

March 7, 1944.

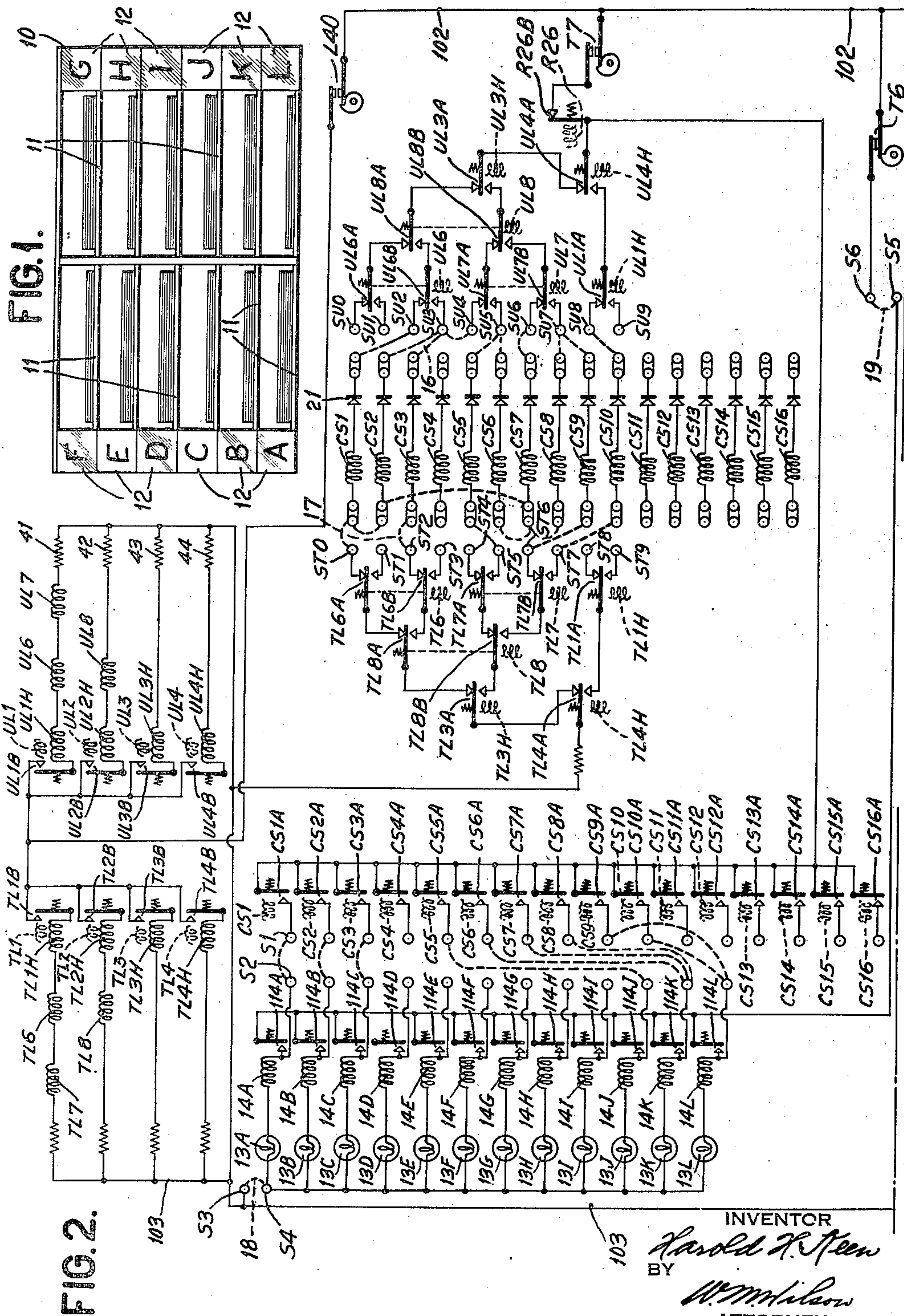
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2,343,377

