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PRINTED MATTER FOR BLIND READING AND METHOD OF PRODUCING THE SAME

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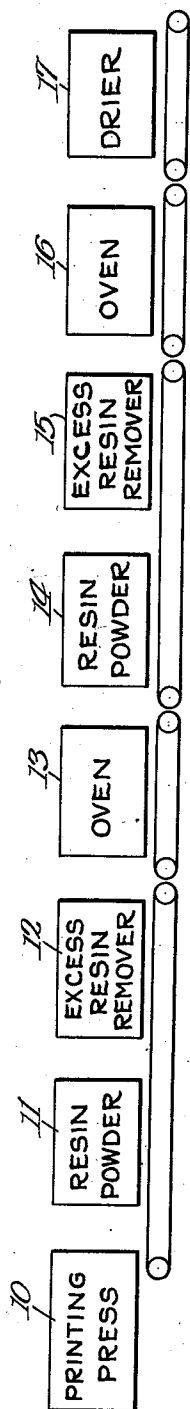


Fig. 1

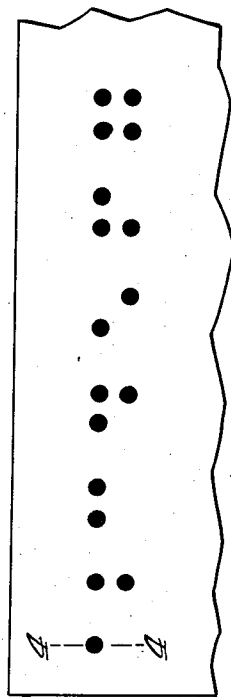


Fig. 2



Fig. 3



Fig. 4

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PRINTED MATTER FOR BLIND READING AND
METHOD OF PRODUCING THE SAME

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7 Claims. (Cl. 41—24)

This invention relates to printed matter for the blind and, more particularly, to improved raised characters for blind touch reading and a method of producing the same.

At the present time the most prevalent system of blind reading is the Braille system of raised dots in various combinations, although other systems have been practiced and are being used to a limited extent. As a general rule, all the systems employ raised characters ranging from fourteen thousandths (.014) to twenty-five thousandths (.025) of an inch in height which are touched by the fingers of the blind in order that reading may be accomplished. For over a century, the raised characters or dots have been formed from the body of the paper sheets themselves by the embossing method requiring fragile and expensive male and female dies of zinc, lead or other materials which are capable of producing only a limited number of copies and which punch up and form the raised characters from the paper itself. Another method utilizes relatively expensive typewriters for punching up the characters from the paper sheets. Inasmuch as such raised characters are formed from the sheets themselves and in order that the characters may possess some degree of strength to maintain their bodily shape and height, a heavy type of paper is required which is not only expensive but also very bulky and, consequently, the printing of the average length novel is accomplished only in many thick volumes which are heavy and space consuming, thereby increasing the cost of handling and maintenance.

The life of the blind reading books produced by the foregoing methods is relatively short, because the raised characters of paper are broken off or become flattened to such an extent that they are rendered blurred and insensitive, and accurate and easy reading by the blind is made difficult. The flattening and destruction of the raised paper characters are due to the pressure to which they are subjected by the fingers of the blind in reading and also to the rubbing together of the sheets and pressure in ordinary use such as when the book is slammed or squeezed into a tight space on a bookshelf. Such sheets cannot be repaired satisfactorily if a few of the raised characters have been destroyed and the entire sheet must be replaced at great expense.

As a consequence of the raised characters of the paper being broken and their tops knocked off or loosened, rough fibers of the paper are presented to the fingers of the blind which, after continuous reading, become irritated, sore and

overly sensitive, thereby causing great discomfort to the reader and increasing the nervous strain of blind reading, which is considerable even under favorable conditions. The rough fibers are also found in newly embossed paper sheets due to the disruption and breaking of the fibers by the male die as it forces up the paper to form the raised characters.

Various attempts have been made to prevent collapse of the raised paper characters such as by varnishing the reverse side of the embossed paper sheets, by filling up the raised portions with a substantially solid material, or by embossing wet sheets of paper which become hard and stiff when dry. However, such attempts, entailing added and expensive steps, have proved ineffective. The varnishing and hardening processes, in addition to being more expensive, caused a hardening or stiffening of the paper fibers of the raised characters and, as a result, increased their capacity to scratch and irritate the fingers of the blind.

