PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G09F	A2	(11) International Publication Number: **WO 96/36956**
		(43) International Publication Date: 21 November 1996 (21.11.96)

(21) International Application Number: PCT/US96/06467

(22) International Filing Date: 7 May 1996 (07.05.96)

(30) Priority Data:
08/437,757 9 May 1995 (09.05.95) US

(71) Applicant: MONSANTO COMPANY [US/US]; 800 North Lindbergh Boulevard, St. Louis, MO 63167 (US).

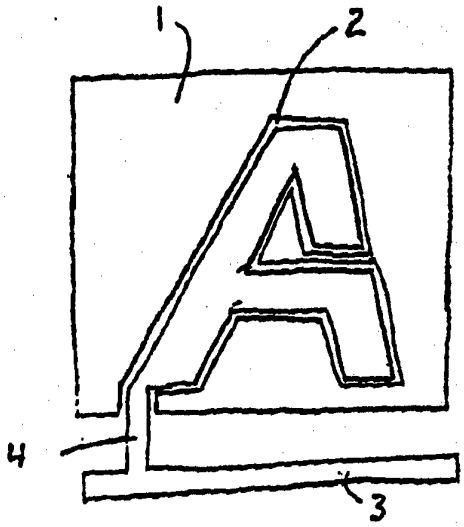
(72) Inventor: COLEMAN, James, Patrick; 2374 Wescreek Drive, Maryland Heights, MO 63043 (US).

(74) Agent: HOLLAND, Donald, R.; Howell & Heferkamp, L.C., Suite 1400, 7733 Forsyth Boulevard, St. Louis, MO 63105-1817 (US).

(81) Designated States: AL, AU, AZ, BB, BG, BR, BY, CA, CN, CZ, EE, GE, HU, IS, JP, KG, KR, KZ, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TR, TT, UA, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: CONDUCTIVE FONT



(57) Abstract

A font for generating interconnected alphanumeric electrode characters adapted for use as an image-generating electrode in flat displays such as electrochromic displays. A display message comprising characters of such font be readily applied to flat display films by printers, e.g. ink jet or laser jet printers, capable of applying electrically conductive ink. The characters in the font are defined by two generally parallel and spaced apart lines where a wide first line has apertures defining the general shape of the character and a second narrow line having curvilinear or segmented portions extending into the aperture of said first line.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	**GB**	United Kingdom	**MW**	Malawi
AT	Austria	**GE**	Georgia	**MX**	Mexico
AU	Australia	**GN**	Guinea	**NE**	Niger
BB	Barbados	**GR**	Greece	**NL**	Netherlands
BE	Belgium	**HU**	Hungary	**NO**	Norway
BF	Burkina Faso	**IE**	Ireland	**NZ**	New Zealand
BG	Bulgaria	**IT**	Italy	**PL**	Poland
BJ	Benin	**JP**	Japan	**PT**	Portugal
BR	Brazil	**KE**	Kenya	**RO**	Romania
BY	Belarus	**KG**	Kyrgystan	**RU**	Russian Federation
CA	Canada	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SG**	Singapore
CH	Switzerland	**KZ**	Kazakhstan	**SI**	Slovenia
CI	Côte d'Ivoire	**LI**	Liechtenstein	**SK**	Slovakia
CM	Cameroon	**LK**	Sri Lanka	**SN**	Senegal
CN	China	**LR**	Liberia	**SZ**	Swaziland
CS	Czechoslovakia	**LT**	Lithuania	**TD**	Chad
CZ	Czech Republic	**LU**	Luxembourg	**TG**	Togo
DE	Germany	**LV**	Latvia	**TJ**	Tajikistan
DK	Denmark	**MC**	Monaco	**TT**	Trinidad and Tobago
EE	Estonia	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**UG**	Uganda
FI	Finland	**ML**	Mali	**US**	United States of America
FR	France	**MN**	Mongolia	**UZ**	Uzbekistan
GA	Gabon	**MR**	Mauritania	**VN**	Viet Nam

CONDUCTIVE FONT

Disclosed herein are conductive fonts for electrically activated displays and methods of making and using such fonts.

