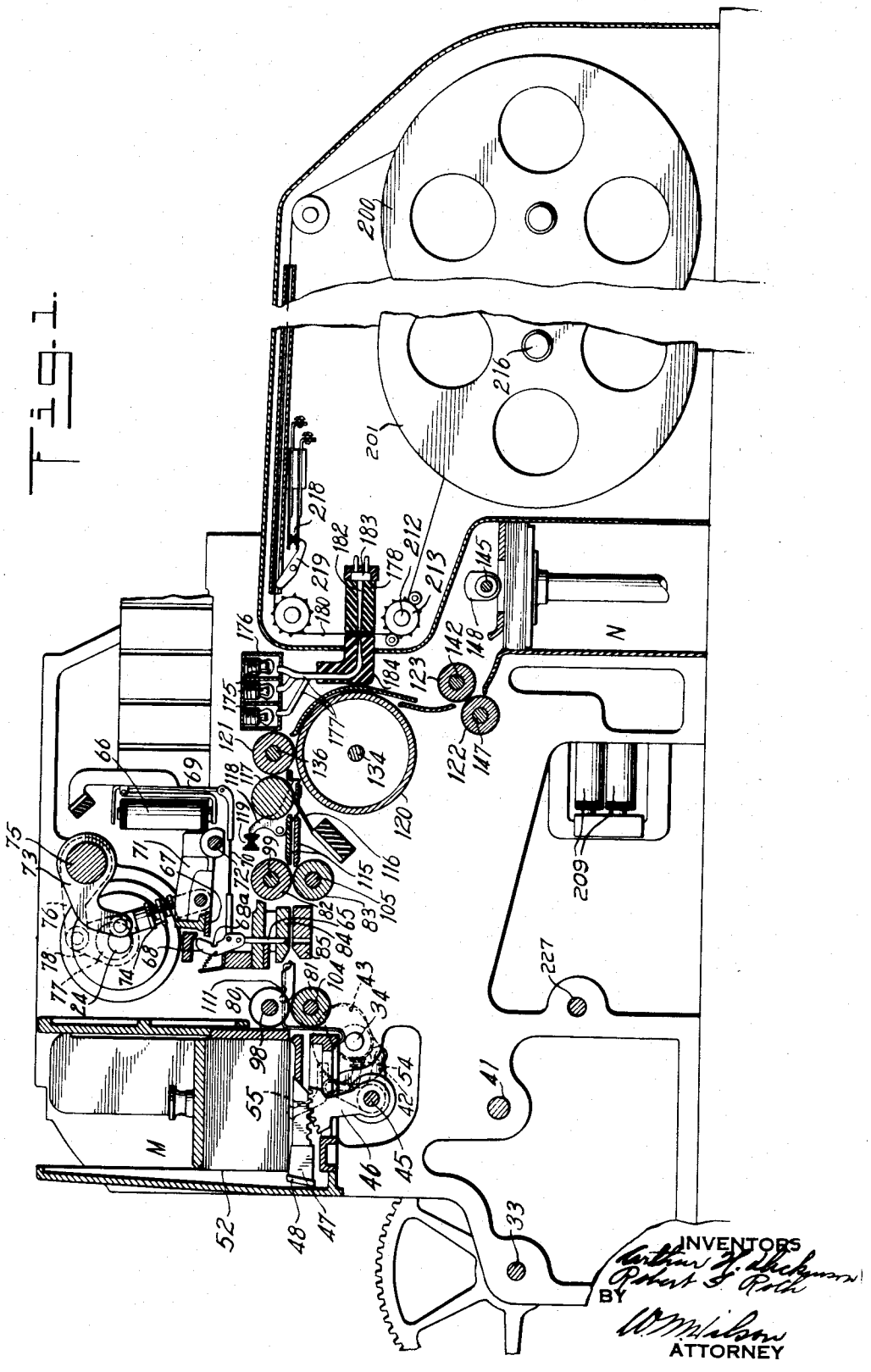
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DATA REPRODUCING MACHINE

Filed June 16, 1939 9 Sheets-Sheet 1

Fig. 1.



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Fig. 1a.

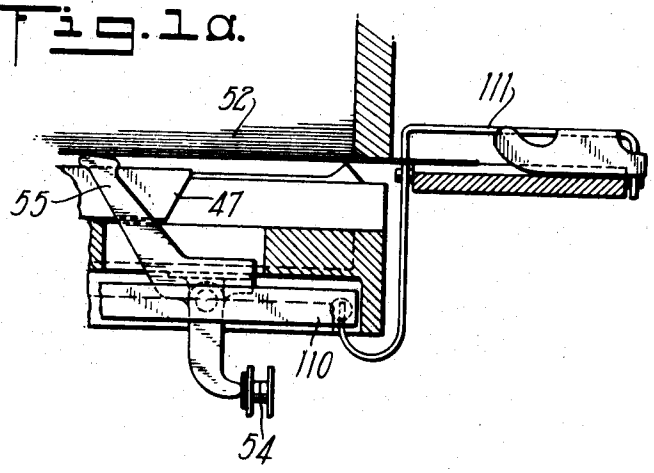


Fig. 1b.

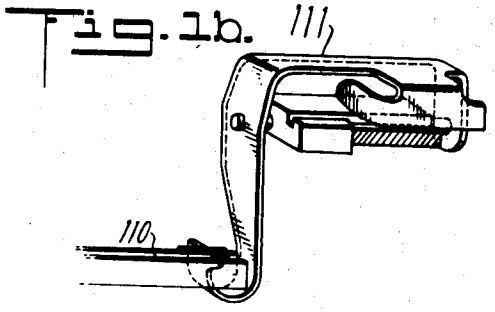


Fig. 1c.

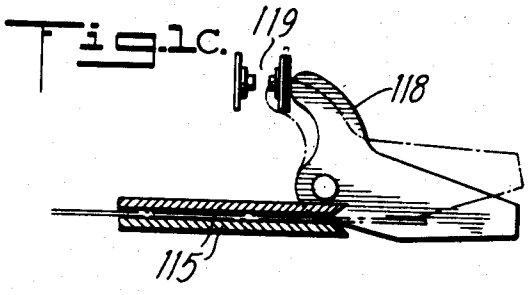
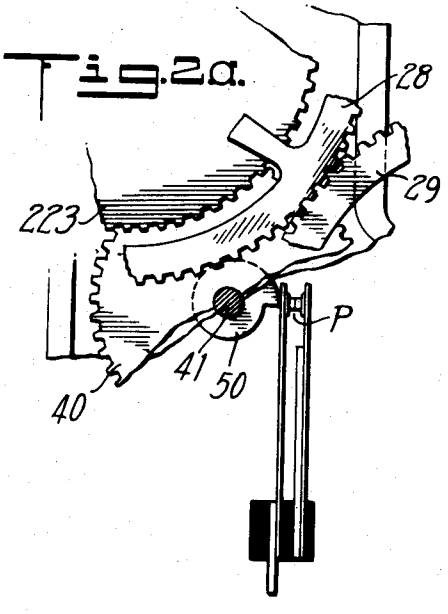


Fig. 2a.



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DATA REPRODUCING MACHINE

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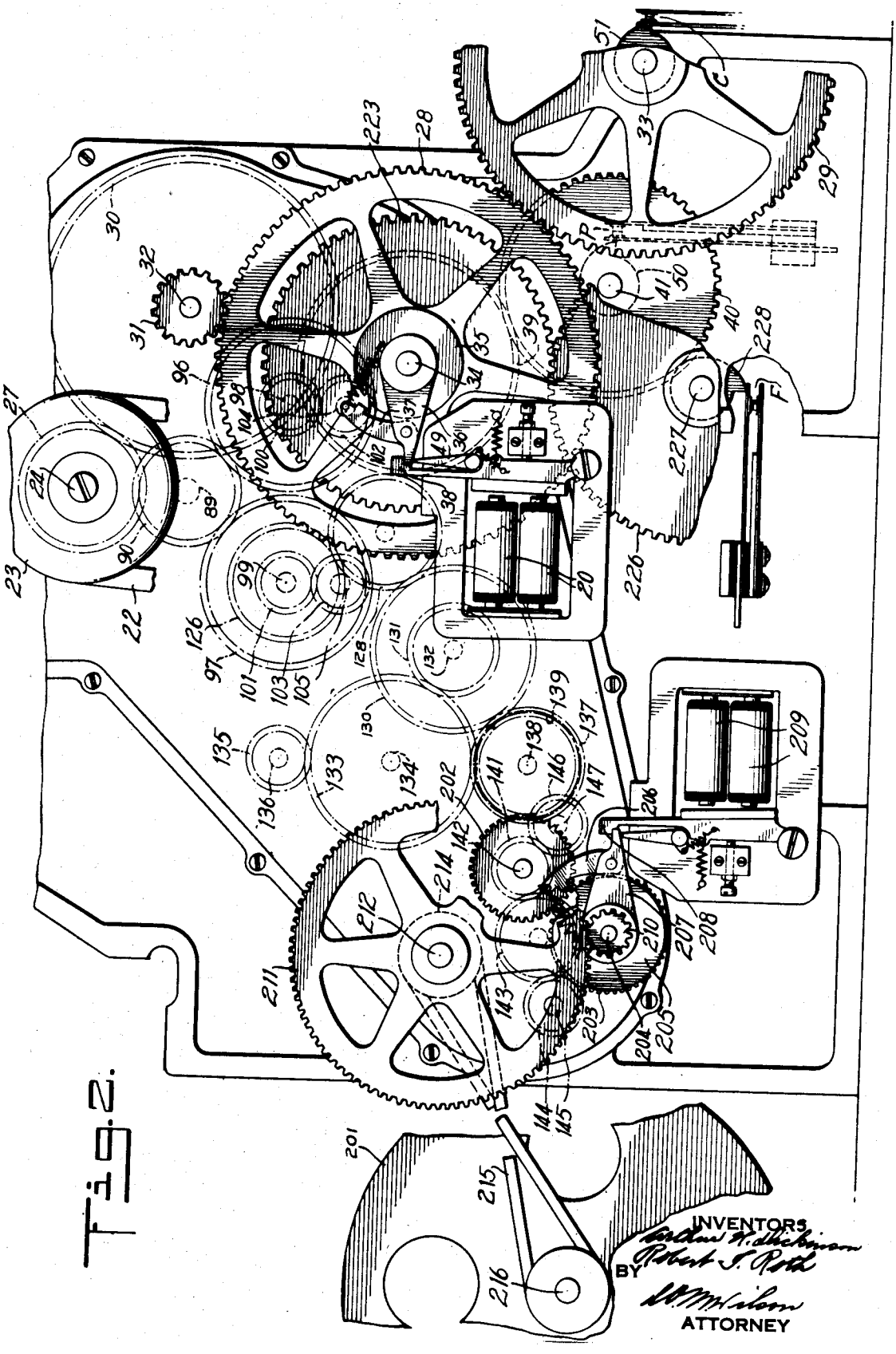


Fig. 2.

