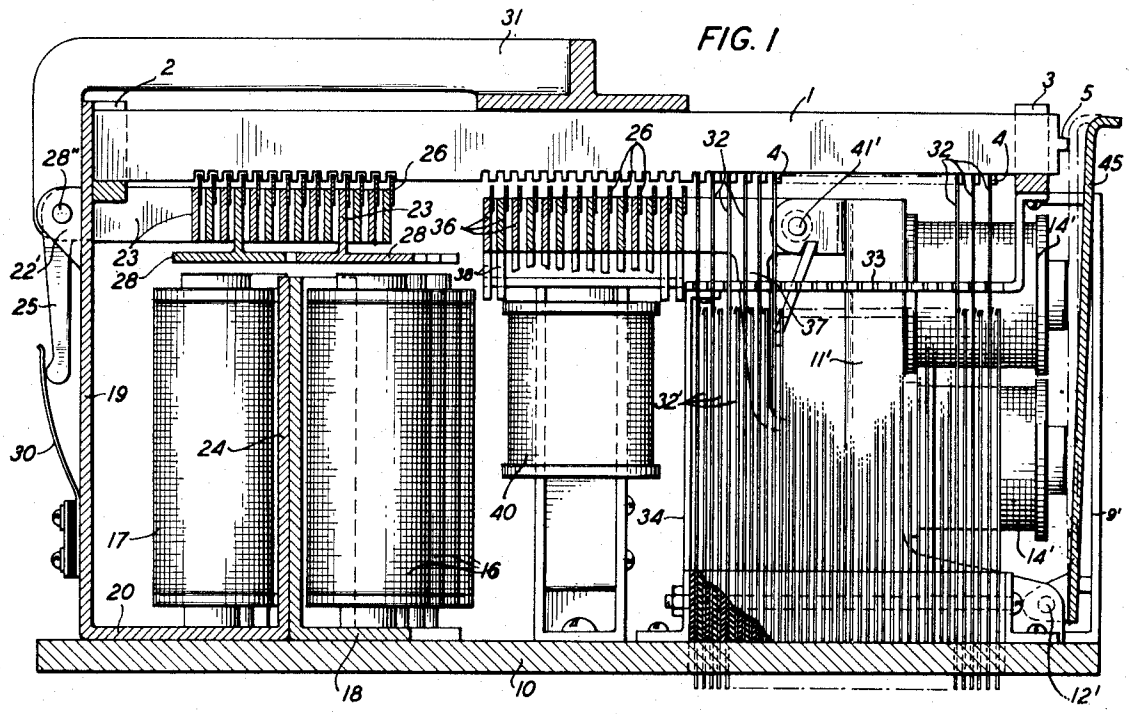
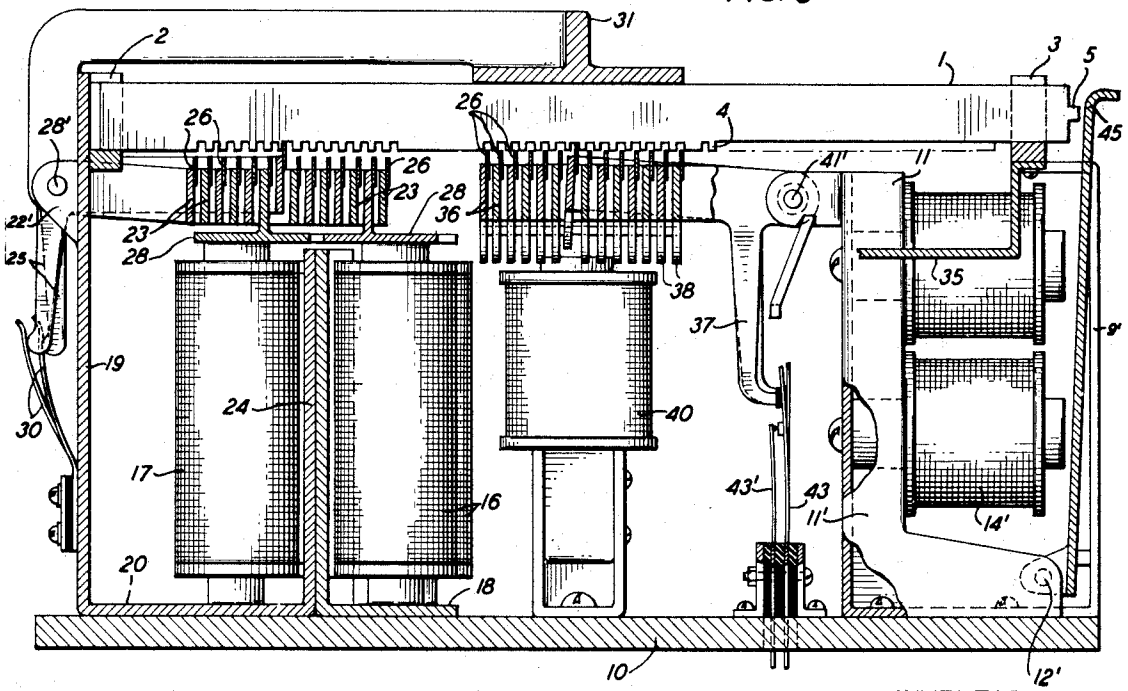


