

Sept. 21, 1954

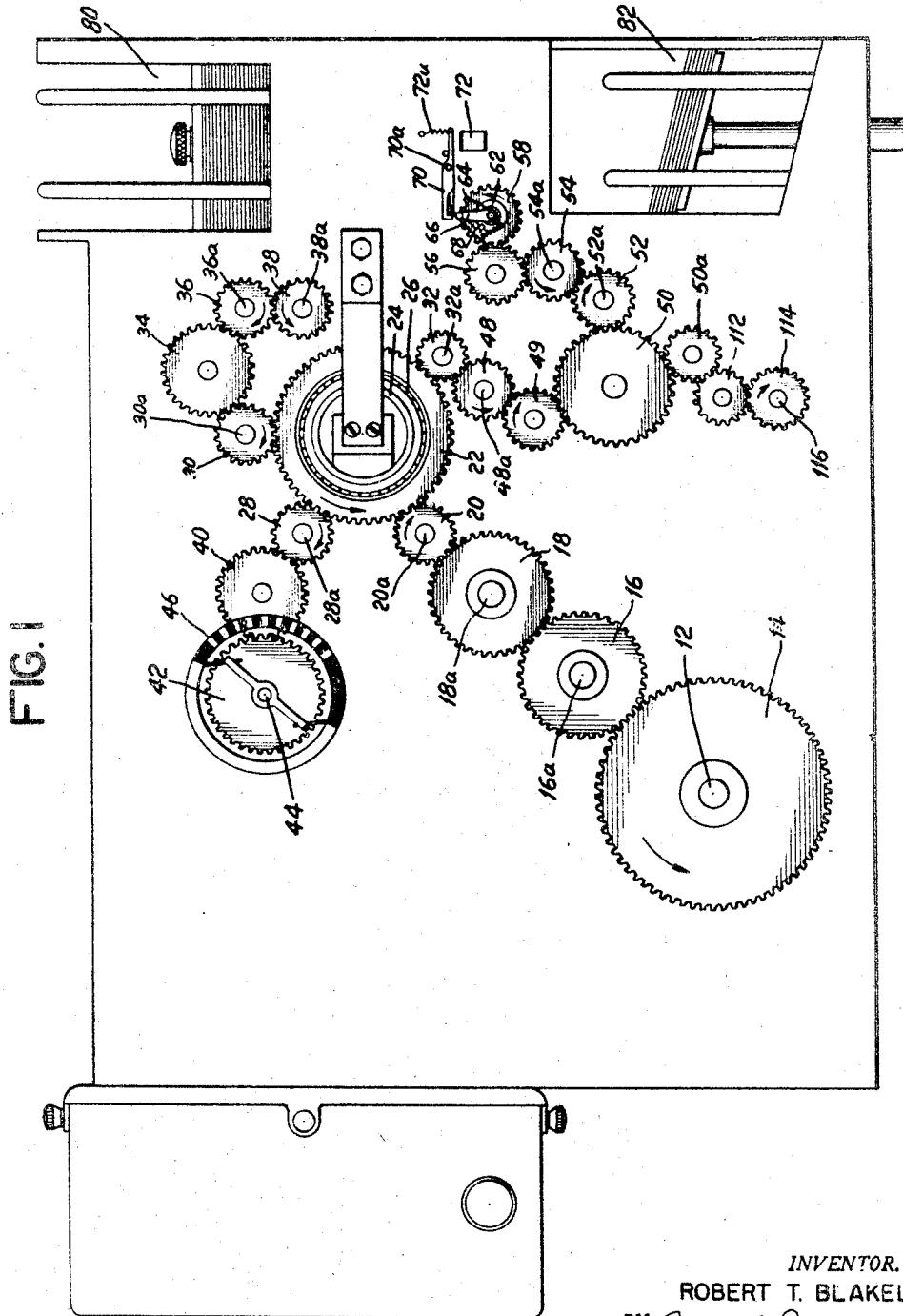
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2,689,508