INDICATING DEVICE

Filed June 2, 1939

2 Sheets-Sheet 1



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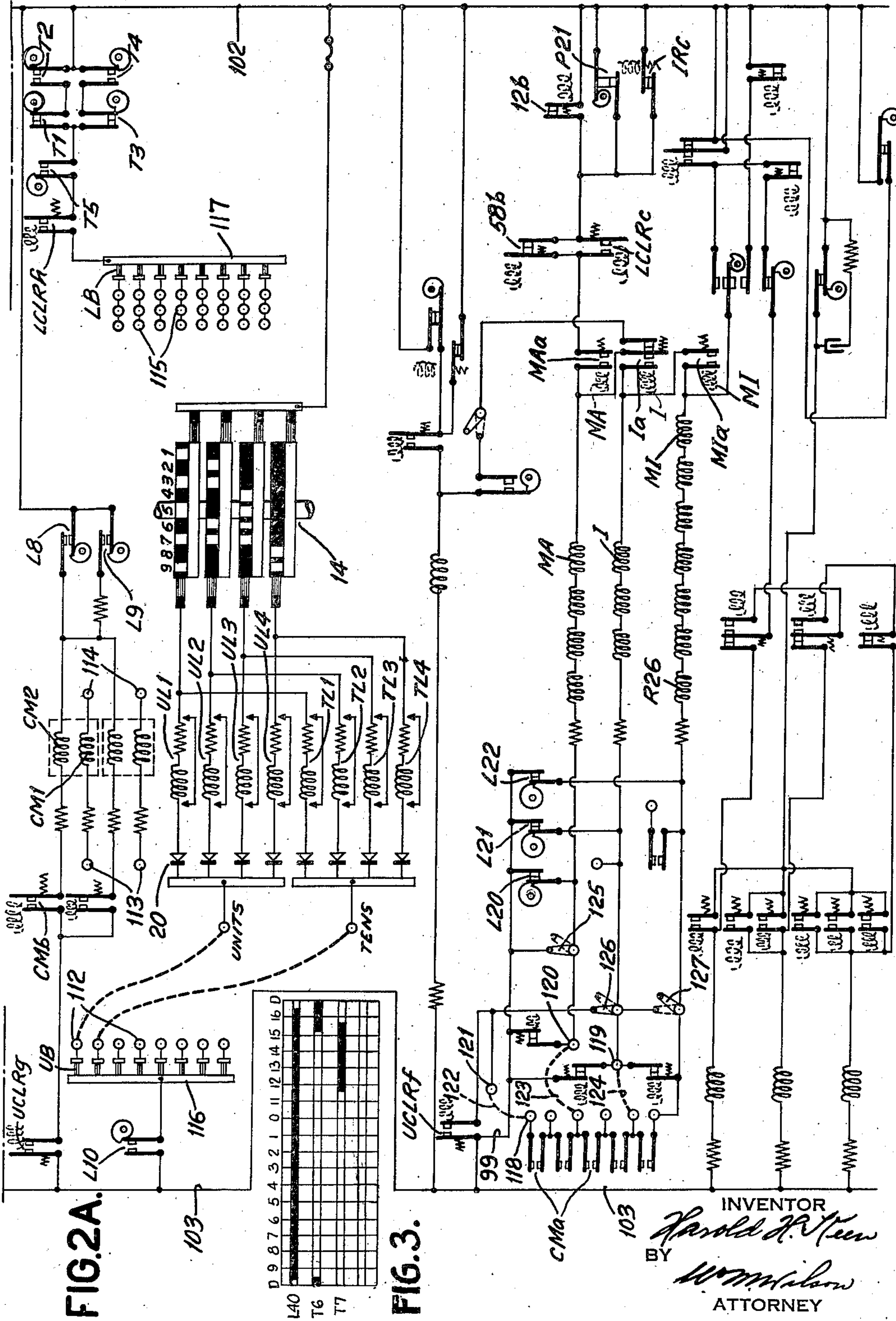
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2 Sheets-Sheet 2



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2,343,377

INDICATING DEVICE

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In Great Britain June 17, 1938

5 Claims. (Cl. 235—61.6)

This invention relates to visual indicators for record-card-controlled printing machines.

