(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 August 2017 (31.08.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/144924 A1

(51) International Patent Classification:
G09B 21/00 (2006.01)

(21) International Application Number:
PCT/HR2016/000008

(22) International Filing Date:
22 February 2016 (22.02.2016)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **STANIC, Vedran** [HR/HR]; Antuna Mihanovica 24, HR-33000 Virovitica (HR).

(72) Inventor; and
(71) Applicant : **MIHALJEVIC, Perica** [HR/HR]; D. Cesarica 46, HR-33000 Virovitica (HR).

(74) Agents: **SUCIC, Tatjana** et al.; Callidea Ltd, Ogrizoviceva 9, HR-10000 Zagreb (HR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2017/144924 A1

(54) Title: TACTILE RELIEF SYMBOLS FOR COLOR RECOGNITION INTENDED FOR THE BLIND OR THE VISUALLY IMPAIRED, AND PERSONS WHO ARE COLOR BLIND - LUNAS SPECTRUM

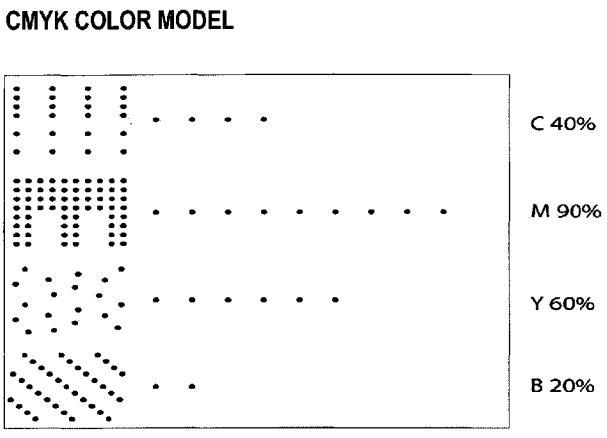


FIG. 23

(57) Abstract: Present invention relates to a tactile relief color symbols, or color marking, for encrypting color information transmitted to the blind or visually impaired individuals by touching tactile relief symbols that uniquely indicate the predetermined color. Tactile relief color symbols are arranged on the surface comprising number of distributed fields wherein at least one field contains tactile relief symbol bearing said information about the color, and wherein said field contains tactile relief symbol that uniquely identifies a primary colors, secondary colors, tertiary colors and colors from CMYK color model, the white and black color, degree of transparency and brightness. Tactile relief symbol is developed by a series of embossed dots which correspond to said colors and/or their mutual combination. The tactile relief symbols indicating secondary colors constitute mutual combination of the pattern of embossed dots of the tactile relief symbols indicating primary RYB colors, and tactile relief symbols indicating tertiary colors constitute mutual combination of the pattern of embossed dots of the tactile relief symbols indicating primary RYB and secondary colors. Further, the tactile relief symbol of color resulting in mixing of two colors is arranged in one, two or four fields arranged on said surface, the tactile relief symbol of color resulting in mixing of three colors is arranged in three or six fields arranged on said surface, and the tactile relief symbol of color resulting in mixing four colors, or CMYK color model, is arranged in four or eight fields arranged on said surface. For labeling of colors are used embossed dots, arranged on surface containing color information transmitted to the blind or visually impaired individuals by touching tactile relief symbols, where dots are of the same size, or smaller than those used in the Braille script. Tactile relief symbols may be applied to paper, adhesive labels, fabric, metal, wood, plastic and other materials,

[Continued on next page]

or combinations thereof. Present invention enables its use in in coloring books for children, toys, as well as tags or labels for the color of the garment, and particularly in the use of objects for which use are important colors and the like.

TACTILE RELIEF SYMBOLS FOR COLOR RECOGNITION INTENDED FOR THE BLIND OR THE VISUALLY IMPAIRED, AND PERSONS WHO ARE COLOR BLIND – LUNAS SPECTRUM

Field of the Invention

The present invention relates to the field of tactile relief symbols – Lunas spectrum- that can be recognized by the blind or the visually impaired persons by tracing with their fingertips, and is directed particularly to tactile relief symbols for identifying color.

Prior Art

The use of a series of raised dots impressed in paper or other media to form symbols for the individual letters of the Roman alphabet and the conventional Arabic numerals has been in existence as the Braille system since the early 19th Century. Each single letter, or numeral, is represented in a matrix of six dots, three dots high by two dots wide which is defined as a cell. Extra codes are often necessary to identify capitals.

Many modifications to the Braille system and alternative systems have been patented in attempts to improve the Braille system. However, they do not provide any tactile symbols for the identification of color other than, of course, the use of the appropriate letter symbols to spell out the word signifying a color.

A patent to Wills, et al., U.S. Pat. No. 4,404,764, discloses the use of Braille on picture cards which identify in word form the depictions on the card. For example, if a sail boat were pictured, the Braille symbols for sail boat would be raised on the card at the location of the pictured sail boat. This patent does not claim or disclose the use of symbols for color other than the Braille letters spelling a color.

U.S. Pat. No. 4,650,421, issued to Anczurowski discloses the use of crosshatching, which may be either raised using the xerographic process or embossed on a substrate, to identify color. A first color may be represented by a series of horizontal lines, a second color will be a series of parallel lines angled at 60 DEG and 120 DEG with the lines of the first primary color. A third primary color will be represented by a third series of parallel lines oriented so that it maintains a 60 DEG or 120 DEG angle with both the first and the second series of lines. Combining the symbols for two or more of the colors would present a symbol comprising crosshatched lines to represent a new color, the new color formed by mixing the colors represented by the symbols together.

U.S. Pat. Appl. No. 2013139952 (A1) published on 06-06-2013 relates to a system and method of tactile relief stickers, decals or moldings to indicate object characteristics, for example to indicate object color. The system can include a plurality of stickers. Each sticker can have a first surface with a relief texture and a second surface opposite the first surface. Each sticker can also have a relief texture corresponding to a color according to a predetermined correspondence of one texture to one color. The second surface can have an adhesive applied thereto.

U.S. Pat. No. 5,286,204, issued to TOUCH BOOKS INC discloses tactile symbols for color recognition by blind or visually impaired persons comprising a surface above which a color symbol is raised substantially parallel to the first surface. The raised surface of the unitary symbol is continuous such that persons may identify the symbol by touch.

U.S. Pat. No. 5,286,204 and many other published patent documents implement geometrical shapes as tactile symbols associated to particular color. Use of geometrical shapes is limited to certain number of colors or their combinations. Further such system is rather complicated in marking color composed from combination of three primary colors and for instance black color. A crosshatching system as disclosed in U.S. Pat. No. 4,650,421 would dominate on any substrate losing the shape and form of the marked elements, particularly in case of combination of more colors such as CMYK color system.

Color is widely used within our language as a means of communicating not only the colors of objects but as coding on maps, charts and other visual displays. There is a need for simple unitary tactile relief symbols which may be applied on everything from maps, toys to clothing. According to the present invention tactile relief symbols associated to the wide color range system is intended for the blind or the visually impaired, and persons who are color blind is developed. Technical problem solved by the present invention is enabling creating of tactile relief symbols intended for the blind or visually impaired persons which, in contrary to the solutions presented in prior art, provides tactile relief symbols of broad range of hue. As well as providing a wide range of colors and shades, also covers informative, educational and creative aspects of the needs of persons with lost vision. It provides them the opportunity to know what color it is a subject that in the hand, showing them the principle of mutual relations of colors and offers the possibility of an independent and creative artistic expression. Its use is easy and applicable to a wider range of industrial production, fast and practical in everyday use of blind persons, adaptable to personal use. Tactile relief symbols associated to color range system are logical and easy to remember having broad application. It may occur in the convex to concave shape and on a wide range of materials. Easily recognizable and usable both in industry and in the arts. System according to present invention provides tactile relief symbols enabling instantaneous recognition of primary colors, and as well their mutual combinations resulting in tactile relief symbols for secondary and tertiary colors.

