June 4, 1963 F. JONKER 3,092,114

SELECTION METHOD AND APPARATUS FOR INDEXING DOCUMENTS AND THE LIKE WITH EXTREME RAPIDITY

Filed May 9, 1956 3 Sheets-Sheet 1

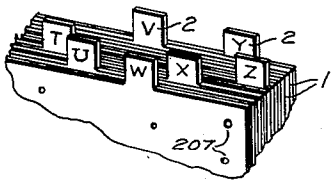


Fig. 1

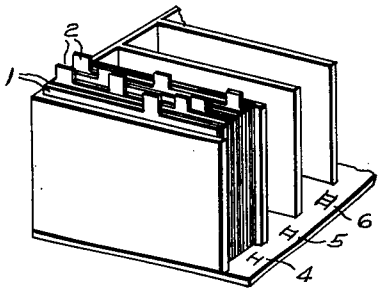


Fig. 2

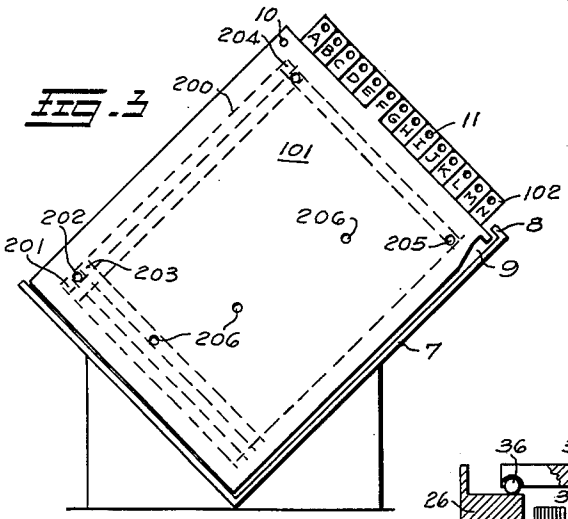


Fig. 3

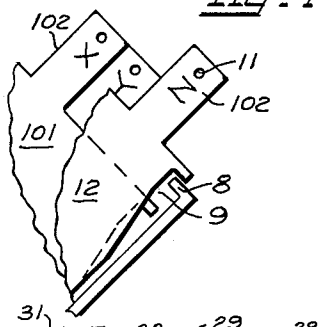


Fig. 4

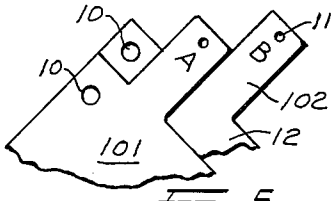


Fig. 5

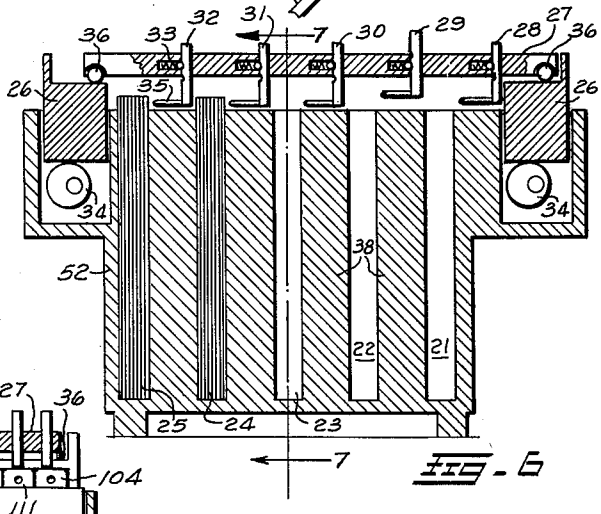


Fig. 6

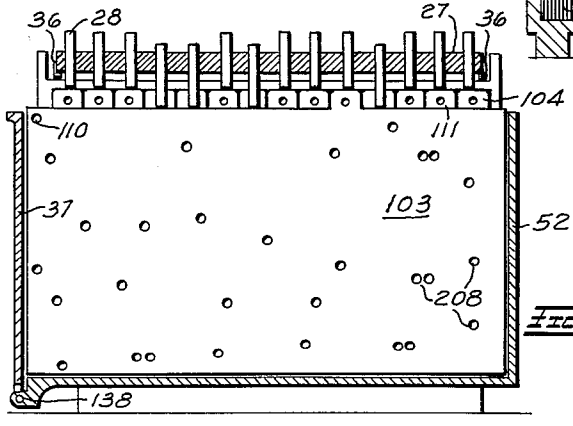


Fig. 7

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SELECTION METHOD AND APPARATUS FOR INDEXING DOCUMENTS AND THE LIKE WITH EXTREME RAPIDITY

