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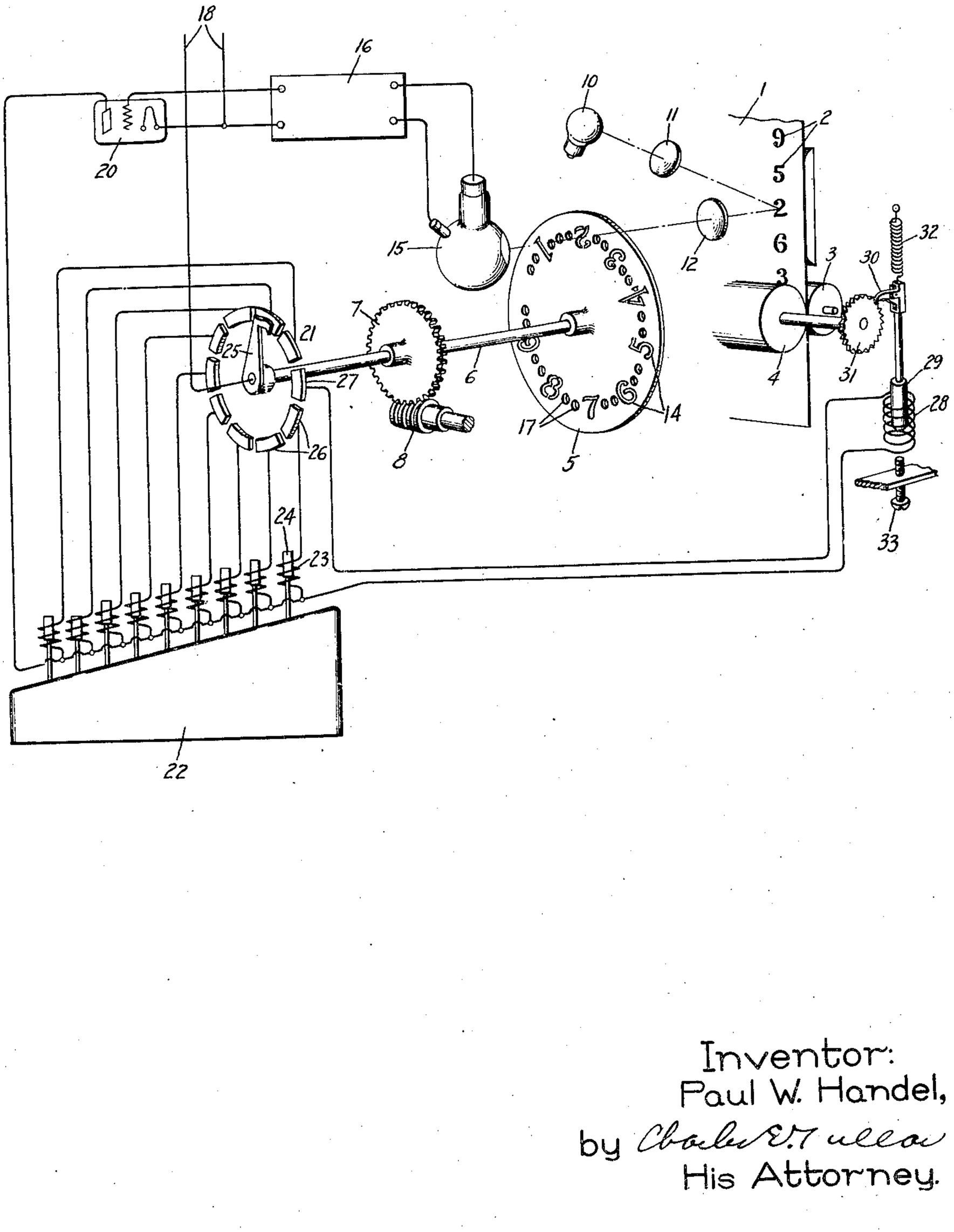
STATISTICAL MACHINE

