APPARATUS FOR PERFORMING RAISED DOT FORMATIONS

The invention relates to an apparatus for performing raised dot formations, said apparatus comprising a running belt forming an endless loop and having a great number of holes adapted to receive balls therein. Particularly said dot formations are meant to represent symbols of the Braille-code type readable to people with visual defects.

Books suitable for reading by blind people generally consist of pages of stiff paper material wherein the Braille symbols are formed by raised dots or embossments grouped in matrices of 2×3. The absence of one or more of the six dots in the matrix makes the symbols distinguishable and each representative of the corresponding alpha-numerical character. Such books are hard to manufacture and expensive, and are also bulky and difficult to handle.

The object of the invention is to replace such permanent registration of literature or the like by a running and temporary exposition of successive small parts of the matter in question and to make said exposition readable to people with visual defects.

In an apparatus of the above-mentioned kind the object of the invention is reached in principle by filling a great number of holes in the running endless belt with balls, sorting-out certain balls in a group of holes at a sorting station so as to form a Braille symbol of dots represented by balls extending above the upper face of the belt, reading-off the symbol by tactile perception at an exposition area and then erasing the symbol by filling all holes anew with balls for the next turn of the belt. The essential characterizing features of the apparatus according to the invention are set forth in the following claims.

The invention will now be more closely described with reference to the accompanying drawings, in which

FIGS. 1–3 refer to a first embodiment of the apparatus according to the invention.

FIG. 1 shows the same as viewed from a vertical longitudinal plane,

FIG. 2 is a view taken from above, and

FIG. 3 is an enlarged perspective view of a fragment of the apparatus taken at an inclined angle from above.

FIG. 4 shows a first modification of the details of FIG. 3.

FIG. 5 shows a second modification thereof in vertical section.

In the drawings, an endless belt **11** is laid in a loop around two parallel rollers **13, 15** rotary about generally horizontal axes **14, 16**, one of them driven by a motor **17** (or other powering means). The belt is moved in the direction of the arrow without slippage, perforation holes **19** at the edge of the belt engaging pegs **21** on the roller **15**. The belt comprises an upper substantially horizontal or slightly inclined path **18**, a semicircular path **20** around the roller **15**, a lower substantially horizontal or preferably slightly upwardly inclined path **22** and a semicircular path **24** around the roller **13**. Between the rollers **13, 15** the upper belt path **18** rests upon and is drawn in contact with an underlying support **23** in the shape of a table. Closely situated parallel grooves **27, 28** in the upper face of said table extend in the direction of travel of the belt **11**.

The belt is perforated by a great number of small through holes **29** adapted to receive spherical balls **31** and of a slightly greater diameter than that of the balls. The holes are arranged in longitudinal and transverse rows and are dimensioned and spaced so as to form square groups corresponding to the Braille matrix system. The balls are made of steel, but some suitable plastic or ceramic material may be used instead. A preferred diameter of the balls is of the order of 1.6 mm, and the thickness of the belt **11** is of the order of 0.2 mm.

The belt holes are filled with balls at an area A of the lower path **22** of the belt loop, and after turning around the roller **13** the belt arrives at a second area B located close to the starting end of the upper run **18** of the belt.

At said area there are provided means for selectively removing some of the balls from positions within the belt holes. Said means form a sorting station, in which selected balls are allowed to drop out by the action of gravity. From there the belt passes towards and past an exposition area C, where the pattern of Braille symbols formed by the remaining balls of a group can be read off by a blind person using his finger tips.

The sorting station B is in principle arranged as a series of traps extending in a row transversely of the belt and each positioned below a longitudinal row of belt holes. Forming part of the sorting station is a slot **25** in the support **23**, extending transversely thereof and having a dimension in the direction of travel of the belt somewhat greater than the diameter of the balls, so that balls can escape therethrough into the open space inside the belt loop.

To the sorting station B there also belongs a series of obstacles placed in said slot **25** and selectively displaceable so as to either block the passage of balls through the slot or allow the dropping of balls by gravity into the interior of the belt loop. In the shown embodiment said obstacles are formed by vertical bars **33** which extend upwardly into the slot **25**, their upper flat end faces **35** being flush with the bottoms of the grooves **27, 28**. Said bars **33** can be shifted sideways, i.e. in the direction of the slot **25**, between an active position (shown at the right of FIG. 3) and an inactive position (shown at the left of FIG. 3). In the active position any bar end **35** forms a "bridge" which supports the balls of a corresponding longitudinal row of balls during their passage of the slot **25**. In the active position the bars allow balls to pass through the slot and the thus downwardly opened escape way, as indicated by the line **37** and three intersecting circles in FIG. 3.

In one embodiment shown in FIGS. **1** to **3** said bars **33** consist of ceramic material which due to the piezoelectric effect will bend under the influences of electric control impulses, their upper ends **35** moving in the slot **25**, as explained, while their lower ends are rigidly attached. A control device **39** supplying said electric impulses to the bars is controlled by a computer **40** connected to a manually operable keyboard **42** or some other input means, such as a punched tape, a disk record or a data memory, supplying the text to be presented at C either in alpha-numeral form or in digital form. The computer transforms the characters of this information into Braille-code and serves it to the control device **39**. The computer **40** also controls the motor **17** in order to synchronize the movement of the belt (either continuous or stepwise) with the operation of the bars. The speed of the belt can also be controlled manually.

The balls sorted-out drop down into a closed spaced bordered by the belt loop and two opposed end walls **41** of an enclosing cover. Beneath the sorting station B there is inserted a ball catching ramp **43** which diverts