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Filed Dec. 21, 1950

4 Sheets-Sheet 1



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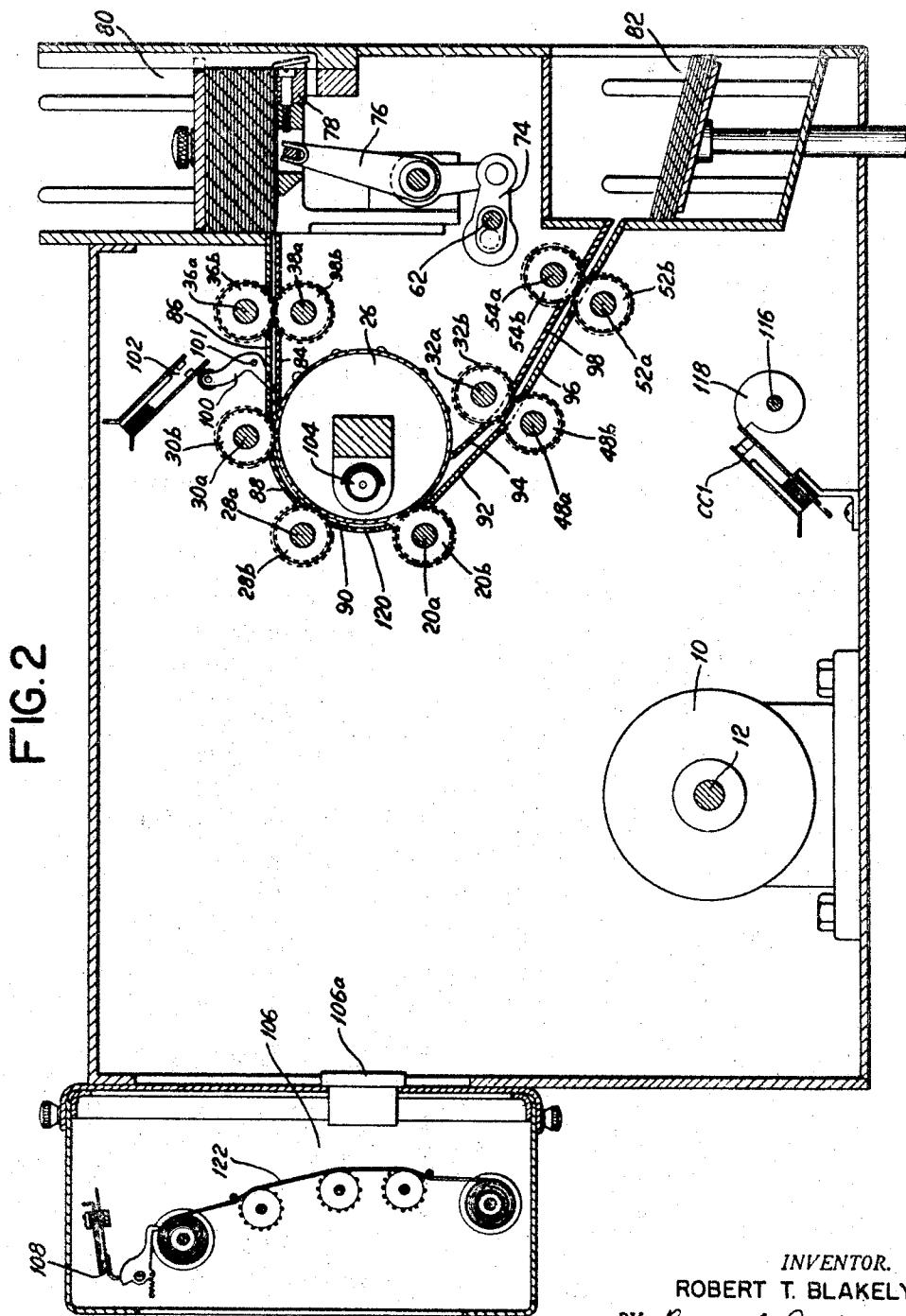
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4 Sheets-Sheet 2