BACKGROUND OF THE INVENTION

Electrically activated displays include thermochromic, electrochromic, electroluminescent and electrochemiluminescent displays, e.g. as disclosed in U.S. Patents 5,080,470; 5,189,549 and 5,413,739. Display patterns can be generated by applying an activatable chromic material over an underlying electrically conductive pattern or activatable matrix. In the case of thermochromic displays, heat generated by electrical current passing through the conductor activates the chromic layer. In the case of electrochromic, electroluminescent and electrochemiluminescent displays, a sandwich-type electrode configuration is typically employed where at least one electrode, typically the display face electrode is typically transparent, e.g. a conductive metal oxide such as indium tin oxide, and the display pattern is defined by the geometry of either electrode. U.S. Patent 5,189,549 discloses sandwich-type geometric configurations for display electrodes and U.S. Patent 5,413,739 discloses side-by-side geometric configurations for display electrodes. A disadvantage of displays of the prior art is that the geometric patterns for electrodes are typically produced by tedious or expensive methods such as one or more repetitive steps of painting or printing a conductive patterns or activatable matrices of conductive ink or by electroless deposition trough a patterned mask.

The disadvantages of these prior electrode fabricating techniques are avoided by use of the character font of this invention which can readily be set into a printer adaptable to receiving computer generated text. The pattern can be printed by using

an electrically conductive ink or a catalytic ink for electroless deposition of a conductive metal such as copper or nickel.

SUMMARY OF THE INVENTION

This invention provides a font for generating interconnected alphanumeric electrode characters adapted for use as an image-generating electrode in flat displays such as electrochromic displays. A display message comprising characters of such font be readily applied to flat display films by printers, e.g. ink jet or laser jet printers, capable of applying electrically conductive ink. Each of the characters in the font is defined by two generally parallel and spaced apart lines where a wide first line has apertures defining the general shape of the characters and a second narrow line has curvilinear or segmented, but continuous, extensions into the aperture of said first line.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a character in a font according to this invention.

Figure 2 illustrates the use of the font of this invention in a script for a display message.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The font of alphanumeric characters provided by this invention provides character images that are adapted to be printed by electrically conductive ink into a message pattern of electrically interconnected characters defined by a first wide line defining the exterior edge of a character and having an aperture within the interior of said character and a second line having curvilinear or segmented, but continuous, extensions passing through said aperture wherein said lines extend parallel from both sides of character allowing interconnection with first and second lines, respectively, of adjoining characters. With reference to Figure 1 there is shown a font according to this invention for the capital letter "A" where wide line 1

has an aperture 3 defining the outline of the letter. Parallel line 3 has an extension segment 4 extending into the aperture 2. Parallel lines 1 and 3 extend beyond the width of the character allowing electrical interconnection with adjoining characters as illustrated in Figure 2.

When printed with an electrically conductive ink, e.g. a common silver ink or carbon ink, the lines of the font of this invention provide electrodes for use in an electrochromic display. The portion of line 3 lying outside of the aperture defining the character can be covered with an insulating material by printing electrical insulating ink or similar coating to advantageously mask the outline of that portion of line 3 which lies outside the area of the character. The area of the aperture 2 can, if needed, be coated an insulating material to separate the electrodes. A layer of electrochromic material, e.g. electrochromic particles in an ionically isolative polymer matrix as disclosed in U.S. Patent 5,413,739, can be applied to overlap the area of the printed electrodes. When applied to a series of adjoning characters the overlapping electrochromic layer will typically extend over the general extended area of a plurality of lines 1 in a sequence of printed characters. The electrochromic layer can be coated with an electrolyte layer to provide an electrochromic display. Such a display can be activated by applying a voltage across lines 1 and 3 providing activation of an electrochromic image corresponding to the characters defined by the apertures in the extended line 1.