SUMMARY OF THE INVENTION

The present invention relates to tactile relief symbols for color recognition intended for the blind or the visually impaired, and persons who are color blind. The primary element of tactile relief symbols is embossed dot where a series of authentic codes have not any similarity with the Braille letters. The only possible similarity can happen if the labeling dye implementing dots where dots are of the same size as in the Braille alphabet, but they are generally smaller. Depending on the context in which they are used can be the same size as the letters and dots for the blind but it cannot be increased because expressiveness of the tactile relief symbol is discolored. Spatial area/surface of the label is undefined. Although in this application tactile relief symbols are shown in squares, it is

not defined by the rules of the system. This proves the great authenticity of each label and makes extensive use on both small and large surfaces of different shapes. The symbols may be embossed directly upon the surface in which the color identification is required, or the symbols may be separately formed and attached to the appropriate surfaces. In a preferred embodiment as shown in accompanying figures, tactile relief symbols are formed into an area/surface upon which a color representation is desired. This surface defines a first plane or base. The tactile relief symbol creates a second generally planar surface when it is embossed into the first surface. That is, within the peripheral boundaries of each tactile symbol, each raised surface is unitary. The embossing or other similar process raises this second surface as a second plane above and substantially parallel to the first plane. The shape of this unitary raised second surface can be detected by blind or visually impaired persons through the sense of touch, permitting them to identify the color which the tactile relief symbol represents. The fundaments of all tactile relief symbols for color recognition constitutes five basic marks. These are the marks of the three basic chromatic colors in the art of blue, yellow and red, and the marks for black and white. Combining tactile relief symbols of these basic marks i.e. by their mutual "combining" other "colors marks" are obtained, namely tactile relief symbols indicating secondary and tertiary colors. Besides said five basic tactile relief symbols, symbols for argent, gold color and transparency have been developed based on said basic symbols and on experience connected to the gold color. The rest of the system refers to the way of lightening and darkening, adding a degree of brightness, and mutual blending and displaying all shades of subtractive traditional RYB color model (Red-Yellow-Blue) or CMYK color model (Cyan-Magenta-Yellow-Black). According to the preferred embodiment of the present invention tactile relief symbols for color recognition are arranged in one up to eight fields defined within an surface of bearing color information and tactile symbol for decryption of color that are entirely located within the specified surface. Theoretically number of fields containing tactile relief symbols associated to particular color arranged within surface associated to the resulting color coincide to number of said fields multiplied with two.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be made to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1a illustrates primary, secondary, and tertiary colors of the RGB color wheel (RED –GREEN- BLUE) and CMYK color model,

FIG. 1b illustrates a traditional RYB color wheel (RED-YELLOW-BLUE),

FIG. 1 is a plan view of the tactile relief symbols used for identification of blue color,

FIG. 2 is a plan view of the tactile relief symbols used for identification of yellow color,

FIG. 3 is a plan view of the tactile relief symbols used for identification of red color,

FIG. 4 is a plan view of the tactile relief symbols used for identification of black color,

FIG. 5 is a plan view of the tactile relief symbols used for identification of white color,

FIG. 6 is a plan view of the tactile relief symbols used for identification of green color,

FIG. 7 is a plan view of the tactile relief symbols used for identification of orange color,

FIG. 8 is a plan view of the tactile relief symbols used for identification of purple color,

FIG. 8a is a plan view of the tactile relief symbols used for identification of vermilion color,

FIG. 8b is a plan view of the tactile relief symbols used for identification of amber color,

FIG. 8c is a plan view of the tactile relief symbols used for identification of chartreuse color,

FIG. 8d is a plan view of the tactile relief symbols used for identification of teal or cyan color,

FIG. 8e is a plan view of the tactile relief symbols used for identification of violet color,

FIG. 8f is a plan view of the tactile relief symbols used for identification of magenta color,

FIG. 9 is a plan view of the tactile relief symbols used for identification of grey color,

FIG. 10 is a plan view of the tactile relief symbols used for identification of brown color,

FIG. 11 is a plan view of the tactile relief symbols used for identification of silver/argent color,

FIG. 12 is a plan view of the tactile relief symbols used for identification of beige color,

FIG. 13 is a plan view of the tactile relief symbols used for identification of golden color,

FIG. 14 is a plan view of the tactile relief symbols used for identification of transparency,

FIG. 15 is a plan view of the tactile relief symbols used for identification of pink color,

FIG. 16 is a plan view of the tactile relief symbols used for identification of brightness,

FIG. 17 is a plan view of the tactile relief symbols used for identification of bright pink color,

FIG. 18 is a plan view of the tactile relief symbols used for identification of 90% of white color in red color by using two fields defined within a surface of bearing color information,

FIG. 19 is a plan view of the tactile relief symbols used for identification of 90% of black color in yellow color by using two fields defined within a surface of bearing color information,

FIG. 20 is a plan view of the tactile relief symbols used for identification of 30% of red color in and 70% of yellow color by using four fields defined within a surface of bearing color information,

FIG. 20a is a plan view of the tactile relief symbols used for identification of 30% of red color in and 70% of yellow color by using five fields defined within a surface of bearing color information,

FIG. 21 is a plan view of the tactile relief symbols used for identification of combination of three colors and element of transparency by using four fields defined within a surface of bearing color information, or indicating three respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object,

FIG. 22 is a plan view of the tactile relief symbols used for identification of combination of the two colors represented in equal % by using two fields defined within a surface of bearing color information, or indicating two respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object,

FIG. 23 is a plan view of the tactile relief symbols used for identification of CMYK color model by using eight fields defined within a surface of bearing color information,

FIG. 24 is a plan view of the tactile relief symbols used for identification of combination of the three colors in the same proportion by using three fields defined within a surface of bearing color information, or indicating three respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object,

FIG. 25 is a plan view of the tactile relief symbols used for identification of combination of the five colors in the same proportion by using five fields defined within a surface of bearing color information, or indicating five respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object., and

FIG. 26 is a plan view of the tactile relief symbols used for identification of combination of the seven colors by using seven fields defined within a surface of bearing color information, or indicating seven respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object.

DETAILED DESCRIPTION OF THE INVENTION

A tactile relief color symbols, or color marking, for encrypting color information transmitted to the blind or visually impaired individuals by touching tactile relief symbols that uniquely indicate particular color, wherein said tactile relief color symbols are arranged on the surface bearing information about the particular color, wherein said surface includes a number of distributed fields, wherein at least one of the fields contains tactile relief symbols bearing information and uniquely identifies each of the primary RYB colors; RYB secondary colors, RYB tertiary colors, or CMYK color model, white color, black color, degree of transparency and brightness. Each of the tactile

relief symbols indicating primary RYB colors is denoted by a different pattern of embossed dots, the tactile relief symbols indicating secondary colors constitute mutual combination of the patterns of embossed dots of the tactile relief symbols denoting primary RYB colors, and the tactile relief symbols indicating tertiary colors constitute mutual combination of the patterns of embossed dots of the tactile relief symbols denoting primary RYB and secondary colors. The tactile relief symbols indicating color which is result of mixing of two colors is arranged in one, two or four fields arranged on said surface; the tactile relief symbol indicating color which is result of mixing of three colors is arranged in three six fields arranged on said surface; and the tactile relief symbol indicating color which is result of mixing of four colors is arranged in four or eight fields arranged on said surface; wherein number of fields containing tactile relief symbols associated to particular color arranged within surface bearing information of the resulting color coincides with the number of colors when said colors are mixed in the same proportion, whereas when each particular color is present in different proportion number of said fields coincides with the number of colors multiplied with two. In another embodiment of the invention, number of fields containing tactile relief symbols arranged within surface where number of fields is coinciding with the number of colors is used for indicating colors present on a certain object. In this embodiment, tag or label associated to a certain object provides to the blind person information of the each respective color present on said object.

For the purposes of present invention term "mixing" refers to additive or subtractive mixing of colors.

For the purposes of present invention term "combination or combining" refers to mutual combination of the pattern of the embossed dots associated to the tactile relief symbols indicating particular colors.

Figures 1a and 1b illustrate three basic color wheels, wherein secondary and tertiary colors are obtained by subtractive or additive mixing of colors. It is well known that by mixing the three primary colors red, blue and yellow in different combinations and different proportions all other colors can be formed and, in addition, by mixing any color with black, white, or black and white, different shades, tints, and tones, respectively, can be formed. For example, mixing red with black results in a shade of red called maroon; mixing red with white results in a tint called pink. The current invention defines a primary set of three tactile relief symbols representing the three primary colors, red, yellow and blue. Further, the current invention defines a secondary set of three tactile relief symbols representing the three secondary colors, green, orange and purple. This latter set of tactile relief color symbols was developed by utilizing the concept that mixing primary colors together forms new colors; therefore, combining the tactile relief color symbols of primary colors provides the new tactile relief symbols for the secondary colors. Further, the current invention defines a tertiary set of six tactile relief symbols representing the tertiary colors of amber, vermilion, chartreuse, teal or cyan, violet and magenta. This latter set of tactile relief color symbols was developed by utilizing the concept that mixing primary colors with secondary colors forms new colors; therefore, by combining the tactile relief color symbols of primary and secondary colors will provide the tactile relief symbols for the tertiary colors. By mixing colors with white, a lighter tint may be created, for example,

pink, light green and light blue. A basic embodiment of this invention regarding the tactile relief symbols for color recognition is illustrated in FIG. 1 to 5, where the plan view of the primary color tactile symbols, and tactile symbols for the most frequently used black and white color is shown. In order to provide complete color model for representing all possible combinations based on traditional painting RYB color model, or CMYK color model, tactile relief symbols attributed to transparency (FIG. 14), golden color (FIG. 13), argent color (FIG. 11) and for brightness(FIG. 16) have been created. Said tactile relief symbols are convention known to the blind or visually impaired person, and are created to enable logical creation of further but limited color combinations based on well-known color models used in traditional painting, printing or in electronic devices. Although limited color combinations according to the embodiment of the present invention are provided, yet number of color combinations is numerous especially in view of creating tactile relief symbols intended for communicating information relating the color to the blind or visually impaired individuals. Primary colors are used in the RGB color model. It is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. The name of the model comes from the initials of the three additive primary colors, red, green, and blue. The main purpose of the RGB color model is for the sensing, representation, and display of images in electronic systems, such as televisions and computers, though it has also been used in conventional photography. Before the electronic age, the RGB color model already had a solid theory behind it, based in human perception of colors. A color in the RGB color model is described by indicating how much of each of the red, green, and blue is included.