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FIG. 3

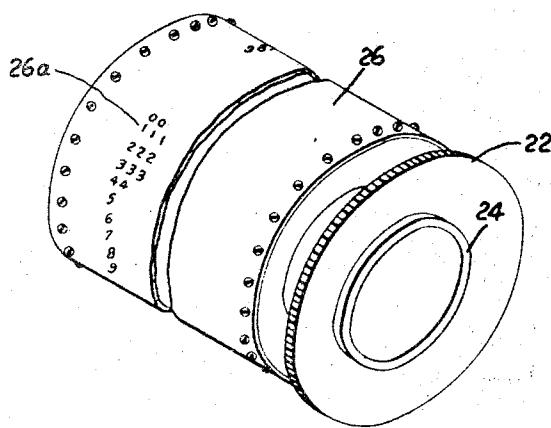
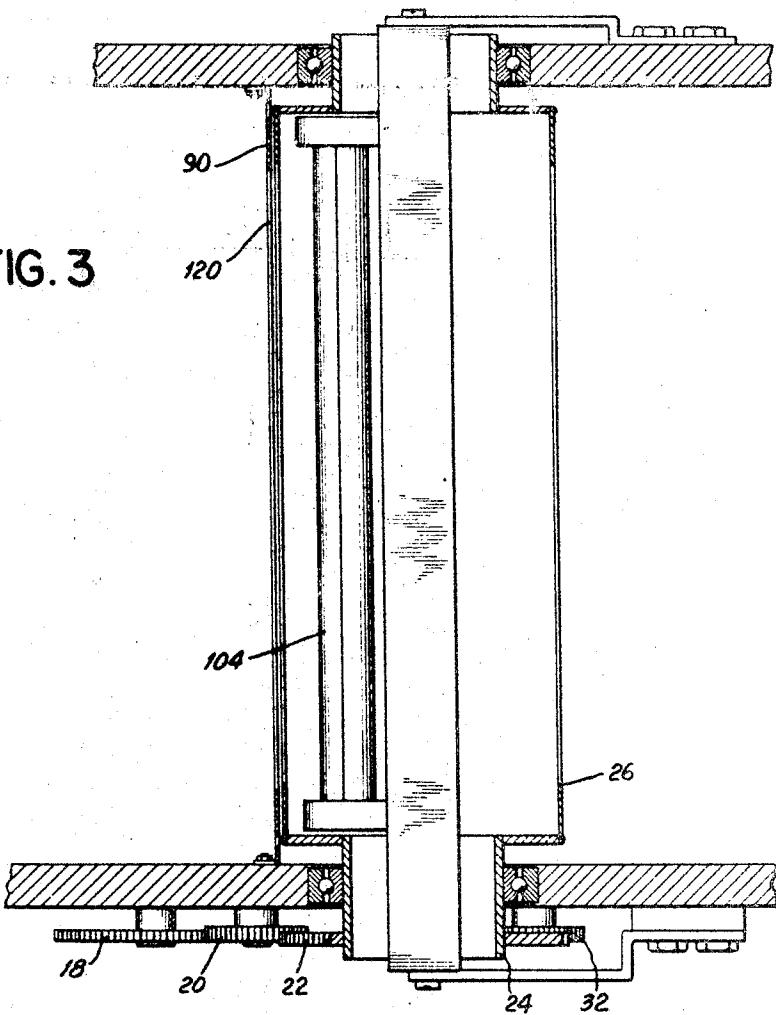


FIG. 4

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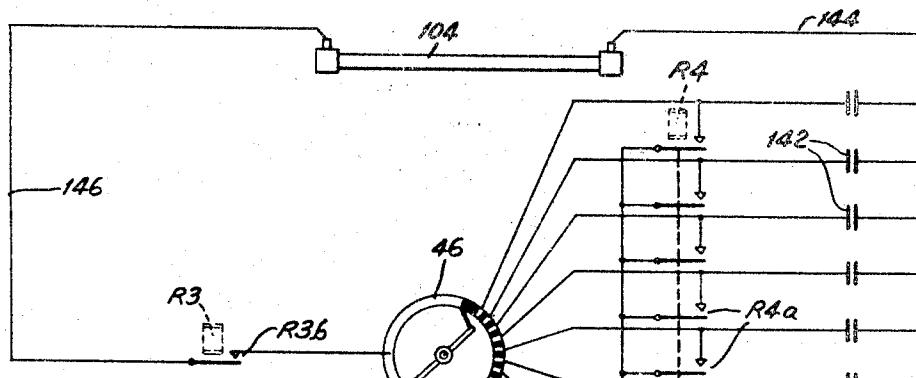


