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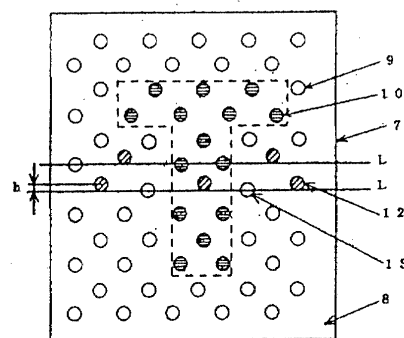
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(54) Verification device

(57) In a truth and falsehood determination device 1, a multiplicity of perforations, which are so fine as to make it difficult for them to be visually observed and composed of a multiplicity of background perforations (5, 9) 5 and a multiplicity of information perforations (6, 10) 6, are disposed in a staggered arrangement with respect to the disposition of stripes having colors of R, G, B which constitute a color element screen (2) 2 used to determine truth and falsehood as well as the information perforations (6, 10) 6 are shifted from the background perforations 5 by a predetermined distance x. Further, the background perforations (5, 9) 5 and the information perforations (6, 10) 6 of each row are partially shifted vertically to provide them with binarized data composed of "0" and "1". With this arrangement, the truth and falsehood determination device 1 can prevent forgery and alteration of precious prints.

Fig 2



ASCIIコード
1010000 : P
1010010 : R
1001001 : I
1001110 : N
1010100 : T
1001001 : I
1001110 : N
1000111 : G

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a truth and falsehood determination device having fine perforations capable of being formed on precious prints such as paper moneys, pass ports, securities, cards, revenue stamps, and the like to prevent them from being forged or altered.

2. Description of the Related Art

[0002] It is required that precious prints such as paper moneys, pass ports, securities, cards, revenue stamps, and the like are difficult to be forged or altered from the properties thereof. As a countermeasure, there is known to use watermark, fine-line drawing, intaglio printing, and the like. In addition to the above countermeasure, the precious prints must include a means for permitting a machine to read them because it is necessary to process them by a machine to determine whether they are true or false. For this purpose, a method of mixing a special material with ink, a method of coating or mixing a special material on or with a substrate such as a paper and the like are used. Further, characters or numerals are expressed by a group of perforations as in an example of Swiss franc 1000. Further, there is also an example that a portrait shown by color shading is binarized and expressed by a group of perforations based on binarized data expressing the color shading. Further, a method of reading a punched tape used in computers of old generation is known as a method of reading a group of perforations.

[0003] Of the above-mentioned forgery prevention means, however, it is difficult to use the watermark of as a perfect forgery prevention means because it can be imitated using varnish and the like. The fine-line drawing cannot sufficiently achieve a truth and falsehood determination function because it can be substantially faithfully reproduced by a color copier the performance of which is greatly improved recently. Further, the intaglio printing also have many problems in design because it requires a large area to provide a sufficient finger touch feeling with a print.

[0004] A typical ink used to read precious prints by a machine is a magnetic ink employed in paper moneys. However, when the truth and falsehood of paper moneys are determined using the magnetic ink, the permissible range of determination of truth and falsehood cannot help being increased for the convenience of circulating the paper moneys. Thus, the magnetic ink cannot be used as a perfect element for determining truth and falsehood at present. Further, in the example of Swiss franc 1,000, it is possible to forge or alter it by perforating it imitating the group of perforations thereof. Further-

more, the means, which expresses a portrait by converting the color shading thereof into binarized data and determining the positions where perforations are formed, that is, an X- and Y-coordinate, based on the binarized data, is complex in its construction and further it is not always easy for the means to determine truth and false.

[0005] Incidentally, technologies for precisely forming fine perforations to a paper, a plastic film, a metal sheet and the like have been remarkably developed recently. For example, a technology for forming fine perforations by laser beams can easily form a group of optional perforations, and the number of burrs which are made when the perforations are formed by the technology is greatly smaller than the number of burrs made when perforations are mechanically formed using a stylus or the like for the purpose of forgery and alteration. In this respect, the truth and falsehood determination device of the present invention can be apparently differentiated from a punched tape the perforations of which have such a large diameter that the information recorded on the tape can be easily read visually.

SUMMARY OF THE INVENTION

[0006] Accordingly, it is an object of the present invention to provide a truth and falsehood determination device having fine perforations capable of being formed on precious prints such as paper moneys, pass ports, securities, cards, revenue stamps, and the like for the purpose of preventing them from being forged or altered making use of a technology for forming the fine perforations precisely. That is, the present invention provides a truth and falsehood determination device to which information of specific figures, characters and the like is given by a multiplicity of fine perforations, which cannot be visually observed, formed on the device so that whether the precious prints are true or false can be determined and that the precious prints can be prevented from being forged or altered.

[0007] An object of the present invention is to provide a truth and falsehood determination device the forgery and alteration of which are very difficult by forming information perforations on the device by a microprocessing technology which are minutely shifted from background perforations formed by the technology. Further, it is an object of the present invention to provide a truth and falsehood determination device whose truth and falsehood can be easily determined visually making use of a monitor such as a liquid crystal panel, a CRT and the like of a personal computer, a video camera and the like which are used widely in homes and offices without using a special, complex and expensive apparatus as well as which can easily and stably read binarized data, which is concealed in a group of perforations, through a machine.