These ranges may be quantified in several different ways:

- From 0 to 1, with any fractional value in between. This representation is used in theoretical analyses, and in systems that use floating point representations;
- Each color component value can also be written as a percentage, from 0% to 100%;
- In computers, the component values are often stored as integer numbers in the range 0 to 255, the range that a single 8-bit byte can offer. These are often represented as either decimal or hexadecimal numbers;
- High-end digital image equipment are often able to deal with larger integer ranges for each primary color, such as 0..1023 (10 bits), 0..65535 (16 bits) or even larger, by extending the 24-bits (three 8-bit values) to 32-bit, 48-bit, or 64-bit units.

According to the fundaments based on established convention for primary, secondary and tertiary colors and black color, and said convention is known to the blind or visually impaired person, generation of tactile relief symbols for CMYK color model is provided. The CMYK color model (process color, four color) is a subtractive color model, used in color printing, and is also used to describe the printing process itself. CMYK refers to the four inks used in some color printing: cyan, magenta, yellow, and key (black). Cyan is a greenish-blue color, it is located midway between blue and green, and for the purposes of present invention in CMYK color model is

denoted with the same tactile relief symbol as teal color (figure 8d) which in traditional painting arises as mixing of blue and green color. On the color wheels of the RGB (additive) and CMYK (subtractive) color models, it is also located midway between blue and green. For the purposes of present invention, when CMYK color model is used for tactile relief symbol, cyan color is represented in the same relief as teal color. Further, magenta is made by mixing equal amounts of blue and red. On color wheels of the RGB (additive) and CMYK (subtractive) color models, it is located midway between red and blue. But in traditional painting RYB color wheel magenta arises as combination of purple and red color. For the purposes of present invention, when CMYK color model is used for tactile relief symbol, magenta color is represented as combination of tactile relief symbols for purple and red color as illustrated in FIG. 8f. Present invention implements the rules of color mixing in traditional painting RYB color model, thus enabling tactile relief color symbols having application and use in all segments of everyday life. Rules of said color mixing are applied in creating tactile relief symbols consisting of embossed dots arranged on surface in manner to enable their combination in creating new tactile relief symbols based on convention for primary colors, white and black color, and said convention is known to the blind or visually impaired person. Referring to FIGS. 1 to 3 illustrating the essence of present invention, it is well known that a number of different colors can be created by mixing various combinations of three primary colors. For example, any color can be represented by mixing the three primary colors of RYB color model or RGB color model, wherein the hue of the desired color depending on the relative proportion of the said primary colors.

FIG 1. Illustrates plan view of the tactile relief symbol used for identification of blue color. The blue color is indicated by at least three vertically oriented parallely arranged single arrays of dots. To be unambiguously clear that such arrangement represents a blue color, tactile relief shall include at least three single arrays of dots, preferably of equal height. If only one or two arrays are used, it is necessary to make it clear or spatially secured. FIG. 2 illustrates a plan view of the tactile relief symbol used for identification of yellow color. The yellow color is indicated by the rare application of dots irregularly distributed. Irregularity here is an important consideration as the further use of rare yellow coating is used in regular geometric relationships. The preferred minimum number of dots in displaying yellow color is five. FIG. 3 illustrates a plan view of the tactile relief symbol used for identification of red color. The red color is indicated by thick and irregularly distributed dots. The minimum number of dots is ten. FIGS. 4 and 5 illustrate a plan view of the tactile relief symbol used for identification of black and white color. In contrast to the above described three primary colors, black and white color have the logic of opposites. Black color is indicated by array of dots inclined to the left side. Preferred angle of inclination to the left side is 45°, but convention in relation to said angle can define other angle as long as left side inclination is provided. White color is indicated as curved array of dots inclined to the right. Preferred angle of inclination to the right side is 45°, but convention in relation to said angle can define other angle as long as right side inclination is provided. The curvature makes an additional distinction between the black and white color in order to avoid their replacement or confusion. Further, in combining for instance white color with any other primary or black color, curved array of dots make clear indication that white color is present in such combination. As with the blue color,

it must be applied with a minimum of three arrays of dots parallelly arranged that would not be doubtful which color is indicated.

A secondary color is a color made by mixing two primary colors in a given color space. In traditional painting mixing of yellow and red color results in orange color. Mixing of red and blue color results in purple color. Further, by mixing blue and yellow color, green color is obtained. In RGB color model by mixing red and blue color, magenta color is obtained as illustrated in FIG 1a. However, in RYB color model by mixing red and purple magenta color is obtained too (see FIG. 1b).FIGS. 6, 7 and 8 illustrate plan view of the tactile relief symbols used for identification of green, orange and purple color. As already mentioned, green is formed by mixing blue and yellow color. In creating green color tactile relief symbol, pattern of dots illustrating blue and yellow are combined in a manner that we use vertically oriented parallel arrays of dots of blue and rare application of dots irregularly distributed of yellow and form a vertically oriented arrays made up of sparsely distributed dots. Thus, we get an array of dots that are easily distinguished from the vertically oriented in blue color, and due its regularity is not replaced with yellow color. Minimum number of arrays is three. As already mentioned, orange color (FIG. 7) is formed by mixing red and yellow color. In creating orange color tactile relief symbol, we combine the application of dots irregularly distributed attributed to yellow color and a thick and irregularly distributed of dots attributed to the red color thus creating clusters of dots. Number of clusters of dots is in range from 3-8, rarely arranged on the surface denoting orange color. Dense clusters of dots rarely deployed cannot be replaced with the yellow or the red color. The orange color is subject to the rules applied for yellow and red color, therefore minimum number of clusters required to display tactile relief symbol for orange color is three.

In RYB color model purple color is obtained by mixing blue and red color, and tactile relief symbol for purple color is created by combining vertically oriented parallel arrays of dots of blue and thick and irregularly distributed red dots. Thus is formed a vertically oriented double array of dots as illustrated in FIG. 8. Preferred number of double arrays of dots is three. It is emphasized that the tactile relief symbol for the blue color is single array of dots and in comparison with the double array of dots, confusion between tactile relief symbol for blue and purple color is not possible. If the double arrays of dots is used on smaller surface, tactile relief symbol must be performed precisely in order not to be replaced with the blue color.

As afore-mentioned the primary colors in an RYB color wheel are red, yellow, and blue. The secondary colors — orange, green, and purple — are made by mixing the primary colors. In the red–yellow–blue system as used in traditional painting and interior design, tertiary colors are typically named by combining the names of the adjacent primary and secondary. FIGS. 8a to 8f illustrate plain view of tactile relief symbols for tertiary colors obtained by combination of tactile relief symbols assigned to primary colors and tactile relief symbols assigned to secondary colors. FIG. 8a illustrates tactile relief symbol assigned to vermilion color as combination of tactile relief symbol associated to red color and tactile relief symbol associated to orange color, wherein central part of the tactile relief symbol contains tactile relief assigned to red color which is surrounded by tactile relief symbols assigned to

orange color. Further, FIG 8b illustrates tactile relief symbol assigned to amber color as combination of tactile relief symbol associated to yellow color and tactile relief symbol associated to orange color, wherein between tactile reliefs symbols associated to orange color are arranged irregularly rare application of dots associated to yellow color. FIG. 8c illustrates tactile relief symbol assigned to chartreuse color as combination of tactile relief symbol associated to yellow color and tactile relief symbol associated to green color, wherein tactile reliefs symbol associated to green color is arranged in the lower field of the surface and tactile relief symbol associated to yellow color is arranged in the upper field of the surface. FIG 8d illustrates tactile relief symbol assigned to teal or cyan color as combination of tactile relief symbol associated to blue color and tactile relief symbol associated to green color, wherein tactile reliefs symbol associated to blue color is arranged in the upper field of the surface and tactile relief symbol associated to green color is arranged in the lower field of the surface. FIG. 8e illustrates tactile relief symbol assigned to violet color as combination of tactile relief symbol associated to blue color and tactile relief symbol associated to purple color, wherein tactile reliefs symbol associated to blue color is arranged in the upper field of the surface and tactile relief symbol associated to purple color is arranged lower field of the surface. FIG. 8f illustrates tactile relief symbol assigned to magenta color as combination of tactile relief symbol associated to purple color and tactile relief symbol associated to red color, wherein tactile reliefs symbol associated to purple is arranged in the lower field of the surface and tactile relief symbol associated to red color is arranged upper field of the surface.