When preparing returns, statements or other documents in record-card-controlled printing machines, the cards are arranged in groups and it is required to print the information derived from each group on a separate form. It is frequently desirable to use different kinds of forms for the different groups of cards, the kind of form used being dependent on the nature of the transaction recorded on the cards and to be printed on the form. Thus an insurance office will issue a large number of different kinds of policies that can be classified in a smaller number of classes, the kinds of policies within each class being similar in that the returns, or other documents regarding them, are in the same form. In order to avoid any risk of the wrong form being used it is the practice, first to sort all the cards into large groups each relating to single classes of transactions, and then to run each group through the machine separately so that only one kind of form is used in each run. The preliminary sorting operation uses up valuable time of the sorting machine and it may also be necessary to sort all the cards back to their original order, thus doubling the time wasted. Further, the preliminary sorting operation may render it impossible to produce the printed documents in the order which most facilitates their subsequent handling and may thus add to the expense of handling the finished documents.

In preparing such documents, the printing machine is arranged to stop, when the last card of a group has been read and the information from that group of cards has been printed, in order to allow the operator time in which to insert the next form. It is known to provide a visual indicator controlled by the first card of each group to indicate, when the machine stops, the group indication of the next group of cards that is to control the machine. This indicator enables the operator to insert the correct form where each form is preassigned to a particular group by matter pre-printed on it but is otherwise the same as all the other forms, for example in a ledger sheet already containing entries.

This last-mentioned indicator is not used in practice to assist the operator in the selection of the proper form out of a number of different forms and could only so be used if each card carried an additional designation indicating the kind of form on which the information it contains should be registered. This is, however, open to the objections that valuable card space

is occupied in designating the kind or kinds of form to be used for receiving information from a card and that the scheme of classification cannot afterwards be altered without repunching a large number of cards.

Broadly, the present invention provides an indicator that is adjustably operable to give any one of its indications in response to each of a number of designations, selected at will, on the cards.

According to the present invention, therefore, there is provided the combination with a record-card-controlled printing machine arranged to stop after the last card of each of a number of groups of cards has controlled it, of a visual indicator, control devices, each operable to cause the indicator to give an indication of a different form, selecting means adjustable under the control of a number designation on the first card of a group, before that card is fed in to control the machine, into the appropriate one of a number of conditions corresponding each to a different designation possible, and means for adjusting any selected control device to be operable by the selecting means in any condition or conditions, selected at will, of the selecting means. With this arrangement the indicator will indicate a given form in response to any one or more single or plural ordered designations on the cards and any designations normally provided on the cards may be used to control the indicator.

Another object of the invention is the selective plugging of an indicating control relay between various units and tens order digital controlled lines so that only a certain multidimensional designation will effect control for a selective indication.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which show by way of illustration a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated of applying that principle. Other embodiments of the invention employing the same or equivalent principle may be used and structural changes made as desired by those skilled in the art without departing from the present invention and within the spirit of the appended claims.

In the drawings:

Fig. 1 shows diagrammatically a stationary rack embodying the indicator.

Figs. 2 and 2A are a circuit diagram of the electrical connections for the indicator.

Fig. 3 shows a chart illustrating the timing of the special cam contacts.

The present embodiment of the invention will be described as applied to a "Hollerith" tabulating machine such as disclosed in British Patent 422,135, or United States Patent 2,174,699, fitted with the semi-automatic form feeding mechanism described in United States patent applications Serial No. 202,220, filed April 15, 1938, now Patent 2,244,252, and Serial No. 228,000, filed September 1, 1938, now Patent 2,192,610.