[0008] A truth and falsehood determination device of the present invention, which has a substrate on which a multiplicity of fine perforations are formed to such a

degree as to make it difficult for the fine perforations to be visually observed and which can determine truth and falsehood by placing the substrate on a color element screen which has a multiplicity of color element stripes disposed thereon at a predetermined pitch so that each of the stripes exhibits any of a plurality of colors and which is composed of the plurality of colors, is characterized in that the multiplicity of fine perforations include a multiplicity of background perforations for forming a background and a multiplicity of information perforations for forming specific pattern information; the multiplicity of background perforations are disposed at predetermined vertical and horizontal pitches in a staggered arrangement with respect to the disposition of the color element stripes constituting the color element screen; and the multiplicity of information perforations are disposed at the same vertical and horizontal pitches as those of the background perforations in the staggered arrangement with respect to the disposition of the color element stripes constituting the color element screen as well as shifted horizontally from the multiplicity of background perforations by a predetermined distance, wherein the specific pattern information can be visually observed in such a manner that when the substrate is placed on the color element screen, a background color observed through the multiplicity of background perforations is different from an information color observed through the multiplicity of information perforations.

[0009] A truth and falsehood determination device of the present invention is characterized in that the horizontal pitch of the background perforations and the information perforations is twice the total width of each set of the color element stripes having the plurality of colors constituting the color element screen; each of the background perforations and the information perforations is a fine circle having a diameter which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen; and the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen.

[0010] A truth and falsehood determination device of the present invention is characterized in that the horizontal pitch of the background perforations and the information perforations is three times the total width of each set of the color element stripes having the plurality of colors constituting the color element screen; each of the background perforations and the information perforations is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen and having a vertical width which is an integer multiple of the horizontal width; and the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time to less than one time the width

of a color element stripe exhibiting any of the plurality of colors constituting the color element screen.

[0011] A truth and falsehood determination device of the present invention is characterized in that the horizontal pitch of the background perforations and the information perforations is four times the total width of each set of the color element stripes having the plurality of colors constituting the color element screen; each of the background perforations and the information perforations is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen and having a vertical width which is an integer multiple of the horizontal width; and the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time or less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen.

[0012] A truth and falsehood determination device of the present invention is characterized in that the multiplicity of background perforations in the multiplicity of fine perforations are partly shifted vertically from the predetermined reference line of each perforation row on which the perforations are disposed horizontally as well as the multiplicity of information perforations are partly shifted vertically; and binarized data composed of a combination of "1" and "0" is provided by the background perforations and the information perforations which are shifted vertically and by the background perforations and the information perforations which are not shifted vertically.

[0013] A truth and falsehood determination device of the present invention is characterized in that the horizontal pitch of the background perforations and the information perforations is twice the total width of each set of the color element stripes having the plurality of colors; each of the background perforations and the information perforations is a fine circle having a diameter which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen; the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen; and the amount of vertical shift of the background perforations and the information perforations is at least 1/2 time the diameter of the perforations.

[0014] A truth and falsehood determination device of the present invention is characterized in that the horizontal pitch of the background perforations and the information perforations is three times the total width of each set of the color element stripes having the plurality of colors; each of the background perforations and the information perforations is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the

plurality of colors constituting the color element screen and having a vertical width which is an integer multiple of the horizontal width; the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen; and the amount of vertical shift of the background perforations and the information perforations is at least 1/2 time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen.

[0015] A truth and falsehood determination device according to claim 5, characterized in that the horizontal pitch of the background perforations and the information perforations is four times the total width of each set of the color element stripes having the plurality of colors; each of the background perforations and the information perforations is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen and having a vertical width which is an integer multiple of the horizontal width; the amount of horizontal shift of the information perforations with respect to the background perforations is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen; and the amount of vertical shift of the background perforations and the information perforations is at least 1/2 time to less than two times the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen.

[0016] A truth and falsehood determination device of the present invention is characterized in that a plurality of perforated regions, with which binarized data composed of a combination of "1" and "0" is provided, are formed in the truth and falsehood determination device; at least two perforated regions are extracted from the plurality of perforated regions; and truth and falsehood are determined by deciding whether or not a predetermined correlation exists between the binarized data of the at least two extracted perforated regions.

[0017] A truth and falsehood determination device of the present invention is characterized in that a perforated region, with which binarized data composed of a combination of "1" and "0" is provided, is used as a reference block; four blocks, that is, the reference block as well as a block obtained by reversing the reference block up and down, a block obtained by reversing the reference block right and left and a block obtained by reversing the reference block up and down and right and left are formed simultaneously, whereby, when the truth and falsehood determination device is inserted into an apparatus for mechanically reading the binarized data, the binarized data can be read in any of the four blocks without regulating the front surface and the back surface of the truth and falsehood determination device as well as

a direction in which the device is inserted.

[0018] A truth and falsehood determination device of the present invention is characterized in that the binarized data composed of a combination of "1" and "0" is provided with the truth and falsehood determination device so that the perforations of the portion corresponding to the black color of a two-dimensional barcode is set to "1" and the perforations of the portion corresponding to the white color of the two-dimensional barcode is set to "0".

[0019] A truth and falsehood determination device of the present invention is characterized in that the binarized data composed of a combination of "1" and "0" is provided with every other row or with every several rows; and binarized data different from the above binarized data or meaningless dummy data, which cannot be read as binarized data, is provided with the remaining rows.

[0020] A truth and falsehood determination device of the present invention is characterized in that a perforated region, in which a multiplicity of fine perforations are formed in the staggered arrangement, is constructed such that perforations, which are shifted vertically from a predetermined reference line of each perforation row, and perforations, which are not shifted vertically therefrom, are disposed on each perforation row on which perforations are disposed horizontally and on every other perforation row on which the perforations are disposed horizontally so as to form perforated subregions with which only binarized data composed of a combination of "1" and "0" is provided; and the perforations shifted vertically and the perforations not shifted vertically are discriminated based on the relative positional relationship thereof to four perforations, which are adjacent to the above perforations in an obliquely upward left direction, obliquely downward left direction, obliquely upward right direction and obliquely downward right direction in the perforated region with which only the binarized data is provided to thereby read the binarized data.