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DATA REPRODUCING MACHINE

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Fig. 3.

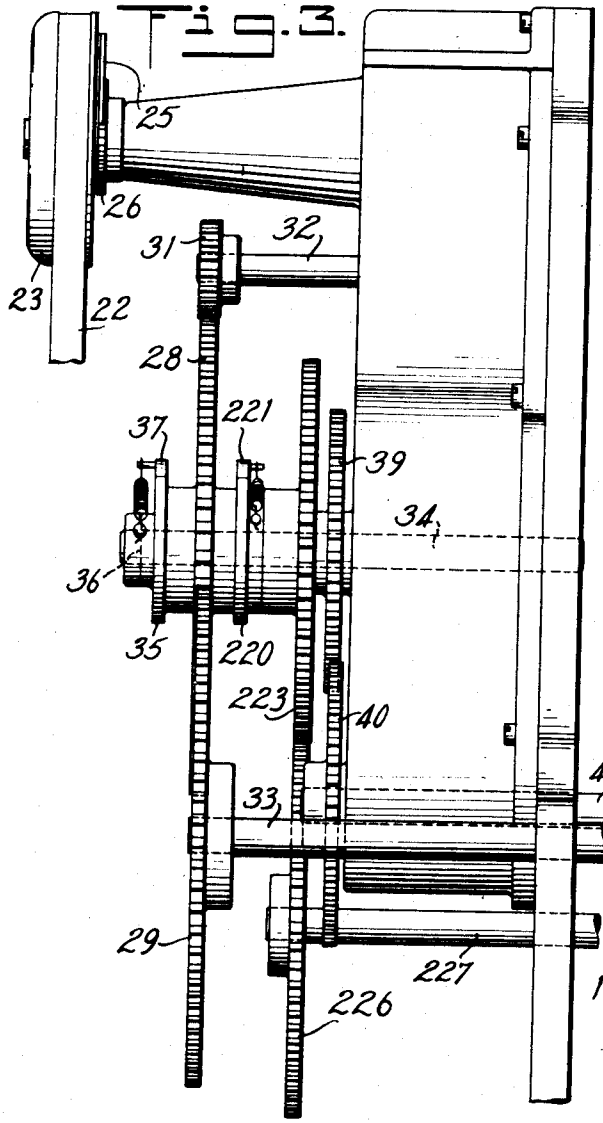
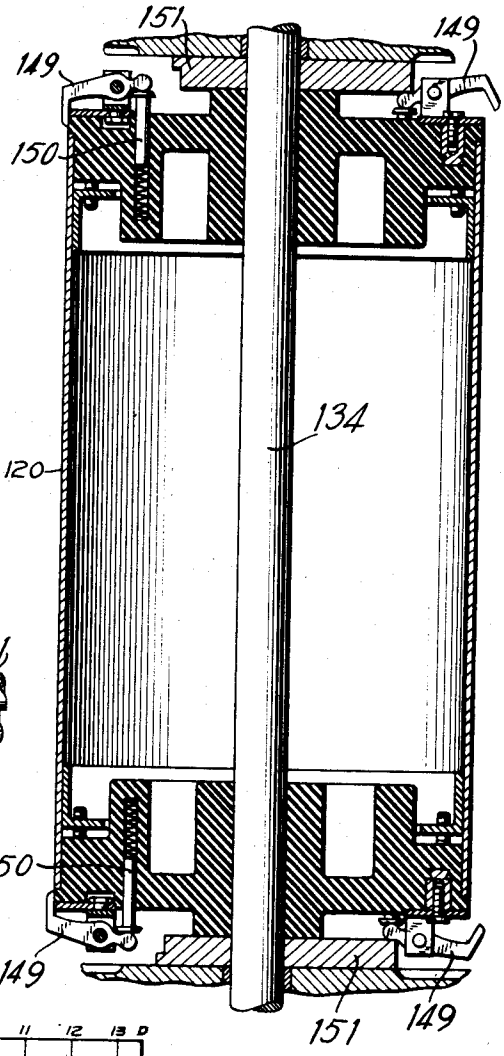


Fig. 8.



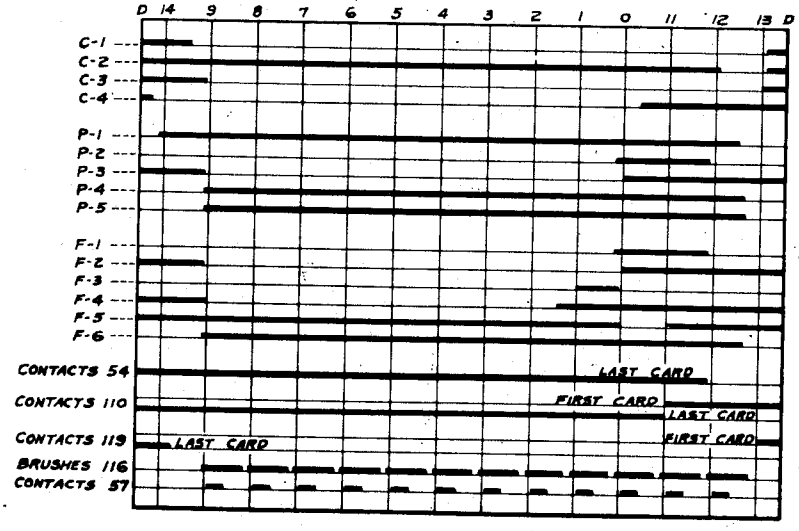


Fig 10.

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DATA REPRODUCING MACHINE

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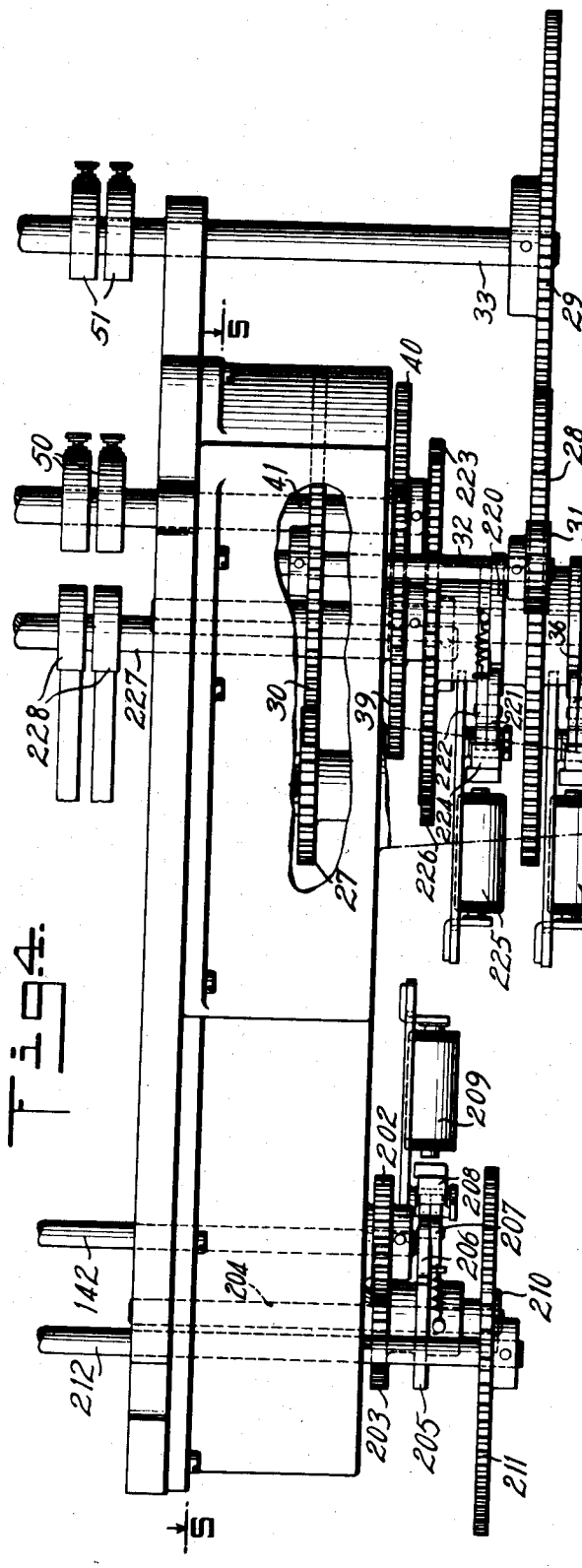


Fig. 4.

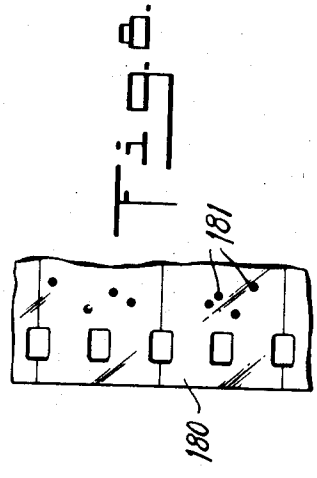


Fig. 6.

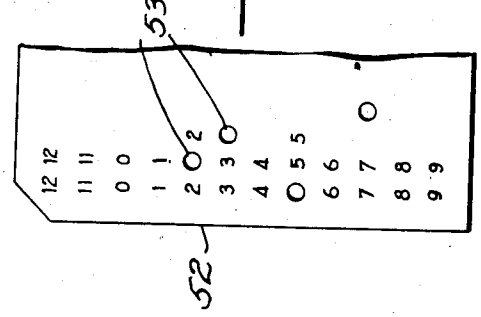


Fig. 7.

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DATA REPRODUCING MACHINE

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Fig. 5.