Filed May 9, 1956 3 Sheets-Sheet 2

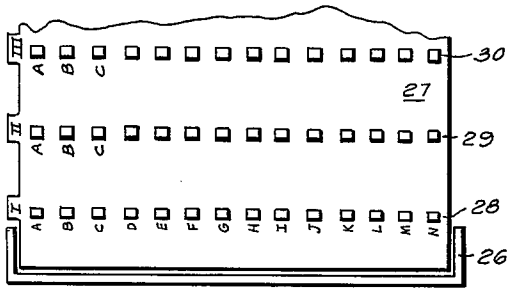


Fig. 8

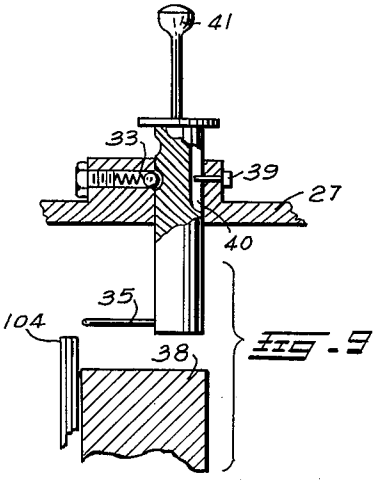


Fig. 9

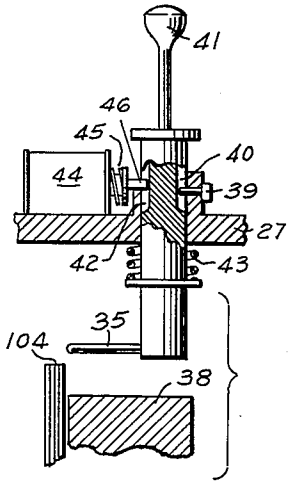


Fig. 10

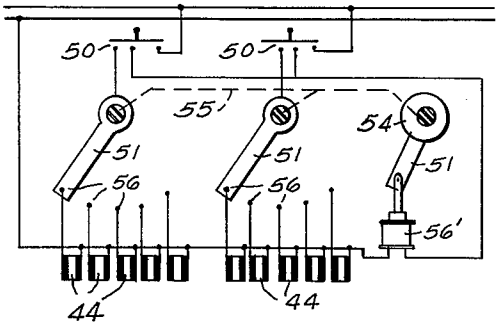


Fig. 11

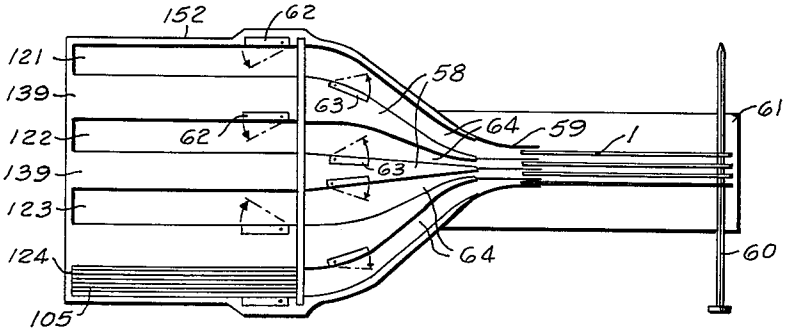


Fig. 12

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SELECTION METHOD AND APPARATUS FOR INDEXING DOCUMENTS AND THE LIKE WITH EXTREME RAPIDITY
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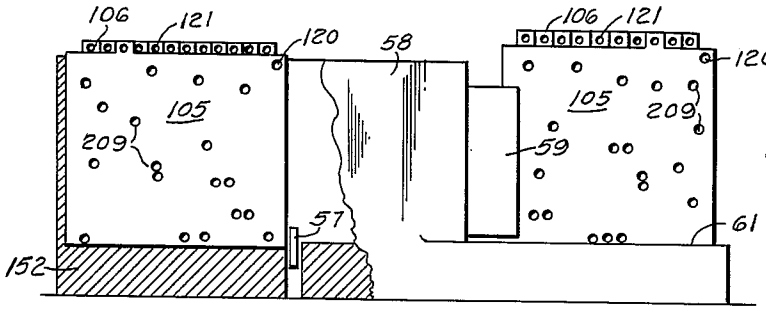