FIG. 5

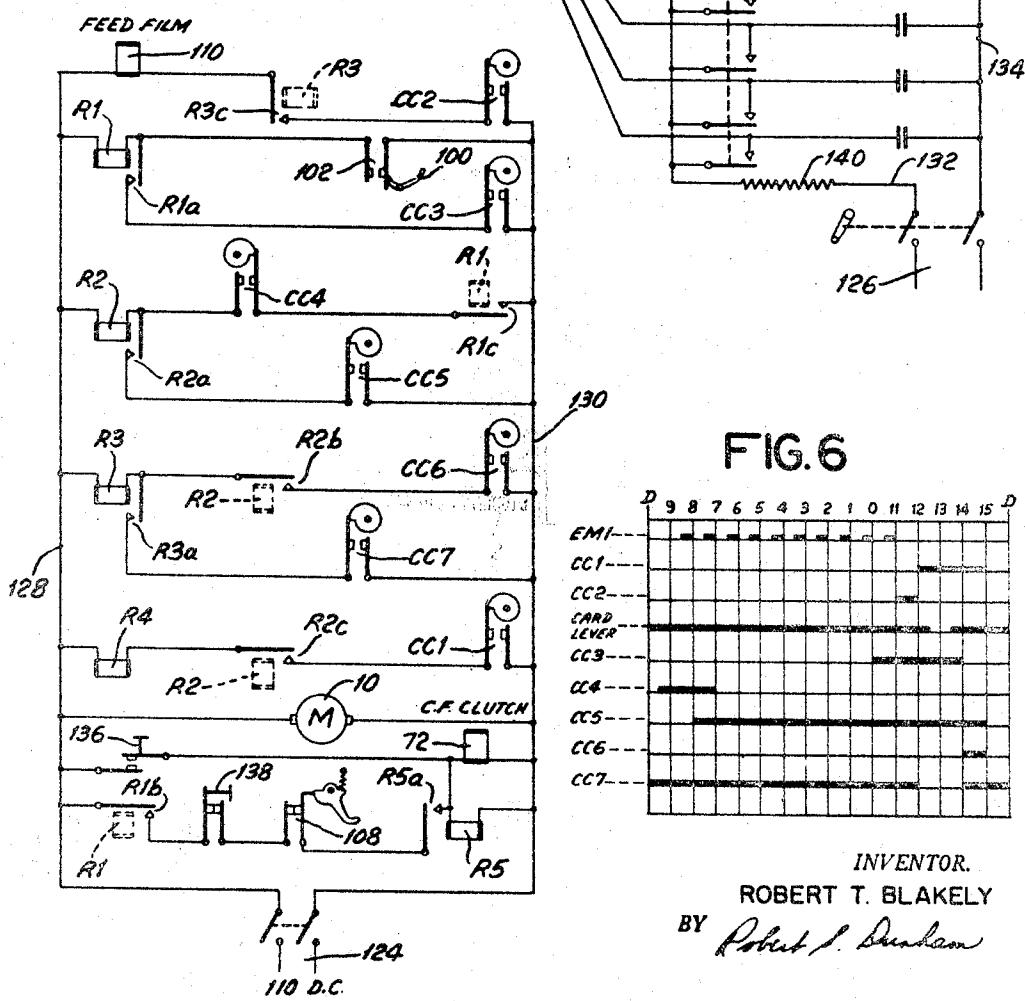


FIG. 6

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## UNITED STATES PATENT OFFICE

2,689,508

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4 Claims. (Cl. 95—4.5)

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This invention relates to photographic recording devices and more particularly it relates to a photographic recording device in which perforated record cards optically control the photographic recording of characters corresponding to perforations in the record card.