FIG. 9 illustrates a plan view of the tactile relief symbol used for identification of grey color. Grey color is formed by combining tactile relief symbols of black and white color by using by array of dots inclined to the left side depicting black color and a curved array of dots inclined to the right of the white color, intermittent and arranged in the direction of black, i.e. to the left side. It is important to note that when applying gray color it is sufficient to apply only one cluster containing at least three curved arrays of dots indicating white color directed in left side. FIGS. 10 and 15 illustrate a plan view of the tactile relief symbols used for identification of brown and pink color. In traditional painting color model brown color is a mixture of black and red, whereas pink color is a mixture of red and white color. As we have combined tactile relief symbols of red with blue and obtained tactile relief symbol for purple color, we use the same principle for obtaining tactile relief symbols for brown and pink color. Tactile relief symbol for brown color is combination of array of dots inclined to the left side indicating black color and of thick and irregularly distributed dots indicating red color. Tactile relief symbol obtained is double array of dots inclined to the left side. Preferred angle of inclination to the left side is 45°, but convention in relation to said angle can define other angle as long as left side inclination is provided. Angle of inclination to the left side in all cases must concur with the angle used for identification of black color. Minimum number of double arrays used to identify tactile relief symbol for brown color is three. Same logic applies to the combination of red and white color tactile relief symbols when creating tactile relief symbols for the pink color. Tactile relief symbol for pink color is combination of a curved array of dots inclined to the right indicating white color and of thick and irregularly distributed dots indicating red color. Tactile relief symbol obtained associated to the pink color is double curved

array of dots inclined to the right side. Preferred angle of inclination to the right side is 45°, but convention in relation to said angle can define other angle as long as right side inclination is provided. Angle of inclination to the right side in all cases must concur with the angle used for identification of white color. Minimum number of double arrays is three. FIG. 12 illustrates a plan view of the tactile relief symbol used for identification of beige color which is obtained by combining tactile relief symbols associated to the white and yellow color. Tactile relief symbol for beige color is combination of a curved array of dots inclined to the right indicating white color and of rare application of dots irregularly distributed indicating yellow color. Tactile relief symbol obtained associated to the beige color is single curved array of sparsely distributed dots inclined to the right side. As in previous combinations, minimum number of single arrays is three.

FIGS. 11 and 13 illustrate a plan view of the tactile relief symbols used for identification of argent and golden color. Argent color was named for the tincture used in heraldry. This is one of the seven standard tinctures of heraldry and this one was considered to be silver or metallic white. This color is a shade of White, Gray. Accordingly tactile relief symbol for argent color is combination of white and grey color, which is of a curved array of dots inclined to the right indicating white color and intermittent and arranged in the direction of arrays denoting black color. Minimum number of clusters is three, each cluster containing two curved arrays of dots, where curvatures are oriented to the left side. Distinction between gray and argent color is achieved by number of curved arrays of dots in each cluster. One cluster for grey color comprises three arrays of dots, while cluster for definition of argent color comprises two arrays of dots. The golden color is actually experienced as a bright yellow. Shine or brightness is popularly illustrated by dashes representing the rays. This fact we used in the presentation of the tactile relief symbols for representing gold color. Slanted arrays of dots rarely and randomly inflicted represent gold color. Rare application of dots indicates that golden color is a bright yellow.

In order to obtain maximum possible combinations of colors and to enable application of present invention in RGB and CMYK color model, it is necessary to define tactile symbols for transparency and brightness (FIGS. 14 and 16).Transparent is defined as having the property of transmitting light without appreciable scattering so that bodies lying beyond are seen clearly. Empty field without dots represents transparency. The degree of transparency in each color is determined by the amount of empty space around the tactile relief symbol applied for each or particular color. To obtain some feature of transparency, field for labeling a dye occupies at least one fourth of the tactile relief symbol surface. Blank i.e. space without any tactile relief symbol has meaning of transparency. The larger the blank space is, the degree of transparency is greater. Absolute empty field means transparency without color. Brightness is indicated as array of dots forming capital letter V or by triangular blank. Figure 17 illustrates one way of implementation of the tactile relief symbol in depicting bright pink color. Degree of the angle α of the capital letter V or of the triangular blank defines degree of the brightness. Degree is in the preferred range between 10° and 160°. Value of the angle α is proportional to the intensity of the brightness. Generally in RGB color model in electronic displays transparency and brightness are expressed in %. Tactile relief symbols for color having certain % of transparency is determined by the amount of empty or blank space.

As to the brightness, and in order not to confuse tactile relief symbol for brightness with symbol for transparency it is defined above said range of angle α for capital letter V. Further, spatial position of the tactile relief symbols for brightness and transparency within the surface defining particular color is determined according to the circumstances as long as its position does not impair definition of embossed tactile indicators for particular color.

So far has been described convention for definition of embossed tactile symbols for primary colors, principle using said convention for their combination to obtain embossed tactile symbols for secondary colors and tertiary colors, and tactile relief symbols for black and white color, degree of brightness and symbol for transparency of particular color and degree of transparency. For representation and for better understanding of principle of the present invention it has been used only one surface of square or rectangular form. It must be understood that other shapes containing tactile relief symbols indicating color are possible and are not limited by said forms presentation. Hereafter will be described tactile relief symbols for CMYK color model, and in addition lightening or darkening of particular color. CMYK color model is implemented in the surface consisting of at least two fields up to eight fields defining surface assigned to particular color. Generally lightening or darkening of particular color is performed by adding white or respectively black color. FIGS. 18 and 19 illustrate tactile relief symbols representing adding of white color to the red color and darkening of yellow color. To illustrate e.g. cardinal color within tactile relief symbol surface two fields are provided, arranged next to each other wherein one field comprises tactile relief symbol for red color and second field comprises sequence of curved arrays of dots inclined to the right assigned to the white color. Each sequence represents 10% of white color added to the red color. In illustrated example number of sequences is 9 representing 90%, but number of sequences varies from 1 to 10. Another example is illustrated in FIG. 19 where is shown yellow color with added 90% of black color. Number of combinations is limited on 10 colors i.e. on hue of red or respectively yellow color. Theoretically, second field could contain sequence comprising scale from 1 to 100%, but such color distribution is demanding for representation in embossed tactile indicators and would involve huge number of hue.

FIG. 20 illustrates tactile relief symbol associated to the color resulting in mixing 30% of red color with 70% of yellow color. To illustrate e.g. hue of orange color within tactile relief symbol surface four fields are provided, arranged next to each other, wherein one field comprises tactile relief symbol for red color, another field arranged below first field tactile relief symbol for yellow color. Fields arranged next to the tactile relief symbols associated to the red or respectively yellow color sequence of embossed dots. Each dot represents 10% of yellow color or respectively red color present in resulting color mixture. In illustrated example number of embossed dots is 3 representing 30% of portion of red color and 70% of portion of yellow color in resulting color mixture. Number of embossed dots varies from 1 to 10, wherein one embossed dot represents 10% of portion of particular color in resulting color.

FIG. 20a illustrates another option for representing color mixture in which 30% of portion of red color and 70% of portion of yellow color is present. In addition to tactile relief symbol indicating color mixture illustrated in FIG 20,

another option contains middle field arranged between fields indicating particular primary or secondary color and its portions. In present illustration said middle field represents hue of the orange color, wherein said number of dots represents portion of particular color in resulting hue of the orange color. As in previous examples number of embossed dots varies from 1 to 10, wherein one embossed dot represents 10% of portion of particular color in resulting color.