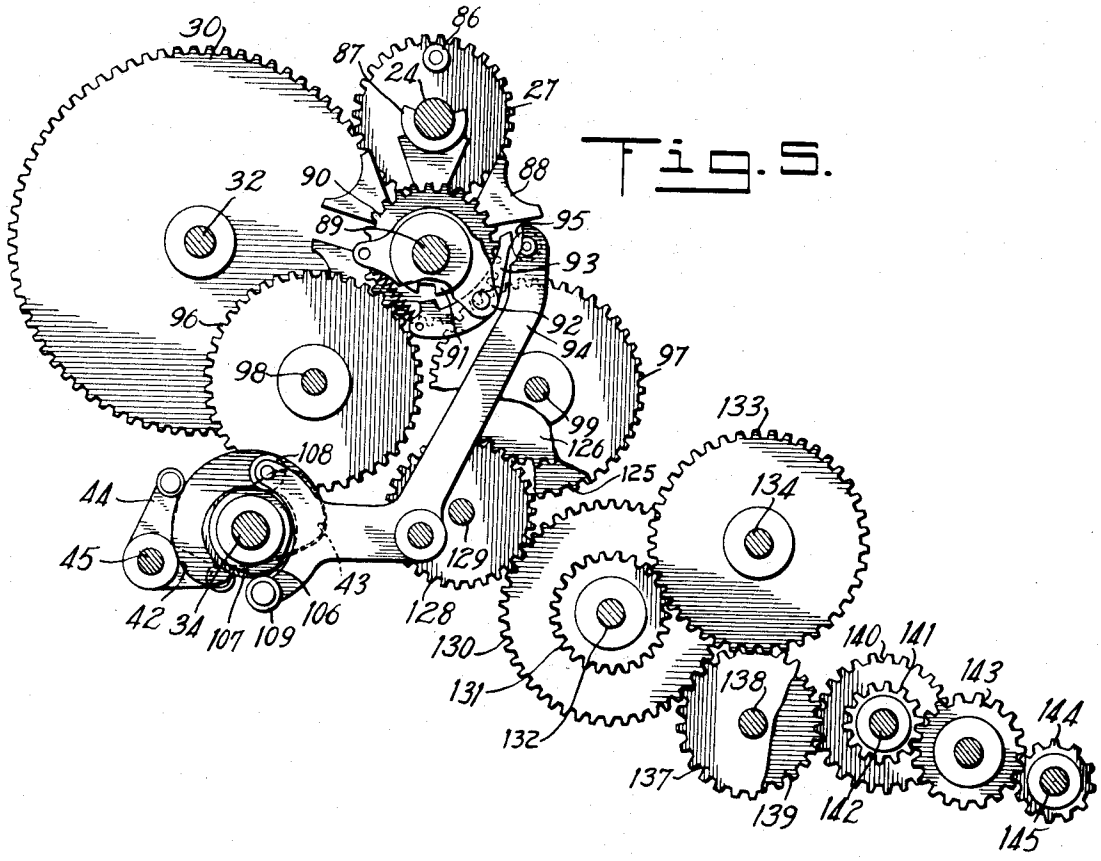
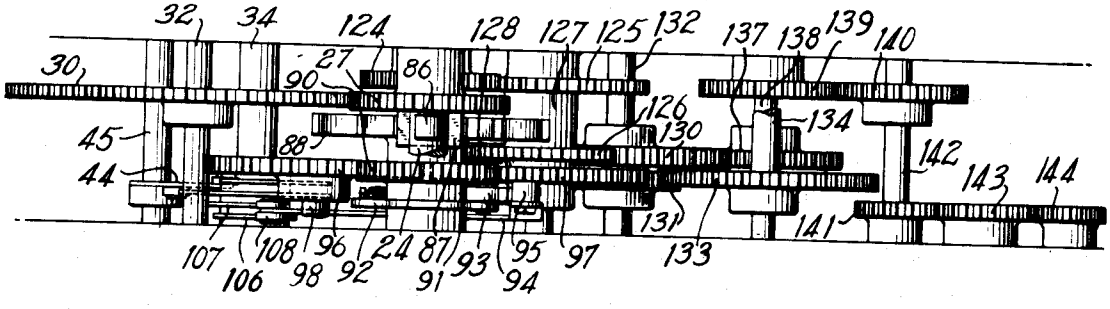


Fig. 6.



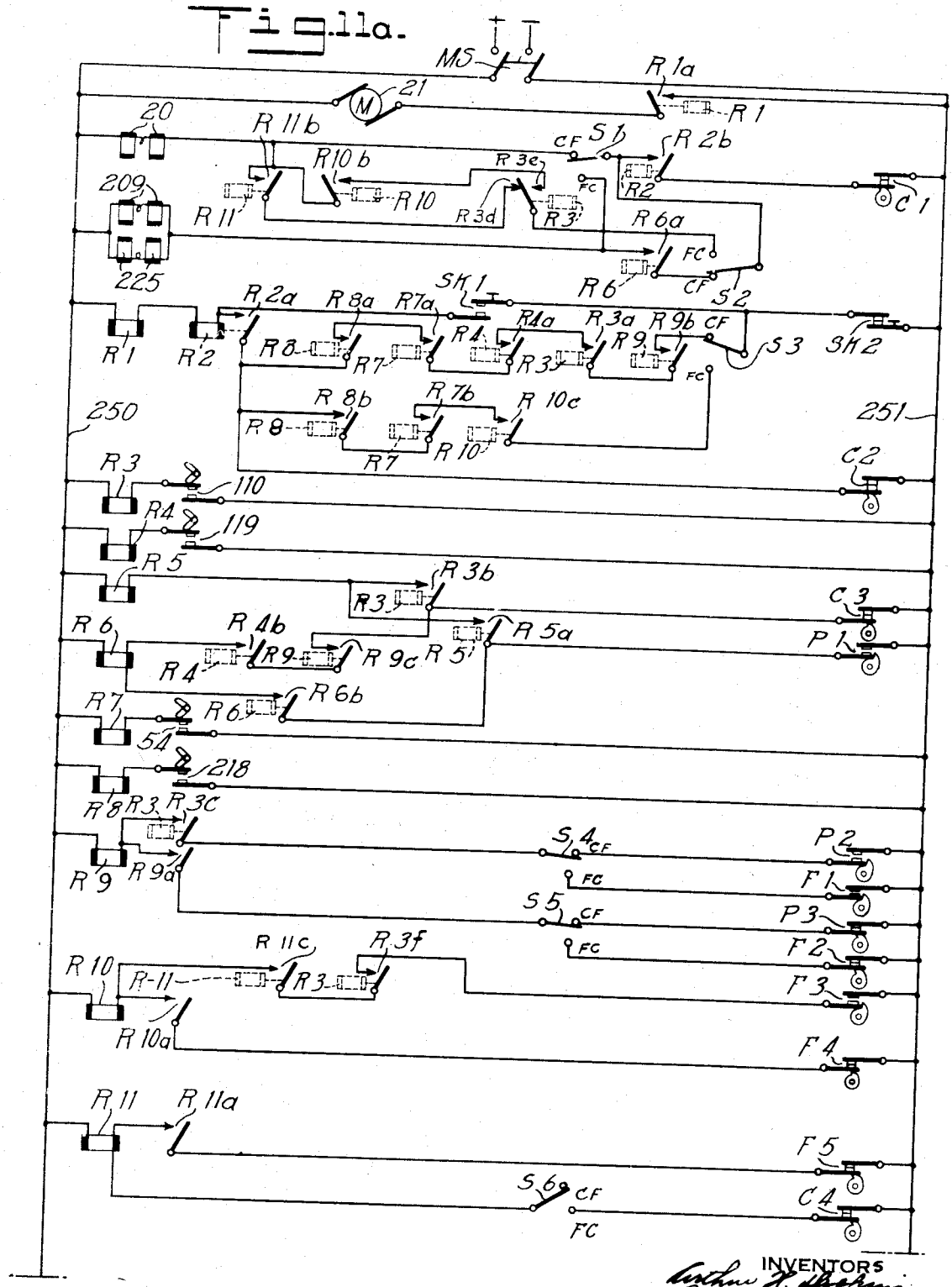
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DATA REPRODUCING MACHINE

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Fig. 11a.



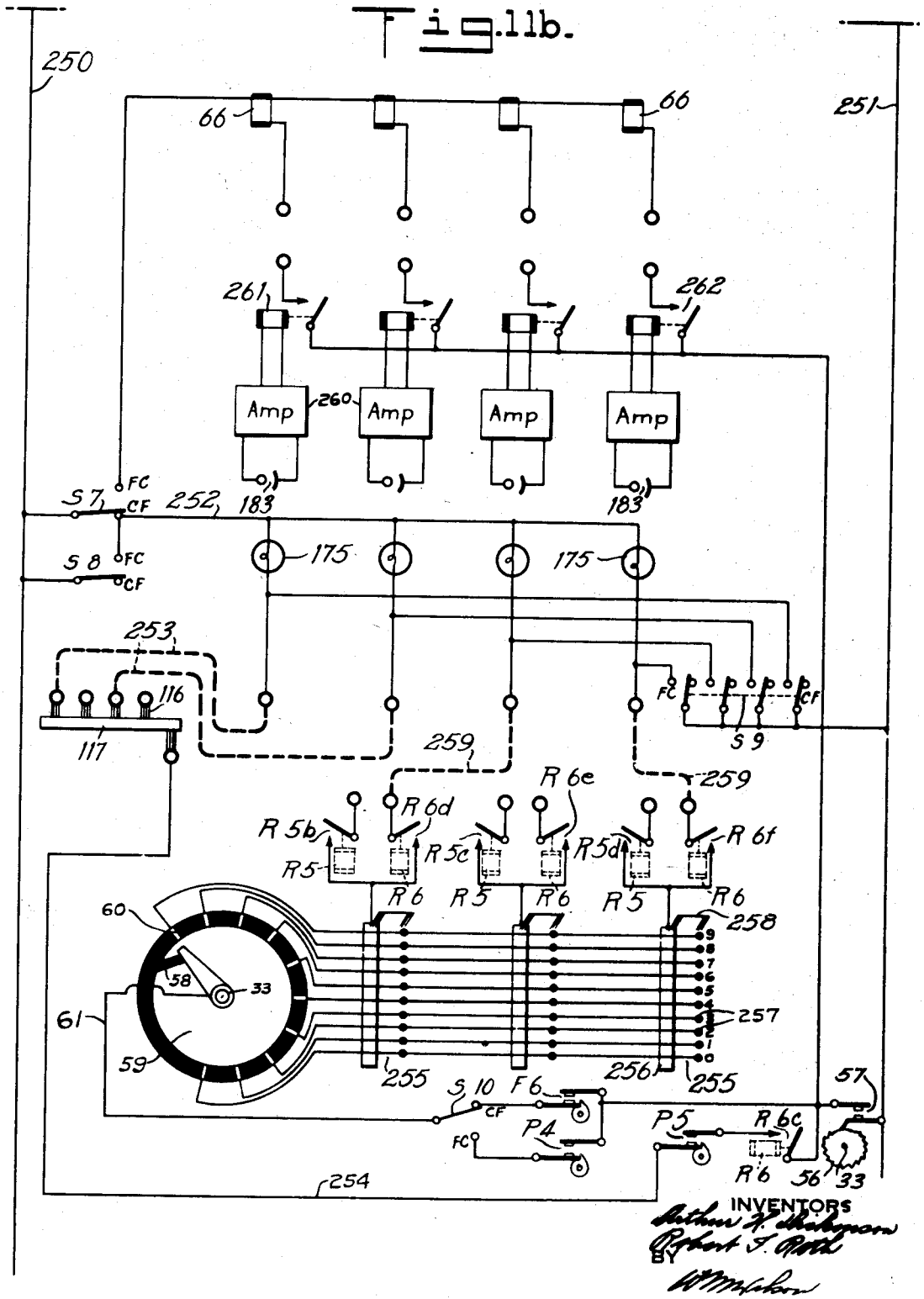
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DATA REPRODUCING MACHINE

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Fig. 11b.