Filed April 27, 1931



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STATISTICAL MACHINE

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My invention relates to statistical machines of the type in which successive comparisons are made between a character and a character image, photo-electric apparatus being employed to respond to a coincidence of a character and image. It is the object of my invention to provide an improved machine of this type which is simple in construction, reliable in operation and inexpensive to manufacture.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the single figure of the drawing which illustrates the preferred embodiment of my invention, I have shown at 1 a card or sheet having thereon a series of numbers 2 which are to be added. The card 1 is shown supported for vertical movement between the rollers 3 and 4, the latter of which, by means subsequently to be described, is arranged to be moved step by step an amount sufficient to move the card a distance corresponding to the spacing of the figures thereon. Arranged opposite the card is the stencil 5 shown as a disc having digits 1 to 9 inclusive stenciled therein and mounted on the shaft 6. This shaft is adapted to be rotated by hand or by electric motor through the worm gear 7 and worm 8. By means of the light source 10 and condensing lens 11, the card 1 is brightly illuminated in the region of one of the numbers 2 thereon and by means of lens 12 an image of the illuminated number is formed on the disc 5. The stenciled numbers 14 on disc 5 are so shaped and proportioned that they are exact duplicates of the images of the numbers used on card 1 and as the disc is rotated there is one position in each rotation of the disc in which the image formed thereon exactly coincides with one of the stenciled numbers. Hence at the instant at which the disk occupies this position, a minimum of zero value of light is transmitted through the disc. Arranged behind the disc is the photo-electric device 15 whose window is arranged to receive light passing through the stencil numbers. The output of tube 15 connects with amplifier 16 of well known construction which not only amplifies the output of the tube but also is constructed to deliver a tripping voltage to device 20, to be described later, only when the light received by the photo cell reaches a predetermined minimum or zero value. In order that the photo tube and amplifier shall not make a response due to the absence of light during the interval between the successive stenciled numbers on the disc, I have provided the small openings 17 in the disc to keep the tube illuminated during such intervals.

The output circuit of the amplifier 16 connects through the vapor electric discharge device 20 to control current flow from source 18 to the selector switch 21 and the registering device 22, which in the present case is an adding machine. This machine may be of any well known construction, the keys of which are provided with electromagnetic operating means shown for example as solenoids 23 having plungers 24 engaging the respective keys. The selector switch 21 comprises the rotatable contact 25 and the cooperating series of nine contacts 26, each contact being connected with one of the solenoids 23 of the nine keys for digits 1 to 9 inclusive. For the purpose of moving the card 1 bearing the numbers to be added a distance corresponding to the spacing of the numbers for each rotation of the disc 5, I have provided the selector switch 21 with an additional contact 27 and I connect this contact with the solenoid 28 having plunger 29 which through pawl 30 serves at each energization of the solenoid to rotate the toothed wheel 31 the proper amount to move the card 1 a distance corresponding to the spacing of the figures thereon. The plunger 29 is provided with the return spring 32 and is limited in its downward movement by the adjustable stop 33.

In the operation of the apparatus the card 1 is placed in position with the first of the series of numbers so located that its image is formed in the proper position on disc 5. The disc is then caused to rotate moving each successive stenciled number through the image of this figure. During the rotation

of the disc 5 the photo tube will continually receive light from the card 1 until the disc passes through that one position at which the image of the particular figure on the card exactly coincides with the stencil of the corresponding number, at which time the light entering the cell will be reduced to a minimum or to a zero value. At that instant an impulse will be delivered to the adding machine 22 but only that key of the latter will be operated which at that instant is included in the circuit by the selector switch 21. After each complete rotation of the disc the circuit of the solenoid 28 will be closed to cause the advance of the card 1 a distance corresponding to the spacing of the figures thereby bringing the next figure of the series in a position to be imaged on the disc when the same operation is repeated.

Under certain conditions I may prefer to omit the extra contact 27 and connect the solenoid 28 in series with the main supply circuit of the selector switch. In this case the card 1 would be advanced simultaneously with the operation of the first key of the adding machine without waiting for a complete rotation of the disc 5.

I may also prefer to make certain obvious changes in the optical system such as to reverse the positions of the lamp 10 and photo-electric device 15 in which case the image of a stencil number would be formed on the card 1, or to employ an unperforated disc carrying white figures on a black face facing the card 1, the photo-electric device in that case receiving light reflected from the disc.