Another example of applying two fields within one surface assigned to particular color is illustrated in FIG. 22. For example combining tactile relief symbols representing mixing of white and purple color in same proportions can be represented by two fields within surface wherein one field comprises tactile relief symbol for one color while other field within defined surface comprises tactile relief symbol for another color. Two fields on said surface are also used when indicating two respective colors on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object. Same principle applies for all combinations of two colors mixed in same proportions. Combining tactile relief symbols representing mixture of three colors where resulting color is being transparent is performed in surface having four fields arranged next to each other. Order of assigning tactile relief symbol for particular color in fields is optional, i.e. is not subject to conditions. Fields are equally distributed within the surface, wherein each field comprises tactile relief symbol for particular color. Example illustrated in FIG. 21 illustrates combination of tactile relief symbols representing red, orange and green color where resulting color is being transparent. As in previous example in mixing two colors, three colors are mixed in the same portion wherein resulting color is being transparent. Since in this embodiment of present invention surface comprises four fields it enables representation of color resulting in mixing four colors in same proportion. Four fields on said surface are also used when indicating four respective colors on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object. For presentation of the color composed of three color components each present in different portions, surface divided in six fields is used. Tactile relief symbols associated to particular color from RYB color model, or for example to secondary color, are arranged vertically each on top of the other symbol. Beside each tactile relief symbol associated to particular color is arranged adjacent field comprising given number of embossed dots wherein one dot represents portion of 10% of that particular color in resulting color. Maximum envisaged number of dots is 10 wherein one embossed dot represents 10% of portion of particular color in resulting color. Representing of CMYK color model is illustrated in FIG. 23. For presentation of the CMYK color model composed of four color components present in different portions, surface divided in eight fields is used. Tactile relief symbols associated to particular color from CMYK color model are arranged vertically each on top of the other symbol. Beside each tactile relief symbol associated to particular CMYK color is arranged adjacent field comprising given number of embossed dots wherein one dot represents portion of 10% of that particular color in resulting color. Maximum envisaged number of dots is 10 wherein one embossed dot represents 10% of portion of particular color in resulting color. As already known CMYK color model is widely used in printing, but any color resulting from combination of four colors mixed in different proportions can be represented by surface comprising

of eight fields. Further, such presentation can be used for more than four colors if necessary. Depending on the number of colors implemented in resulting color, number of fields arranged within surface associated to the resulting color is number of colors is multiplied with two. As already mentioned, theoretically, each adjacent field representing portions of particular color in resulting color mixture could contain sequence of embossed dots comprising scale from 1 to 100%, but such color distribution is demanding for representation in embossed tactile indicators and would involve huge number of hue.

Combination of tactile relief symbols when mixing three, five or seven colors in the same proportions is shown in FIGS. 24, 25 and 26. For presentation of resulting color surface comprising three, five or respective seven fields containing tactile relief symbols associated to particular color are arranged next to each other, or one on top of the other. FIGS. 24, 25 and 26 also illustrate tactile relief symbols arranged within surface where number of fields is coinciding with the number of respective colors wherein such color marking is used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object.

Theoretically number of fields containing tactile relief symbols associated to particular color arranged within surface associated to the resulting color coincide to number of colors wherein said colors are mixed in the same proportion, or when indicating respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object, or when each color is present in different proportion number of said fields coincides with number of colors multiplied with two. Generally, most common number of fields containing tactile relief symbols associated to particular color is one up to eight fields defined within a surface of bearing color information.

Having thus set forth a preferred principle for the tactile relief symbols for color recognition, it is to be remembered that this is but a preferred embodiment. For example, the unitary tactile relief symbols may be punched, cut, or by other similar and well known means, removed from a relatively thick material and fastened by adhesives, or other well-known fastening means, to the first surface, thus, providing a color tactile relief symbol that may be detected and identified by the sense of touch. Tactile relief symbols can be applied to paper, adhesive labels, cloth, metal, wood, plastic and other materials, or a combination thereof. Tactile relief symbols can be made of paper, metal, wood, plastic and other materials, or combinations thereof. Tactile relief symbols can be used in the form of the graphic display or image used in coloring books for children, toys, as well as labels for the color of the garment, and particularly in the use of objects for which use are important colors and the like.

Having set forth the description of the use of the tactile symbols, it will thus be seen that the objects set forth above among those made apparent from the preceding description are efficiently attained and, since certain changes may be made in the above article without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

CLAIMS

1. A tactile relief color symbols, or color marking, for encrypting color information transmitted to the blind or visually impaired individuals by touching tactile relief symbols that uniquely indicate particular color, **characterized by that** said tactile relief color symbols are arranged on the surface bearing information about the particular color, wherein said surface includes a number of distributed fields, wherein at least one of the fields contains tactile relief symbols bearing information and uniquely identifies each of the primary RYB colors; RYB secondary colors, RYB tertiary colors, or CMYK color model, white color, black color, degree of transparency and brightness; wherein each of the tactile relief symbols indicating primary RYB colors is denoted by a different pattern of embossed dots, the tactile relief symbols indicating secondary colors constitute mutual combination of the patterns of embossed dots of the tactile relief symbols denoting primary RYB colors, and the tactile relief symbols indicating tertiary colors constitute mutual combination of the patterns of embossed dots of the tactile relief symbols denoting primary RYB and secondary colors; wherein the tactile relief symbols indicating color which is result of mixing of two colors is arranged in one, two or four fields arranged on said surface, the tactile relief symbol indicating color which is result of mixing of three colors is arranged in three or six fields arranged on said surface, and the tactile relief symbol indicating color which is result of mixing of four colors is arranged in four or eight fields arranged on said surface; wherein the number of fields containing tactile relief symbols associated to particular color arranged within surface bearing information of the resulting color coincides with the number of colors when said colors are mixed in the same proportion or when indicating respective colors used on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object, whereas when each particular color is present in different proportion the number of said fields coincides with the number of colors multiplied with two.
2. The tactile relief color symbols according to the claim 1, **characterized by that** the mixing of said colors with white or respectively black color is arranged on the surface containing two fields of which the first field comprises a tactile relief symbol associated to said color, and a second field located adjacent to the first field comprises a parallely arranged array of tactile relief symbols associated to the white or respectively black color, wherein one member of the array represents 10% of white or respectively black color in the said color.
3. The tactile relief color symbols according to the claim 1, **characterized by that** on said surface one field is used for the mixing of two primary colors resulting in secondary colors, or for mixing black or respectively white color with one color chosen from the primary colors so as to combine the tactile symbols associated to chosen color of the primary colors and tactile symbols associated with black or respectively white color.

4. The tactile relief color symbols according to the claim 1, **characterized by that** on said surface two fields are used for the mixing of two colors of said colors in the same proportion, wherein one field comprises tactile relief symbols associated to the first color and another field comprises tactile relief symbols associated to the second color, or two fields on said surface are used when indicating two respective colors on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object.
5. The tactile relief color symbols according to the claim 1, **characterized by that** on said surface four fields are used for the mixing of two of said colors in different proportion, wherein the first field comprises tactile relief symbols associated to the first color, the second field comprises tactile relief symbols associated to the second color, the third field located adjacent to the first field comprises arranged array of embossed dots, and the forth field located adjacent to the second field comprises arranged array of embossed dots, wherein one dot in said arrays represents 10% of the first or respectively the second color in resulting color.
6. The tactile relief color symbols according to the claim 1, **characterized by that** on said surface four fields are used for the mixing of four colors of said colors in the same proportion, wherein the first field comprises tactile relief symbols associated to the first color, the second field comprises tactile relief symbols associated to the second color, the third field comprises tactile relief symbols associated to the third color and the fourth field comprises tactile relief symbols associated to the fourth color, or four fields on said surface are used when indicating four respective colors on tag or label associated to a certain object providing to the blind person information of the each respective color present on said object.
7. The tactile relief color symbols according to the claim 1 **characterized by that** on said surface eight fields are used for the mixing of four colors of said colors in different proportion, wherein the first up to the forth field each comprises tactile relief symbols associated to the each of chosen four colors, the fifth up to the eight field located adjacent to the corresponding field comprising tactile relief symbol associated with the respective color comprises arranged array of embossed dots, wherein one dot in said array represents 10% of each respective color in resulting color.
8. The tactile relief color symbols according to the claim 7, **characterized by that** the four colors are colors selected from the CMYK color model.
9. The tactile relief color symbols according to the claims 1 to 8, **characterized by that** tactile relief symbol for the blue color is indicated by at least three vertically oriented parallely arranged single arrays of embossed dots where said arrays have equal height, tactile relief symbol for the yellow color is indicated by the rare application of embossed dots irregularly distributed in regular geometric relationships where preferred minimum number of dots in displaying yellow color is five, and tactile relief symbol for the red color is indicated by thick and irregularly distributed embossed dots where minimum number of dots is ten.

10. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbol for the black color is indicated by array of dots inclined to the left side where preferred angle of inclination to the left side is 45°, but convention in relation to said angle can define other angle as long as left side inclination is provided.
11. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbol for the white color is indicated as a curved array of dots inclined to the right where preferred angle of inclination to the right side is 45°, but convention in relation to said angle can define other angle as long as right side inclination is provided.
12. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbol for the gold color is indicated by slanted arrays of dots rarely and randomly inflicted and tactile relief symbol for argent color is combination of white and grey color, which is of a curved array of dots inclined to the right indicating white color and intermittent and arranged in the direction of arrays denoting grey color, wherein minimum number of clusters is three, each cluster containing two curved arrays of dots, where curvatures are oriented to the left side.
13. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbol for the brightness is indicated as array of dots forming capital letter V or by triangular blank where degree of the angle α of the capital letter V or of the triangular blank defines degree of the brightness, wherein degree is in the preferred range between 10° and 160°, wherein the value of angle α is proportional to the intensity of the brightness.
14. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbol for the transparency is indicated by empty field without embossed dots where degree of transparency in each color is determined by the amount of empty field adjacent to the tactile relief symbol applied for each or particular color, wherein to obtain feature of transparency, field indicating transparency occupies at least one fourth of the tactile relief symbol.
15. The tactile relief color symbols according to the claim 1, **characterized by that** tactile relief symbols for identifying tertiary colors are arranged in one or two fields arranged on said surface.
16. The tactile relief color symbols according to any of the preceding claims, **characterized by that** for the labeling of said colors are used embossed dots arranged on surface containing color information transmitted to the blind or visually impaired individuals by touching tactile relief symbols, where dots are of the same size or smaller than those used in the Braille script.
17. A graphic display for encryption of data that uses tactile relief color symbols according to any of the preceding claims, **characterized by that** the tactile relief color symbols may be applied to the paper, adhesive labels, fabric, metal, wood, plastic and other materials or combinations thereof.
18. The graphic display according to claim 17, **characterized by that** the tactile relief color symbols are made of paper, metal, wood, plastic and other materials or combinations thereof.

19. The graphic display according to claims 17 and 18, **characterized by that** the tactile relief color symbols are used in coloring books for children, toys, as well as tags or labels for the color of the garment, and particularly in the use of objects for which use of colors is important and the like.

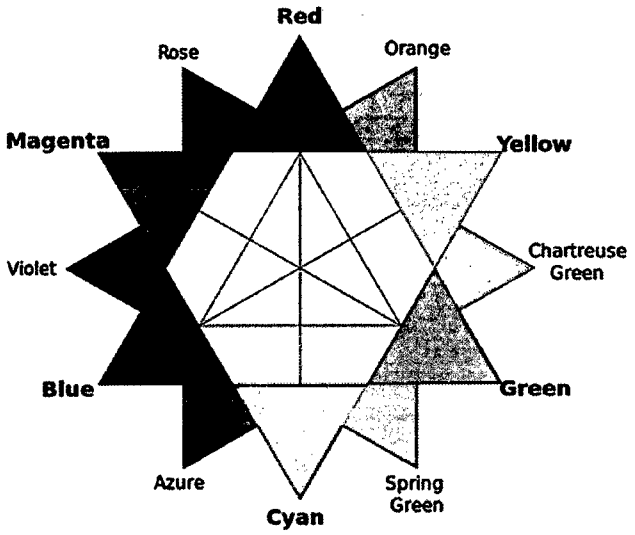

Red
Rose
Orange
Magenta
Yellow
Violet
Chartreuse Green
Blue
Green
Azure
Spring Green
Cyan

FIG 1a

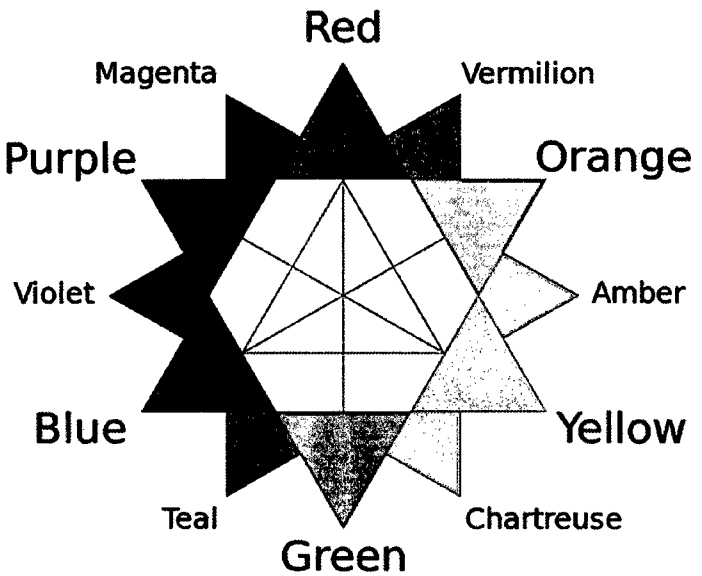

Red
Magenta
Vermilion
Purple
Orange
Violet
Amber
Blue
Yellow
Teal
Chartreuse
Green

FIG 1b

BLUE

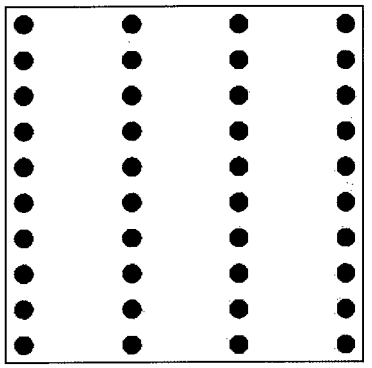


FIG. 1

YELLOW

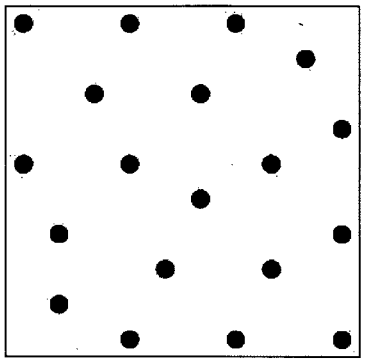


FIG. 2

RED

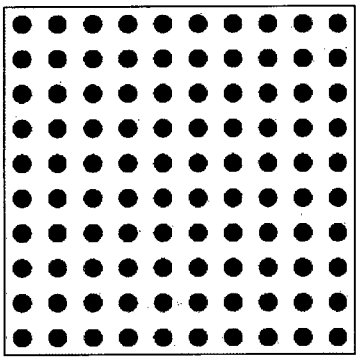


FIG. 3

BLACK

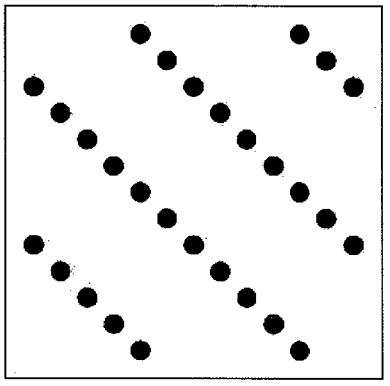


FIG. 4

WHITE

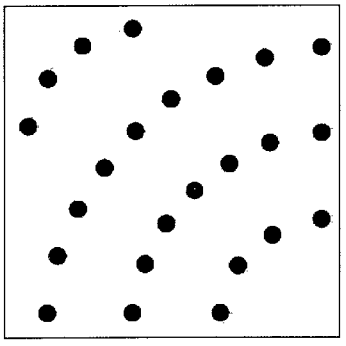


FIG. 5

GREEN

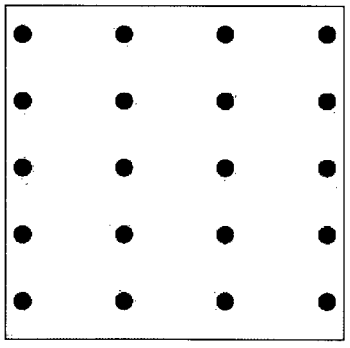


FIG. 6

ORANGE

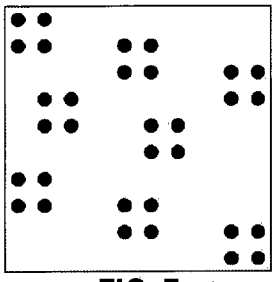


FIG. 7

PURPLE

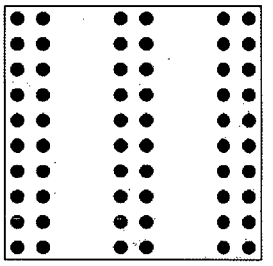


FIG. 8

VERMILION

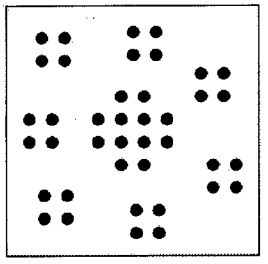
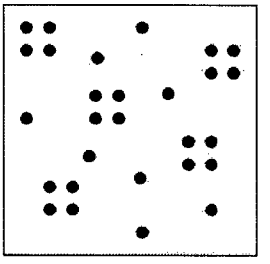