Fig - 13

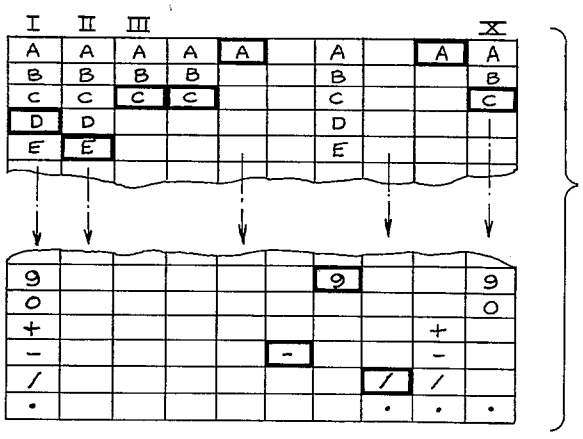


Fig - 14

United States Patent Office 3,092,114 Patented June 4, 1963

3,092,114

SELECTION METHOD AND APPARATUS FOR INDEXING DOCUMENTS AND THE LIKE WITH EXTREME RAPIDITY

Frederick Jonker, Takoma Park, Md., assignor to Jonker Business Machines, Inc., a corporation of Delaware

Filed May 9, 1956, Ser. No. 583,774
4 Claims. (Cl. 129—16.1)

This invention is a modification of my co-pending patent application Serial No. 366,543, filed July 7, 1953, now abandoned. The present invention pertains to indexing systems of the same general nature but offers a considerably simplified and less expensive construction and much faster operation.

The present invention as well as my co-pending patent application pertains to information retrieval systems utilizing cards dedicated to "terms," where each card has an area dedicated to each "item" in the information collection. Systems of this nature can be characterized as the inverse of the well-known Hollerith systems where cards are dedicated to "items" and the "terms" punched out on the cards.

Said co-pending patent application describes a greatly improved system of this nature having a limited amount of cards dedicated to alphabetic characters or other symbols, which provides for automatic selection of all cards required for an information search or to enter an item of information. In this system all cards are stored in a random manner and the cards are selected by a mechanical selection device.

My present invention pertains to this same type of device but it provides a greatly simplified and less expensive construction and much faster operation, made possible by the fact that cards are no longer stored in a random fashion but instead in a semi-random manner.

In my United States patent application Serial No. 366,543, filed July 7, 1953, and entitled "Method and Apparatus for Indexing Documents and the Like," there is disclosed an indexing machine of the same general nature as that which is contemplated by the present invention, the same using relatively large, thin, non-transparent flexible cards of metal, plastic, or other suitable material. A document having a certain accession number is entered on such a card by drilling a hole in a certain position which is dedicated to this accession number. Each of the cards to be indexed has the same position dedicated to the same accession number.

According to both the present invention and the invention of said co-pending patent application, in the event the documents are classified according to a classification system, each of the cards of the system may be assigned to one of the "classes," "subject headings" or "descriptive terms" used in the system to "index," that is to describe, each of the items of the complete information collection. For example, if it is desired to obtain from a file of reports on aircraft instrumentation indexed with descriptive terms, all reports which are concerned with the testing of supersonic airspeed indicators, the investigator would, in practicing the present invention, select the cards assigned to the term "Testing" or "Test"; the card assigned to the term "Supersonic"; and the card assigned to the term "Airspeed Indicator"; or, if this latter term is broken up into two separate terms, the investigator would select the card assigned to the term "Airspeed" and the card assigned to the term "Indicator."

Classes, subclasses, phrases and one-word terms will be generally referred to hereinafter as "terms." According to both the present invention and the invention of said co-pending patent application, all of the cards co-selected are superimposed and held against a source of light.

Whenever a hole is found through which the light emanates, the accession number corresponding to that hole represents a document involving the desired subject. Systems of this nature are well known in the art and no claim was laid thereto.