For purposes of illustration I have shown and described my invention as adapted for adding a row or column of numbers, although it is not limited to such use as it is equally applicable to various other uses. For example, the disc 5 may have stenciled characters of various other forms, such as letters of the alphabet, etc., and also machine 22 may be a form of recording machine such as a typewriter.

While I have shown this apparatus in its simplest form and as adapted to add a single column of figures, it will be evident that by the use of a plurality of stenciled discs, photo tubes, amplifiers and selector switches, a plurality of columns may be added each column being arranged to operate a separate row of keys on the adding machine.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A statistical machine comprising means adapted to support a member bearing a plurality of characters, a movable member having a series of different characters similar to said characters, means for imaging a portion of one of said members on the other whereby in one position of the movable member a character and an image of the corresponding character will coincide, a photo-electric device arranged to respond to said coincidence, a registering device connected with said photo-electric device and having a plurality of operating circuits corresponding respectively with the different characters and a circuit selector therefor arranged to move with said movable member.

2. A statistical machine comprising a movable member having a series of different characters thereon, means for projecting on said member the image of a character similar to one of said characters, a photo-electric device arranged to respond to the coincidence of said image and a like character on the member, a registering device having a plurality of electromagnetic operating members and a circuit selector therefor arranged to move with said movable member for connecting the photo-electric device with the respective operating members.

3. A statistical machine comprising a movable member having a series of different characters thereon, means for projecting on said member the image of a character similar to one of said characters, a photo-electric device arranged to respond to the coincidence of said image and a like character on the member, a summation device having an electromagnetic operating member for each character on said movable member and a selector switch comprising a contact movable with said movable member and a series of contacts cooperating therewith and connected with the respective operating members.

4. A statistical machine comprising a movable member having a series of different stenciled characters thereon, means for projecting on said member the image of a character similar to one of said characters, a photo-electric device arranged behind the movable member, a summation device having an electromagnetic operating member for each character, a switch between said photo-electric device and said operating members comprising a contact movable with the movable member and a plurality of cooperating contacts connected respectively with said operating members.

5. A statistical machine comprising a rotatable stencil of different characters, means for projecting on said stencil the image of a character similar to that comprising the stencil, a photo-electric device behind the stencil, an amplifier therefor, a summation device having a plurality of keys corresponding with said characters and each provided with an operating electro-magnet, and a selector switch in circuit with the summation device and the amplifier having a plurality of fixed contacts connected with the respective electro-magnets and a rotatable contact connected to rotate with the stencil.

6. A statistical machine comprising a rotatable disc having different numbers stenciled therein, means arranged to project on

said disc the image of each of a series of numbers to be added, means for rotating the disc, a photo-electric device positioned behind the disc, an amplifier therefor, an adding machine having a plurality of keys corresponding with said characters and an electromagnet for operating each key and a selector switch for connecting the machine with the amplifier comprising a contact rotatable with said disc and a series of fixed contacts connected with the respective magnets.

7. A statistical machine comprising means adapted to support a member bearing a plurality of characters, a movable member having a series of different characters similar thereto, means for imaging a portion of one of said members on the other whereby in one position of the movable member a character and an image of the corresponding character will coincide, a photo-electric device arranged to respond to said coincidence, a registering device connected with said photo-electric device and having a plurality of operating circuits corresponding with said characters, a circuit selector therefor arranged to move with said movable member and means in circuit with said selector for moving said supporting means to advance the member bearing the characters.

8. A statistical machine comprising means adapted to support a member bearing a series of numbers, a rotatable disc having different numbers stenciled therein, means arranged to project on said disc the image of a portion of said member, means for rotating the disc, a photo-electric device positioned behind the disc, an amplifier, an adding machine having magnets for operating the respective keys corresponding with said characters, a selector switch having a contact rotatable with said disc and connected in the amplifier circuit and an electromagnetic device connected with said selector switch for intermittently advancing the supporting member.

In witness whereof, I have hereunto set my hand.

PAUL W. HANDEL.