It will be assumed that not more than twelve different kinds of forms will be needed and that these kinds will be designated form A to form L inclusive. It will also be assumed that there are not more than 99 sub-classes of cards which are grouped in classes in accordance with the kind of form that is to receive information from a card. The sub-classes will be designated 1 to 99 inclusive and each card has the number of its sub-class recorded on it. Thus, in insurance work each sub-class number may indicate a different kind of policy so that the classification is by kinds of policy.

The cards are arranged in groups in any desired manner which may have no connection with the classification in sub-classes.

The cards are passed through the machine and each card is fed first past upper brushes and then, one cycle later, past lower brushes. The items are read from the cards by the lower brushes, added in accumulators and, if desired, printed by a printing unit on a form. When the last card of a group has passed the lower brushes, conventional automatic group-control mechanism operates to interrupt card-feeding and initiate one or more totaling cycles in which the totals for the group of cards is printed on the form in the printing unit and the accumulators are reset.

The machine is provided with automatic group control mechanism which compares group numbers on the card passing the lower brushes with the group numbers on the card passing the upper brushes and maintains the master-control relay de-energized as long as these group numbers agree. If the group numbers disagree, indicating that the card passing the upper brushes is the first card of a new group, the automatic control mechanism energizes the relay and initiates a totaling operation.

Referring to Fig. 2A, if corresponding columns in the group number fields of two succeeding cards contain the same hole the circuit will be completed from the line 103 through cam contacts L—10, a contact roll 116, the upper brush reading the column in question, a plug socket 112, a plug connection, a plug socket 113, an operating coil CM—1 of a control relay, a plug socket 114, a plug connection, a plug socket 115, the lower brush reading the column in question, a contact roll 117, contacts LCLR_h of the lower card lever relay, and contacts T—1 to T—5 to the line 102. The contacts T—1 to T—5 are operated during card-feeding cycles only.

A similar circuit is completed for each column of the group number field in which corresponding holes are present, in two succeeding cards, so that, if the group numbers agree, all the control relays in use will be energized at some time during the cycle. If the group numbers do not agree one or more of the control relays will not be energized. When energized, the coil CM—1 closes contact CM_b to provide a holding circuit extending through upper card lever relay contacts UCLR_g, the contacts CM_b in question, a

holding coil CM—2 and cam contacts L—8 and L—9. This circuit is maintained until the end of the cycle and is then broken to de-energize the control relay.

When energized, each control relay closes an associated pair of contacts CM_a. These contacts are connected in series and between each pair of contacts is connected a plug socket 118 by means of which the contacts can be split into a minor group of contacts, an intermediate group of contacts and a major group of contacts in a known manner.

The control circuits are arranged to allow of the cards being divided into major groups, each of which is in turn divided into intermediate groups, each intermediate group being in turn divided into minor groups. At the end of a minor group of cards one or more of the minor group contacts CM_a will be open. At the end of an intermediate group of cards one or more of the intermediate group of contacts CM_a will be open, while at the end of a major group one or more of the major group of contacts CM_a, will be open. These three groups of contacts control a minor control circuit, an intermediate control circuit and a major control circuit.

The major control circuit extends from the line 103 through a line 99, cam contacts L—20, relay coil MA, relay contacts MA_a which are held closed by the relay MA and tend normally to open, lower card lever relay contacts LCLR_c and normally closed contacts 58_b in parallel and cam contacts P—21, relay contacts 12_b and relay contacts IRC in parallel to the line 102. The cam contacts L—20 open towards the end of each cycle but if there is no major group change during that cycle the major group contacts CM_a will be closed and a shunt circuit will exist about the contacts L—20, extending through contacts UCLR_f, a plug socket 121, a plug connection 122, the major control contacts CM_a, a plug connection 123 and a plug socket 120. The major control circuit will thus be maintained. On the other hand, if there is a major group change, the major control circuit will fail and the relays in it will become de-energized, the contacts MA_a opening to prevent the circuit being re-established when the cam contacts L—20 close.