It is among the objects of the invention disclosed and claimed in patent application Serial No. 366,543 to provide a completely automatic apparatus for performing automatically functions of the class described hereinbefore.

However, the teachings of the invention of the said co-pending application comprehend a greatly simplified machine wherein the cards, in lieu of being assigned to terms, are assigned to symbols, or characters, such as letters, figures, and other symbols, as well as to codes, the manner of which will be described hereinafter.

If the terms to be recorded have a maximum length of, for example, ten (10) letters, there will be utilized ten (10) "basic character lists." Each of these basic character lists contains, for example, the twenty-six (26) letters of the alphabet, the numerals 0 to 9, and a few notations and marks, such as the + and the —, and the /, a total of forty (40) basic characters in all. More basic characters might be added in the form of Roman numerals, the Greek alphabet, an alphabet of capitals, more notations, etc. Each of the basic characters is assigned a certain card in such a way that the letter "a" out of the first character list has a different card from the letter "a" out of the second character list, etc. Thus, a total of $10\times40=400$ cards is provided. To enter a document, for example, document No. 5219 dealing with the testing of supersonic airspeed indicators, the terms "testing," "supersonic," "airspeed" and "indicators" will have to be entered on the cards. In order to do this, the cards out of the first character list assigned to the first letters of the above terms, the "t," the "s," the "a," and the "i," will have to be selected. Out of the second basic character list, the cards assigned to the letters "e," "u," "i," and "n," will have to be selected. Out the third character list, it will be the cards assigned to the letters "s," "p," "r," and "d," etc. When all cards assigned to all the letters required to spell out these terms have thus been selected, they are superimposed and a hole is made which extends through all of the cards in the position dedicated to this document No. 5219.

A typical scheme for such a 10×40 array of characters and "alphabets" is more fully described in connection with FIG. 14 at the end of this specification.

The dedication of areas on the cards to the information items in the system can for example be based on a system of rectangular coordinates parallel to the edges of the cards and having their intersection at one corner of the cards. Position #5219 can in that case be found by starting at the intersection of the X and Y axes, moving 52 positions along for example the X-axis followed by a move parallel to the Y-axis of 19 positions.

In order to retrieve information very much the same procedure is followed. For example, if we want to have the document numbers of all documents containing information on the "testing" of "supersonic airspeed indicators," the sheets corresponding to letters of these terms will be selected and placed in superimposition against a source of light. The places where light will then be visible through coinciding holes, then correspond to documents containing such information. The coordinates of these coinciding holes can be read off by a special scanning device.

The invention of my aforementioned patent application Serial No. 366,543 enables a further reduction in the necessary number of cards by utilizing a code for the terms, instead of using the words themselves. For ex-

ample, there might be used a field of (240) code positions divided in, for example, 4 subfields of (60) positions each. Each term would be represented by a code pattern of 4 positions selected among these 240 positions in such a manner that one position of this pattern belongs in the first subfield, another position in the second subfield etc. There are more than enough possible code patterns of this nature in a field of 240 to cover all possible requirements. There is a card dedicated to each of these 240 code positions. These cards are kept together in groups similar to the earlier discussed "alphabets." Each group would then consist of 60 randomly filed cards. To enter the document, all cards corresponding to all terms characterizing this are superimposed and a hole is made at the dedicated position corresponding to the accession number of the document.

While in said co-pending application all cards are stored in a completely random manner, and certain cards are selected from among the total by means of a suitable selection mechanism, the present invention provides for storage in definite groups with randomness only within such groups. This arrangement greatly simplifies selection methods and devices, as a result of which an apparatus of much lower cost can be obtained.

The present invention particularly applies to the selection of cards, and the manner in which information is entered upon or read out from the selected superimposed cards will therefore not be dealt with in this present invention.

The manner in which the selection of cards can, according to the present invention, be performed will now be described with reference to the following figures:

FIG. 1 shows a perspective view of a corner of a deck of cards on which information is stored.

FIG. 2 shows a perspective view of a card holder in which a number of such decks of cards can be stored.

FIG. 3 shows a front view of a tilted card holder with the card holder and cards adapted for selection and removal by means of needles.

FIG. 4 shows a corner of the apparatus of FIG. 3 with one card in the selected position.

FIG. 5 shows another corner of the apparatus of FIG. 3 with one card in the selected position.