[0021] A truth and falsehood determination device of the present invention is characterized in that the multiplicity of fine perforations are formed by laser beams.

[0022] A truth and falsehood determination device of the present invention is characterized in that the color element screen is any of a liquid crystal panel or CRT having the color element stripes, a transparent film or a paper excellent in light transmittance on which the color element stripes are printed, and a substrate on which the color element stripes are printed with fluorescent ink.

[0023] A truth and falsehood determination device of the present invention is characterized in that the liquid crystal panel is a commercially available liquid crystal panel or a color liquid crystal panel dedicated for determination of truth and falsehood on which a color element screen is formed in accordance with the size of the multiplicity of fine perforations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

Fig. 1 is a plan view explaining an example 1 of a truth and falsehood determination device according to the present invention;

Fig. 2 is a plan view explaining an example 2 of a truth and falsehood determination device according to the present invention;

Fig. 3 is a plan view explaining an example 3 in which binarized data according to the present invention is set to a truth and falsehood determination device; and

Fig. 4 is a plan view explaining an example 4 in which binarized data according to the present invention is set to a truth and falsehood determination device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] Examples of an embodiment of a truth and falsehood determination device according to the present invention will be described below with reference to the accompanying drawings. However, the truth and falsehood determination device of the present invention is by no means limited to the following examples, and it goes without saying that various modifications can be made to the embodiment of the present invention within the range which does not depart from the gist of the claimed invention.

Example 1

[0026] Fig. 1 is a view explaining a basic principle and arrangement of the truth and falsehood determination device according to the present invention as well as showing an example 1. In the example 1, when a truth and falsehood determination device 1 shown in Fig. 1a is placed on the screen of a liquid crystal panel 2 which is shown in Fig. 1b and utilized as a color element screen of a truth and falsehood determination apparatus, information (characters or a figure) which is provided with the truth and falsehood determination device 1 and cannot be visually recognized can be visually observed as shown in Fig. 1c, which permits to determine whether the truth and falsehood determination device 1 is true or false.

[0027] While the liquid crystal panel 2 is utilized as the color element screen, the color element screen is not limited to the liquid crystal panel, and a CRT, a printed line drawing and the like can be utilized as the color element screen. When a transparent film and a paper excellent in light transmittance are utilized as the color element screen, truth and falsehood of the device can be determined by light passing therethrough; and when a substrate which is printed with fluorescent ink is utilized as the color element screen, truth and falsehood of the

device can be determined by irradiating ultraviolet light to the substrate. The color element screen includes a multiplicity of color elements disposed thereon so as to exhibit any of a plurality of colors and is composed of the plurality of colors. The plurality of colors are combinations of various colors, for example, R, G and B (red, green, and blue), Y, C, and M (yellow, cyan, and magenta), black and white, and other colors. In the following examples, however, the plurality of colors are described as a combination of the above-mentioned R, G, and B (red, green, and blue) for the convenience of explanation.

[0028] In the example 1, while the liquid crystal panel 2 is utilized as the color element screen, utilized as the liquid crystal panel 2 is an ordinary type of a liquid crystal panel which is widely used in homes and offices, although a liquid crystal panel, which is dedicated for determination of truth and falsehood on which a color element screen is formed in accordance with the size of a multiplicity of fine perforations formed on the truth and falsehood determination device 1, may be used.

[0029] The liquid crystal panel 2 is arranged such that stripe-shaped color filters of R, G, and B (red, green, and blue), each of which extends vertically and has a predetermined width, are alternately disposed horizontally thereon so as to form a color element screen (screen having color elements for forming a color image), which is composed of a multiplicity of color elements as the R, G, B stripes (portions indicated by R, G and B in Fig. 1b) disposed on the color element screen. The truth and falsehood determination device 1 includes a substrate 3 on which perforation arrays 4 each composed of a multiplicity of fine perforations are formed by laser beams. The perforations are composed of background forming perforations (which are called "background perforations") 5 and information giving perforations (which are called "information perforations") 6 (information "T" is given in Fig. 1c).

[0030] The background perforations 5 are formed in a staggered arrangement with a horizontal pitch p and a vertical pitch p' with respect to the disposition of the R, G, B stripes which constitute the color element screen. An integral multiple of the total width w of each set of the R, G, B stripes of the liquid crystal panel is employed as the horizontal pitch p of the background perforations 5. In contrast, the horizontal pitch and the vertical pitch of the information perforations 6 are the same as the horizontal pitch p and the vertical pitch p' of the background perforations 5, and the information perforations are formed in the staggered arrangement with respect to the disposition of the R, G, B stripes which constitute the color element screen similarly to the background perforations 5. While the information perforations 6 are formed on the same rows as those on which the background perforations 5 are formed, they are shifted from the arrays of the background perforations 5 horizontally by a distance x .

[0031] Operation of the truth and falsehood determi-

nation device 1 arranged as described above will be described below. When the truth and falsehood determination device 1 is placed on the screen of the liquid crystal panel 2, the background perforations 5 are placed on the B (blue) stripes as shown in Fig. 1c so that a blue color can be observed through the background perforations 5. In contrast, the information perforations 6 are placed on the R (red) stripes so that a red color can be observed through the information perforations 6. As a result, information T of the red color as shown by a broken line a in Fig. 1c can be visually observed as if it comes up to the surface of a blue background.