FIG. 3



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SLIDE CARD TRANSLATOR

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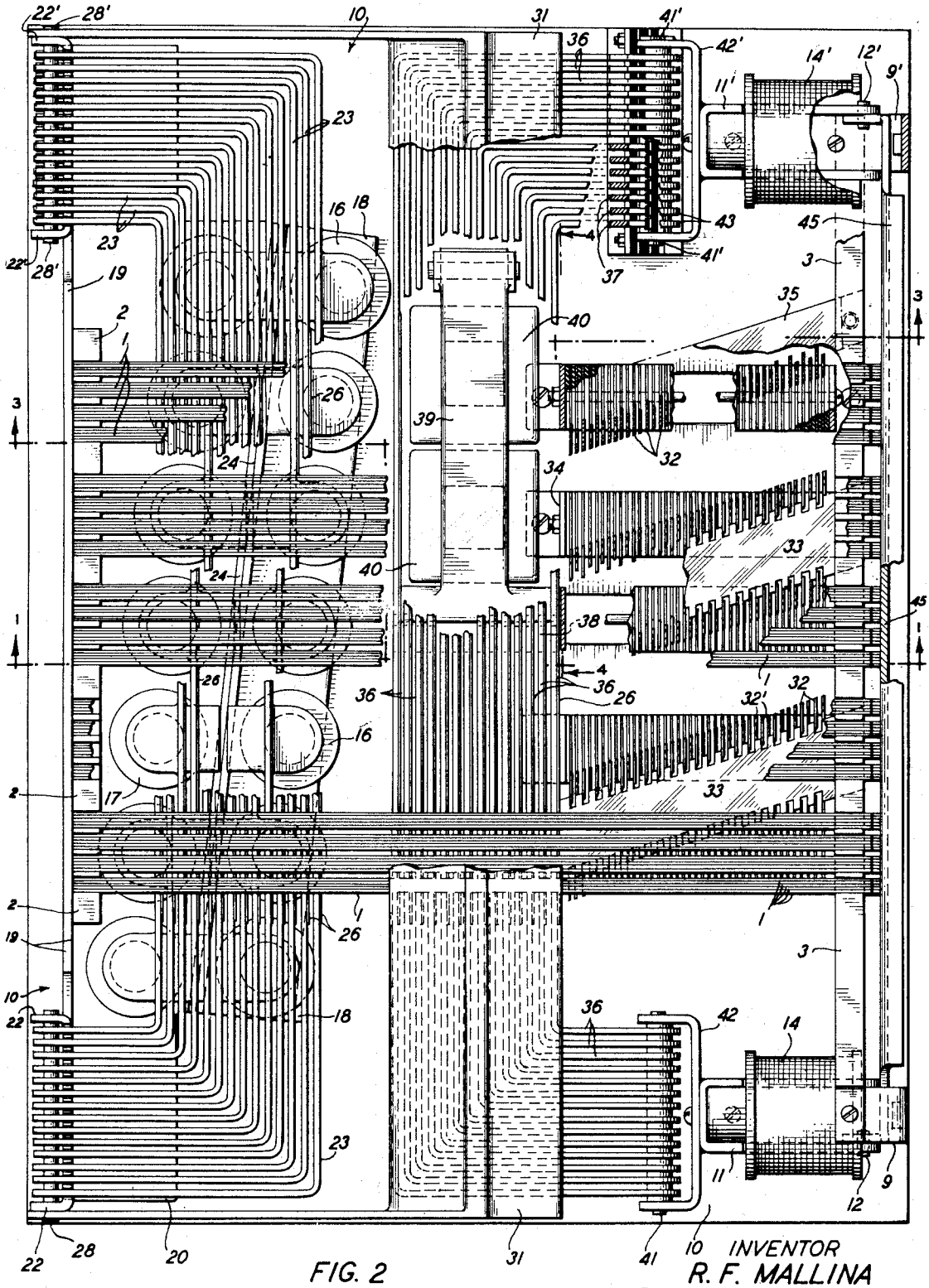