The intermediate control circuit is similar and includes cam contacts L—21, relay coil I, relay contacts I_a of the coil I and the contacts MA_a of the major control circuit. A shunt circuit about the cam contacts L—21 extends through the plug connection 122, all the major and intermediate control contacts CM_a, a plug connection 124 and a plug socket 119. It will be noted that the intermediate control circuit will fail on an intermediate group change and also on a major group change when the major control circuit fails.

The minor control circuit includes cam contacts L—22, relay coils R26 and MI, contacts MI_a controlled by the relay MI, and the contacts I_a and MA_a. The shunt circuit about the cam contacts L—22 includes all the control contacts so that the minor control circuit will fail on each change of group, whether it is a minor change, intermediate change or major change.

The cam contacts L—20 can be shunted by closing a switch 125 so as to maintain the major control circuit permanently energized. With this switch closed, the machine will operate under intermediate and minor control only. The cam contacts L—21 can be shunted by a switch 126. With this switch closed the intermediate control circuit is maintained permanently energized.

When both the switches 125 and 126 are closed the machine will operate under minor control only. Finally, the cam contacts L—22 can be shunted by closing a switch 127 to maintain the minor control circuit permanently energized. With all three switches closed the automatic group control mechanism is entirely inoperative and a total will only be printed when the last card has been fed from the magazine.

The machine is adjusted so that the usual automatic restart of card-feeding after the totaling cycles is suppressed and the machine is left idle except that a platen in the printing units is rotating to feed out the printed forms.

The operator selects a blank form and places it on a tray in the machine whence it is automatically fed into the machine. The machine is then restarted. The first form is selected from an inspection of the first card before the cards are placed in the machine. The remaining forms are selected with the aid of an indicator which will now be described.

It will be assumed that six forms are needed to deal with a batch of cards comprising 11 sub-classes and that the forms are assigned to the sub-classes as follows:

- Form A is for sub-class 2
- Form B is for sub-classes 3 and 4
- Form C is for sub-classes 23 and 24
- Form J is for sub-class 55
- Form K is for sub-classes 5, 6 and 7
- Form L is for sub-classes 67 and 78.

The indicator comprises a cabinet or holder rack 10 (Fig. 1) with twelve shelves or compartments 11 one for each of the twelve kinds of forms. In the example assumed only the six shelves for forms A, B, C, J, K and L are used. Beside each shelf is a separate indicator 12 comprising a lamp 13A to 13L (shown in Fig. 2) behind a window. Each window is glazed with frosted glass which has a form designation, in the present case a letter from A to L on it. If the forms are differently colored, the glass in each indicator may be correspondingly colored so that the operator at a glance can see that each shelf contains only the proper forms. When the machine starts to perform totaling cycles one of the lamps 13A to 13L will be illuminated to indicate the proper form to use for the next group of cards and the operator can take a form from the related shelf and place it in the machine.

The lamps are controlled in the following manner. As the last card of a group passes the lower brushes the first card of a group will pass the upper brushes which will read the sub-class or group number from the card and adjust selecting means accordingly. The selecting means comprises a set of primary selecting control relays UL1 to UL4 and UL6 to UL8 (Figs. 2 and 2A) adjusted in accordance with the units digit and a set of primary selecting control relays TL1 to TL4 and TL6 to TL8 adjusted in accordance with the tens digit. As the card passes the upper brushes, the brush reading the units column will encounter a hole and complete a circuit including one, two or three of the relay coils UL1, UL2, UL3 and UL4 and a commutator 14. The commutator 14 is operable in synchronism with the card movement to connect the relay coils in circuit in a different manner as each hole-position in the column passes the upper brush so that the coils which are energized depend on where the hole is in the

column and therefore on the digit it represents. The arrangement is such that:

- Hole 0 energizes no relay
- Hole 1 energizes relay UL1
- Hole 2 energizes relay UL2
- Hole 3 energizes relays UL1 and UL2
- Hole 4 energizes relay UL3
- Hole 5 energizes relays UL1 and UL3
- Hole 6 energizes relays UL2 and UL3
- Hole 7 energizes relays UL1, UL2 and UL3
- Hole 8 energizes relay UL4
- Hole 9 energizes relays UL1 and UL4

Each relay coil UL1, UL2, UL3 or UL4 closes contacts UL1B, UL2B, UL3B or UL4B (Fig. 2) to energize a holding coil UL1H, UL2H, UL3H or UL4H which holds the contacts closed. The circuits for the holding coils UL1H to UL4H include cam contacts L40 which open momentarily at the end of each cycle to de-energize the relays. The coils of the relays UL6 and UL7 are connected in series with the holding coil UL1H of the relay UL1 so that they will be energized when this relay is energized. The coil of the relay UL8 is connected in series with the holding coil UL2H of the relay UL2. The relays UL6 and UL7 and UL8 are provided to allow the use of small relays having only two sets of contacts; the relays UL1, UL6, and UL7 operate together as one, and the relays UL2 and UL8 also operate as one. These relays have triple contacts which serve to connect one supply line through cam contacts T7 and minor control contacts R26B to one of ten "units" sockets SU0 to SU9 each of which is allocated to a different units digit 0 to 9 respectively. The contacts are so arranged that only one connection is established for each relay or combination of relays energized. These circuits are as follows:

Hole	Relay	Connection to Socket
0		4A 3A 8A 6A socket 0.
1	1, 6, 7	4A 3A 8A <u>6A</u> socket 1.
2	2, 8	4A 3A <u>8A</u> 6B socket 2.
3	1, 6, 7 and 2, 8	4A 3A <u>8A</u> <u>6B</u> socket 3.
4	3	4A 3A <u>8B</u> 7A socket 4.
5	1, 6, 7 and 3	4A <u>3A</u> <u>8B</u> 7A socket 5.
6	2, 8 and 3	4A <u>3A</u> <u>8B</u> 7B socket 6.
7	1, 6, 7 and 2, 8 and 3	4A <u>3A</u> <u>8B</u> 7B socket 7.
8	4	<u>4A</u> 1A socket 8.
9	1, 6, 7 and 4	<u>4A</u> <u>1A</u> socket 9.

In the above table the prefixes UL and SU have been omitted to save space and the different sets of contacts are designated A and B; where the contacts are underlined they are to be understood as having been shifted from their normal position and the connection includes their normally open side. For example, for an "8" hole the connection is through the normally open contacts UL4A and the normally closed contacts UL1A to the socket SU8.

The arrangement of the tens relay TL1 to TL4 and TL6 to TL8 is the same except that the contacts serve to connect the other supply line to "tens" socket ST0 to ST9 inclusive. The arrangement and operation of these relays need not therefore be described.

Certain of the relays UL1, etc., and TL1, etc., are energized each time a card passes the upper brushes but normally no circuit is completed through their contacts because the minor control contacts R26B are open. These contacts form part of the automatic control and close, in