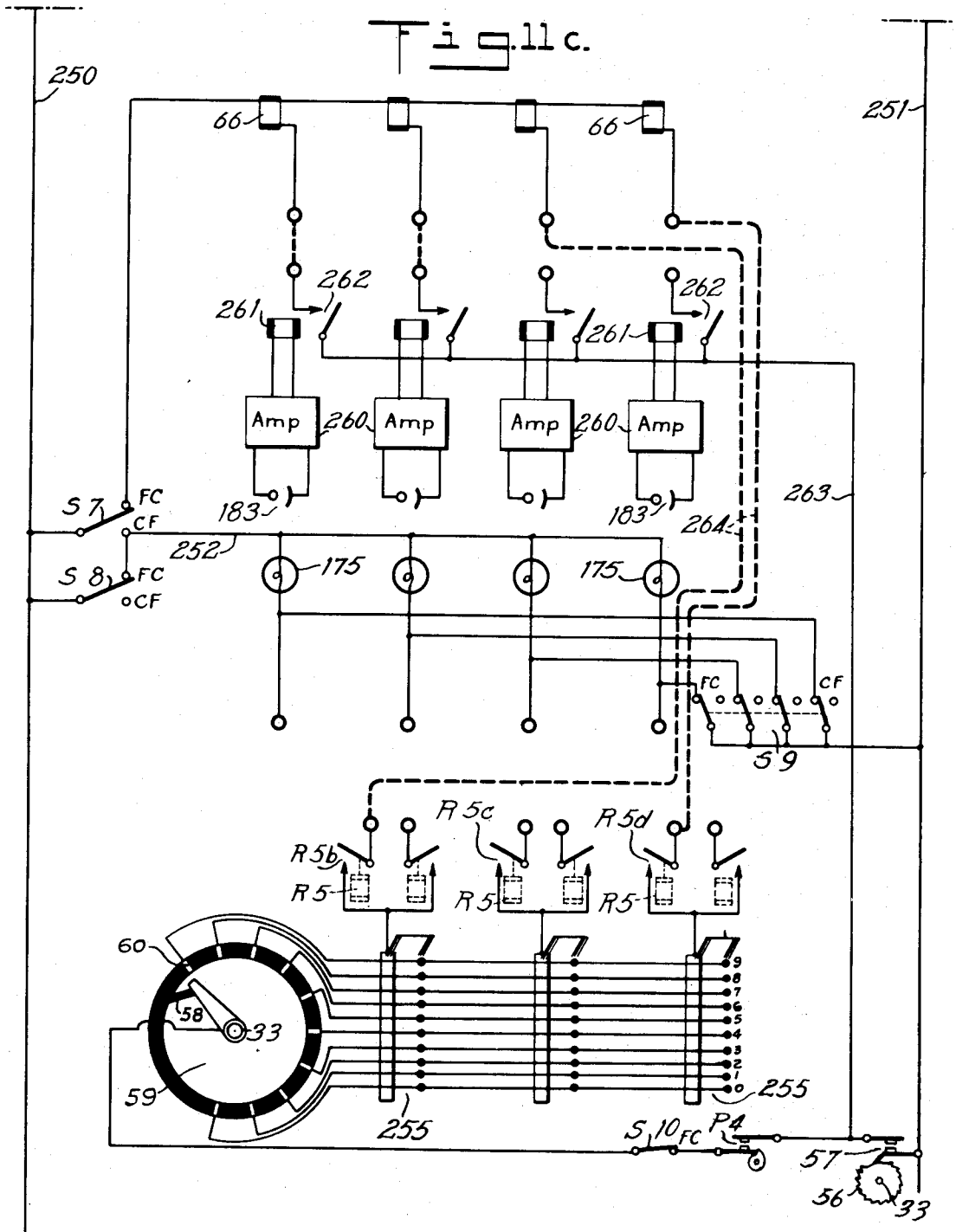
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DATA REPRODUCING MACHINE

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Fig. 11c.



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UNITED STATES PATENT OFFICE

2,224,761

DATA REPRODUCING MACHINE

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Application June 16, 1939, Serial No. 279,503

17 Claims. (Cl. 164—115)

This invention relates to a data reproducing machine and more particularly to a machine capable of reproducing coded data representations from one type of data carrying medium to another and different type of data carrying medium.

The data carrying mediums may be of the types or forms suitably adapted for the automatic control of well-known types of machines, such as statical machines, typewriting machines, or the like. For example, in mechanized accounting systems, employing various types of known statistical machines, record cards, having data representations disposed thereon, are used for controlling the operations of the machines used in such systems; when utilizing the well-known Hollerith type of statistical card, the data representations usually are in the forms of perforations, which are formed at different columnar index point positions. The codes employed may be of different types, such as the combinational perforation code system, or single perforation code system.

It has been suggested to employ different types of control records other than the perforated record cards, for controlling the machines referred to, for example, one type suggested, being a record medium having a layer of light sensitive emulsion disposed thereon which, when exposed to suitable recording mechanisms, and properly conditioned, is adapted to bear the data representations in the form of imperforate control spots disposed in various code positions thereon. These control spots, or index points, may then serve as light modifying or modulating areas for controlling the statistical or other operations of the machines.

It has been found that, when it is desired to employ such machines controlled by different types of control records, provision must be made, whereby the data representations carried by one type of records can be reproduced and formed on the other type of records, or vice versa. To simplify the description of the present invention, the illustration and disclosure thereof, will be limited to suitable mechanism which may be conditioned, whereby the data representations, in the form of coded perforations on a record control card, can be reproduced on a photographic control record in the form of differentially positioned control spots, or vice versa.

Therefore, one of the objects of the present invention resides in the provision of suitable mechanism which can be conditioned, whereby the data representations disposed on one type of record medium are sensed and reproduced on a different type of record medium in accordance with the condition of the mechanism. Suitable control elements are provided in this mechanism, which elements can be conditioned so that the data representations on the record cards are sensed and reproduced as control spots on the photographic control records, or, so that the data representations in the form of control spots on the photographic control records are sensed and reproduced as suitable index points on the record cards, and for illustrative purposes shown as perforations disposed in differential index point positions on the record cards.

Another object of the present invention is the provision of common control driving means and circuits, which are called into action irrespective of the conditioning of the machine, whereby the data is sensed on the individual record cards and reproduced on the light sensitive record medium, or if the data is sensed on the light sensitive medium, reproduced on the individual record cards.

Another object of the present invention resides in the provision of electrical sensing means and electromagnetically controlled perforating means for the record card, and sensing means comprising light rays and light responsive means, and photographically recording means for the film record, and means to convert the electrical values into light values, or vice versa.

Another object resides in the provision of manually positionable means for storing data which may be recorded on the mediums at the same time, and in addition to, the data sensed and reproduced.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a sectional elevation view of the machine showing the feeding, sensing and reproducing devices.

Fig. 1a is an enlarged detail view of contacts 54 and card lever 55.

Fig. 1b is a detail perspective view of the card lever 111 and its associated contacts.

Fig. 1c is an enlarged detail view of card lever 118 and its associated contacts.

Fig. 2 is a rear elevation view of the machine showing the driving and associated gearing mechanism.

Fig. 2a is an enlarged detail view showing the cam controlled contacts P.

Fig. 3 is an end elevation view of the mechanism shown in Fig. 2.

Fig. 4 is a plan view of the driving and associated gearing mechanism.

Fig. 5 is a sectional view along the lines 5—5 of Fig. 4.

Fig. 6 is a plan view of the gearing shown in Fig. 5.

Fig. 7 and 8 are detail views of several types of data carrying mediums.

Fig. 9 is a detail view of the card stacker drum.

Fig. 10 represents a timing chart of several elements of the machine.

Fig. 11*a* taken alternately with Figs. 11*b* and 11*c* as directed hereinbelow form several wiring diagrams of the machine.

General description

Briefly and broadly, the instant application discloses, by way of illustration, record card sensing and recording means, photographic film sensing and recording means, and associated control elements, all of which when suitably conditioned render the device effective, (1) for sensing the data representations, in the form of perforations on the record card, and thereafter controlling the film recording means, at differential times, thereby reproducing the sensed data representations on the photographic film, in the form of discrete control spots, in different index point positions, (2) for sensing the differentially positioned control spots on the photographic film to control the record card perforating, or recording means, at differential times, thus reproducing the data representations sensed on the record cards in the form of differentially displaced perforations or the like.

Manually settable devices are also provided, which have positionable elements to represent any desired data, and are effective to control the selected record medium recording means to effect recording of the data, upon the selected record medium, corresponding to the data set up in the said devices, in addition to the recording of the data corresponding to the data sensed on the related control record medium.

Referring now to Fig. 1, the data reproducing mechanism, or device, is shown to comprise a record card magazine, or supply hopper M, from which the cards are fed singly by the card feeding means, comprising in part, the card picker 47 and 48 and actuating arm 46 therefor, to the feed rollers 80 to 83, past the card sensing station including the brushes 116, to the card drum 120, feed rollers 122 and 123, and card stacking magazine or hopper N. Interposed between feed rollers 80, 81 and 82, 83 is shown one suitable type of card recording means, for example, the punch plungers 65 and control magnets 66 therefor.

The photographic film 180 is fed, by means of the driving sprockets 213, from a supply reel 200 past a suitable sensing and recording station, comprising the individual light sources 175, associated light conducting quartz rods 177 and 182, and suitable light responsive means, such as photocells 183, to a suitably disposed take-up reel 201.

Suitable control and conditioning means are provided so that the control units referred to can be conditioned whereby the cards are fed, singly, from the supply magazine to the card sensing station. At the said card sensing station, the perforations on the record cards are sensed, at differential times, for controlling the energization of the corresponding individual light sources, at the said differential times, for effecting the recording of the control spots on the photographic film. The mentioned control units can also be conditioned so that the control spots on the photographic film are sensed, at differential times for controlling the operation of the associated photocells, which photocells, in turn, are effective to control the card perforating control magnets, thereby effecting perforation of the record cards in accordance with the data sensed.

By referring to Figs. 7 and 8, facsimiles of portions of the perforated record cards and recorded photographic film are shown. In Fig. 7, the reference character 53 represents the differentially disposed perforations on the record card 52, whereas in Fig. 8, the reference character 181 represents the differentially disposed control spots, or light modifying areas, on the control film record 180.