FIG. 2

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SLIDE CARD TRANSLATOR

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FIG. 4

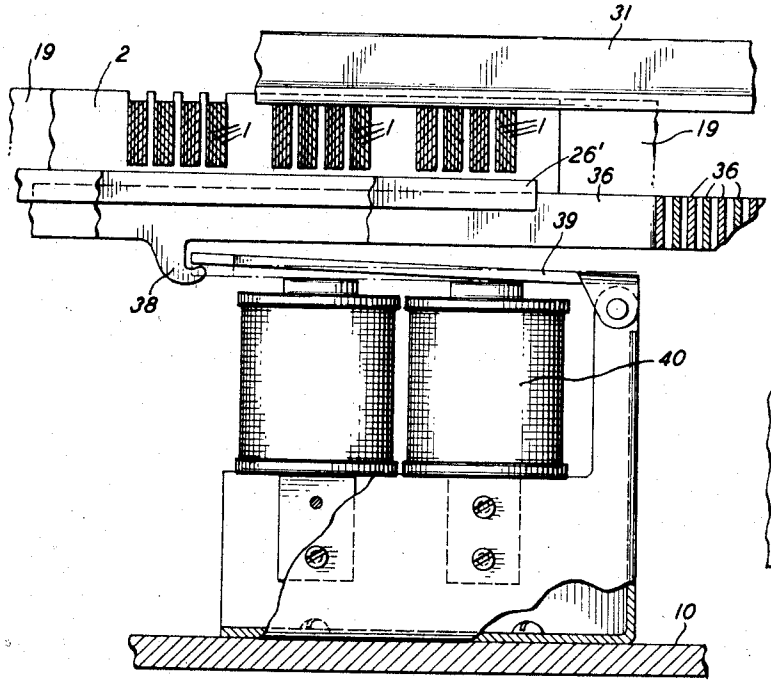

FIG. 5

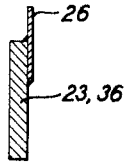

FIG. 6

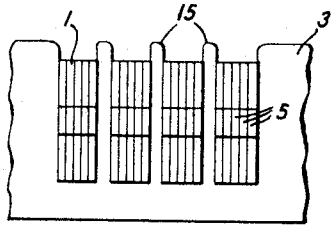

FIG. 7

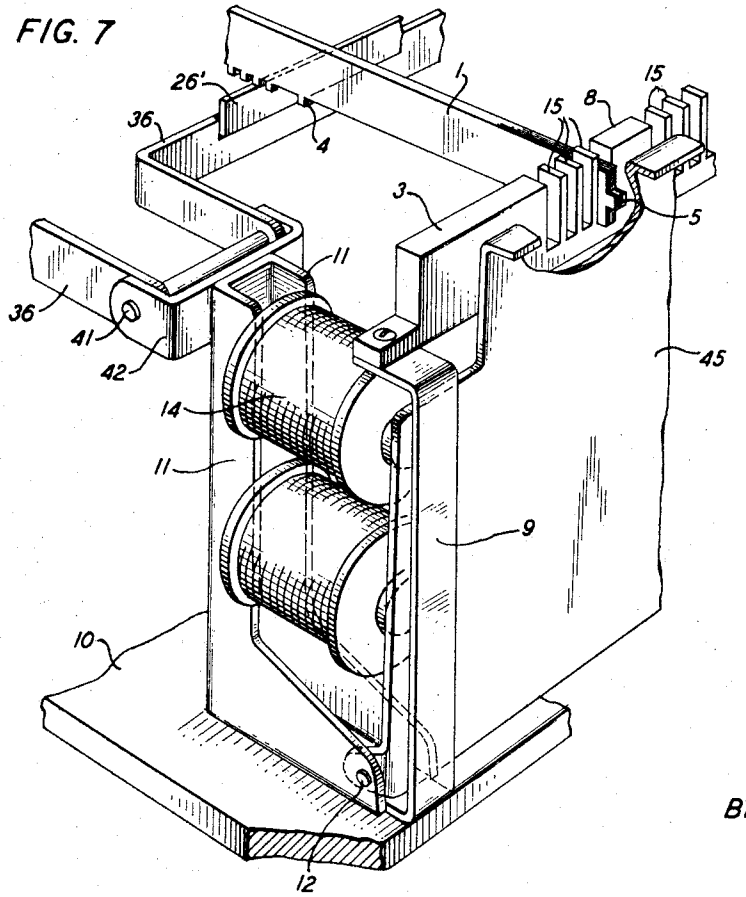

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FIG. 8

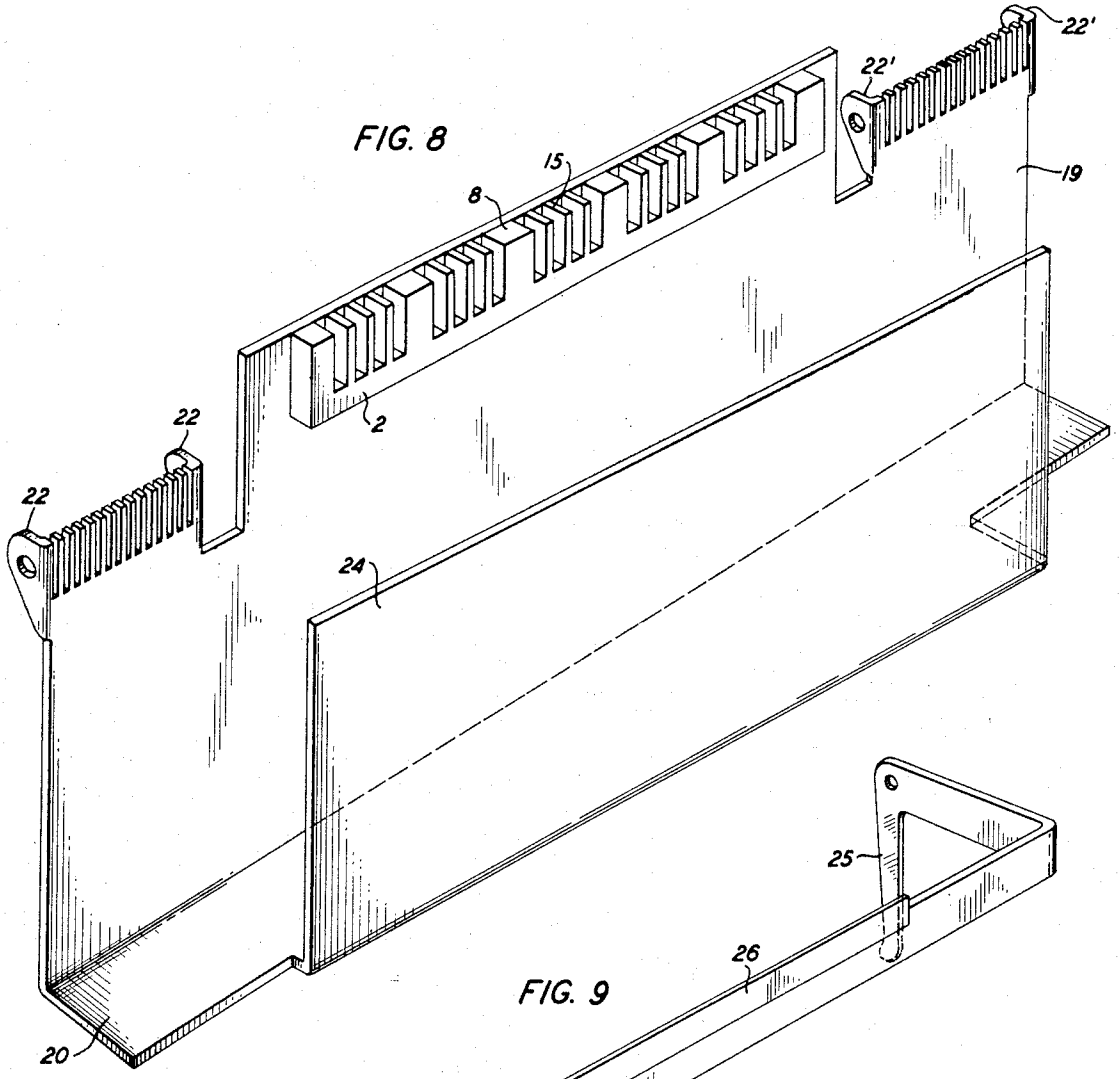

FIG. 9

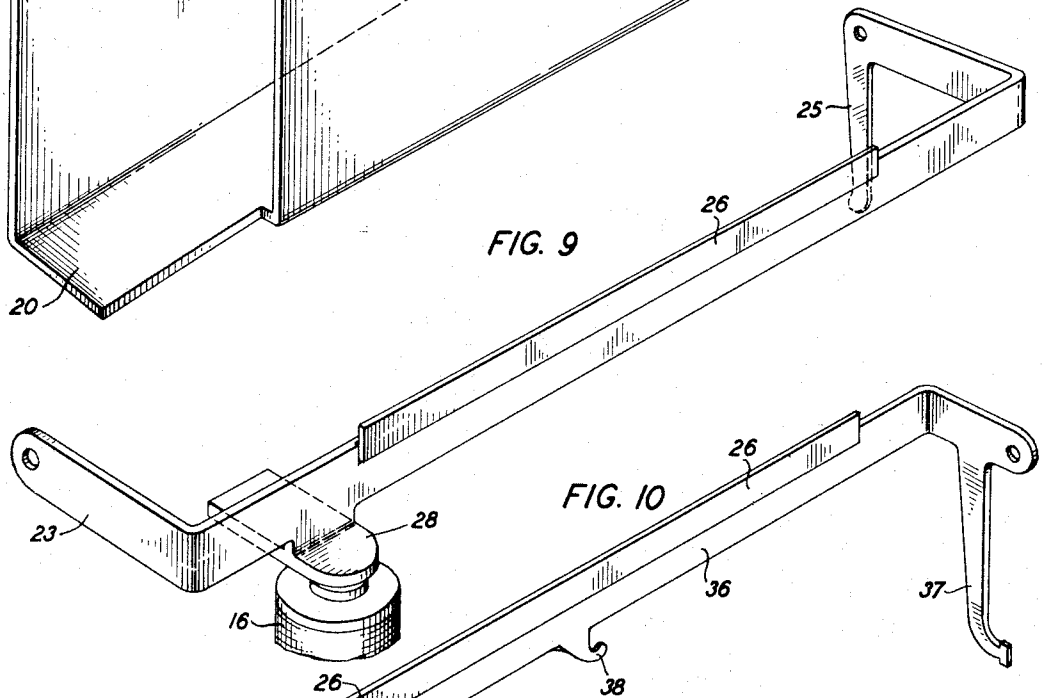

FIG. 10

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UNITED STATES PATENT OFFICE

2,361,859

SLIDE CARD TRANSLATOR

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Application November 9, 1943, Serial No. 509,564

6 Claims. (Cl. 179—18)

This invention relates to improvements in "card" translators of the type disclosed in the copending application of G. R. Stibitz, Serial No. 485,734, filed May 5, 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 cards as desired in a much more accurate and expeditious manner than has heretofore been possible with apparatus of this kind.

Another object of the invention is a translator of the character described in which the cards contained within the supporting apparatus may be easily and reliably removed therefrom, or replaced by other cards, through the simple expedient of operating a hinged pressure pad that normally rests upon the card stack, said pressure pad having also the additional function of normally holding the cards securely in place in stacked relationship within the supporting apparatus.

Another object of the invention is to provide a translator of the character described in which the notches on the different cards may be altered without necessitating any changes in the construction of the translator itself and without complicating its method of operation, thereby making the apparatus adaptable for a variety of uses in which translators of this kind may be employed.

A further object of the invention is to provide a translator of the character described which will provide a suitable housing for a greater number of cards, and make possible a more rapid, reliable and accurate selection thereof in a smaller and more simply constructed apparatus than has heretofore been possible.