a known manner, when the last card of a group passes the lower brushes. After they have closed, the cam contacts T7 close momentarily so that the supply lines are connected respectively to the tens and units sockets corresponding to the tens and units digits of the sub-class number of the first card of the next group. If an intermediate or secondary selecting control relay CS1 to CS16 is plugged between these sockets, it will be energized. Thus, for example, if the sub-class number is 23, a circuit is completed through the contacts T7, R26B, UL4A (upper), UL3A (upper), UL8A (lower) and UL6B (lower), the socket SU3, a plug wire 16, the relay coil CS3, a plug wire 17, the socket ST2 and the contacts TL6B (upper), TL8A (lower), TL3A (upper) and TL4A (upper) to energize the relay CS3. The relays CS1 to CS16, when energized, each close corresponding normally open contacts CS1A to CS16A to connect the minor control contacts R26B to a related plug socket in a first set of sockets S1. Each lamp 13A to 13L is connected, in series with a holding relay 14A to 14L, respectively, to a related plug socket in a second set of sockets S2. Any socket S1 in the first set can be plug connected to any socket S2 in the second set to form a circuit such as the one comprising a plug wire 18 between a pair of sockets S3 and S4, the lamp 13A, its holding relay coil 14A, the contacts CS1A of the intermediate selecting relay CS1, the minor control contacts R26B and the contacts T7. When the intermediate relay CS1 is energized, the aforesaid circuit is completed and the holding relay 14A closes contacts 14A to provide a holding circuit for itself and the lamp 13A through a plug connection 19 between sockets S5 and S6 and cam contacts T6 which are normally closed at D in the cycle, Fig. 3. The lamp is thus illuminated. The cam contacts T6 and T7 operate in card feed cycles only and the contacts T6 open at the beginning of each card feed cycle. Thus the lamp will be illuminated until the machine recommences card feeding and this will not occur until a new form has been fed into the machine.

The plugging necessary to produce the operation of the indicator in response to the various sub-class designations given above is shown below.

Lamp	Intermediate relay	Tens socket	Units socket
13A	CS1	ST0	SU2
13B	CS2	ST0	SU3 and 4
13C	CS3	ST2	SU3 and 4
13J	CS5	ST5	SU5
13K	CS6	ST0	SU5
13K	CS7	ST0	SU6
13K	CS8	ST0	SU7
13L	CS9	ST6	SU7
13L	CS10	ST7	SU8

Each lamp shown in the first column is plugged for control by the intermediate control relay shown in the second column and this relay is connected between the sockets shown in the third and fourth columns. Thus if the sub-class number on a card is 02, the relay CS1 is energized and completes the circuit for the lamp 13A. If the number is 03 or 04, the relay CS2 and lamp 13B are energized; if the number is 23 or 24 the relay CS3 and lamp 13C are energized and if the number is 55, the relay CS5 and lamp 13J are energized. The lamp K is controlled by three relays CS6, CS7 and CS8 which are energized respectively when the number is 05, 06 or 07. The reason for not connecting the units sockets SU5, SU6 and SU7 together and to a single intermedi-

ate relay is that a circuit could then be completed through the relay CS5 when the number was 56 or 57. The units sockets SU5 and SU6 must not therefore be connected together. In the same way, a circuit could be completed when the number was 66 if the units sockets SU6 and SU7 were connected together since the relay CS9 would then be connected between the tens socket ST6 and the units socket SU6 through the socket SU7. For similar reasons the lamp L is controlled by two relays CS9 and CS10 which are energized when the numbers are 67 and 78 respectively.

It will be appreciated that each lamp and its circuit forms a control device for the indicator and causes it to indicate a particular form. Were it not for the possibility of the faulty circuits pointed out above, each lamp and its holding relay could be plugged directly between the tens and units sockets. The intermediate control relays are provided to remove the possibility of wrong connections by allowing two such relays to be used to control one lamp and to separate the circuits where interconnection would lead to wrong results.

Rectifiers 20 are provided to render impossible the formation of back-circuits through the relay coils UL1 to UL4 and TL1 to TL4 and rectifiers 21 serve the same purpose for the relay coils CS1 to CS16.

It may be noted that the devices disclosed hereinbefore may be applied to the selection of objects other than forms and operations other than indicating and form selection. The devices are applicable wherever there is need for selective control in one of a plurality of ways, each of which is related to one or more digital or multi-denominational designations on records.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a record controlled machine, means for sensing designations on the records, a plurality of primary control devices, means under control of said sensing means for operating a different combination of said primary control devices for each of the various designations sensed, a series of secondary control devices, means under control of said primary devices for making the secondary control devices selectively effective, and responsive to a plurality of different combinations of said primary devices, a plurality of indicators, means for selectively connecting each indicator to certain of the secondary devices for selectively operating an indicator representative of a plurality of sensed designations, whereby a single indicator is selectively responsive to secondary devices operated by a plurality of combinations of primary devices and thereby selectively responsive to a predetermined plurality of sensed designations.