Record card feeding means

Referring now to Figs. 1 to 4, it will be shown, how the card feed magnets 20 control the operation of the record card feeding means. A motor 21 (Fig. 11*a*), suitably mounted in the machine, is effective to rotate the shaft 24, by means of the interconnecting belt 22, pulley 23, pawl 25 secured to said pulley, and ratchet 26 which is secured to shaft 24, and engaged by the pawl 25. In this manner, the shaft 24 is rotated continuously as long as the motor is operated. Gear 27, attached to the shaft 24, is effective to drive gears 28 and, 29 by means of the interconnecting gears 30 and 31, both of which are affixed securely to shaft 32. Gear 29 is secured to shaft 33, thus it is seen, that shafts 32 and 33 are arranged to be rotated continuously, similarly as shaft 24, as long as the motor is operated. A single tooth ratchet 35 is secured to gear 28, both gear and ratchet being rotatably mounted on the supporting shaft 34, and to which shaft an arm 36 is attached. A spring actuated dog 37 is pivotally mounted on the arm 36, and arranged to be held out of engagement with the ratchet 35 by the armature 38, which armature is associated with, and controlled by, the magnets 20. From the description thus far, it is understood, that upon energization of the magnet 20, the associated armature 38 is displaced sufficiently out of the path of dog 37 and arm 36, to release these elements, and permit the dog 37 to engage the single tooth of ratchet 35, thus effecting rotation of the shaft 34, by means of the ratchet and associated gearing. Shaft 34 is rotated, as long as the magnet 20 remains energized, and in turn, effects rotation of gear 39 attached thereto, gear 40 and shaft 41 to which the last mentioned gear is secured.

Complementary cams 42 and 43 (see Fig. 5) are mounted on shaft 34, and are arranged to displace the two armed lever 44 on shaft 45 thereby rocking shaft 45 and the sector arms 46 (Fig. 1) attached thereto. The said sector arms are provided with gear teeth which mesh with racks on the card picker slides 47. A knife edge 48, attached to the slides, is adapted to engage the bottom card in the supply magazine, or hopper M, and displace the card to the right (Fig. 1), when the picker slide is reciprocated by the cams 42 and 43 on shaft 34. The ratio of the described gearing is such that gear 28 rotates one revolution for each card cycle. Associated with the card hopper M are the contacts 54 (Fig. 1*a*) controlled by the lever 55, which contacts are adapted to remain closed, as long as cards are provided in the supply hopper, and upon exhaustion thereof, the said lever is permitted to swing in a clockwise direction to open the said contacts.

Upon deenergization of the magnet 20, the spring-urged armature 38 is positioned in the path of dog 37 and arm 36, so that disengage-

ment of dog 37 and ratchet 35 is effected. A locking lever 49 is provided to maintain arm 36 in a predetermined position, thus locking the shafts 34 and 41 in the normal "D" or home position (see Fig. 10).

It should be mentioned that cam elements 50 are provided on the shaft 41 (Figs. 2, 2a, and 4) to control the associated cam controlled contacts P—1 to P—5; and, that shaft 33 carries cam elements 51 to control the associated cam controlled contacts C—1 to C—4. Upon shaft 33 (see Fig. 4) a suitable cam 56 (see Fig. 11b) is mounted, which cam is adapted to operate the associated contacts 57, at different times, during the machine cycle (see Fig. 10), and in addition thereto, the brush 58 of a well-known type of impulse emitter 59 (see Fig. 11b) is secured to the said shaft, so that the individual conducting segments 60 are connected to the common conductor 61, at different times, during the machine cycle, by means of the rotated brush, the purpose of which will be described later.

It has now been shown, how the record cards 52 are fed singly from the supply hopper M, by means of the card picker mechanism, whenever the control magnet 20 is energized. For further detailed description of the card feeding mechanism reference may be made to U. S. Reissue Patent #21,133 dated June 27, 1939, wherein elements similar to those just described are shown in detail. The individual record cards are now displaced and fed to the first set of feed rolls 80 and 81, which in turn, feed the cards past the card recording or perforating station. It will be shown, that the individual cards are positioned intermittently, by the feed rollers, not only past the card recording station, but also past the card sensing station. This mechanism will now be described in conjunction with the card recording or perforating means.

Record card recording means

Referring now to Fig. 1, the card recording station is shown to comprise recording means, illustrated in the form of record card perforating plungers 65, the operation of which are selectively controlled by the magnets 66. The said magnets, upon energization, select the associated plungers so that, during the operation of the operating bar 67, the bar depresses or operates all the selected plungers, and thereby effects perforation of the record card. This opeation is explained in detail, in the patent referred to hereinabove, and therefore the following brief description thereof is deemed sufficient. It is well known, that an individual plunger 65 and controlling magnet 66 are provided for each columnar area of the card, and that all the selected plungers are operated or depressed for all columnar areas simultaneously. It will be explained shortly, how the different index point positions of the cards are fed, intermittently, to the punching station, and that the perforating thereof is effected while the cards are stationary thereat.

The said plungers are shown provided with individual spring-urged pivoted interposer pawls 68, which are connected to the armatures 69 of the magnets, by call wires 70, so that, upon energization of a magnet, the connecting call wire is effective to swing the pawl 68 to the right, as viewed in Fig. 1, positioning the said pawl in the path of the operating bar 67. Upon depression of the said bar, which is adapted to cooperate with the notch 68a in the pawl, the related pawl is caused to be depressed to perforate the record card accordingly, and is then quickly withdrawn therefrom to permit feeding of the card to the next index point position.

The operating bar 67 is supported by a control bail 71 which is suitably pivoted on studs 72. The control bail is attached to arm 73, by means of an adjustable turnbuckle connection 74, said arm 73 being secured to shaft 75 which is also provided with an arm 76. An eccentric 77 is suitably disposed and formed on the shaft 24, which eccentric is encircled by an arm 78, the upper end of which is pivotally connected to the said arm 76.

It is now seen that, since the eccentric 77 is positioned on the constantly rotating shaft 24, shaft 75 and arm 73 are rocked to depress, at periodic intervals, the bail 71 and bar 67. As the said bail and bar are reciprocated, any of the pawls may be positioned by the call wires so as to effect engagement of the pawls and bar. Then, the connected pawls and plungers are depressed to perforate the card, and thereafter withdrawn immediately therefrom to permit the feeding of the card. Referring to Fig. 7, a facsimile of a portion of a perforated record card 52 is shown, the index point positions for several columnar areas are shown to be provided with perforations 53, at different positions in the columnar areas, to represent different data representations.

The feeding of the cards to, and from, the punching station is effected by the feed rollers 80, 81, 82 and 83. The cards are fed, intermittently, by rollers 80 and 81, between a stipper plate 84 and die plate 85, through which plates the plungers are adapted to be positioned.

The mechanism for operating the said feed rollers is as follows—referring now to Figs. 5 and 6, it is seen, that the continuously rotated gear 27 (also see Fig. 2) is provided with a Geneva roller 86 and segment 87, which cooperate with a Geneva disc 88 fixed on shaft 89. The Geneva disc is provided with seven radial slots, so that one revolution of gear 27 will rotate the shaft 89 one-seventh of a revolution, which partial revolution corresponds to a movement of one cycle point of the record card. Shaft 89 rotates continuously, with an intermittent motion, as long as the motor 21 is operated. Rotatably mounted on the shaft 89 is a gear 90, which has affixed thereto a single tooth ratchet 91, and secured to the shaft 89 is an arm 92, upon which a spring-urged dog 93 is pivoted. The spring-urged dog normally tends to engage the ratchet 91, however, disengagement of the dog and ratchet is effected by the lever 94 and attached roller 95, which roller as shown in Fig. 5, engages the tail of the dog to position it, so as to prevent engagement thereof with the ratchet. When the said lever and roller are positioned to the right, as viewed in Fig. 5, and out of the path of the dog, the dog and ratchet are permitted to be engaged, thereby effecting rotation of gear 90 which is arranged to drive gears 96 and 97, which gears are fixed to shafts 98 and 99, respectively. Suitably disposed on shafts 98 and 99 (see Figs. 1 and 2) are gears 100 and 101, arranged to engage gears 102 and 103, which are pinned to shafts 104 and 105, respectively. Shafts 98 and 104 carry the first pair of feed rollers 80 and 81, respectively, whereas, the second pair of rollers 82 and 83 are carried by shafts 99 and 105, respectively.

It is evident now, that whenever the lever 94

is displaced out of the path of dog 93, engagement of the dog and ratchet 91 is effected to drive the feed rollers 80 to 83, intermittently, by means of the described gearing. As mentioned hereinabove, the gear ratio is such, that for each movement of shaft 89, the feed rollers are rotated to an extent sufficient to displace the card one cycle point which displacement is equivalent to the distance between index point positions on the record card. The lever 94 is displaced, so as to release the dog 93, by the complementary cams 106 and 107 positioned on shaft 34, which cams are engaged by the rollers 108 and 109 carried by the horizontal portion of lever 94. It is remembered, that the rotation of shaft 34 is controlled by the magnet 20, and that, whenever this magnet is energized, shaft 34 is rotated continuously by the shaft 24 and associated gearing, described hereinabove. The cams 106 and 107 are designed, so that, if the magnet 20 is not energized and the shaft 34 is not rotated, lever 94 is positioned in the path of the dog 93, thereby preventing the dog from engaging the driving ratchet 91. However, should the said magnet be energized, cams 106 and 107 are turned, lever 94 displaced, permitting engagement of the said dog and ratchet, and establishing a driving connection between the intermittently driven shaft 89 and gear 90 for effecting intermittent movement of the card feed rollers 80 to 83.

Adjacent to rollers 80 and 81 is suitably disposed a control lever 111, which lever is effective to close a pair of associated contacts 110 (Figs. 1a, 1b, and 11a) as long as cards are fed successively to, and from, the rollers 80 and 81, however, when cards are not fed successively thereto, the said contacts are opened.

Record card sensing means

Referring now to Fig. 1, the record cards are fed from the recording station to the sensing station, by the rollers 82 and 83, through the guide plates 115, and past the suitably mounted sensing brushes 116 (also see Fig. 11b) cooperating with the conducting roller 117. It is understood that the index point positions of the intermittently fed cards are positioned properly at the sensing station, so that, whenever perforations are present in the cards at particular index point positions, the corresponding sensing brushes are adapted to extend therethrough and engage the conducting roller, thereby completing the circuits associated with said brushes and roller. The controlling circuits thus established will be described later herein. A facsimile of a portion of a suitable perforated record card 52 is shown in Fig. 7 provided with the differentially positioned perforations 53.

It should be mentioned, that at the sensing station a suitable and well known type of card lever 118 (see Fig. 1c) is provided for controlling the associated card lever contacts 119. Whenever a card is fed to, and present at, the sensing station, the said card lever is operated, by the cards, to close the card lever contacts, and whenever no cards are present to engage the card lever, the card lever contacts are opened.

Record card stacking means

From the sensing station, the cards are fed to a hopper N (Fig. 1), by means of the card stacker drum 120, and associated feed roller 121, and feed rollers 122 and 123. The said drum and feed rollers are operated continuously, with an intermittent motion, and in a synchronous relationship with the feed rollers 80 to 83.