The great expense of production of blind reading books by the old processes described briefly above has necessarily restricted their variety and distribution inasmuch as the available charitable funds are limited. The supply of such Braille books falls far short of the great demand and an increase of such supply produced by the old paper embossing methods would be possible only by an increase in the available funds.

It is, therefore, an object of this invention to provide an improved raised character for blind reading and a rapid, simple and inexpensive method of producing the same.

Another object is to provide raised characters for blind reading which are noncollapsible and substantially indestructible and capable of long life.

A further object is to provide raised characters for blind reading which present smooth nonirritating surfaces to the fingers of the blind reader.

The novel features believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its form and method of production, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the accompanying drawing in which Figure 1 is a diagrammatic view of the apparatus for accomplishing the steps of my process of producing raised characters of sufficient height for blind reading; Fig. 2 is a plan view of a portion of a sheet having thereon raised dots of the

Braille system with which this invention is illustrated although it is applicable to other blind reading systems employing raised characters; Fig. 3 is an enlarged sectional view of a partially formed character; and Fig. 3 is an enlarged sectional view of my improved Braille raised character taken on the line 4—4 in Fig. 2.

My process of producing raised blind printing may be classed in the old art of thermography in which characters are printed on a sheet and, before the characters have dried, a resin or fusible material is sprinkled on the sheet, some of the fusible material adhering to the printed characters. After the excess nonadhering material is removed, the sheet is subjected to heat to fuse the material, which, upon drying, produces printing in relief. Printing by such a process produces characters of slightly raised effect to the eye to simulate characters produced by the more expensive engraving process, and such characters on the average attain maximum heights of approximately eight thousandths (.008) of an inch, an insensitive height for practical and efficient blind reading. However, the process of my invention, although utilizing the basic principles of thermography, has so extended such principles that raised characters produced thereby have attained heights on an average of seventeen thousandths (0.17) of an inch, such heights never having been attained before in the thermographic art. The raised characters so produced by my process, which will now be described, are very pronounced in relief and easily discernible to the fingers of the blind.

Referring now more particularly to Fig. 1 of the drawing, there is illustrated diagrammatically the apparatus employed in practicing the steps of my process of producing my improved raised characters for blind reading. A sheet of paper of any proper weight and thickness is first inserted in the printing press 10 which for the purposes of this invention may be of any one of the conventional types of printing presses but having the printing type formed to produce the blind reading characters or Braille dots. The printing type of the press may be set by any of the modern type-setting machines such as the Linotype machine, the Monotype machine and others. The printing press 10 employs, preferably, a stiff or tacky slow-drying ink which may be of the type illustrated by the Schneider Patent No. 1,966,907, although other thermographic inks and materials may be employed in practicing my invention. The ink or material with which the characters are printed should be of such nature as to give permanent adhesion of the fused material to the paper. The type members of the press 10 do not cause any deformation of the paper sheet upon printing but merely deposit the ink on the surface of the paper in a thin film.

As the printed sheet is ejected from the printing press 10, it falls on a conveyor belt which carries the sheet under an open hopper 11, containing a fusible material or resin powder, where it is coated with a thin layer of the resinous powder. The resinous powder adheres to the tacky ink defining the blind reading characters and the excess loose powder is removed from the surface of the sheet as it continues on the conveyor under a suction device 12, immediately following the hopper, which returns the unused nonadhering powder to the hopper 11 for reuse. The sheet with the printed Braille dots having the resin powder adhering thereto is then conveyed

under an oven 13 where heat is applied in a sufficient amount to cause fusion of the resinous powder without causing the fused material to flatten and spread beyond the limits of the characters defined by the ink as initially printed by the press. Fig. 3 illustrates the height of the dot as it passes from the first oven 13.

The partially formed Braille characters are still sticky when the sheet emerges from the oven 13, and the next step in my process is to coat the sheet with another layer of resinous powder as it passes under a second hopper 14. A substantial amount of this second application of resinous powder adheres to the sticky fused material defining the partially formed Braille dots and the excess powder is removed from the sheet by a second suction device 15 immediately following the hopper 14 in the line of apparatus. When the resin powder is sprinkled on the sheet the second time, the resin particles tend to adhere only to the relatively level central portion of the partially formed sticky fused Braille dots, and those particles falling on the relatively steep outside or circumferential portions of the dots do not adhere as readily and mostly spill onto the paper. The sheet is then passed under a second oven 16 where heat is applied in an amount sufficient to fuse the second application of resinous powder on the top surface of the central portion of the initially fused material without causing the entire fused mass to flatten and spread beyond the limits of the Braille dot as initially defined by the ink of the printing press, with the result that the characters are built up in the form of more domelike formations. As a final step in the process, the sheet is conveyed under a drier where the raised and fused characters are cooled and hardened so as to form hard and smooth noncollapsible raised Braille dots for blind reading.