In previous devices of this general type the perforations of a record card have been sensed as by electrical analyzing means. Through an electrical control system it has been common heretofore to transfer to a film the data so sensed in perforated record cards by the selective transillumination of characters arranged in the periphery of a continuously rotating character drum bearing columns of data representations. In these prior devices, one of which is shown in the James W. Bryce Patent No. 2,346,251, granted April 11, 1944, each column of data on the character drum has associated therewith an individual gaseous discharge flash lamp which is momentarily illuminated under control of the record card analyzing means. These recording systems have been effective to transilluminate the drum character corresponding to the record card perforation and thereby cause exposure of a film with the consequent recording of the character on the film.

In the present invention, however, the perforated record card itself constitutes the control device through perforations of which characters of the rotating character drum may be transilluminated to effect exposure of the recording film. In this respect the perforated record card constitutes a mask for the columns of characters on the character drum and permits the transillumination of characters in the periphery of that drum only at those positions which correspond to a record card perforation. Furthermore, in the present invention a single flash tube extends axially through the drum and the same is adapted to flash at each index point in the rotation of the character drum and the passage of the perforated record card in conjunction therewith. Consequently, whenever a perforation in the record card, a character on the character drum, and the lens system of the photographic recorder are in alignment the drum character will be recorded on a recording film when the lamp is flashed.

Accordingly, it is the principal object of the invention to provide a card analyzer and photographic recorder which avoids control devices intermediate the card and the recording medium.

More specifically it is the object of this invention to provide a high speed photographic record-

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ing mechanism which is optically controlled by a perforated record card.

It is a further object of the invention to provide a high speed photographic recorder which utilizes a single flash tube for all character columns of the recording drum.

It is a still further object of the invention to provide in a photographic recorder having a rotating character drum means for feeding a perforated record card into association with the periphery of the character drum and in synchronous movement therewith. To this end a positive, interrelated drive is provided for feeding perforated record cards through a closed course into contact with the periphery of the drum as the drum is rotated.

Further objects and advantages of the invention will appear as the description of the recorder is read in reference to the accompanying drawings in which:

Fig. 1 is a side elevational view of the recorder;  
Fig. 2 is a longitudinal, vertical, sectional view through the recorder;

Fig. 3 is an axial, sectional view through the transilluminatable character carrying drum;

Fig. 4 is a perspective view of the character carrying drum;

Fig. 5 is a diagram of the recorder control circuit; and

Fig. 6 is a timing chart of the various circuit making devices of the control system.

The rotatable character bearing drum, its illuminating lamp, and the photographic mechanism including a lens system and a film feed mechanism are housed within a light-tight cabinet. Within the cabinet is provided a driving motor 10 which drives a shaft 12. Shaft 12 has attached to one end thereof a gear 14 which, through a train of gears, is adapted to drive a gear 22 which is affixed to a hub of the character drum. Specifically, the gear 14 operates through gears 16 and 18 which are mounted for rotation on stub shafts 16a and 18a, respectively. The gear 18 is in operative contact with a gear 20 which in turn contacts the teeth of the character drum drive gear 22. The gear 22 is affixed to the hub 24 of the character drum 26.

The character drum gear 22 is adapted to drive peripherally arranged gears 28, 30 and 32. The gear 30 is in contact with an idler gear 34 which in turn drives a pair of gears 36 and 38. The gear 28 is in mesh with an idler gear 40 which drives a gear 42 which is attached to a shaft 44 on which is fixed the brush arm of an electrical impulse emitter 46 of well known construction.

The gear 32 drives a train of gears comprising gears 48, 49, 50, 52, 54 and 56. Gears 20, 28, 30, 32, 36, 38, 48, 52 and 54 have affixed to their drive shafts 20a, 28a, 30a, 32a, 36a, 38a, 48a, 52a and 54a, respectively, record card feed rollers (Fig. 2) 20b, 28b, 30b, 32b, 36b, 38b, 48b, 52b and 54b. The feed rollers are disposed on the interior of the cabinet and extend into a record card feed course through which perforated record cards may be fed. It will appear from the foregoing, therefore, that there is a positive drive connection from the drive motor 10 to the character drum 26 as well as to the several record card feed rollers. By this device the feed of cards by the feed rollers is maintained in synchronism with the rotation of the character drum 26. This function follows from the fact that the feed rollers are all positively driven, and one or more of these rollers are in feeding contact with the card at all times as a card passes through the feed course.