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:

Fig. 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;

Fig. 5 is a cross-section of a preferred construction of a part of the "select" and "read" bars;

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, read bar and read magnet support;

Fig. 9 shows a select bar in relation to its controlling select magnet; while

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

Before proceeding with the detailed description of the invention, it may be well to remark that the translator shown and described in the above-mentioned copending application of G. R. Stibitz comprises a structure adapted to support a plurality of cards each notched along the top and bottom edges thereof according to a code of paired wide and narrow notches to indicate certain items of information and some arbitrary or actual translation thereof, also in 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 to fit into the narrow portion of the groove, and when the translation of a particular item of information is desired, bars are selectively inserted into those grooves 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 that contains the desired translation. Since the number of wide notches and their distribution along the information edges of a card are individual to the card, and since the bars are adapted to fit the grooves formed by the narrow notches, it follows that the bars which are inserted into grooves determined by the wide notches of a particular card will cause all cards to be locked against sidewise movement except the one whose wide notches determined the bars to be inserted, 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 on said card forming part of its translation record 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 were not blocked by narrow notches in the translation record of the card moved out; that is, those bars which are disposed over the grooves marked by wide notches of the translation record of this card. These bars, upon entering the grooves, each close a pair of contacts, and the combination of separate electric circuits closed therethrough 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 which constitutes my invention, the code notches are all on one edge of the card instead of being paired on opposite edges thereof, and the "select" bars, that is, the bars which are instrumental in selecting the various cards, are normally inserted in the grooves formed by the wide and narrow notches that constitute the select codes. This automatically locks all the cards in stacked relationship. In selecting a particular card, the select bars, instead of being selectively inserted in the grooves determined by the wide notches in the select record of the card to be selected, are selectively withdrawn from the grooves determined by the narrow notches thereof, thus leaving undisturbed those bars which are normally in the grooves determined by the wide notches. Since each card is held locked by the bars against the tension of a spring individual to each card, the withdrawal of the bars from the grooves determined by the narrow notches on the card to be selected frees the latter card to the pull of its own spring, the latter moving the card out of the stack by the difference between a wide and narrow notch. The card thus selected blocks, by means of the narrow notches of its select record, the grooves determined by its narrow notches and leaves unblocked the grooves determined by its wide notches. A normally operated "read" magnet that controls a "read" bar individual to each groove formed by the notches of the various translation records is then deenergized to release the bars in an attempt to cause each bar to become intruded 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 intrusion of the associated bars, leaving only those bars free to intrude which are disposed over 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, indicating the translation recorded on the selected card.

In restoring the translator mechanism to normal, 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 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.