In practicing my aforesaid process, it has been found that if the paper sheet was at too high degree of temperature as it passed from the first oven 13, some of the resin powder which did not adhere to the partially formed raised characters as the sheet was next passed under the second hopper 14 became fused indiscriminately over the surface of the hot sheet before the excess powder could be removed by the suction device 15. As a more positive method of controlling the heat of the paper sheet, the sheet may be cooled by a suitable cooling device (not shown diagrammatically) after it emerges from the first oven 13, and, upon cooling, may be passed through another oven (not shown diagrammatically) at a heat sufficient to render the partially formed raised characters sticky without unduly heating the sheet itself to fusing temperature. The sheet may then be passed under the second hopper 14 and the process completed in the manner described above. These two additional steps of cooling and reheating require, therefore, additional devices in the line of apparatus but a more positive control and regulation of the heat of the first oven 13 would render the same unnecessary.

The raised Braille dot produced by the foregoing process is illustrated in Fig. 4 of the drawing and is of much greater height than the dot illustrated in Fig. 3, which is the height of the dot as it emerges from the oven 13. If the dot were to be cooled and hardened at such intermediate point in my process it would be of a height insufficient for accurate and easy reading by the blind or much less than fourteen

thousandths (.014) of an inch. Although such dots would be raised in relief to some extent, they would present to the fingers of the blind substantially insensitive bodies and thus be impractical for blind reading. My process, however, is capable of producing Braille dots of fourteen thousandths (.014) of an inch in height which are capable of being read with speed and ease by experienced blind readers and also dots of greater heights for beginning blind readers. With my improved process, the height of the characters may be varied by varying the degree of granulation of the resin powder, the larger granules producing higher dots. Added application of the powder and fusion thereof may also increase their height.

The characters of fused material are sticky as the sheet emerges from the first oven 13 and are capable of causing a great deal more resin powder to adhere to their central portions when resin powder is again sprinkled on the sheet. It might be supposed that, when the sheet with its second application of resinous powder adhering to the fused characters was again subjected to heat in the oven, the great amount of fused material would, upon fusion, tend to flatten and spread beyond the limits initially defined by the printed characters as the sheet leaves the printing press. However, such is not the case and the second application of resinous powder is fused or built up on the top surface of the central portion of the already fused first application of resinous powder, and the character upon cooling and drying presents a hard pressure-resistant body projecting fourteen thousandths (.014) of an inch or more above the surface of the paper sheet.

The Braille characters produced by my foregoing process, as well as presenting very definite and sensitive upstanding bodies, have smooth and well-rounded nonirritating surfaces free from rough and minute projections such as paper fibers, and because of this smoothness, the blind are capable of reading for longer periods to their own enjoyment without increasing the nervous strain and tension of blind reading. Since my improved raised characters are formed, not from the paper sheets themselves by being pressed up through the paper by expensive dies, but by depositing a substance on the surface of the sheet without deformation thereof, a lighter and more inexpensive paper may be used with the result that Braille books may complete a novel, for instance, at a much lower cost and in fewer volumes which are lighter and more economically and easily handled. As another advantage of my improved process, well-known types of printing presses and thermographic devices may be employed so that present equipment may be used in practicing my invention without requiring specialized and expensive machines. Furthermore, any type of character, such as maps and outlines of objects that may be printed by a printing press may be reproduced in raised relief for blind reading by my improved process without increased cost. Also, Braille sheets may be produced by my aforesaid process at a rate of 2500 or more an hour, a speed which the older paper embossing systems do not approach.

My improved Braille characters of fused resinous material have hard and solid bodies that are noncollapsible and are, therefore, substantially indestructible and capable of withstanding the pressure exerted upon them by the fingers

of the blind during reading, and those pressures resulting from normal handling of the books. If, because of accident or abusive handling, some of the raised dots produced by my process are loosened from the sheet, they may easily be replaced in accordance with my foregoing process without necessitating replacement of the entire sheet.