Feeding of record cards through the feed course is effected periodically by operation of a reciprocating card picker which is under control of an electromagnetically operated single-revolution clutch device. A gear 58 is freely rotatable on a shaft 62 and is continuously driven by the motor 10 through the gear train above described, including the gear 56 meshing with the gear 58. The gear 58 has attached thereto a notched disc 64 constituting one element of a single-revolution clutch. Secured to the shaft 62 is an arm 66 on which is pivotally mounted a dog 68 normally restrained from engagement with the notched disc 64 by a latch armature 70. The latch armature 70 is pivoted on a pin 70a about which it is adapted to rock in one direction under the influence of its associated magnet 72 and in the other direction under the influence of a spring 72a. Energization of the magnet 72 will attract the latch armature 70, thereby releasing the dog 68 to engage the notch in the notched disc 64 and thereby permit the shaft 62 to rotate through a single revolution. Rotation of the shaft 62 operates the crank arms 74 and 76 of a reciprocating card picker 78 in a well known manner, thereby causing the card picker 78 to feed one card from a card hopper 80. When a card is advanced from the bottom of the stack in the card hopper 80 so that its leading edge comes into contact with the first set of feed rollers 36b and 38b, the card will be fed into the closed course which will lead it into association with the character drum at the character exposing position. The feed rollers 36b and 38b will advance the card into contact with the feed roller 30b and from thence the card will be under the successive control of feed rollers 28b and 20b, which are respectively located about and below the exposure position of the character drum. Thereafter, the card is engaged by the last two pairs of feed rollers 32b-48b and 52b-54b. The last pair of feed rollers will deposit the card into a stacker 82 which is of well known construction.

It will be noted by reference to Fig. 2 that the closed course through which the cards are fed is composed of guide blades 84, 86, 88, 90, 92, 94, 96 and 98. Guide blades 84 and 86 constitute a spaced pair, while guide blades 88 and 90 are disposed in spaced relation to the periphery of the character drum 26 and cooperate therewith in the feed of cards about said drum. On the discharge side the guide blades 92 and 94 constitute a first spaced pair, while guide blades 96 and 98 constitute a second spaced pair. It will be observed by viewing Fig. 2 of the drawings that the

guide blades constitute segments of the closed card feed course, and that the several feed rollers extend into substantial feeding contact between the several segments of the guide blades.

5 The tip of a card feed lever 100, which is mounted for rocking movement about a pivot pin 101, extends through the guide blade 86. The passage of a card under the tip of the card lever 100 rocks the same sufficiently to close a card lever contact 102. Near the end of the first card feeding cycle, card lever 100 closes card lever contact 102.

10 Details of the character drum 26 may be seen in Figs. 3 and 4 of the drawings. The drum is of the same type as that shown in Figs. 10 and 11 15 of the aforesaid Bryce patent, and differs therefrom in that it is provided with a single flash tube 104 which extends through the drum parallel to the axis thereof. It is sufficient to note that the drum 26 has an opaque wall in which is formed 20 columns of transilluminatable characters 26a which correspond to the several index points of a conventional perforatable record card.

25 Herein the camera mechanism is the same as that shown in Figs. 2, 3 and 4 of the Bryce patent No. 2,346,251 and specific description thereof is, therefore, deemed unnecessary. It is sufficient to say that the camera mechanism 106, as shown in Fig. 2 of the drawings, is attached to one end of the recorder casing and that it includes a lens 30 106a which is in alignment with the lamp 104 and an exposure slot 120 in the guide blade 90. The camera mechanism includes appropriate supply and take-up reels and feed sprockets, together with convenient mechanism for rotating the same 35 to feed the photographic film 122 in timed relation with the rotation of the drum 26, i. e. the film is advanced once for each card cycle. This mechanism as suggested heretofore may be that shown in the Bryce patent noted. A contact 108 40 is arranged to open when the supply of film in the camera mechanism has been exhausted. It is contemplated that a film feed magnet 110 (see Fig. 5) be also provided, this magnet functioning in the same manner as the magnet 86 in Fig. 4 45 of the aforementioned Bryce patent. Generally, the film feed is effective to move the film at least one line space after each card passes the exposure position, which is represented by the opening 120 hereinafter described. Thus, the film is 50 moved intermittently, one increment for each card passing the exposure position, so that the data from a single card will be photographically reproduced on one line on the film.