[0032] Even if a forged truth and falsehood determination device 1 on which neither the background perforations 5 nor the information perforations 6 are formed is placed on the liquid crystal panel 2, neither a background image nor an information image is observed. Further, a forged or altered truth and falsehood determination device 1, on which the background perforations 5 are formed but on which the information perforations 6 are not formed or false information perforations 6 are formed, is placed on the liquid crystal panel 2, the true information of T cannot be recognized, whereby it can be determined whether the device 1 is true or false.

[0033] Further, when the perforation arrays of the truth and falsehood determination device 1 are not in parallel with the R, G, B stripes of the liquid crystal panel 2 or when a value, which is three times the pitch w of the R, G, B stripes, does not perfectly coincide with the perforation pitch p , a color emitted through the perforations 5 and 6 is not the same on an entire surface, which makes the iris moire of the Three R, G, B colors. When a glass is interposed or a gap is formed between the liquid crystal panel 2 and the truth and falsehood determination device 1, there is a possibility that the stripes are observed in a different color depending upon an angle at which they are observed, thus the color of the moire is also changed. It should be noted that when the perforations of the truth and falsehood determination device 1 are disposed entirely at random, no moire is generated to the Three R, G, B colors. As a result, whether the truth and falsehood determination device 1 true or false can be roughly determined depending upon whether or not the moire is generated.

[0034] To describe the example 1 in more detail with reference to a specific example, it is supposed that each of the R, G, B stripes of the liquid crystal panel 2 has a width of 0.1 mm, although the width is slightly different depending upon a type of the liquid crystal panel 2.

[0035] Next, the shapes of the background perforations 5 and the information perforations 6 of the truth and falsehood determination device 1 shown in Fig. 1 will be examined. It is supposed that both of the background perforations 5 and the information perforations 6 of the truth and falsehood determination device 1 shown in Fig. 1 are formed in an elliptical shape having the same size. In consideration of the width of the R, G, B stripes, each perforation has a minor axis (horizontal

width) set to 0.1 mm, which is approximately the same as the width of each of the R, G, B stripes, when information is to be recognized by monochrome. Further, the minor axis (horizontal width) of each perforation may be set larger than the width of each of the R, G, B stripes so that the perforations of the truth and falsehood determination device 1 cover a plurality of colors of the R, G, B stripes so that a mixed color passes through the perforations and recognized.

[0036] In this case, when both the background perforations 5 and the information perforations 6 cover the three colors of the R, G, B stripes, both the background perforations and the information perforations are observed through white light and cannot be discriminated from one another. Thus, in the case of the three colors, a discriminating function cannot be obtained unless at least any of the background perforations 5 and the information perforations 6 cover two or less colors. In short, even if any one perforations of the background perforations 5 or the information perforations 6 cover the three colors of the R, G, B stripes and are observed through white light, when the other perforations of them cover two colors at the maximum, the discriminating function can be obtained.

[0037] When this is expressed generally, both or at least ones of the background perforations and the information perforations must have a horizontal width which is equal to or less than $[\text{horizontal width of one stripe}] \times [\text{the number of colors of the color element screen} - 1]$.

[0038] It should be noted that the information perforations have a size equal to or different from that of the background perforations. For example, the horizontal width of the information perforations may be larger or smaller than the horizontal width of the background perforations by an amount corresponding to the horizontal width of each stripe. When the three colors of the R, G, B stripes are utilized, if the horizontal width of the background perforations is set to a value corresponding to the width of two or three stripes and the horizontal width of the information perforations is set to a value corresponding to the width of one or two stripes in correspondence to the horizontal width of the background perforations, the information perforations can be observed through any one color of R, G and B or through a color made by mixing any two colors thereof, while the background perforations are observed through a color made by mixing any two colors or through a white color.

[0039] Incidentally, the shape of the background perforations 5 and the information perforations 6 may be basically any one of a circle, an ellipse, a polygon, and the like. However, when the appropriate size thereof is taken into consideration, a longer radius or side, which is in parallel with the R, G, B stripes, can be more easily recognized. When it is too long, however, the strength of the substrate 3 is lowered as well as a large area is required to the substrate 3. When the above points are taken into consideration, it has become apparent from an experiment that it is effective to dispose the back-

ground perforations 5 and the information perforations 6 in the staggered arrangement with respect to the disposition of the R, G, B stripes which constitute the color element screen, to form the perforations densely so as to make the size of the truth and falsehood determination device 1 as small as possible, and to form the perforations in a circle having a diameter 1.5 to 2 times the width of each stripe of the liquid crystal panel 2 when the visually recognizing property of the information perforations 6 is to be improved. In this case, an appropriate diameter of the perforations obtained in the experiment is 0.18 mm.

[0040] Next, the horizontal pitch p of the background perforations 5 and the information perforations 6 of the truth and falsehood determination device 1 will be examined. Each of the R, G, B stripes of the liquid crystal panel 2 has a width of 0.1 mm. Thus, when the perforations having a minor axis of 0.1 mm are formed, the pitch p is set to an integer multiple of 0.3 mm so that the perforations cover any of R, G, and B. When the perforations having a minor axis of 0.2 mm are formed, the pitch p is also set to an integer multiple of 0.3 mm. As described above, the pitch p is set to an integer multiple of 0.3 mm here. However, actually, when the diameter of the perforations is set to 0.2 mm, the pitch of 0.3 mm cannot be employed because the sufficient strength of the substrate cannot be obtained by the pitch of 0.3 mm and the perforations cannot be discriminated due to the excessive proximity of the perforations to each other when binarized data composed of "1" and "0" is given based on the positions of the perforations which will be described below. Accordingly, a minimum pitch is set to 0.6 mm, and the size of the truth and falsehood determination device is increased in the sequence of the pitch of 0.9 mm and 1.2 mm.