FIG. 6 shows a cross-section of a card storage and selector device adapted to allow selection of cards by pushing certain buttons.

FIG. 7 shows a cross-section of the apparatus of FIG. 6, along the plane 7—7.

FIG. 8 shows a top-view of the apparatus of FIGS. 6 and 7.

FIG. 9 shows a view partly in section of the selection hooks of the apparatus of FIGS. 6, 7, and 8, in greater detail.

FIG. 10 shows a view partly in cross-section of a selector hook operated by a solenoid.

FIG. 11 shows a circuit diagram of the actuation of the selector hooks via a stepping switch, by switches mounted under the keys of a typewriter and actuated by the same.

FIGS. 12 and 13 show respectively a top-view and a side-view, partly in section, of a selector cabinet having provisions to bring the selected cards automatically together in superimposition.

FIG. 14 shows schematically the manner in which the cards in the system can be dedicated to letters of the alphabet.

We now refer to FIGS. 1 and 2. According to the present invention all cards **1** forming together one alphabet are stored together in one compartment. Each card is provided with a tab **2**, the position of this tab corresponding to the letter of the alphabet to which this card is dedicated. For example, if a tab has a width of ¼", all tabs of cards dedicated to the letter A are placed at the extreme left of the top edge of the cards. All tabs on cards dedicated to the letter B could be placed ¼" to the right of the tabs on the cards dedicated to A. All tabs on cards dedicated to the letter C could be placed ¼" to the right of the tabs on the cards dedicated to the letter B, etc. The corner of the top edge of such a group of 26 cards is shown in FIG. 1. All tabs are of course marked with the letter to which they are dedicated. Numerals **207** designate holes in the cards corresponding to the date entered in the same in the manner described above.

FIG. 2 shows how, according to the invention, these groups of 26 cards each can be placed in a separate compartment of a card holder. Each compartment is marked with markings **4**, **5**, and **6**, indicating that all the cards of the first alphabet go into the first compartment and all cards of the second alphabet go into the second compartment, etc. For greater convenience all tabs of cards belonging to the first alphabet can, for example, be painted white, all tabs of cards belonging to the second alphabet yellow, etc., a different color for each alphabet.

Standing in front of the card holder facing the tabs, identical letters are always found in the same line of sight even if the cards are placed randomly within one compartment. Thus the cards spelling out certain terms can be rapidly selected, and after use be placed back randomly within each compartment. Terms can be spelled out one by one until all cards together spelling out all terms have been removed.

FIG. 3 shows a section of a different modification of device, according to the present invention, allowing selection with much greater rapidity. Here all cards **101** have tabs **102** provided with holes **11**. All cards are also provided with a notch **9** and a needling hole **10**. The card holder **7** is tilted at approximately 45° and is provided with a ridge over which the notch **9** of the cards can be hooked. Terms can now be spelled out one by one, merely by hooking the corresponding cards by the notch **9** over the ridge **8**. After all terms have been thus spelled out, a needle can be speared through the holes **10** of the selected cards, which may then in one movement all at the same time be removed from the card holder and used either for information entry or information retrieval. FIGS. 4 and 5 show respectively the right and left hand top corner of the device with cards designated by numeral **101** in the normal position and a card designated by numeral **12** in the selected position. The tabs are at least twice as high as the displacement required to hook the cards over notch **9**. The markings are on the top half.

When the tabs are small compared to the size of the fingers it may be more convenient to perform the above described displacement of the cards with the aid of a little hook, held in the hand, which can be hooked into the holes **11**, in order to displace the cards. The card **101**, in FIG. 3, dedicated to the letter F shows a number of "data holes," **201**, **203**, **204**, **205**, and **206**, that is holes corresponding to the date entered in the system. The dedication of areas on the items of information is shown in dashed lines **200**. If the cards can comprise one hundred rows of one hundred areas each, **201** would be the area dedicated to item of information #1 and numeral **202** would designate the area dedicated to item #2. Area **204** would be dedicated to item #100 and area **205** to item #10,000.

