

the rolling balls towards the roller 15. They are collected close to said roller to form a store 45 of balls resting upon the lower run 22 of the belt.

Said store supplies balls for refilling all empty holes of the belt. A possible excess of balls will be pushed back by a scraping means 47 before the belt turns around the roller 13 and starts a new turn.

The apparatus thus far described may be completed by printing means for transmitting the Braille-readable tactile perceptible ball configuration into permanent impressions in a web of sheet material. Said printing means comprises a roller 55 having an external surface of yieldable material, about which a web 59 of sheet material is looped. The axis 54 of said roller is journaled in eccentric bearings 56 which are turnable by means of a handle 57. By manipulating the same the roller can and will be shifted from an off-lying inoperative position into the shown active position, in which it presses the web against the balls extending through holes of the running belt.

In the modification of FIG. 4 the support table 23 has a completely flat upper face, i.e. it has no grooves as in FIG. 3. Here the belt consists of rubber and has a thickness of the order of 0.7 mm, i.e. it is approximately as thick as half the diameter of the balls, in order securely to retain them in the holes and to expose a part of the ball tops conveniently large for the tactile sensing of the Braille symbols.

FIG. 5 shows a further modification consisting in that the ball selection takes place by the use of magnetic forces. Above each longitudinal row of belt holes and opposite to the slot 25 of the support table 23 there is placed an electromagnet 61 in such a position that the balls 31 roll or slide along its pole shoe 63. When electric current is supplied to the electromagnet, the same keeps the ball attracted during its passage of the slot 25, thus preventing it from dropping therethrough. On the other hand, when the electromagnet is shut off, the gravity force prevails, and therefore the ball will drop freely through the slot 25.

At the exposition area C the ball patterns are presented as on a book page, several parallel rows of consecutive characters being shown simultaneously and readable in the transverse direction of the belt. According to a modification, the Braille characters may be read lengthwise of the belt, and in that a case a simplified version of the apparatus may comprise a belt having merely three longitudinal rows of holes.

From the above it is evident that an apparatus is created, by the use of which people with visual defects are given the possibility of taking part, at a desired moment, of literature recorded in other forms than by Braille code, and that other messages can be transmitted to them without significant delay otherwise than orally.

Of course, the above-described apparatus may be modified in several respects within the framework of the following claims.

What is claimed is:

1. Apparatus for producing raised dot formations, comprising a belt mounted for movement along a looped path, said belt forming an endless loop, said belt being perforated by a plurality of holes of predetermined and substantially equal size and each for receiving a ball therein, said path having an upper portion above another portion thereof and said upper portion having an underlying support means for supporting the said balls received in the said holes, said belt having an upper face and being of a smaller thickness than the

diameter of said balls, said balls, when received in a respective said hole, having their uppermost parts extending above the upper face of said belt so as to be freely accessible for tactile perception, the apparatus further comprising means for filling empty holes with balls at a first area of the belt along said looped path, and means for selectively removing some of the balls from selected holes at another, second area along said looped path, said holes being dimensioned and grouped in a readable Braille dot matrix arrangement, said means for selectively removing balls comprising a sorting station having means for releasing selected balls in selected holes by allowing the balls to drop away from said belt under the action of gravity and to collect said released balls in said first area, said sorting station comprising a downwardly directed, selectively blockable escape in the shape of a slot formed in said belt support means and having a horizontal dimension in the direction of travel of the belt significantly greater than the diameter of a ball, a plurality of obstacles being disposed in said slot and each being selectively displaceable to either block or allow the dropping of a ball through said slot, said obstacles comprising piezoelectric bars fastened at one end and bendable under the influence of electric control signals controlled by a computer.

2. Apparatus as recited in claim 1 characterised in that said ball selectively removing means comprises a plurality of electromagnets located above said looped path and positioned to, when energized, hold a ball in a belt hole means in which it is disposed so that the ball will not drop out of said belt hole, means and when de-energized not providing a ball holding action.

3. Apparatus as recited in claim 1, characterised in that beneath said sorting station there are provided ball catching ramp means for directing balls towards the another portion of said path of the belt to form a store of balls thereupon, from which empty belt holes are refillable.

4. Apparatus as recited in claim 1, characterised by the provision of printing means for transmitting the Braille-readable tactile perceptible ball configuration into permanent impressions in a web of sheet material.

5. Apparatus as recited in claim 4, characterised in that said printing means comprises a roller having an external surface of yieldable material, about which the web is looped, means being provided for selectively moving said roller into a position pressing against balls extending through holes of the running belt.

6. Apparatus for producing raised dot formations comprising:

a belt, having a selected thickness and forming an endless loop, said belt being perforated by a plurality of holes of a selected size and each for receiving a ball therein, said holes being dimensioned and grouped in a readable dot matrix system;

means for mounting belt for movement in a looped path;

a plurality of balls for receipt by said belt holes, each ball having a diameter which is greater than the thickness of the belt and so that a portion of a ball extending into a hole in the belt will have a portion extending outwardly from the belt;

means for supplying said balls to said belt at a first area thereof along its looped path, for disposition in said holes; and

means for selectively removing some of the balls from positions within belt holes at another, second area along said looped path, said selectively remov-