[0041] It should be noted that the above-mentioned appropriate diameter 0.18 mm of the perforations is employed when the truth and falsehood determination device is made at the pitch 0.6 mm, and when the device is made at the pitch of the perforations set to 0.9 mm or 1.2 mm, the diameter of the perforations may be more increased in a direction parallel with the stripes. When the perforations are disposed at the pitch 0.9 mm in the staggered arrangement with respect to the disposition of the R, G, B stripes constituting the color element screen, perforations on a second row are formed at positions shifted rightward by 0.3 mm from a certain row A as a reference and perforations on a third row are formed on the same array as the certain row A because the stripes having three colors of R, G, B are formed in the odd number of arrays. Further, perforations on a fourth row are formed at positions shifted rightward by 0.6 mm from the certain state A, whereby the information perforations can be displayed uniformly on an entire plane.

[0042] Next, positions where the information perforations 6 are formed will be examined. The shape and the pitch p of the information perforations 6 are as described

above. However, since the information perforations 6 are recognized in a color different from that of the background perforations 5, they are formed at position which are shifted rightward or leftward by 0.1 mm from the positions of the background perforations 5 when they are recognized in monochrome. When the information perforations 6 are recognized in a mixed color, they are formed at positions which are shifted rightward or leftward in the range of 0.1 to 0.2 mm. In this case, to prevent the information of the truth and falsehood determination device from being observed only the device without placing the device on the liquid crystal panel, it is effective to make the minor axis of the background perforations 5 equal to that of the information perforations 6 and further to set an amount of shift (the above-mentioned "x") between the information perforations 6 and the background perforations 5 to less than the width of one stripe. In the experiment as to the truth and falsehood determination device made with the pitch of 0.6 mm, the diameter of the perforations was set to 0.18 mm, about 0.07 mm which was slightly larger than 1/2 time the width of the stripes was obtained by a difference of a mixed color made of two colors as well as the truth and falsehood determination device had a conceal property which prevented the observation of the device when it was observed by reflected light.

[0043] What is mentioned above will be described below more specifically. To examine the size of the truth and falsehood determination device 1, it is preferable that the device 1 be not too large to provide it with a paper money and the like. When the number of perforations on each row which was necessary to express a specific pattern information was examined, it was found that the number of perforations constituting the truth and falsehood determination device was $40 \times 40 = 1600$ in order to express a circular figure having a diameter of about 12.00 mm as specific pattern information.

[0044] Next, the perforation pitch p is set to 0.3 mm in accordance with the pitch w of the stripes of the liquid crystal panel 2 which is set to 0.3 mm. However, since it is effective to set the diameter of the perforations to about 0.2 mm to obtain an excellent visual recognizing property, when the pitch P is set to 0.3 mm, the substrate is liable to be broken. To cope with this problem, it is necessary to set the perforation pitch p to 0.6 mm which is twice the pitch w of the stripes of the liquid crystal panel 2. However, when the number of the perforations of each row is set to 40, the overall width of the information perforations is made to 24 mm (40×0.6 mm) which is too large. Accordingly, the perforations are disposed in the staggered arrangement with respect to the R, G, B stripes constituting the color element screen so as to increase the density of the perforations in place of that the number of the perforations of each row is reduced to 20 to set the overall width of the information perforations to 12 mm (20×0.6 mm) so that the excellent visual recognizing property can be obtained. As a result, the information perforations are disposed in the staggered

arrangement with respect to all the R, G, B stripes constituting the color element screen when the horizontal width of the overall information perforations expressing specific pattern information is $20 \times 0.6 \text{ mm} = 12 \text{ mm}$ (S type) and when the horizontal width of the overall information perforations expressing specific pattern information is $20 \times 1.2 \text{ mm} = 24 \text{ mm}$ (L type).

[0045] It should be noted that an M type is available in which the horizontal width of the overall information perforations expressing specific pattern information is set to 18 mm ($20 \times 0.9 \text{ mm}$). In this case, however, the information perforations are not disposed in the simple staggered arrangement but they are disposed such that when the perforations on a first row are shifted rightward by 0.6 mm from a first row, the perforations on a third row are shifted rightward by 0.3 mm from the first row, and thereafter the perforations are disposed to repeat the above arrangement so that an amount of shift x is sequentially repeatedly changed. With this rule, the information perforations 6 can be expressed by providing them with predetermined amounts of shift x with respect to the background perforations 5.

[0046] First, the S type in which the liquid crystal panel 2 the respective R, G, B stripes of which have a width 0.1 mm will be described. The number of perforations on a first perforation row is set to 20 and the perforations are formed at the perforation pitch p ; and a second perforation row is disposed below the first perforation row at the pitch p' and perforations are formed at positions which are shifted horizontally by $1/2$ time the perforation pitch p from the positions of the perforations on the first row so that the perforations are disposed in the staggered arrangement. Further, to arrange the shape of the truth and falsehood determination device in a square, the number of the perforations on each row which is necessary to express the information perforations is set to 40. That is, the perforation pitch p is set to 0.6 mm on each perforation row and the pitch p' between the perforation rows is set to 0.3 mm so that the perforations are disposed densely in the staggered arrangement.