For generating display information the fonts of this invention are preferably alphanumeric characters. In such characters first line has a width about the height of symbols in said font, extending close to but not intersecting the path of the second line. In addition to alphanumeric characters the font preferably comprises punctuation marks, symbols such

as smiles, hearts, arrows and the like and spacers. In this regard a spacer character can comprise parallel lines for interconnecting first and second lines extending between spaced apart characters. In Figure 2, the character "A" is shown with no electrical connection to the enclosed area in the upper part of the letter. In this embodiment, the enclosed area can be covered with a pigmented insulating coating having a color similar to that of the area outside of the letters when the the display is activated.

The font of this invention can be advantageously used in manufacturing flat screen electrochromic display devices by printing the display image, e.g. an alphanumeric message, using conventional conductive ink printing techniques, e.g. ink jet printing or flexographic printing onto an insulating sheet such as polyester or polyimide film.

While specific embodiments have been described herein, it should be apparent to those skilled in the art that various modifications thereof can be made without departing from the true spirit and scope of the invention. Accordingly, it is intended that the following claims cover all such modifications within the full inventive concept.

WHAT IS CLAIMED IS:

1. A font for alphanumeric electrodes comprising characters defined by a first line segment having a length and a width larger than the corresponding width and height of said character and having within the area defined by the length and width of said line segment an aperture defining the boundary of said character and a second curvilinear or segmented line extending in said aperture wherein said first and second lines extend parallel from both sides of character allowing interconnection with first and second lines, respectively, of adjoining characters.

2. A font according to claim 1 wherein said symbols are alphanumeric characters.

3. A font according to claim 1 comprising spacer character of parallel lines for interconnecting first and second lines extending between spaced apart characters.

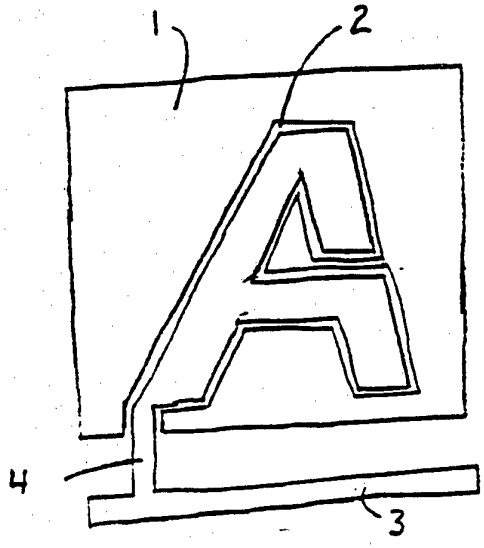


FIG. 1

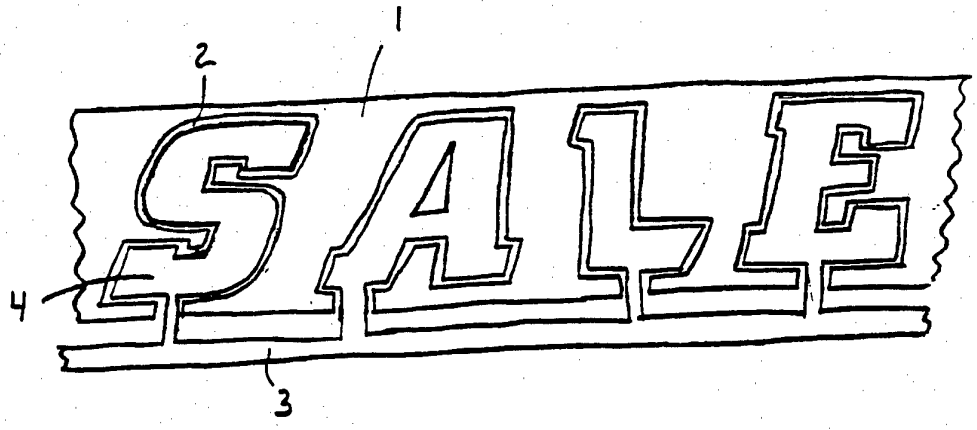


FIG. 2