A still more automatic operation can, according to the invention, be obtained with the device of FIGS. 6, 7, and 8. FIG. 6 shows a section of this machine. The cards **103** again have tabs **104** spaced in the same manner as shown in FIGS. 1 and 2. The tabs have holes **111**. Each of the cards has a hole **110** by which cards can be withdrawn from the device by means of a needle. Numerals **24** and **25** designate two alphabets of cards sitting in their compartments of the cardholder **52**. Each alphabet has its own compartment. Numerals **23**, **22**, and **21** designate vacant compartments. Corresponding with each of these five alphabets are five rows of 26 hooks, each

designated respectively by numerals **28**, **29**, **30**, **31**, and **32**. Each alphabet therefore has its own row of hooks and each card in each alphabet has its own hook. A spring and ball mechanism **33** holds these hooks in either a lower or higher position. Some of the hooks in FIGS. 6 and 7 are in the lower and some in the higher position. All hooks are suitably marked with the alphabet and letter of the alphabet to which they correspond as shown in FIG. 8. Thus the tops of the hooks provide a matrix-keyboard on which the terms can be typed out one by one by depressing these hooks. The member **27** in which the hooks are mounted has four rollers **36** which run on two members **26**. These rollers can be raised or lowered by means of eccenter **34** or some other suitable means. After the terms have been punched out on this keyboard, member **27** can be rolled to the left so that the pins **35** of the lowered selection hooks can penetrate into the holes **111** of the tabs **104** of the desired cards. Next, member **27** can be raised by raising members **26**. This allows a long needle to spear the selected cards through their holes **110**. Member **27** can then be rolled to the right so that the hooks **35** are withdrawn from the holes **111**. Next, the door **37** hinging on hinge **138** can be opened and the selected cards can be pulled out on the needles. The selected cards can then be used for information entry or retrieval. Cards can be placed back randomly within their compartments, but each card should go back in the same compartment it came from.

The selection hooks can be raised again by lowering member **27** below the position shown in FIG. 6, so that the selection hooks are pushed against the tops of the separators **38**, separating the card compartments, and will thus be raised with relation to member **27**.

FIG. 9 shows a selection hook in more detail. A pin **39** cooperating with slot **40** prevents the selection hook from turning. Button **41** facilitates the pulling up of the selector hook in making corrections.

FIG. 10 shows a solenoid operated selection hook. When solenoid **44** is actuated it pulls in its slug **46** against the pressure of spring **45**, thus allowing spring **43** to lower the selection hook. When the selection hook is raised again, in the same manner as described for FIG. 9, the spring **45** pushes the stem **46** of the slug of the solenoid **44** back in groove **42**. Thus the selection hook is held in the raised position by the stem **46**, against the pressure of spring **43**.

According to the invention the selector hooks can also be actuated electrically by a conventional typewriter. A circuit diagram of this electric actuation is shown in FIG. 11. Numeral **50** designates switches placed under those keys of a typewriter corresponding to the 26 letters of the alphabet. Depressing a typewriter key will actuate one of these switches. A stepping switch has as many wiper arms **51** as there are switches **50**. Each wiper arm serves as many contacts **56** as there are alphabets in the system. Each contact **56** connects to one of the solenoids **44**, shown in FIG. 10. All wiper arms are mounted on the shaft **55**. Solenoid **56'** advances shaft **55** one contact position every time one of the switches **50** is actuated, via the ratchet mechanism **54**. In this manner the proper solenoids **44** can be actuated by typing out the terms one by one on the keyboard of a typewriter or some other device having a suitable keyboard mechanism. Stepping switches are well known in the art and their mode of operation need not further be explained to those skilled in the art.

FIGS. 12 and 13 show a modification of the cardholder **52** in which the cards are stored. FIG. 12 is a top view of this modification and FIG. 13 is a partial section and partial front view according to the section line **13—13** of FIG. 12. According to the invention, this modified cardholder comprises provisions to bring the selected cards automatically tightly together for information entry or retrieval and allows the cards to be moved automatically back into the proper compartments. In FIGS. 12 and 13 the selection mechanism and the mechanism to raise and lower the bank of selector hooks **27** is not shown. However, this selection mechanism is similar to that of FIGS. 6, 7, and 8 and operates in the same manner. It is mounted over the card storage compartments **121**, **122**, **123**, etc., in a manner similar to FIGS. 6, 7, and 8.

A vertically movable bar **57** is during the selection process in the position shown in FIG. 13. The cardholder is very similar to the cardholder **52** in FIGS. 6, 7 and 8. It comprises a number of card compartments, **121**, **122**, **123**, etc., in FIG. 12, separated by solid sections **139**. Numeral **124** designates a card compartment filled with cards; the others are vacant. Each of the storage compartments extends sideways into curved channels **64**. Each of the separators **139** likewise extends sideways into curved separators **58**. These separators terminate in thin flexible sheets **59**.