[0047] Three types of perforation diameter, that is, 0.11 mm, 0.15 mm and 0.18 mm were evaluated. As a result, a truth and falsehood determination device 1 whose perforations had a diameter 0.18 mm could be most excellently discriminated because light from the liquid crystal panel 2 passed through the perforation arrays 4 in a relatively large quantity. The amount of shift x was evaluated as to a perforation diameter 0.18 mm using samples having an amount of shift of 0.05 mm, 0.06 mm, 0.07 mm, 0.08 mm, 0.09 mm and 0.1 mm. As a result, it was difficult to recognize the sample having the amount of shift of 0.05 mm because an information color was made the same as a background color; and the sample having the amount of shift of 0.1 mm could be excellently recognized but the information perforations 6 could be recognized even with reflected light. Accordingly, the most appropriate amount of shift x having both a visual recognizing property and a concealing

property resides in the range of 0.06 mm to 0.08 mm.

[0048] Next, the L type will be described. The perforations were disposed in the staggered arrangement in the number of 20 on each row similarly to the S type and in the number of 40 on each column, the perforation pitch p was set to 1.2 mm and the perforation pitch p' was set to 0.6 mm. The perforations were evaluated as to 4 types of shape, that is, as to circles having a diameter of 0.11 mm, 0.15 mm, and 0.18 mm as well as an ellipse of $0.13 \text{ mm} \times 0.65 \text{ mm}$. As a result, a truth and falsehood determination device having the ellipses of $0.13 \text{ mm} \times 0.65 \text{ mm}$ could be excellently recognized because they had the largest total quantity of light relatively passing therethrough with respect to the size of the device. When the amount of shift x was evaluated as to the ellipse of $0.13 \text{ mm} \times 0.65 \text{ mm}$ using samples having an amount of shift of 0.05 mm, 0.06 mm, 0.07 mm, 0.08 mm, 0.09 mm and 0.1 mm, no problem arose in the visual recognizing property and the concealing property even if the amount of shift was set to 0.1 mm because the pitch p had a large value of 1.2 mm.

Example 2

[0049] Fig. 2 is a view explaining an embodiment 2 of a truth and falsehood determination device according to the present invention. The truth and falsehood determination device 7 shown in Fig. 2 includes a substrate 8 on which a multiplicity of fine background perforations 9 and a multiplicity of fine information perforations 10 shifted horizontally to give information "T" are formed by laser beams. The basic structure of the example 2 is the same as the example 1 in this respect. Fig. 2 shows a state that the truth and falsehood determination device 7 is placed on stripes having three colors of R, G, B and information "T" of the red color is recognized by the information perforations.

[0050] In addition to the above basic structure, the truth and falsehood determination device 7 shown in Fig. 2 is provided with binarized data composed of "1" and "0" based on the positions of perforations disposed horizontally on each row. That is, in Fig. 2, perforations 13 on a background perforation line L of each perforation row are set to "0" and perforations 12 shifted upward from the background perforation line L are set to "1".

[0051] As described above, the background perforations 9 and the information perforations 10 on each perforation row are partly selectively formed above the background perforation line so that binarized data (shown by ASCII code 14 in Fig. 2), which corresponds to the respective alphabetical characters and the like of, for example, information "PRINTING", is provided, in addition to information "T". The respective perforation rows for providing the binarized data are recorded by a line camera or an area camera and the images recorded thereby are subjected to image processing to recognize the above information.

[0052] The perforations formed on the respective per-

foration rows are fine and an amount of shift (hereinafter, referred to as "an amount of rising-up") h between the perforations 12 and 13 representing "0" and "1" is very small and it is difficult to visually observe them. Moreover, information is provided with one truth and falsehood determination device in various types of mode (such as the shift of the information perforations with respect to the color stripes and the shift thereof with respect to the line of the perforation row), which makes it very difficult to forge and alter the truth and falsehood determination device 7 of the present invention. In addition, it is possible to provide the device with a lot of information.

[0053] An appropriate value of the rising-up amount h was variously examined and the following result was obtained. First, the S type will be described. Three types of the rising-up amount h , that is, rising-up amounts h of 0.05 mm, 0.1 mm, and 0.15 mm were examined as to a perforation diameter of 0.18 mm. As a result, in the rising-up amount h of 0.05 mm, a camera having high resolution was necessary from the view point of resolution of cameras and shapes of perforations; and in the rising-up amount h of 0.15 mm, when adjacent perforations (on an upper row) represented "0", the vertical distance therebetween was -0.03 mm ($0.3 \text{ mm} - (0.15 \text{ mm} + 0.09 \text{ mm}) - 0.09 \text{ mm}$) and it was difficult to discriminate between them and perforations adjacent to them. Accordingly, an appropriate rising-up amount h was one third the vertical perforation pitch p' , that is, about 0.1 mm. Note that, as to the L type in which the perforation pitch p was 1.2 mm and the perforation pitch p' was 0.6 mm, a distance up to an upper row had a large amount of 0.6 mm, and thus even the perforations formed of the ellipse of $0.13 \text{ mm} \times 0.65 \text{ mm}$ could be recognized without any problem even if the rising-up amount was set to 0.2 mm.

Example 3

[0054] Fig. 3 is a view explaining a basic arrangement when a truth and falsehood determination device is provided with binarized data according to the present invention as well as showing an example 3.