55 The operation of the recorder is under the control of cam operated contacts CC1 to CC7 (see Fig. 5), inclusive. By reference to Figs. 1 and 2 of the drawings, it will be noted that the gear 50 is adapted to drive gears 50a and 112. These latter gears are mounted for rotation on stub shafts in 60 the side wall of the casing and the gear 112 is in mesh with a drive gear 114 which is affixed to the end of a shaft 116 which extends through the casing and is journaled in bearings in the side walls thereof. By reference to Fig. 2 of the drawings it will be noted that a contact operating cam 118 is carried by the shaft 116 for rotation therewith. The cam 118 is in operative contact with the contact CC1. It will be appreciated that similar cams on the shaft 116 are associated 65 with each of contacts CC2 through CC7, whereby the contacts are positively closed in the timed relation indicated in the timing chart of Fig. 6.

70 During recording operation, perforated record cards are fed from the card hopper 80 by the card picker 78, as heretofore described. As the

cards are fed one by one from the bottom of the stack in the card hopper 80, they pass through the closed card course under the influence and control of the card feed rollers as heretofore described. In their passage through this course, the cards pass the exposure slot 120 in the guide blade 90. As the successive index points of the cards pass the opening 120, the flash tube 104 is momentarily flashed once at each index point of the record card. At any index point in the record card at which a perforation occurs, the flashing of the lamp 104 will transilluminate the corresponding underlying character on the character bearing drum 26, thus causing an image of such character to be recorded on the film 122 in the camera 106. The film is fed one line space for each card after recording is completed for that card.

The control of the recorder is best understood by reference to Fig. 5 of the drawings which is a circuit diagram. In operation of the machine and after a supply of record cards has been placed in the card hopper 80, the switches 124 and 126 are closed to supply potential to lines 128, 130 and 132, 134. A start key 136 is now depressed to energize the card feed clutch magnet 72 and the relay R5. The first card in a progression will be fed from the card hopper 80 and near the end of the first feeding cycle, the card lever contact 102 will close and such closure will cause energization of the relay R1. The start key 136 must now again be depressed or alternatively it may be held depressed to effect feeding of the second card. Thereafter, when the card lever contacts 102 open between cards the relay R1 will be maintained energized by the holding circuit established through relay contacts R1a and cam contacts CC3. Relay contacts R1b and contacts R5a maintain magnet R5 and clutch magnet 72 energized until film contacts 108 open or until the cards in the card hopper 80 are exhausted, whereupon relay R1 will be deenergized. Recording may also be interrupted by depressing a stop key 138 which will break the control circuit.

With relay R1 energized and upon closure of cam contact CC4 in the following cycle, relay R2 will be energized and it will be maintained energized by relay contacts R2a and by cam contacts CC5. Near the end of this cycle of operation cam contacts CC1 close, and with contacts R2c closed, a circuit will be completed to energize relay R4. The relay contacts R4a close and a circuit is thereby completed from the high voltage source line 132, through the resistor 140, through contacts R4a now closed, through condensers 142 and to the other side of the line 134. Near the end of the cycle, relay R3 is energized through cam contacts CC6 and relay contacts R2b. Relay R3 is maintained energized by its contacts R3a and cam contacts CC1. At the end of this cycle the leading edge of the card will be aligned with the center of the slot 120. During the next cycle a condenser discharge circuit is completed to the flash tube 104 at each index point under control of the emitter 46 (EM1 in Fig. 6). This circuit extends from the flash tube 104, through the line 144, the appropriate one of the condensers 142, through the emitter 46, through contacts R3b, through line 146, and back to the tube 104. At any index position of the card where a perforation appears, the corresponding transilluminating character of the character drum will be recorded on the film 122 in the camera. Near the end of the cycle cam contacts CC2

close to complete a circuit through relay contacts R3c to energize film feed magnet 110.