FIG. 8a

AMBER



8b

CHARTREUSE

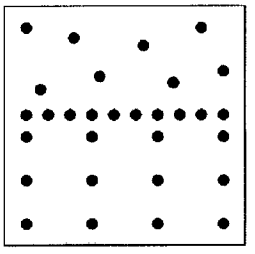


FIG. 8c

TEAL

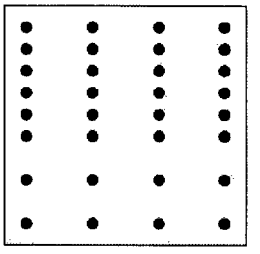


FIG. 8d

VIOLET

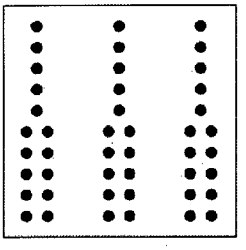


FIG. 8e

MAGENTA

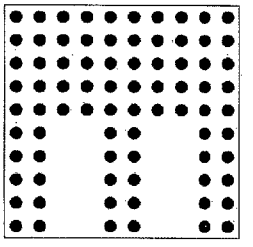


FIG. 8f

GREY

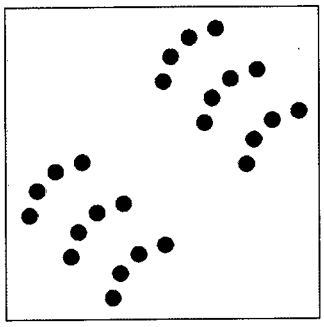


FIG. 9

BROWN

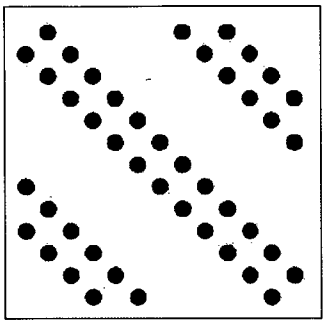


FIG. 10

ARGENT

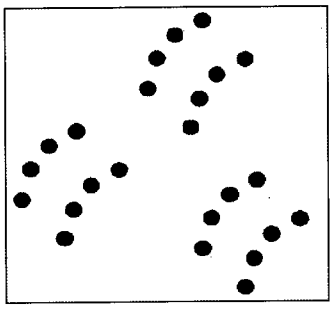


FIG. 11

BEIGE

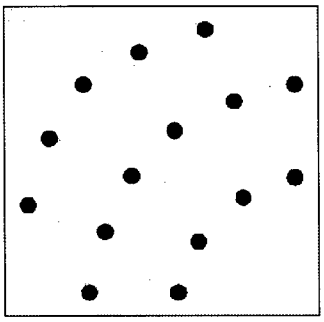


FIG. 12

GOLD

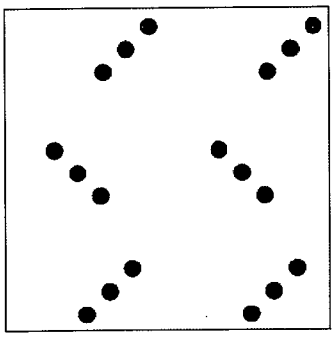


FIG. 13

TRANSPARENT

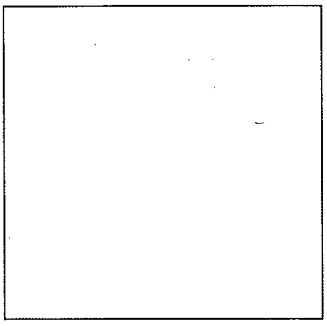


FIG. 14

PINK

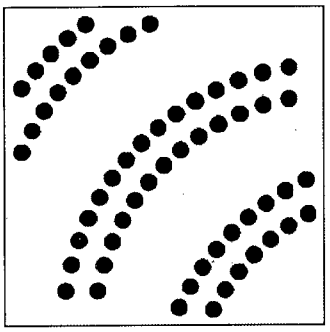


FIG. 15

MARK FOR BRITHNESS

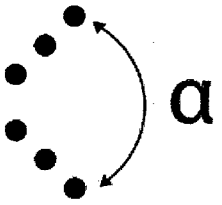


FIG. 16

BRIGHT PINK

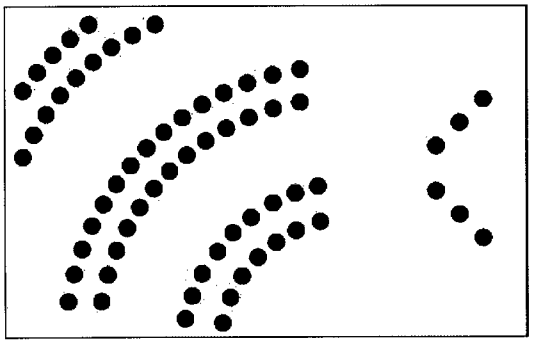


FIG. 17

90% OF WHITE IN RED

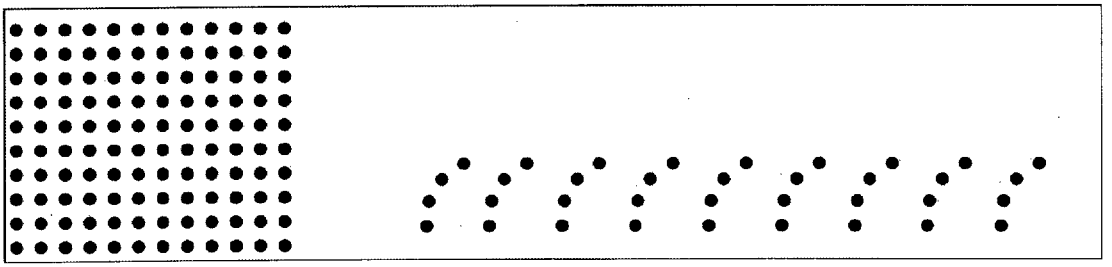


FIG. 18

90% OF BLACK IN YELLOW

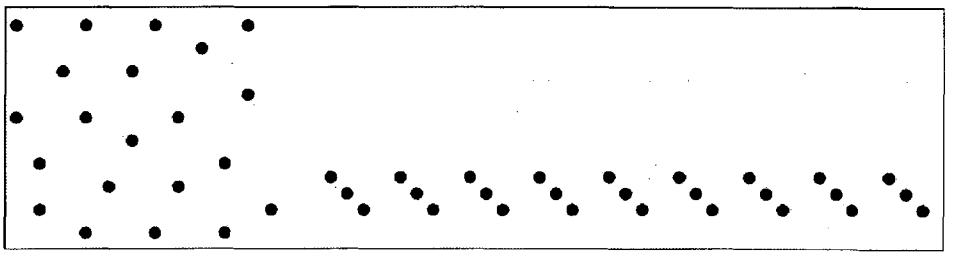


FIG. 19

COMBINATION OF RED AND YELLOW

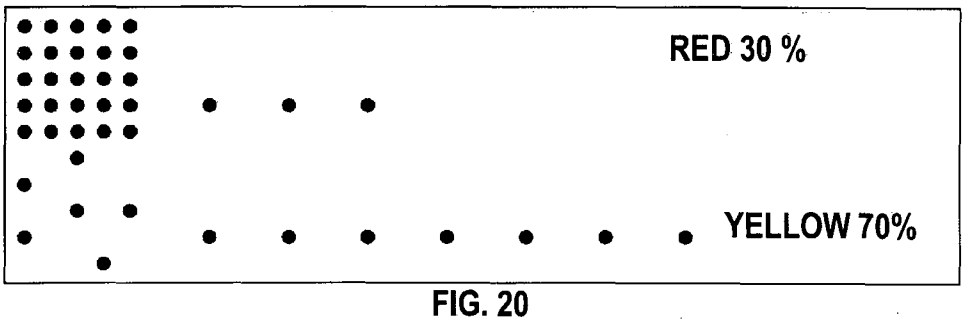


FIG. 20

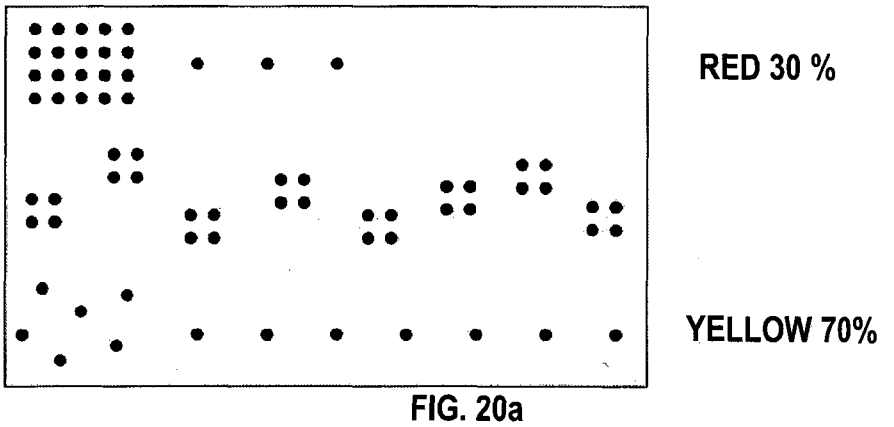


FIG. 20a

COMBINATION OF RED, ORANGE AND GREEN COLOR WITH MARK FOR TRANSPARENCY

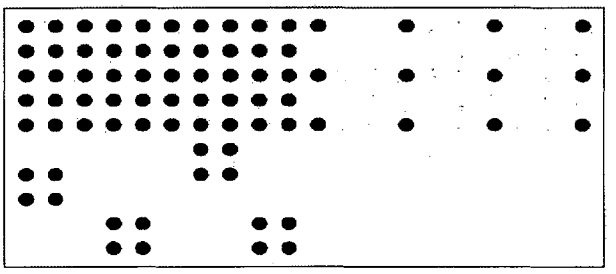


FIG. 21

COMBINATION OF WHITE AND PURPLE IN SAME PROPORTION

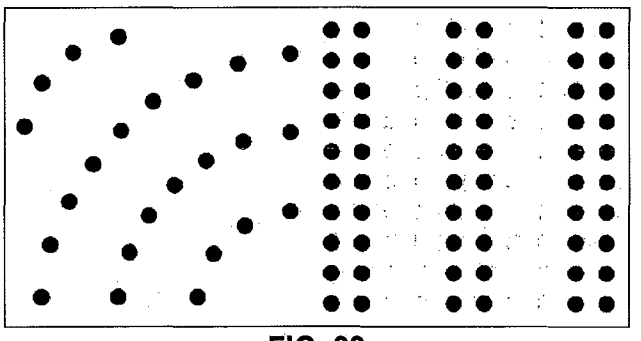


FIG. 22

CMYK COLOR MODEL

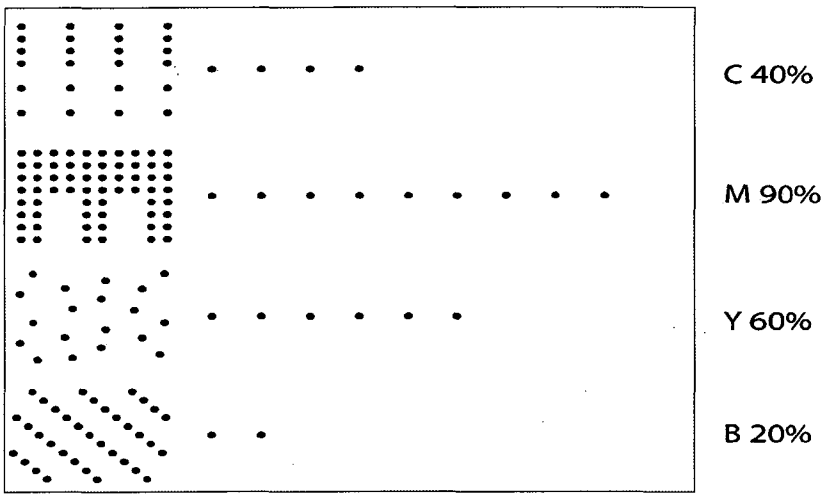


FIG. 23

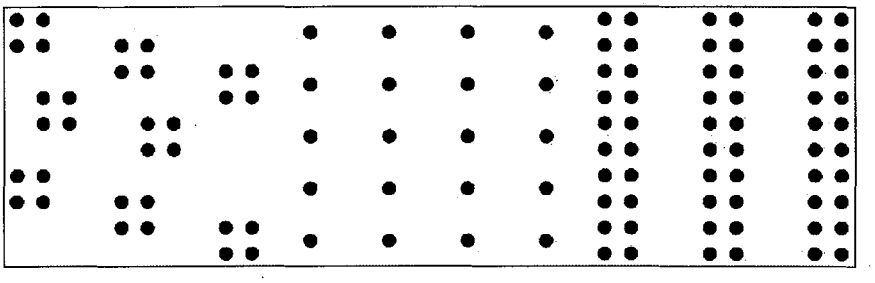


FIG. 24

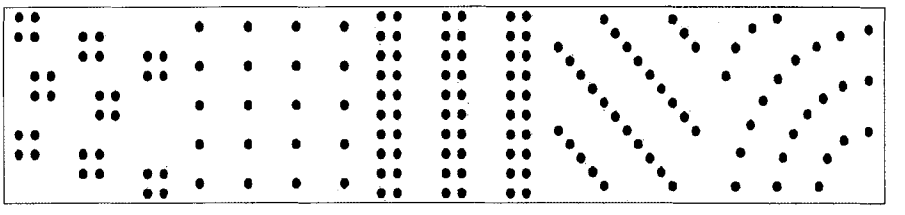


FIG. 25

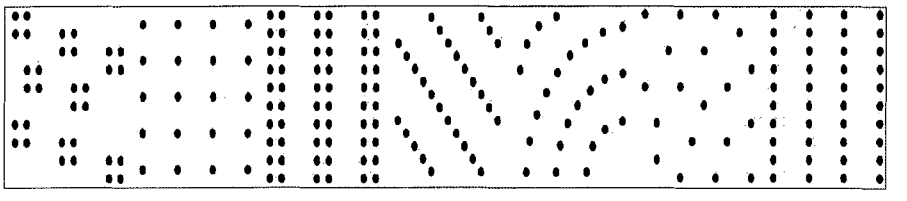


FIG. 26

INTERNATIONAL SEARCH REPORT

International application No
PCT/HR2016/000008

A. CLASSIFICATION OF SUBJECT MATTER