Although the foregoing description has set forth one form of raised blind reading character and a method of producing the same, it will be understood that changes and modifications may be resorted to without departing from the spirit and scope of the invention as defined in the appended claims. For instance, the foregoing process employs a tacky slow-drying ink and a resinous powder to form my improved raised characters, but any type of thermographic fluid or semi-fluid substance, colored or colorless, that may properly be printed on paper and which will cause a substantial amount of any fusible material such as shellac and gums to adhere and fuse permanently to the paper may serve the purpose with satisfactory results.

I claim:

1. The process of producing raised characters of more than .013 of an inch in height for blind reading which comprises the steps of printing wetted material on a sheet to define blind reading characters, applying a fusible material to the characters while the characters are wet, applying heat to the fusible material to fuse the same to the sheet, again applying a fusible material to the characters while the fused material partially forming said characters is sticky, applying heat to fuse the second application of fusible material to the top surfaces of the partially formed characters and then drying the fused material to form hard noncollapsible blind reading characters.

2. The process of producing raised characters of more than .013 of an inch in height for blind reading which comprises the steps of printing a slow-drying ink on a sheet to define blinding reading characters, applying a fusible material to the printed characters while the characters are wet, applying heat to the fusible material to fuse the same to the sheet, again applying a fusible material to the characters while the fused material partially forming said characters is sticky, applying heat to fuse the second application of fusible material to the top surfaces of the partially formed characters, and then drying the fused material to form hard noncollapsible blind reading characters.

3. The process of producing raised characters of more than .013 of an inch in height for blind reading which comprises the steps of printing a slow-drying ink on a sheet to define blind reading characters, applying a resinous material to the printed characters while the characters are wet, applying heat to the resinous material to fuse the same to the sheet, again applying a resinous material to the characters while the fused material partially forming said characters is sticky, applying heat to fuse the second application of resinous material to the top surfaces of the partially formed characters and then drying the fused material to form hard noncollapsible blind reading characters.

4. The process of producing raised characters of more than .013 of an inch for blind reading which comprises the steps of printing wetted material on a sheet to define blind reading characters, applying a fusible material to the sheet while

the printed characters are wet, removing excess fusible material which has not adhered to the printed characters, applying heat to the fusible material to fuse the same to the sheet, again applying a fusible material to the sheet while the partially formed characters are sticky, removing excess fusible material which has not adhered to the sticky characters, applying heat to the second application of the fusible material to fuse the same to the top surfaces of the partially formed characters, and then drying the fused material to form hard noncollapsible blind reading characters.

5. The process of producing raised characters of more than .013 of an inch for blind reading which comprises the steps of printing a slow-drying ink on a sheet to define blind reading characters, applying a resinous powder to the printed sheet while the ink is wet, removing excess powder which has not adhered to the ink, applying heat to the resinous powder to fuse the same to the sheet, again applying a resinous powder to the sheet while the partially formed characters are sticky, removing excess resinous powder which has not adhered to the sticky characters, applying heat to the second application of resinous powder to fuse the same to the top surfaces of the partially formed characters and then drying the fused material to form hard noncollapsible blind reading characters.

6. The process of producing raised characters of more than .013 of an inch in height for blind reading which comprises the steps of printing an adhesive material on a sheet to define blind reading characters, applying fusible material to the printed sheet before the characters have dried, removing excess fusible material which has not adhered to the printed characters, applying heat to the sheet and fusible material to fuse the

material to the sheet, cooling the sheet to reduce the temperature thereof to below fusion point of said fusible material, applying heat to the sheet in an amount sufficient to render the partially formed fused characters sticky but insufficient to raise the temperature of the sheet above fusion point of said fusible material, again applying fusible material to the sheet while the fused characters are sticky, removing the excess fusible material which has not adhered to the sticky fused characters, applying heat to the sheet to fuse the second application of fusible material, and then drying the fused material to form hard noncollapsible blind reading characters.

7. The process of producing raised characters of more than .013 of an inch in height for blind reading which comprises the steps of printing a slow-drying ink on a sheet to define blind reading characters, applying resinous powder to the printed sheet before the characters have dried, removing excess resinous powder which has not adhered to the printed characters, applying heat to the sheet and resinous powder to fuse the powder to the sheet, cooling the sheet to reduce the temperature thereof to below fusion point of said resinous powder, applying heat to the sheet in an amount sufficient to render the partially formed fused characters sticky but insufficient to raise the temperature of the sheet above fusion point of said resinous powder, again applying resinous powder to the sheet while the fused characters are sticky, removing the excess resinous powder which has not adhered to the sticky fused characters, applying heat to the sheet to fuse the second application of resinous powder, and then drying the fused material to form hard noncollapsible blind reading characters.

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