[0055] Fig. 3a is a view showing a truth and falsehood determination device 15 truth on which the same binarized data A is provided at four positions using ASCII code representing alphanumeric characters by 7 bits, or the like. In Fig. 3a, even if any of blocks 16 showing perforated regions, with which the binarized data A is provided, is broken and the binarized data A recorded thereon cannot be read, whether the truth and falsehood determination device 15 is true or false can be determined if the same binarized data A can be read on at least two remaining blocks 16. In this case, even if any the blocks 16 with which the binarized data is provided is broken, it is also possible to determine whether the truth and falsehood determination device 15 is true or false by not providing the same binarized data A with the blocks 16 showing the perforated regions at the four positions but

providing desired binarized data with each of the blocks and by deciding whether or not a predetermined correlation exists between the binarized data read in at least two remaining blocks 16.

[0056] Fig. 3b is an enlarged view of a block 16 showing a perforated region with which the binarized data is provided. The binarized data A is provided with every other row using ASCII code representing alphanumeric characters by 7 bits, or the like and binarized data B different from the binarized data A is provided with the remaining rows, which makes it more difficult to read the binarized data A, thereby improving a deterrent against forgery. In this case, the same effect can be obtained even if the binarized data A is provided with every other row or every several rows and any of the binarized data B different from the binarized data A and meaningless dummy data, which cannot be read as binarized data, is provided with the remaining rows.

[0057] Further, Fig. 3c is a view showing a perforated region in which simultaneously formed are a block 16, with which binarized data is provided, as well as a block 16(a) obtained by reversing the block 16 up and down, a block 16(b) obtained by reversing the block 16 right and left and a block 16(c) obtained by reversing the block 16 up and down and right and left. According to the truth and falsehood determination device 15 shown in Fig. 3c, when the truth and falsehood determination device 15 is inserted into an apparatus for mechanically reading the binarized data, the binarized data can be read in any of the four blocks without regulating the front surface and the back surface of the device 15 as well as a direction in which the device 15 is inserted.

Example 4

[0058] In a truth and falsehood determination device shown in Fig. 4a, a perforated region, in which a multiplicity of fine perforations are disposed in the staggered arrangement, is constructed such that perforations, which are shifted vertically from a predetermined reference line of each perforation row, and perforations, which are not shifted vertically therefrom, are disposed on each perforation row on which perforations are disposed horizontally and on every other perforation row on which the perforations are disposed horizontally so as to form perforated subregions with which only binarized data of such as ASCII code representing alphanumeric characters, or the like is provided; and the perforations shifted vertically and the perforations not shifted vertically are discriminated based on the relative positional relationship thereof to four perforations which are adjacent to the above perforations in an obliquely upward left direction, obliquely downward left direction, obliquely upward right direction and obliquely downward right direction to thereby read the binarized data. That is, Fig. 4a shows such a method that in a perforation row with which binarized data is provided, the binarized data is provided with perforations 18 and 19 which are sur-

rounded by four perforations 17 formed on perforation rows located above and below the above perforation row with which no binarized data is provided; and "0" is set to the perforation 18 which is located on the diagonal lines of four perforations 17 located in an obliquely upward left direction, obliquely downward left direction, obliquely upward right direction and obliquely downward right direction of the perforation 18 adjacent thereto, and "1" is set to the perforation 19 which is shifted upward from the diagonal lines.

[0059] Fig. 4b is a view schematically showing a two-dimensional barcode. The two-dimensional barcode can record an amount of data which is several ten times to several hundred times as much as that of an ordinary barcode as well as the same data is recorded in each scan direction. Accordingly, the data can be read in any of scan directions such as right, left, up, down and oblique scan directions. Therefore, even if the data cannot be partly read due to contamination, the data can be read by being scanned in a different direction.

[0060] The present invention pays attention to a method of providing two-dimensional data such as the two-dimensional barcode and the like and provides the binarized data, which is applied to the truth and falsehood determination device, as a light transmitting type two-dimensional barcode. That is, in the method of the present invention, a portion corresponding to the black portion of an ordinary printed two-dimensional barcode, is risen up vertically and set to "1", whereas a portion corresponding to the white portion thereof is not risen up vertically and set to "0". In the transmitting type two-dimensional barcode, binarized data is provided by fine perforations which are difficult to be visually observed. Thus, the barcode does not lower the quality of printed matters in addition to the deterrent against forgery of the truth and falsehood determination devices described up to now. Further, the binarized data is read with transmitting light, which permits the binarized data to be read stably even in a black printed matter and a glossy printed matter.

[0061] It should be noted that while the arrangement that the portion corresponding to the black color of the two-dimensional barcode is risen up vertically and set to "1" and the portion corresponding to the white color thereof is not risen up vertically and set to "0" is described in the above method, a unique reading algorithm can be constructed by combining Figs. 3b and 4a. That is, in the example shown in Fig. 3b, ASCII code representing alphanumeric characters by 7 bits, or the like is used, the binarized data A is provided with every other row and the binarized data B different from the binarized data A is provided with the remaining rows. However, when ASCII code or the like is replaced with the binarized data recorded by the two-dimensional barcode, the binarized data recorded by the two-dimensional barcode can be provided with every other row of the truth and falsehood determination device of the present invention. Further, in Fig. 4a, the binarized data is provided

ed with the perforations 18 and 19 which are surrounded by the four perforations 17 adjacent thereto in the obliquely upward left direction, obliquely downward left direction, obliquely upward right direction and obliquely downward right direction, "0" is set to the perforation 18 which is located on the diagonal lines of the four perforations 17, and "1" is set to the perforation 19 which is shifted from the diagonal lines. However, it is sufficient to provide binarized data corresponding to one cell of the two-dimensional barcode with the perforation 18 or 19 surrounded by the four perforations 17.