2. In a record controlled machine, means for sensing plural ordered designations on the records, sets of primary control devices, one set for each order of designations, means under control of said sensing means for operating certain combinations of said primary control devices according to the designations sensed, a series of second-

ary control devices, means under control of said primary devices for making the secondary control devices selectively effective, and responsive to a plurality of different combinations of said different sets of primary devices, a plurality of indicators, means for selectively connecting each indicator to certain of the secondary devices related to a plurality of the sets of primary control devices or selectively operating an indicator representative of a plurality of plural ordered designations, whereby a single indicator is selectively responsive to secondary devices operated by a plurality of combinations of said primary devices in different sets and thereby selectively responsive to a plurality of predetermined plural ordered designations when sensed.

3. In a record controlled machine, means for sensing designations on the records, a plurality of communicators, two series of control relays, one series for each denomination of designations sensed, means cooperating with said sensing means and said commutators for energizing combinations of said relays representative of sensed duodenominal designations, two series of holding relays operated by said control relays, two sets of circuits with pyramidically arranged contacts arranged in series and operated by said holding relays, a single series of selection relays, means for selectively connecting said selection relays in said circuits between said sets of contacts to be energized by various combinations of closed contacts in both sets, a plurality of indicating lamps, contacts in series with said lamps and operable selectively by effective selection relays to light the lamp representative of the selected combinations of sensed designations, and a holding circuit established through the lighted lamp.

4. In a record controlled machine utilizing forms arranged in groups, each group containing one or more forms of the same classification, the combination of a plurality of indicators each associated with a group of forms and each indicator when operative indicating the kind of form to be required, means for sensing multidimensional designations on the records, a series of primary control relays for the units denominational order, a series of primary control relays for the tens denominational order, units circuit connections including ten pluggable sockets made se-

lectively effective by the units primary relays, tens circuit connections including ten pluggable sockets made selectively effective by the tens primary relays, a set of secondary relays between the units and tens circuit connections, means for plugging any of said secondary relays to any unit socket and to any tens socket to be representative of a multidimensional designation, contacts operated by said secondary relays, electrical connections for each indicator, means for selectively connecting one or more of said contacts in series with the electrical connection of any indicator and means under control of said sensing means for energizing the units and tens primary relays corresponding to the sensed designations and thereby making effective the secondary relay plugged to the effective circuit connections to operate the related contacts connected to an indicator which is operated to indicate the group of forms related to the sensed multidimensional record designations.

5. In a record controlled machine, means for sensing multidimensional designations on the records, a plurality of indicating lamps, each related to certain multidimensional designations on the records, a series of primary control relays for the units order, a series of primary control relays for the tens order, units circuit connections including ten pluggable sockets made selectively effective by the units primary relays, tens circuit connections including ten pluggable sockets made selectively effective by the tens primary relays, a set of secondary relays between the units and tens circuit connections, means for plugging any of said secondary relays to any unit socket and to any tens socket to be representative of a multidimensional designation, contacts operated by said secondary relays, electrical connections for each lamp, means for selectively connecting certain of said contacts in series with the electrical connection of any lamp and means under control of said sensing means for energizing the units and tens primary relays corresponding to the sensed designations and thereby making effective the secondary relay plugged to the effective circuit connections to operate the related contacts connected to a lamp.

HAROLD H. KEEN.

CERTIFICATE OF CORRECTION.

Patent No. 2,343,377.

March 7, 1944.

HAROLD HALL KEEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 26, for "two sets of circuits with" read --circuits with two sets of--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of May, A. D. 1944.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.