

READING AND WRITING MACHINE USING RAISED PATTERNS

CONTRACTUAL ORIGIN OF THE INVENTION

The invention described herein was made in the course of, or under, a contract with the UNITED STATES ATOMIC ENERGY COMMISSION.

BACKGROUND OF THE INVENTION

At present there is a large unbalance between the availability of printed and written material to the sighted and to the blind. The blind have access to recorder material primarily through braille writings and sound recordings. While these two media do not conflict but rather complement each other, the sound recordings have certain disadvantages.

Only a small amount of sound recorded material is generally available; thus sound recordings for the blind must be specially prepared by individuals who read aloud from written material that a blind person wants to study. Access to a particular portion of sound recorded material is not convenient. Furthermore, it is known that peripheral stimulation of senses not directly involved is often advantageous in performing work. This is particularly important for a blind reader, whose connection with the outside world is predominantly auditory. When "reading" is done by ear, the auditory peripheral stimulation becomes confusing rather than helpful.

The braille system of reading uses tactile recognition of raised dots on a page to convey information to the reader who perceives the dot patterns in a manner comparable to a sighted reader's seeing letters. The braille pages are relatively easy to index, so there is good random access to the material. Braille writers have also been developed so that the reader can take notes and prepare material for others to read. Braille has the advantage of being able to be read at a very rapid speed not substantially different from the speed commonly achieved in reading ink print material by sighted people. A further advantage is that the braille material can be read at a desired speed, while recordings must be listened to a predetermined speed. A braille passage can be read and reread as desired, while this is not convenient with a recording.

However, braille has a very large drawback in that the braille material is necessarily very voluminous; its bulk is approximately 50 times that required for corresponding ink print material. Furthermore, braille material must be translated from ink print material because there is not a simple (one to one) correlation between the two. Therefore translation, rather than simple substitution of one character for another, is required. The bulky material, together with the need for translating, causes the braille material to be very costly and it is available only in very limited scope.

Modern printing systems have been developed which use tape for setting the printing type. Computer programs have been developed which will translate the print tape into a braille tape at low cost. However, the extremely large bulk of the braille material and the cost of manufacturing a braille book limit the availability of braille material even if these techniques are used.

Certain machines have been developed which will present braille symbols to the reader in response to a tape input. However, these machines have themselves been relatively bulky, inconvenient to use and expensive. While some of these machines have provided an indexing system, this system is of limited value. In addition there is no provision on these machines for writing, and in particular annotating, the material read.

It is therefore an object of this invention to provide and improved reading and writing machine using raised characters and in which the bulk of the material used to store the desired information is extremely small.

Another object of this invention is to provide a reading and writing machine using raised characters and having a reading speed controllable by the operator.

Another object of this invention is to provide a reading and writing machine using raised characters wherein the cost of the reading material is low.

Another object of this invention is to provide a reading and writing machine using raised characters which does not require the operator to learn a new reading skill.

Another object of this invention is to provide a reading and writing machine using raised characters which gives easy and fast random access to any page, subject volume, etc.

Another object of this invention is to provide a reading and writing machine using raised characters which has a writing feature so that the reader can annotate material or write original material.

Another object of this invention is to provide a reading and writing machine using raised characters which is lightweight, portable, easily operated and has low power consumption so that the operator can use it at any desired location.

SUMMARY OF THE INVENTION

In practicing this invention, a machine is provided having a belt upon which raised characters are formed and a magnetic tape having information stored thereon. The machine "reads" the information stored on the tape and from this information develops the patterns of raised characters on the belt. The tape is capable of storing reading material and is indexed so that any desired portion of the tape can be quickly and automatically found. In addition, a portion of the tape may be reserved so that the machine operator can make notes on the tape. The note-making feature of the machine can also be used by the operator to place information on a blank tape, which can then be used by another operator in a similar machine.

The drive mechanism for the machine provides a fast forward or fast reverse movement as well as an intermittent or stepping tape transport. The tape is driven directly from the periphery of the tape coils wound on supply velocity without the need for complicated variable rotary speed tape-driving mechanisms.

The belt is a plastic material upon which "bubbles" have been formed in a desired pattern. The "bubbles" are bistable in that they can be pushed to one side or the other side of the belt and will remain in either position. In operation, a portion of the machine sets all of the bubbles so that they are on one side of the belt. A solenoid-actuating mechanism selectively pushes desired ones of the bubbles to the other side of the belt to form the raised characters to be read by the machine operator.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is shown in the drawings, of which:
 FIG. 1 is a perspective drawing of the machine;
 FIG. 2 is a view of the belt mechanism of the machine;
 FIG. 3 is a view of the belt and solenoid actuators;
 FIG. 4 illustrates the belt, bubble and magnetic track patterns;
 FIG. 5 illustrates the arrangement of information on the magnetic tape;
 FIG. 6 shows the code pattern used on the magnetic tape; and
 FIG. 7 is a block diagram showing the logic used to control the machine.

DETAILED DESCRIPTION OF THE INVENTION

While the machine described can be used with any system using raised patterns to convey information, it will be described as a machine for reading and writing braille.

Referring to FIG. 1, an endless belt 10 is held by wheels 11, 12, 14 and 15. Wheel 12 is driven by motor 18 through shaft 19, variable speed transmission 22 and shaft 24 so that the belt moves in the direction of the arrow 26. The operator places his hands on belt 10 with the raised braille characters thereon moving under his hand, permitting the operator to read the in-