INV. G09B21/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/137757 A1 (FACULDADE DE ARQUITECTURA [PT]) 19 September 2013 (2013-09-19) page 4, paragraph 2 page 1, paragraph 3 page 2, last paragraph - page 3, paragraph 2; claim 1; figures 2-13 page 3, paragraph 3-6	1-19
X	US 4 650 421 A (ANCZUROWSKI EDWARD [CA]) 17 March 1987 (1987-03-17) column 1, lines 42-56 column 2, lines 55-62 column 3, lines 19-26 column 3, lines 47-52	1-19

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 May 2016	25/05/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Beauce, Gaetan

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/HR2016/000008

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 286 204 A (MINARDI MICHAEL J [US]) 15 February 1994 (1994-02-15) the whole document	1-19
A	GB 2 011 145 A (TONELLI R R) 4 July 1979 (1979-07-04) claim 1; figure 1	1-19
A	US 2013/139952 A1 (BAKLANOV DMITRY [RU]) 6 June 2013 (2013-06-06) claim 1; figure 2	1-19
A	WO 97/03427 A1 (PX IDEA AB [SE]; SIGURDSSON THOMAS [SE]; SUNDHOLM LARS [SE]; WIKSTROEM) 30 January 1997 (1997-01-30) claim 1; figures 1-5	1-19
A	DE 10 2010 018025 A1 (SCHWARZ ASTRID [DE]) 27 October 2011 (2011-10-27) claim 1; figures 5-11	1-19

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/HR2016/000008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013137757 A1	19-09-2013	PT 106211 A	16-09-2013
		WO 2013137757 A1	19-09-2013
US 4650421 A	17-03-1987	CA 1237941 A	14-06-1988
		US 4650421 A	17-03-1987
US 5286204 A	15-02-1994	NONE	
GB 2011145 A	04-07-1979	CA 1141600 A	22-02-1983
		GB 2011145 A	04-07-1979
US 2013139952 A1	06-06-2013	US 2013139952 A1	06-06-2013
		US 2014182770 A1	03-07-2014
WO 9703427 A1	30-01-1997	AU 6373696 A	10-02-1997
		EP 0850469 A1	01-07-1998
		WO 9703427 A1	30-01-1997
DE 102010018025 A1	27-10-2011	DE 102010018025 A1	27-10-2011
		WO 2011131764 A1	27-10-2011