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 character of the select and reading codes to be used thereon. To illustrate the general principle of construction and operation exemplified by my invention, I have chosen to illustrate the same by a device adapted to accommodate one-hundred cards, each notched along one edge according to a code indication of two numbers, the one set of two numbers designating the card itself and the other set of two numbers designating the translation individual to the card. The code adopted is the "binary" code which is described and illustrated in the above-mentioned copending application of Stibitz 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. Since the one-hundred cards may be assumed to have the decimal numbers 00 to 99, each such number will have its equivalent of seven binary digits, each such digit (0 to 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 fourteen notches, wide and narrow according to the indicated number, to form fourteen grooves of varying widths when the cards are stacked in the same sense.

The number which represents the "output" or "translation" record notched on 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. Where, for example, each item of information for each of the hundred cards may be designated by a two-digit decimal number, seven binary digits or fourteen pairs of wide and narrow notches will be sufficient to provide this translation. Where, on the other hand, the translation requires more than two decimal digits, corresponding increases in the binary code thereof will be required. In the present embodiment of the invention described hereunder by way of example, it is assumed that the translation of the information may be represented in terms of two-digit decimal numbers which require the equivalent of a seven-digit binary number each necessitating fourteen wide and narrow notches along the edge of the card. It should be understood, however, 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 either for the "input" or "output" 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 select and 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 fourteen wide and narrow notches 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 seven binary digits, designates the card itself or "input" as it shall hereinafter be called, while the right group of notches, also comprising seven binary digits, designates the information or "output" or "translation" as it shall hereinafter be called, which the card is intended to convey. Since it is assumed that the input and output entries on each card will be designated by an equal number of binary digits, each card 1 is, of course, made up of the same number of notches. Further, each card is formed with a spring rest 4 on its lower edge to the right of the input group of notches and with a detent 5 projecting outwardly from the middle of its right end, said detent 5 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 in 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 1 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 as many select bars 23 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-hundred cards are used with each card identified by a decimal number 00—99 and the binary code is applied for each of these numbers, seven binary digits or fourteen select notches will be required in each card to form as many grooves. Hence in the present embodiment of the invention which illustrates a translator using one-hundred cards notched in the binary representation of two decimal digits, fourteen select magnets divided into two groups of seven magnets each are provided. The seven 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 in magnetic contact with the flange 24 is the L-shaped magnetic member 18 which is of the same length and width as flange 24, and on the base of said member 18 are secured the seven 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 ears 22 and the back ears 22'. These ears provide apertures for the pivots that will support the select bars 23 in the manner indicated hereinafter, and the slotted space between each pair of ears, while equal for both pairs, will be determined by the number of select bars provided for the translator.

Each select magnet 17 and 16 controls a U-shaped select bar 23 (see Fig. 9) which, at the end of one cross member (the rear cross member in the present embodiment of the invention) is provided with a downwardly extending lever portion, a hole 25 being provided at the end of the rear cross member, and a similar aligned hole being provided at the end of the forward cross member. Each select bar 23 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 to the right or to the left of said main member will depend, of course, upon the location of the associated magnet upon either the member

19 or the member 18, as will be apparent from Figs. 1 and 2. Along the upper edge of the bar is welded or otherwise suitably secured thereto a thin strip 26 of a thickness which is slightly less than the width of a narrow notch on the cards. The strip is secured to the bar so as to leave a portion of it exposed which is slightly greater than the depth of the notch so that, when the bar is lifted into the groove formed by a column of notches, this exposed portion may fully and freely be intruded into the groove. It is obvious that while the bar has to have sufficient thickness to insure rigidity, the fact that a thin strip 26 can be mounted thereon for intrusion into a groove means that the notches can be made smaller and thus reduce the length of the cards. But the use of the strip 26 may be dispensed with and the top edge of the bar inserted in the groove if, for any reason, small notches are undesirable, the "narrow" notch of a card being dimensioned, in this case, to be slightly wider than the thickness of the bar.

The bars 23 of which fourteen are provided in the present embodiment of the invention, are of progressively diminishing dimensions, the largest, for control by the last magnet 16 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 and 22' the aligned holes 25 in said cross members being in alignment with the holes in said ears. With the outer bar so adjusted between the two slots, the main member of the bar will come directly underneath the fourteenth groove formed by the extreme right-hand select notches of the card stacks.

On the other hand, the smallest bar 23 which will be controlled by the first or frontmost select magnet 17 of the inner row of seven 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 and 22' with the holes thereof in alignment with those of the ears and with the main member thereof coming directly underneath the first groove (counting from the left in Fig. 1) formed by the first select notch in each of the cards. The remaining twelve bars, disposed between the largest or outermost bar and the smallest or innermost bar, 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 and 22'. These bars 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, and the latter traversing the holes of the rear cross bar members between the ears 22'.

