

rectifier 152 drives it into saturated conduction early in one of the applied power pulses shown in FIG. 13, sufficient to operate the related solenoid armature 37 to release the related ball-drop mechanism. The function of diode 153, which is connected across the terminals of armature coil 36, is to protect the silicon-conductor rectifier 151 and the rectifier 136 from damage caused by induced voltages in the solenoid windings. A resistor 154 is connected to one terminal of the unijunction device 148 and provides operating bias for such unijunction device. The combination of resistor 154 and capacitance 156, connected across one terminal of photo-transistor 143 and the conductor leading to emitter terminal 147 of device 148, determines the frequency at which unijunction 148 operates as a relaxation oscillator. A resistor 157 is connected from the base 149 of device 148 to the negative lead 158 of the 26V pulsating direct current supply from rectifier 136 and provides common coupling of output impulses from unijunction transistor 148 to the gate 151 of silicon controlled rectifier 152, but holds such gate at a ground potential between gating pulses. When the rectifier 152 is triggered into conduction, its related solenoid 36 permits a ball to drop into place in one of the perforations 22 of perforated belt 8.

The interconnection circuit 10, see FIG. 21 likewise comprises well known, commercially available components arranged as shown for energizing relays for limit switches 96 and 97 and the coils of solenoids 58 and 107 in response to the opening and closing of such limit switches, as well as for starting and stopping motors 63 and 69 controlling respectively, the drive for perforated belt 8 and forward gear belt 72 as well as the return motor and return gear belt 74 in timed sequence, to move the photo-sensor head 5 first from left to right and then from right to left in the line by line screening of the pages of the text 46 on bookholder 4. Also, for effecting the operation of the ball-release solenoids 36 to drop the requisite number of balls 21 from hopper 9 and the deposition thereof in perforations 22 transversely of the endless perforated belt to build or assemble replicas of the characters delineated on the pages of the text 46, such as the words "I read" designated by the reference numeral 44. The circuit 10 is provided with a pair of holding coils 161 and 162 controlled by the diodes 163 and 164, respectively, to maintain current flow in the circuit despite the opening of limit switches 97 and 96, respectively, for recurrently stopping the primary motor 63 and starting return motor 69, and vice versa, during the sequential scanning of the lines of characters delineated in the pages of the text 46. Suitable resistors 166 and 167 as well as capacitors 168 and 169 are connected across the holding coils 161 and 162 which are fed from diodes 163 and 164, and across these holding coils and limit switches 97 and 96, respectively. A conventional solid state governor or motor speed control 171 is connected in series with primary motor 63 for controlling its speed as well as the moving belt assembly containing the bi-directional gear belts 72 and 74 and the solenoids 58 and 107. The power supply switch controls can be connected into circuit 10 on a suitable panel, designated generally by the reference numeral 172 for opening and closing the various circuits.

While any suitable means can be employed for movably mounting the bookholder 4, we preferably use the same type of mount as employed for movably mounting

the sensor head and carriage 6. As shown at the lower left of FIG. 6, this mount for the bookholder includes a base 173 which is fashioned with races to receive a plurality of ball bearings 174 upon which a slidable member or carriage 176 is mounted and rides; such carriage 176 being directly connected onto and supporting the bookholder which in turn is fastened to the linear actuator 111.

The 117-120 volt alternating current supply for the interconnection circuit of our present embodiment of reading machine for the blind may comprise the conventional voltage regulator circuit 181, see FIG. 14 of the annexed drawings, wherein the output of the secondary of the transformer at approximately 24 volts alternating current is fed through a silicon bridge rectifier to provide the pulsating direct current for operating the integrated circuit voltage regulator which provides precisely regulated 20 volt dc for the operation of photo-transistors 143 and unijunction transistors 148.

It is to be understood that variations or modifications within the scope of our present concept are intended to be embodied in the subject of the appended claims.

We claim:

1. A reading machine for the blind comprising, in combination with a sheet on which lines of character are delineated, an endless belt having a plurality of circular perforations therein, means for moving said endless belt, a plurality of spherical bodies for removable placement and retention in some of said perforations and in partial relief in relation to said endless belt, and means for positioning said spherical bodies in said circular perforations in the form of a line of characters corresponding to a line of characters delineated on said sheet for tactile sensing by a blind person.

2. A reading machine for the blind as set forth in claim 1 wherein said endless belt has a read-out section in which said spherical bodies are removably retained for tactile sensing by a blind person, and a drive belt underlying said endless belt for holding said bodies in said read-out section of said endless belt and in partial relief in relation to said belt for tactile sensing by a blind person.

3. A reading machine as set forth in claim 2, wherein said drive belt moves away from underlying relation to said endless belt at one end of said read-out section of said endless belt to permit said spherical bodies to drop by force of gravity from said perforations, and a hopper for receiving and retaining said spherical bodies dropped from said endless belt at one end of said read-out section thereof.

4. A reading machine for the blind as set forth in claim 3, and a plurality of solenoids for releasably holding said spherical bodies in said hopper until released therefrom upon energization of said solenoids.

5. A reading machine for the blind as set forth in claim 4 and an electronic circuit containing said solenoids, and a plurality of light-responsive sensors each co-related with a separate solenoid connected into said electronic circuit to effect energization of said solenoids and release of said bodies from said hoppers onto said endless belt for the building of a line of characters thereon to be read by a blind person using the tactile sense.

6. A reading machine for the blind as set forth in claim 5, and means for actuating said sensors by scanning the characters delineated on said sheet.