The cards **105** again feature tabs **106** each having a hole **121**. The tabs **106** are again spaced in the manner described with reference to FIGS. 1 and 2. All cards comprise a hole **120** for moving the selected cards by means of a needle.

After the selection of cards has taken place, by means of the selection mechanism, described with reference to FIGS. 6, 7 and 8, the selected cards can be needled through the holes **120** by means of needle **61** and pulled out sideways by the needle onto platform **61**. When the selected cards are on this platform **61**, these superimposed cards can be scanned for coinciding holes, or holes can be drilled into these same cards to enter information. The cards are only pulled so far that the edges of the flexible sheets **59** remain over a short distance between the selected cards. FIGS. 12 and 13 show the device with a number of selected cards pulled sideways out on platform.

Before returning the cards to their compartments, the flaps **62**, pivotally mounted in the wall of the card selector **152** and the separators **139** of this selector, are opened to push the cards remaining in the compartments **121**, **122**, **123** and **124** over to one side. Next, the cards are, by means of the needle **60**, pushed back to the slot in which the bar **57** is mounted. Next, the flaps **63** pivotally mounted in the curved extensions **58** of the separators **139** are opened. Next, the cards are pushed into their compartments until they touch the flaps **62**. After this, the flaps **62** and **63** can be closed and the cards **105** be pushed back entirely into their compartments. The cards **105**, visible in FIG. 13, show a number of data holes **209**.

FIG. 14 illustrates schematically, in tabular form, one typical way in which individual cards can be dedicated to letters of the alphabet, numerals, symbols et cetera in the systematic fashion required. The left-hand vertical column I in FIG. 14 has positions assigned to the possible letters, numerals and symbols constituting the "first" character list, that is, the "alphabet" from which the "initial" letter, or numeral, or symbol of a descriptive term is selected. The remaining nine columns, marked by the Roman numerals II through X, have the same vertical position assignments of letters, numerals and signs, but column II represents the group or alphabet from which is selected the "second" character of the descriptive term, and so on.

Each of the positions in the first column (I) of FIG. 14 represents an individual card in the group 4 of FIG. 2, and the positions in the second column represent respective cards of group 5 of FIG. 2, and so on. The cards to be selected from the respective decks and superposed to receive (or exhibit) code holes for a document under the descriptive term "DECCA–9/AC" have been indicated in FIG. 14 by heavy margins, by way of example.

While I have shown and described certain specific embodiments of the present invention, it will be readily understood by those skilled in the art that I do not limit myself exactly thereto, since various modifications may

be made without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. In a record selection apparatus for selecting from a plurality of decks of selectively edge-tabbed record cards those cards tabbed at specified positions, and in which each tab is provided with an opening capable of being engaged by a card tab hook, comprising: container means for supporting a plurality of decks of such cards in parallel aligned facing relation with the opposed faces of adjacent decks spaced from one another by spacers providing inter-deck spaces to dispose all of the card tabs in a rectangular array of rows and columns as viewed from above said tabs, a movable panel mounted parallel to the plane of the tab array, a plurality of card tab hooks symmetrically disposed and movably mounted individually on said panel for movement to and from card tab-selecting positions within the inter-deck spaces, means mounting said panel for movement in a direction carrying all of said hooks to and from tab-engaging positions, and means for moving said panel in a direction parallel to the planes of said cards to displace from their respective decks all of the cards whose tabs have been engaged by any of said hooks.

2. Apparatus in accordance with claim 1, in which each of said hooks comprises a portion passing through said movable panel and reciprocable therethrough, each of said hooks having an extremity for digital operation whereby all of said hooks form a keyboard to facilitate selecting the desired hooks to be moved to card-selecting positions.

3. Apparatus in accordance with claim 1, in which the card-supporting container means comprises a compartmented cabinet having one wall movable to expose, for edgewise removal, those cards displaced from their respective decks.

4. Apparatus in accordance with claim 1, including means operable automatically upon return of said panel from its card-displacing position, for restoring all said hooks, theretofore moved to their tab-selecting positions, away from such positions.

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