Having explained the invention in an exemplary form, it is contemplated that the practice thereof be not limited to the specific form illustrated and described, but that various changes and modifications within the spirit of the invention may be made.

I claim:

1. In a photographic recorder having means for advancing a photographic film through an exposure zone and a continuously rotating, character carrying drum on which a plurality of columns of transilluminatable characters are arranged, the combination of a lamp within the drum, an exposure position at which the characters on the drum may be transilluminated, a closed guide course extending in close proximity about a substantial peripheral portion of said drum through which perforated record cards may be fed into contact with the periphery of the character drum at said exposure position, means for feeding perforated record cards and moving said cards continuously through said closed course in synchronous movement with the continuously rotating drum, means for instantaneously flashing said lamp as the characters on the drum are successively presented at said exposure position, so as to project onto said photographic film an image of any character on said drum which is in registry with a perforation of a record card at said exposure position and when said lamp is flashed, and means for operating said film advancing means to move the film a distance equivalent to at least one line space after each of said cards has moved past said exposure position.
2. In a photographic recorder having means for advancing a photographic film through an exposure zone and a continuously rotating, character carrying drum on which a plurality of columns of transilluminatable characters are arranged, the combination of a lamp within the drum, an exposure position at which the characters on the drum may be transilluminated, a closed guide course comprising a plurality of guide plates extending in close proximity about a substantial peripheral portion of said drum through which perforated record cards may be fed into contact with the periphery of the character drum at said exposure position, continuously rotating feed rollers associated with said guide plates for feeding perforated record cards through said closed course, a single continuously operating drive motor, intermeshed gears continuously connecting said drive motor, said feed rollers, and the drum for effecting continuous synchronous operation of said rollers and the drum, means for instantaneously flashing said lamp as the characters on the drum are successively presented at said exposure position, so as to project onto said photographic film an image of any character on said drum which is in registry with a perforation of a record card at said exposure position and when said lamp is flashed, and means for operating said film advancing means to move the film a distance equivalent to at least one line space after each of said cards has moved past said exposure position.
3. A photographic recorder in accordance with claim 1, in which said exposure position is an elongate slot parallel to the axis of said drum and a single character in width, and in which said lamp is a single elongate lamp disposed within said drum parallel to the axis thereof and adjacent to said exposure position.

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4. In a photographic recorder having means for advancing a photographic film through an exposure zone and a continuously rotating, character carrying drum on which a plurality of columns of transilluminatable characters are arranged, the combination of a magazine for a plurality of perforated record cards, means for successively moving said cards from said magazine, means for moving the successive cards continuously through a closed guide course extending in close proximity about a substantial peripheral portion of said drum, the last named means comprising a plurality of card feed rollers, certain of which cooperate with said drum to move cards therebetween, said card feed rollers and said drum being arranged at such locations along said closed course that a card passing along said course is always under the control of at least one pair of drive means including said rollers and said drum, said card feed rollers and said drum being so constructed and arranged that cards will be brought successively into registry with predetermined portions of said drum, so that predetermined characters on said drum will appear through particular perforations of said cards respectively, a single elongate light source disposed within said drum and extending parallel to the axis thereof, an exposure position at which said

characters on said drum may be transilluminated, said exposure position extending lengthwise of said drum parallel to the axis thereof and being a single character in width, a common drive means for positively continuously driving said drum and all said rollers, means for instantaneously flashing said light source as each row of characters on said drum is successively presented opposite said light source at said exposure position, and means for operating said film advancing means to move the film a distance equivalent to one line space after each of said cards has moved past said exposure position, all the aforesaid means being so constructed and arranged that said light source is effective to project onto said film an image of any character on said drum which is in registry with a perforation of a record card at said exposure position when said light source is instantaneously illuminated.

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