The lower portion 25 of each of the select bars 23 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 form select grooves of varying widths, also as above set forth, with each groove directly over the edge 26 of the select bar 23 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 of the bars and the lower edges of the cards when the intrusion 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 intrusion edges 26 meanwhile being directly underneath their corresponding grooves), it follows that the edge 26 of each bar will be fully intruded within its own above disposed groove. Moreover, since each card will have one or more narrow select notches in its group of select notches, and since the thickness of the edges 26 of the intruded bars is slightly less than the width of the narrow notches, it further follows that, with the edges 26 of the select bars 23 fully intruded into their corresponding grooves, each card will be locked against any sidewise movement.

To counteract the force of the bars (applied thereto by the springs 30) in trying to lift the cards out of their respective slots in the card guides, 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' exterior to the outer pairs of ears 22 and 22' by aligned apertures at the ends of said cross members. The pad 31 is thus adapted to swing counter-clockwise about the pins, and the length of its cross members preferably may be such as to cause the main member to rest upon the stack at the cross center thereof, as shown in Fig. 2. The weight of the pad is such that, when resting upon the card stack, it will fully counteract the force of the select bars 23 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. Preferably it would be desirable under these circumstances first to energize all the select magnets 16 and 17 and thereby withdraw all the select bars 23 out of their respective grooves. With the pressure pad off the card stack and the select magnets energized, 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 deenergized to cause their respective bars 23 again to be intruded within 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 con-

trolling 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, the space would be insufficient to accommodate all the springs.

For each two groups of forty cards there is provided a double-edged staggered slot guide **33** of insulating material, said guide being formed with twenty rectangular teeth along its front edge and twenty rectangular teeth 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, in turn, 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 teeth 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 shown, 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 a wide and narrow notch in its selection group of notches, the width of the slots in the spring guides **33** is made no larger than this difference so that the spring will be limited in moving the card out any further than this distance. 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 select notches in the different cards, there being the same number of select notches in each card, in this case, fourteen. The translation notches on the cards, that is, the group of notches to the right of the select notches that designate the information carried by the cards, also form grooves when the cards are arranged in stacked formation, there being, in this case, as many translation grooves as there are reading 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 **23** is tilted upward by its individual spring **30** until the top edge **26** of each bar is fully intruded into the select groove formed directly thereover. Since the thickness of the edge **26** is slightly less than the width of a narrow select notch, and since each card has seven such narrow notches distributed among the total of fourteen (the remainder being wide notches), it is evident that, with the select bars **23** fully intruded into their respective select grooves, the cards will be "locked" and thereby restrained by the bars from responding to the force applied to them by the tension of their respective springs of the pairs of springs **32**. To release any one of these cards so that the moving spring of its pair **32** may impel the card to move to the right, the select magnets **16** and **17** are energized in the combination indicated by the bars intruded into those select grooves which are determined by the narrow notches in the card to be selected. The energization of these magnets will attract their armatures **28** which are integral with the bars, and since the bars are hinged on the ears **22** and **22'**, as before described, the bars will be rotated clockwise against the tension of their respective springs **30** until their respective edges **26** are withdrawn from the select grooves indicated and cleared entirely therefrom. The select bars which are now left in the grooves are only those determined by the "wide" notches of the card to be selected, and since the number of these notches and their distribution in the group of fourteen are unique to this card, and since the thickness of the intruding edge **26** of each of these bars is slightly less than the width of a narrow notch, the card will no longer be locked but will be free to move to the right out of the stack under its force of the moving spring of the pair **32** until the left edges of the wide notches engage the left surfaces of the edges **26** of the intruded bars; that is, the card will be free to move to the right substantially by the difference between a wide and a narrow notch. The moving spring of the pair **32**, pressing on the left edge of lug **4** of the card traversed only by bars which are intruded into its wide notches, urges the card to the right, which moves out of its slot in the card guide **2** and through the corresponding slot 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 **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 **32**. The card thus moved out is in a "selected" position, the other cards remaining locked against displacement by the individual moving spring of their respective pairs of springs **32** because the still intruded select bars are also intruded into grooves which, while formed in part only by the wide notches of the selected card, are also formed by the narrow notches of the other cards, leaving said other cards no space between their respective wide and narrow notches that can be utilized by the individual moving springs of their pairs of springs **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 a wide and narrow select notch 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 were to be made to insert bars in all the translation grooves, the only ones that would get through would be those located below the grooves which include the wide translation notches of the selected card, since the most that could happen to these grooves by the movement of the selected card would be the reduction of their respective widths from those of wide notches to those 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 36, fourteen such bars being provided in the present embodiment of the invention because of the existence 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, like the upper edge of a select bar, carries a thin edge 26' similar to the thin edge 26 of the select bar, said former edge being coextensive with the length of the translation grooves formed by all the card stacks.

As in the case of the select bars 23, the read bars 36 are progressively dimensioned to fit freely, in spaced relation inside of 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 bottom of the front channel member and the rear channel member, respectively, of the reset magnet supports 11 and 11'. Thus the bars are free to swing about these supports.