Referring now to Figs. 2, 5 and 6, it is remembered, that shaft 89 is rotated continuously with an intermittent motion. This shaft has secured thereto gear 124, which drives gears 125 and 126, both of which gears are mounted on a common hub 127, which is rotatably supported by shaft 99. By means of the gearing, comprising the gear 128 pinned to idler shaft 129, gears 130 and 131 pinned to shaft 132, the gear 126 is effective to rotate the gear 133 and associated shaft 134 upon which is mounted the stacker drum 120 (see Fig. 1).

Pinned to the opposite end of shaft 134 is a gear, not shown, but similar in size to gear 133, and which is arranged to drive gear 135 and its related shaft 136, upon which the feed roller 121 (Fig. 1) is mounted; thus, it is seen, that the stacker drum and associated feed roller are rotated continuously, with an intermittent motion, as long as the motor is energized, and in synchronism with the operation of the feed rollers 80 to 83, since the controlling drive shaft 89 is the common drive for both the controlling gearings. The gear ratios between gears 124 and 133 are such that one-seventh of a revolution of gear 124 will displace the drum upon which the cards are held, one cycle point.

Gear 130 also drives gear 137 and related shaft 138, upon which shaft is mounted gear 139 which drives the gearing, comprising gears 140 and 141 pinned to shaft 142, gears 143 and 144, the latter gear being pinned to shaft 145. Upon the shaft 142, a feed roller 123 (Fig. 1) is mounted, and by means of a gear similar to gear 141, mounted on the shaft 142, the gear 146 and related shaft 147 are driven; feed roller 122 is mounted on shaft 147 and rotated thereby.

From the feed rollers 122 and 123 (Fig. 1) the cards are stacked in the hopper N, whereat provision is made to insure proper insertion of the cards in the stack, by providing a rubber stacker roll 148 mounted on shaft 145, which when rotated, by means of the said shaft, urges the cards to the right as viewed in Fig. 1.

Referring now to Fig. 9, the stacker drum 120, mounted on and rotated by shaft 134, is shown to be provided with a plurality of pivoted gripping fingers 149. These fingers are urged into card gripping position by the spring pressed plungers 150. Fixed face cams 151 are provided, to be suitably disposed so as to cooperate with the fingers, to effect their opening and closing at the proper time. The timing of the fingers is such that the record card is gripped, after it passes the feed roller 121, and held securely to the drum as it rotates to further advance the card, and finally releasing and discharging it to the feed rollers 122 and 123.

Film sensing and recording means

With reference now to Fig. 1, the film sensing means is shown to comprise generally, a light source comprising the individual lamps 175 supported in suitable enclosures, generally indicated 176, from one side of which, individual light conducting quartz rods 177 are provided, and which are supported by the frame member 184. Mounted in the same plane as member 184 is another frame member 178 for supporting the quartz rods 182 extending to individual light responsive means 183, such as photo-cells. The said members 178 and 184 are provided with a small gap between them through which the photographic

film 180 is fed. In the instant application, the film is fed intermittently to, and from, the sensing station, by means to be described later herein, so that the index point positions of the film are presented successively thereto. Referring to Fig. 8, a facsimile of a portion of the film record 180 is shown, wherein the index points 181 are shown differentially disposed in various index point positions in the columnar areas. The quartz rods 177 and 182 are spaced in the respective members 184 and 178 so that they correspond to the individual columnar areas in position.

The method of sensing the data representations on the photographic film record will now be understood, assuming that the index points, representing the data representations, in the form of control spots are presented, intermittently and successively, to the sensing position or station, and that the individual light sources 175 are continuously energized, it is seen that, when no control spots appear at the particular index point positions analyzed, the light conducted from the light source to the film record by the one group of quartz rods is permitted to permeate the film, and be conducted by the other group of quartz rods to the related photo-cells thereby conditioning the photo-cells, in a predetermined manner. However, whenever control spots appear at the sensing position, the corresponding beams of light conducted thereto are modified or blocked off, so that the light no longer is conducted to, and impinged upon, the related photo-cells, thereby controlling the action or operation of the photo-cells. It is obvious, since the said control spots disposed on the film record in different index point positions, and since the index point positions are analyzed successively, that the different beams of light are modified, at differential times, for controlling the operation of the related light responsive means.

The method of recording the data representation in the form of differentially positioned control spots is now evident, since the only requirement necessary for this operation is for the light sources to be normally deenergized. Now, as the film record is fed to the sensing station intermittently, the individual light sources are controlled, so as to be energized at different times, thus permitting the beams of light to be conducted and directed, by the quartz rods 177, to the corresponding columnar areas, thereby effecting recording upon the light sensitive photographic film, at different positions, in the said columnar areas corresponding to the timed intervals at which the related light sources are energized.

Film feeding means

Referring now to Figs. 1, 2 and 4, the means for feeding the photographic film from the supply reel 200 intermittently to, and from the sensing or recording station, and to the take-up reel 201 comprise the following gearing, which gearing is controlled by the shaft 142, which as described hereinbefore, is rotated continuously with an intermittent motion. A gear 202, pinned to shaft 142, is arranged to drive the gear 203 rotatably mounted on shaft 204; attached to gear 203 is the single tooth ratchet 205, which is arranged to cooperate with the dog 206, pivotally mounted on the arm 207, which arm is fixed to the shaft 204. The armature 208 of magnet 209 normally, when the magnet is deenergized, is adapted to be positioned in the path of the said arm and dog, thereby preventing engagement of the dog 206 and ratchet 205. However, upon energization of the said magnet, the armature is displaced sufficiently to release the dog, thereby permitting engagement of the said dog and ratchet, thus effecting rotation of shaft 204 by means of gears 202 and 203.

Secured to shaft 204 is the gear 210 engaging gear 211, which is fastened to shaft 212, upon which shaft 212 is mounted the film drive sprocket 213. Also secured to shaft 212 is a pulley 214 which, by the connecting belt 215, is adapted to rotate the shaft 216, upon which the take-up reel 201 is mounted. Thus, it is seen, that the film 180 is fed to, and from, the sensing and recording station intermittently, by means of the driving sprocket 213 and the described gearing. It should be mentioned, that contacts 218 are provided, and adapted to be closed by the lever 219, whenever the film record 180 is present in the sensing unit, and are arranged to be opened whenever the film record supply is exhausted.

Certain circuit controlling elements are provided, which will now be described, and which must be operated in synchronism with the feeding of the film, but are shown operated with a uniform motion instead of an intermittent motion, therefore, the following controlling and gearing means is provided. Referring particularly to Fig. 4, it is seen, that the continuously rotated gear 28 has secured thereto an additional single tooth ratchet 220, which is arranged to cooperate with a dog 221, pivotally mounted on the arm 222, which arm is secured to a gear 223 rotatably mounted on shaft 34. Normally, the dog and ratchet are maintained disengaged, by means of the armature 224 of magnet 225, in a manner similarly as described hereinabove with reference to the same type of clutch. Upon energization of the magnet, the armature 224 releases the dog 221 to engage the ratchet 220, thus effecting rotation of gear 223 and the gear 226 engaged thereby (Fig. 2). Gear 226 is secured to shaft 227, which carries the cams 228 for controlling the associated contacts F, the purpose of which will be understood as the description progresses.

Operation of machine

Referring now to the circuit diagrams, particularly Figs. 11*a* and 11*b*, the operation of the data reproducing machine will be described. The description to be given first will relate to sensing the perforated cards, and reproducing the data representations sensed upon an unrecorded photographic film record, in the form of differentially positioned control spots. To effect this type of data reproduction, the machine must be conditioned accordingly, therefore, let it be assumed that the main switch MS is closed, that the control switches S—1 to S—10 are positioned in the CF positions as shown, that perforated record cards are provided in the supply hopper M, that the unrecorded photographic film 180 is properly inserted in the machine, and that the start key is depressed to close the associated contacts SK—1.

A circuit is then completed from conductor 250, to coils of relays R—1, R—2, contacts SK—1, and contacts SK—2 of the stop key to the conductor 251, causing the said relays to be energized. Upon energization of relay R—1 the contacts R—1*a* are closed to complete a circuit from the power supply source to the drive motor 21, thereby effecting operation thereof, to drive the associated gearing described hereinabove. Upon energization of relay R—2, a holding circuit

therefore is established by the associated contacts R—2a now closed, through the normally closed cam operated contacts C—2. The contacts R—2b are also closed, upon energization of relay R—2, to effect energization of card feed control magnet 20, by the circuit completed by the said contacts, which is as follows: conductor 250, coils of magnet 20, switch S—1, contacts R—2b, and the normally closed cam operated contacts C—1 to conductor 251.

Upon energization of magnet 20, the shaft 34 is rotated to operate the card picker mechanism, thereby effecting the feeding of a card to the feed rollers 80 and 81. The gearing driving the feed rollers is also operated, when magnet 20 is energized and shaft 34 is operated. Thus, the record card is fed, intermittently, up to the card perforating station, and thereby causes the contacts 110 to be closed. A circuit is then completed, during this machine cycle, from the power supply conductors 250 and 251 to the coil of relay R—3, energizing said relay, and causing the contacts R—3a, R—3b, and R—3c to be closed. The P—2 cam contacts are closed at the time the contacts 110 are operated, thus a circuit is established from conductor 250 to the coil of relay R—9, contacts R—3c, switch S—4, and contacts P—2 to conductor 251, energizing the said relay. A holding circuit for this relay is completed, upon closure of the associated contacts R—9a, through the switch S—5, and cam contacts P—3 which are closed at the time contacts 110 are closed, and are maintained in this condition the remaining part of the machine cycle, (see timing chart, Fig. 10). This condition occurs near the end of each machine cycle, so it is understood, that relay R—9 is energized, near the end of each machine cycle, and maintained so until after the beginning of the following machine cycle.

The purpose of the circuit arrangement (shown in Fig. 11a) is to cause operation of the relays R—3, R—4, R—7, R—8, and R—9 so that the contacts R—3a, R—4a, R—7a, R—8a, and R—9b, which are connected in series with the contacts R—2a, are all closed at one time in the cycle, and thus provide a bridge circuit for the circuit, including the cam contacts C—2, (which are opened near the end of each machine cycle) so that relays R—1 and R—2 are maintained energized, thus providing continuous operation of the machine.

However, when first starting the machine, it will be necessary to hold the starting key depressed, for several machine cycles until all the control circuits are properly conditioned for continuous operation. This is obvious, since at the end of the first machine cycle, the first card is just approaching the card perforating station. This being the case, it is seen, that contacts 119 at the card sensing station are still open, thus preventing operation of relay R—4, and thus preventing continuous operation of the machine at this point.

Assume that the start key is kept depressed, so that another machine cycle is completed, the feed rollers 82 and 83 are then effective to feed the first card up to the sensing station, past the card lever 118 sufficiently to close the contacts 119, but not under the sensing brushes as yet. The sensing operation of the first card occurs during the third machine cycle. Now, at the end of the second cycle, the following circuits are conditioned: relays R—3 and R—4 are energized, since contacts 110 and 119, respectively, are closed. Relays R—7 and R—8 are energized since contacts 54 and 218 respectively are closed, these contacts are controlled by the supply of cards in the hopper M, and the film record 180 in the machine.

