

magazine 16. The record material 20 extends from the spiral 10 to the spool 22, and passes between the arcuate guide 24 and the opening 25, the guide rollers 23 serving to guide the material through the space therebetween.

When the magazine is in playing position on the reproducer 15, as is shown in Figure 1, driving spindles 31, 32 extend, respectively, into the hollow spools 21, 22 and splines 33 on the spindles lock with grooves in the hollow spools so that as the spindles 31, 32 turn under the driving power of motor, the two spools 21, 22 are rotated. In the "play-back" position the opening 25 in the edge 26 of the magazine registers with an opening 35 in a vertically extending portion 36 of the reproducer unit 15, and as the motor rotates the spools 21, 22 in a forward direction the record medium moves from right to left carrying successive indicia past the opening 35.

The indicia, indicated by reference character 38, corresponding to numbers and letters may be arranged on the record carrier 20 in accordance with Braille convention and may comprise a plurality of black dots printed on the paper, or black areas photographed on film or other light-sensitive material, as is well known in the sound-on-film art and as is shown in the aforementioned Staar application. Many other suitable arrangements are also shown in that application.

As is known the Braille system makes use of six raised dots to indicate different letters of the alphabet and to indicate different numbers. All six dots are not used for each letter. Thus, for example, the words "Blind Reader" are spelled out on the label 19 in Fig. 1. Reproduced on a larger scale the words "blind reader" appear as follows in Braille.

```

B L I N D R E A D E R
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .

```

It will be seen that certain letters like N and R require 4 dots, and it will be seen that the dots representing the letters lie in two columns of three positions each, though certain letters like B, L, A have dots which appear in only one of the two possible columns.

In order to reduce the length of the record member 20 it is preferable though not essential, to use only one column of dots having 6 possible positions for dots, as follows:

```

B L I N D R E A D E R
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .

```

Such an arrangement cuts to about one-half the required length of the record member 20, though it does increase its width. The increased width is not considered to be a disadvantage as the record member is made of thin, light-weight material and the added width gives it additional strength.

The letters in the words "Blind Reader" do not happen to illustrate the use of a dot in the sixth position. In Braille practice the sixth position is not used very much as it is associated with letters which are infrequently used.

Within the reproducer unit 15 there is mounted a suitable system for reproducing the indicia and for actuating a plurality of banks of plungers, as is shown in Figure 4. The first bank of plungers comprises six blunt pointed pins or plungers 41, 42, 43, 44, 45, 46 which extend in a direction perpendicular to the perforated plate

47 and have their upper ends in six holes in the plates; and the second bank of plungers comprises pins or plungers 41', 42', 43', 44', 45' and 46', similarly mounted, with their ends in six holes in the plate 47'. Normally the end of each pin is just below the top surface of the plate with which it is associated but as an indicia 38 in a particular position on the record member 20' passes the opening 35 it causes, through the pick-up system, the pin corresponding to its position in the first bank to be raised slightly above the surface of the plate 47 so that the blind person can feel it, and after a short time delay the corresponding pin is raised above the surface of the plate 47'. Thus, as the record material moves past the opening 35 the pins 41 to 46 and 41' to 46' each form successive Braille letters above the surface of the plates 47 and 47' corresponding to the successive indicia on the record member 20' which pass the pickup, and a blind person by holding a finger on the plates so that it covers the holes for the pins will be able to read the message recorded on the record member 20'.

By providing two or more banks of plungers which are similarly actuated by the indicia on the record member but with a slight time delay between the actuation of the successive banks of plungers it is possible to give to the reader an almost exact duplicate of what he feels when reading a Braille book. Experienced Braille readers often utilize two or more fingers on the Braille dots when reading, the leading fingers giving them a "presense" of the character to be sensed by a following finger. It is believed that it is this "presense" which permits the reader to read rapidly as the reader's brain sums up the impressions gained from his several fingers. The time delay between the finger station 47 indicating a given letter and the station 47' indicating the same letter remains in the reader's mind, giving an impression of having had the letter under his second finger for a longer length of time. Thus it is possible to drive the record member past the pickup means at an appreciably greater rate of speed.

One pickup system which may be used to reproduce the recorded indicia is of use with a record member which has portions of different light-reflecting qualities. For example, black dots on white paper, white dots on black paper, black dots on predominantly clear film or the like. The system is shown schematically in Figure 4, and comprises a light source 50, preferably of high intensity, positioned so that its light strikes the record medium 20' at an angle. The light is of considerable extension across the width of the record member, and the width of the light opening 49 in the reflector 51 should be about equal to the width of one "letter" on the record member. The light which reflects from the record member 20' is "picked up" by six photoelectric cells, all of which preferably are mounted within one envelope 53, and the output from each cell is used, respectively, to control one of six sensitive relays 60-65. Six short light-transmitting tubes 66 are positioned in order to efficiently transmit the light which reflects from the record member 20' directly to the photoelectric cells, and in order to effectively segregate the light so that each photocell is controlled only in accordance with the presence or absence of indicia in its particular portion of the record member. Thus the electrical output from each of the six photoelectric cells varies in accordance