The read magnet 40 which controls the operation of all the fourteen read bars 36 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 at its outer extremity an eyelet for each of the hooks 38 of the several read bars 36.

For each read bar 36 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 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 36 is turned about the 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 36 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 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 36 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 read grooves which have not been covered up by the narrow notches in the translation record of the selected card, since these are the only ones that will present no obstruction to the edges 26'; that is, the grooves that will be entered by 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 top 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 36 into grooves marked by the wide notches in the translation record of the selected card, it follows that the operated spring pairs designate, in binary code, the information indicated 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 described will 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' is vertically mounted a reset magnet 14 and 14', respectively, the former magnet being located at the front and the latter magnet being located 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 armature may normally be either in an operated or unoperated position. If it is in the operated position, it is up against the lugs 5 of all the cards in the different card stacks. Now when a card is selected and moved out of its stack, its lug will push the armature away, causing it to move slightly to the right until the reduced portions thereof abut against the inner sides of brackets 9 and 9'. 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 38 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. Before releasing the reset magnets 14 and 14' the circuits of the operated select magnets 16 and 17 are opened, causing their respective select bars 26 to be acted upon by their restoring springs 30, which tilt their respective bars 23 in the counterclockwise direction and cause their edges 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 builds up tension to push the card out of the stack upon its next selection. The reset magnets 14 and 14' may now be released but the armature may remain against the array of lugs 5. With the read magnet 40 energized and the select magnets 16 and 17 unenergized, the selection of another card may proceed in the manner 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 slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of the card and an item of translation 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 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 by the designation characteristics of the cards for keeping said cards in the stack against the action of said individual means, and electromagnetic means individual to each bar for controlling the insertion and withdrawal thereof from the associated groove, whereby the operation of said electromagnetic means in designated combinations to withdraw bars from the grooves that include the narrow 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, said card being restrained from further movement out of the stack by the bars in the grooves that include only the wide notches of its designation characteristic.

2. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of a card and 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 wide and narrow notches that record the designations characteristic of the cards and the items of translation individual thereto, means individual to each card for moving said card out of its stack, U-shaped select bars of a thickness slightly less than the width of a narrow notch normally inserted in the grooves formed by the designation characteristics of the cards for 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 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 withdrawn out of the groove against the restraining action of the spring individual to the bar and whereby the energization of said electromagnets in the combination indicated by the narrow notches of the designation characteristic of a particular card and the consequent 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, said card being restrained against further displacement by the bars retained in the grooves which include the wide notches of its designation characteristic.

3. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of a card and an item of translation individual thereto, 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 wide and narrow notches that record the designation characteristic of the different cards and the 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 the designation characteristics of the cards 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 and out of their associated grooves, said electromagnet including an armature integral with the bar, whereby the energization of said electromagnet causes the bar to be 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 narrow notches of the designation characteristic of a particular card

and the consequent 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 to cause said card to be moved out of the stack within said guides by the difference between a wide and narrow notch, said card being restrained against further movement by the bars retained in the grooves which include the wide notches of its designation characteristic.

4. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of a card and an item of translation individual thereto, said wide notches being twice the width of the narrow 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 with grooves of varying widths traversing the stack formed by the wide and narrow notches that record the designation characteristics of the different cards and the items of information individual thereto, means individual to each card for displacing the card out of the stack, bars adapted to fit the width of a narrow notch normally inserted in the grooves formed by the designation characteristics of the different cards, electromagnetic means for withdrawing said bars out of the grooves in the combination indicated by the narrow notches in the designation record of 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 wide notches of the designation record, 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.

5. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of a card and an item of translation individual thereto, each of said wide notches being twice the width of each of said narrow notches, 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 wide and narrow notches recording the designation characteristics of the different cards and 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 a narrow notch normally inserted in the grooves formed by the designation characteristics of the different cards, electromagnetic means for withdrawing said bars out of the grooves in the combination indicated by the narrow notches in the designation characteristic record of a particular card whereby said card is acted upon by said individual means to move it 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 wide notches in the designation characteristic record of 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 and 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, a 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 under 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 bar clear of its associated groove and whereby upon the deenergization of said 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 arm 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.

6. A slide card translator of the character described comprising in combination a plurality of cards each having a plurality of wide and narrow notches along one edge thereof to record a designation characteristic of a card and an item of translation individual thereto, each wide notch being twice the width 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 wide and narrow notches that record the designation characteristics of the different cards and 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 designation characteristics of the different cards, an electromagnet individual to each select bar for withdrawing the same out of the grooves, said electromagnets upon energization in the combination indicated by the narrow notches in the designation characteristic record of a particular card causing bars to be withdrawn from

the grooves indicated by the narrow 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 wide notches in the designation characteristic record of said card, 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 groove 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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