It is seen now, that at the time, in the second machine cycle, the cam contacts C—2 are opened that cam contacts P—3 are closed. It was mentioned hereinabove, that shortly before contacts P—3 are closed, the cam contacts P—2 are operated to energize the relay R—9, thus closing the associated contacts R—9a at this time in the cycle, so that a holding circuit therethrough is established for the said relay, by means of the operated contacts P—3; and as mentioned before, this holding circuit is maintained for the remaining part of the said cycle, and during the beginning of the following machine cycle. Thus it is seen, that from now on, during each machine cycle, a circuit is completed from conductor 250 to coil of relays R—1 and R—2, contacts R—2a, R—8a, R—7a, R—4a, R—3a, R—9b, switch S—3, and normally closed contacts SK—2 of the stop key, to conductor 251. This circuit is completed at a time in the cycle when cam contacts C—2 are opened, thus, the relays R—1 and R—2 are maintained energized for the beginning of each following machine cycle. Also, near the end of each machine cycle, the cam contacts C—1 are closed, and maintained so, until after the beginning of the following cycle, so that the magnet 20 is energized at the end of each cycle, thus effecting a card feeding operation for each machine cycle. The machine is now conditioned for continuous operation, and at the beginning of the third cycle the card sensing operations are effected. Therefore, it is evident at this time, that it will be necessary to render the film feeding mechanism operative, so that the film is positioned, intermittently, in synchronism with the progression of the record card. This is effected as follows:

Near the end of each machine cycle, the cam contacts C—3 are closed, therefore, a circuit is completed from conductor 250 to the coil of relay R—5, to contacts R—3b, and cam contacts C—3 to conductor 251, energizing said relay; at the same time, a circuit is completed from conductor 250 to the coil of relay R—6, contacts R—4b, R—9c, and cam contacts C—3 to conductor 251, energizing this relay. These circuits are maintained for the remaining part of the said cycle, and during the beginning of the following cycle, by means of cam contacts C—3. Before these said cam contacts are opened, during the said following cycle, contacts P—1 are closed to maintain the relays R—5 and R—6 energized, through the associated contacts R—5a and R—6b respectively, all during the sensing and recording portions of each cycle. Contacts R—5b, R—5c, R—5d and R—6a, R—6c, R—6d to R—6f, associated with said relays, are therefore operated, at all times, during the sensing and recording portions of the machine cycles.

Closure of contacts R—8a completes a circuit as follows, near the end of each cycle, from conductor 250 to coils of magnets 200 and 225, contacts R—8a, switch S—2, contacts R—2b, and cam contacts C—1 to conductor 251, energizing said magnets. Energization of magnet 200 permits the film feeding mechanism, described hereinabove, to become effective to feed the film record 180, intermittently, to its sensing and recording station, in timed relationship, with the feeding of the record cards 52 past the sensing station therefor. Energization of magnet 225

is effective to render the control shaft 227 operative, to control the timing of the F cam contacts, which are controlled by cams 228 mounted thereon, the purpose of which will be described later.

The machine is now conditioned to sense the first card, and all cards following thereafter, successively, for controlling the film recording mechanism. It is now seen, as the individual record cards are fed past the record sensing station, the data representations represented by the differentially positioned perforations thereon are sensed, by means of the sensing brushes 116 cooperating with the common conducting roller 117, to complete the following circuits, at different times, depending upon whether or not perforations in the various columnar areas are presented thereto: from conductor 250 to switch S—7, conductor 252, individual light sources 175, conductors 253, sensing brushes 116, conducting roller 117, conductor 254, cam contacts P—5 which are closed during the sensing portion of the machine cycle, contacts R—6c now closed, contacts 57, which are closed during each card index point position (see Fig. 10) to conductor 251, energizing the said individual light sources in accordance with the perforations sensed on the record cards. Obviously, as many columnar positions can be sensed, on the record cards, as desired for controlling corresponding individual light sources for reproducing all the sensed data representations on the photographic film record.

It was mentioned hereinabove, that upon energization of the film feed control magnets 209, the photographic film record 180 is fed, intermittently, to the recording station, in synchronism with, the intermittent feeding of the record card to the card sensing station, so that, for example, when the "9" index point positions on the card are presented for sensing thereof, the film record is fed to its recording station, so that the "9" index point position thereof of the individual frame, or portion of the film record, is presented at the film recording station. Therefore, at the particular timed intervals the light sources are energized, by means of the card sensing circuits, the light sensitive record is exposed to the light rays, at such intervals, to effect recording thereon in the form of control spots, as indicated in Fig. 8, at differential positions in accordance with the data sensed. Further explanation of this form of sensing the record cards, and recording the data, in the form of control spots on the film record, is deemed unnecessary in order to comprehend fully the scope of the instant invention, with this exception, that provision is also made, whereby additional data, in addition to the sensed data, may be recorded in various columnar areas on the film record as desired, by means of manually controlled data storing devices. These devices are represented generally by the reference character 255, in Fig. 11b, and each comprise a common conducting ring 256, and individual conducting segments 257 which are connected as desired by means of the cooperating brushes 258. The brushes are positioned manually to represent any desired data, and are effective, by means of the common emitter 59, to initiate control impulses at a differential times to correspond to the stored data for controlling, in this illustration, the individual light sources 175. Assume now, that certain orders of the said storing devices are positioned as desired, representing predetermined data to be recorded on the film record, at the same time, and in addition to the data sensed on the record cards. It is seen, that circuits are completed from conductors 250 and 252 to the individual lights 175, conductors 259, contacts R—6d and R—6f (which are closed during the sensing portion of the cycle), data storing devices 255, emitter 59, switch S—10, contacts F—6 (closed during the sensing cycle), contacts 57 and conductor 251, energizing the said light sources, whenever the rotating brush 58 engages conducting segments 60 which are connected to the conducting segments 257, which segments in turn are connected to the associated common conductor 61 by the positioned brush 58. The brush 58 of the emitter is rotated, in synchronism, with the card sensing operations, by means of the shaft 33, so that during the intervals the "9" index point positions are sensed, the emitter is effective to read out the "9" position of the data storing devices, thus being effective to establish circuits for controlling the energization of the light sources for recording the stored date, upon the film record, in the form of differentially positioned control spots.

In view of the detailed description just set forth, and since the driving mechanism, feeding mechanisms, and control circuits are operated and conditioned, in the same manner, for reproducing the data sensed upon recorded film records on the blank record cards, in the form of perforations, the following brief description is believed to be sufficient. Assume now, that all the control switches S—1 to S—10 are positioned in the FC position, and that the start key is depressed to close the contacts SK—1, long enough to condition the machine for automatic operation. For this description, reference should be made to the circuit diagrams shown in Figs. 11a and 11c. It will be understood, for this type of operation, whereby the recorded film record is sensed and the sensed data is reproduced or perforated on the blank record cards accordingly, that upon feeding the film record, the record cards must be presented at that time at the punching station. As it will be seen from the description to follow, the film record must be properly positioned in the machine, and two blank frames thereof are fed to the film sensing station upon starting the machine in operation; of course, it will be evident too that in the event this is not done, no harmful results are effected with respect to the instant invention, the suggestion is made merely as a practical expedient.

Upon depression of the start key, the relays R—1 and R—2 are energized, causing operation of the driving motor 21, and associated gearing, by means of operated contacts R—1a and energization of the control magnets 209 and 225, causing operation of the film feeding mechanism, and the F cam shaft, as described hereinabove. At this time, cam contacts C—4 are closed to energize relay R—11, and to establish a holding circuit therefor, through the closed contacts R—11a and cam contacts F—5. Thus, it is seen that, upon depression of the start key, the card feed magnet 20 is energized by the following circuit: from conductor 250 to coils of magnet 20, contacts R—11b, normally closed contacts R—3d, switch S—2, contacts R—2b, and contacts C—1 to conductor 251, thereby effecting a card feeding operation. Near the end of the first machine cycle, the contacts 110 are operated by the card fed there past to energize relay R—3, and cause the contacts R—3e to be closed, thus opening the circuit to the feed control magnet 20 for the following machine cycle. This is effected, since

contacts R—10b are not closed until near the end of the said following cycle, when cam contacts F—3 are closed to establish a circuit from conductor 250 to coil of relay R—10, contacts R—11c and R—3f and contacts F—3 to, conductor 251, energizing said relay, and establishing a holding circuit therefor through contacts R—10a and cam contacts F—4. Therefore, at the beginning of the third machine cycle, the magnet 20 is again energized through a circuit from conductor 250 to coil of magnet 20, contacts R—10b, contacts R—3e, switch S—2, contacts R—2b, and cam contacts C—1 to conductor 251, whereby card feeding operations are effected, and by means of the feed rollers 80 and 81, the first card is now fed, intermittently past the perforating station.

Upon properly conditioning the machine with record cards, and a control film record, the contacts 54 and 218, respectively, are operated to energize relays R—7 and R—8, respectively. Thus, it is seen that a holding circuit, bridging the holding circuit including contacts C—2, is established for relays R—1 and R—2, by the series circuit arrangement of contacts R—2a, R—8b, R—7b and R—10c, thus establishing continuous operation of the machine. It should also be mentioned, that relay R—5 is energized at the beginning of each cycle, by means of the cam contacts C—3, through the contacts R—3b to establish a holding circuit through the contacts R—5a, and cam contacts P—1, which holding circuit is maintained throughout the entire sensing portion of the cycle, thus maintaining contacts R—5b to R—5d closed during the said sensing cycle.

It should be understood now, that as the different index point positions are advanced to the punching station, the corresponding index point positions on the film record are sensed, for example, as the "9" index point position on the film record is sensed, the "9" index point positions of the record cards are at the punching station under the perforating plungers. As the differentially positioned control spots on the film record are introduced at the sensing position, the presence of the control spots is effective to modulate or interrupt the impingement of the light rays from the light sources upon the related photo-cells. It is seen that, by means of switches S—8 and S—9, all the individual light sources are energized continuously. Whenever no control spots are present at the sensing station, the light rays are conducted by the quartz rods 177 and 182 therefrom through the transparency of the film record to the related photo-cells, thus conditioning the said cells. These light responsive means 183 are connected to any well known type of amplifiers, generally indicated at 260, which in turn are connected to control relays 261. The amplifiers are adjusted so that, when light impinges upon the light responsive means, no current flows in the output circuit thereof, however, when the light rays are interrupted, by the presence of control spots on the film record, the light responsive means and amplifier are conditioned so as to permit current to flow in the output circuit of the amplifier units, this is a well known expedient in the art and needs no further explanation.

It is understood now, that upon the presence of a control spot at the film sensing station, the corresponding light responsive means and amplifying means are conditioned so as to effect energization of the related relays 261 when they, by means of the associated contacts 262, complete circuits through the punch control magnets 66 as follows: from conductor 250 to switch S—7, punch magnets 66, contacts 262, common conductor 263, contacts 57 to conductor 251, energizing the corresponding punch magnets 66. Energization of the said magnets operate the related punch plungers, to effect perforation of the record card, at the particular columnar index point positions corresponding to the index point positions in which the sensed control spots appeared on the film record. Further detailed description is believed unnecessary, possibly with the exception, that the manually set devices 255 may be used to effect perforating of additional data on the record card to the data sensed on the film record. The desired data stored in the devices is read out, at differential times, by the emitter 59 to complete additional circuits to the punch magnets as follows, from conductor 250 to switch S—7, selected punch magnets 66, conductor 264, contacts R—5b to R—5d (closed during the sensing cycle), hand set devices 255, emitter 59, switch S—10, cam contacts P—4, and contacts 57 to conductor 251, thus energizing the selected punch magnets, at differential times, corresponding to the data stored in the hand set devices, thus effecting perforation of the record card in accordance with this data, in addition to the sensed data disposed on the film record.

Summary

It has now been shown and described, how the same data reproducing machine may be conditioned, whereby it is effective to sense data designations from one type of record medium and control the recording of corresponding data designations upon another type of record medium, or vice versa.

When conditioned for one particular type of operation, in accordance with the instant illustion of the invention, it has been seen, that individual record cards bearing perforations at differential columnar positions on the cards, when fed to the card sensing station, are sensed at differential times, thereby initiating electrical impulses at such times for controlling the photographic film record recording means. The electrical energy comprising the said impulses are then converted into light energy by energizing, at differential times, the individual light sources. The light rays are then effective for controlling the photographic recording of the control spots upon the light sensitive web, or film, which is fed in synchronism with the feeding of the record cards, so that the corresponding data, sensed on the cards, are reproduced on the film in the form of differentially positioned control spots.

It has also been seen, that upon proper conditioning of the machine, a photographic film control record having differentially positioned data designations thereon, in the form of control spots or light modifying areas, which are positioned longitudinally of the film so as to represent by their relative positions the values of the designations, is fed to a sensing station, comprising a light source and light responsive means, which are influenced by the data designations on the film record at such times, whenever the control spots are fed into the path of the light source and effect modification of the light rays. The light responsive means are effective, whenever such data designations are sensed, to initiate electrical impulses, which in turn are effective to control the record card perforating means so as

to perforate the blank record cards fed thereto, in synchronism with the feeding of the film record, and thus reproduce the data, sensed on the film, upon the record cards in the form of differentially positioned perforations in various columnar areas.

It has also been seen, that manually settable devices are provided, which have elements which are positionable so as to represent any desired data, and are effective to control the record medium recording means for the several types of reproducing described, so as to effect recording of the data, upon the selected record medium, corresponding to that set up in the manually settable devices, in addition to the recording of the data corresponding to the data sensed on the related record medium.

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. A unitary data reproducing machine controlled by individual records having data designations recorded thereon to be reproduced on blank records, comprising a first group of record sensing and recording means, a second group of record sensing and recording means, means for feeding blank or recorded records past the sensing and recording means of the first group, means for feeding blank or recorded records past the sensing and recording means of the second group, common operating means for operating the said feeding means for engaging directly both feeding means in synchronism so that the records are presented to the respective sensing and recording means in a predetermined time relationship, common control circuits, means for alternately connecting the sensing means, of one of the said groups, and the recording means, of the other said group, to the said common control circuits, and means controlled by the circuits whereby the recorded records sensed by the said connected sensing means are effective to control the connected recording means for recording the data sensed upon the blank records presented thereto.

2. The invention set forth in claim 1 in which the first group of record sensing and recording means comprises perforated record card sensing means and record card perforating means, respectively.

3. The invention set forth in claim 1 in which the second group of record sensing and recording means comprises photographic film record sensing and photographic recording means.

4. The invention set forth in claim 1 in which the first group of record sensing and recording means comprises perforated record card sensing means and record card perforating means, respectively, and the second group of record sensing and recording means comprises photographic film record sensing and photographic recording means.

5. A unitary data reproducing machine controlled by individual records having data designations recorded thereon to be reproduced on blank records, comprising a first group of record sensing and recording means, a second group of record sensing and recording means, means for feeding blank or recorded records past the sensing and recording means of the first group, means for feeding blank or recorded records past the sensing and recording means of the second group, common gear train means for cooperating directly with both feeding means for operating the said feeding means in synchronism so that the records are presented to the respective sensing and recording means in a predetermined time relationship, and means for alternately selecting and rendering effective the sensing means of one of the said groups for controlling the recording means of the other said group, and means for controlling the selected recording means to reproduce the data upon the blank record presented thereto in accordance with the data sensed upon the recorded record presented to the selected sensing means.

6. The invention set forth in claim 5 in which the first group of record sensing and recording means comprises perforated record card sensing means and record card perforating means, respectively.

7. A data reproducing machine of the character described comprising gear train means and driving means therefor, means for feeding successively individual blank statistical machine record cards or perforated record cards having differentially positioned perforations disposed thereon to represent the digital values of the data thereby, means for connecting the card feeding means to the said gear train means, means for feeding a continuous blank photographic film control record or a photograpic film control record having differentially disposed control spots thereon representing the values of the data thereby, means for connecting the said film feeding means to the gear train means, record card sensing means and photographic film record sensing means, record card recording means comprising perforating means and photographic film record recording means, and control circuits for conditioning the said sensing means and recording means whereby perforated record cards are sensed for controlling the photographic film record recording means in accordance with the data sensed, or whereby the said film sensing means is effective for controlling the record card perforating means in accordance with the data sensed.

8. A unitary data reproducing machine of the character described, comprising means for feeding a data carrying medium comprising a record card and means for feeding another data carrying medium comprising a photographic film record, said record cards and photographic film records having differentially disposed data designations, the differential positions of the designations representing the values of the data, means for alternately rendering the record card feeding means and photographic film record feeding means effective, individual means for alternately sensing at differential times the data designations disposed on either the record cards or photographic film records fed thereto, and means controlled by the sensing means including individual means for alternately recording at differential times data designations on the photographic film records or record cards, in accordance with the data sensed on the record cards or photographic film records, respectively.

9. A unitary data reproducing machine of the character described including a light source, feeding means for feeding a photographic film record having a plurality of groups of data designations thereon into the path of said light source,

each group of designations comprising one or more light modifying areas differentially disposed on the said film record, and positioned longitudinally thereof, so as to represent by their relative positions the values of the designations, light responsive means influenced by the data designations upon the film at such times whenever the designations are fed into the path of the light source, and effecting modification of the light rays, record sheet perforating means and means for feeding the sheet thereto, common operating means for engaging both feeding means for operating the feeding means in synchronism for presenting the groups of data designations on the film record to the light source in predetermined timed relation with the feeding of the said sheet to the perforating means, and means controlled by the light responsive means, including means for rendering the perforating means effective for perforating the record sheet at such times, whenever the data designations on the film record are effective to modify the light rays, thereby reproducing the sensed data upon the record sheet.

10. A unitary data reproducing machine of the character described including a light source, feeding means for feeding a photographic film record having coded data designations disposed thereon into the path of said light source, light responsive means influenced by the data designations upon the film record at such times whenever the designations are fed into the path of the light source, and effecting modification of the light rays, record sheet recording means and means for feeding individually the sheets thereto, common operating means for engaging directly both feeding means for operating the said feeding means in synchronism to present the coded data designations on the film record to the said light source in timed relation with the feeding of the said sheets to the said recording means, and means controlled by the light responsive means, including means for rendering the recording means effective for recording data designations upon the sheets at such times, whenever the data designations on the film are effective to modify the light rays, thereby reproducing the sensed data upon the record sheets.

11. A unitary data reproducing machine of the character described including means for sensing a photographic film record having data designations disposed thereon, comprising a light source and light responsive means influenced by the light rays modified by the data designations, a record sheet and means for recording data designations thereon, means for presenting the film record to the said sensing means, means for presenting the record sheet to the said recording means, common operating means for cooperating directly with both feeding means for causing the said feeding means to be operated so as to present the film record to the sensing means in timed relation with the presenting of the record sheet to the recording means, and means controlled by the light responsive means, including means for rendering the recording means effective, whenever the light rays are modified by the data designations on the film record, thereby effecting reproduction of the sensed data upon the record sheet.

12. The invention set forth in claim 7 including manually settable means comprising positionable means adapted to be set for representing different data and means controlled thereby for controlling the light sensitive web recording means for effecting recording of data designations corresponding to the data set up in the settable means in addition to the sensed data.

13. A data reproducing machine controlled by record cards bearing data designations, comprising means for sensing the data designations disposed on individual record cards, including means for initiating electrical impulses upon sensing the data designations, means for converting the electrical impulses into light energy upon the initiation of the impulses, photographic film records, means for recording photographically data designations upon the said film records by said light energy upon the generation thereof, manually settable means comprising positionable means adapted to be set for representing different data, and means controlled by the said settable means for controlling the said photographic recording means for effecting recording of data designations, corresponding to the data set up in the settable means, in addition to the sensed data.

14. A unitary data reproducing machine controlled by record cards bearing data designations in various columns thereon, comprising individual means for sensing the data designations on the record cards, one for each column of data to be sensed, photographic film records, means controlled by the sensing means for recording photographically the sensed data on the said film records, said controlled means including individual means for effecting recording of the data in individual columns on the said film records, and individual circuits connecting the individual sensing means to the related individual means of the said recording means for effecting control of the recording means in accordance with the data sensed by the sensing means.

15. The invention set forth in claim 14 in which the said individual means of the photographic recording means comprises individual light sources, and means for directing the light rays from said light sources to the said film records.

16. A unitary data reproducing machine controlled by record cards bearing data designations, comprising means for feeding successively the individual record cards, means for sensing the data designations on the record cards fed to the machine, photographic film records, means for recording photographically data designations on the film records, means for feeding the said film records to the recording means, common gear train means for cooperating directly with both feeding means for feeding the record cards and film records in synchronism, and means controlled by the sensing means for rendering the said recording means effective to record photographically on the film records the data sensed by the sensing means.

17. The invention set forth in claim 16 in which the said recording means comprises light source means, and the said controlled means comprises means for producing differentially timed impulses in accordance with the sensed data for energizing the light source means at differential times to effect the photographic recording of the sensed data.

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CERTIFICATE OF CORRECTION.

Patent No. 2,224,761. December 10, 1940.

ARTHUR H. DICKINSON, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 9, first column, lines 40 and 41, claim 1, strike out the words "for engaging directly both feeding means" and insert the same after "means" in line 39, same claim; 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 21st day of January, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)