[0062] According to the present invention arranged as described above, the following effects can be achieved.

(1) The truth and falsehood determination device of the present invention is provided with the information perforations formed using a microprocessing technology capable of forming fine perforations by irradiating laser beams so that the they are minutely shifted from the background perforations which are also formed by the microprocessing technology. As a result, it is very difficult to forge or alter the device. Further, information cannot be visually observed only by the truth and falsehood determination device, which also make it difficult to forge or alter the device.

(2) The color element screen used to determine the truth and falsehood of the truth and falsehood determination device may be any color element screen such as a liquid crystal panel, a CRT, a printed transparent film, a fluorescent printed screen and the like so long as it has colors composed of a plurality of color elements and emits, reflects or transmits light. In particular, monitors of such as personal computers, video cameras and the like which are widely used in offices and homes can be used, which permits the truth and falsehood determination device of the present invention to simply determine truth and falsehood.

(3) The truth and falsehood determination device can make the execution of forgery and alteration difficult by variously combining specific information by, for example, setting binarized data of "0" and "1" to the perforations by selectively shifting the positions of them on each perforation row vertically.

(4) The truth and falsehood determination device of the present invention is provided with the information perforations which are minutely shifted with respect to the background perforations. Thus, not only whether the information perforations are true or false can be determined only by placing the device on the color element screen but also the positions of the perforations are selectively shifted vertically on each perforation row to provide the perforations with binarized data of "0" and "1", which permits to determine whether binarized data such as ID data and the like is true or false by a machine, whereby the execution of forgery and alteration is made more

difficult.

(5) The truth and falsehood determination device of the present invention can be applied to a wide range because it can be employed by forming perforations at appropriate positions of characters, portraits, barcodes and the like of existing precious printed matters such as a paper money, passport, security, card, revenue stamp and the like.

Claims

1. A truth and falsehood determination device (1, 7, 15), which has a substrate (3, 8) on which a multiplicity of fine perforations are formed to such a degree as to make it difficult for the fine perforations to be visually observed and which can determine truth and falsehood by placing the substrate (3, 8) on a color element screen (2) which has a multiplicity of color element stripes disposed thereon at a predetermined pitch so that each of the stripes exhibits any of a plurality of colors and which is composed of the plurality of colors, characterized in that:

the multiplicity of fine perforations include a multiplicity of background perforations (5, 9) for forming a background and a multiplicity of information perforations (6, 10) for forming specific pattern information;

the multiplicity of background perforations (5, 9) are disposed at predetermined vertical and horizontal pitches in a staggered arrangement with respect to the disposition of the color element stripes constituting the color element screen (2); and

the multiplicity of information perforations (6, 10) are disposed at the same vertical and horizontal pitches as those of the background perforations (5, 9) in the staggered arrangement with respect to the disposition of the color element stripes constituting the color element screen (2) as well as shifted horizontally from the multiplicity of background perforations (5, 9) by a predetermined distance,

wherein the specific pattern information can be visually observed in such a manner that when the substrate (3, 8) is placed on the color element screen (2), a background color observed through the multiplicity of background perforations (5, 9) is different from an information color observed through the multiplicity of information perforations (6, 10).

2. A truth and falsehood determination device (1, 7, 15) according to claim 1, characterized in that;

the horizontal pitch of the background perfora-

tions (5, 9) and the information perforations (6, 10) is twice the total width of each set of the color element stripes having the plurality of colors constituting the color element screen (2); each of the background perforations (5, 9) and the information perforations (6, 10) is a fine circle having a diameter which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2); and the amount of horizontal shift of the information perforations (6, 10) with respect to the background perforations (5, 9) is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2).

3. A truth and falsehood determination device (1, 7, 15) according to claim 1, characterized in that;

the horizontal pitch of the background perforations (5, 9) and the information perforations (6, 10) is three times the total width of each set of the color element stripes having the plurality of colors constituting the color element screen (2); each of the background perforations (5, 9) and the information perforations (6, 10) is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2) and having a vertical width which is an integer multiple of the horizontal width; and the amount of horizontal shift of the information perforations (6, 10) with respect to the background perforations (5, 9) is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2).

4. A truth and falsehood determination device (1, 7, 15) according to claim 1, characterized in that;

the horizontal pitch of the background perforations (5, 9) and the information perforations (6, 10) is four times the total width of each set of the color element stripes having the plurality of colors constituting the color element screen (2); each of the background perforations (5, 9) and the information perforations (6, 10) is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2) and having a vertical width which is an integer multiple of the horizontal width; and the amount of horizontal shift of the information perforations (6, 10) with respect to the back-

ground perforations (5, 9) is at least 1/2 time or less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2).

5. A truth and falsehood determination device (1, 7, 15) according to claim 1, characterized in that;

the multiplicity of background perforations (5, 9) in the multiplicity of fine perforations are partly shifted vertically from the predetermined reference line of each perforation row on which the perforations are disposed horizontally as well as the multiplicity of information perforations (6, 10) are partly shifted vertically; and binarized data composed of a combination of "1" and "0" is provided by the background perforations (5, 9) and the information perforations (6, 10) which are shifted vertically and by the background perforations (5, 9) and the information perforations (6, 10) which are not shifted vertically.

6. A truth and falsehood determination device (1, 7, 15) according to claim 5, characterized in that;

the horizontal pitch of the background perforations (5, 9) and the information perforations (6, 10) is twice the total width of each set of the color element stripes having the plurality of colors;
each of the background perforations (5, 9) and the information perforations (6, 10) is a fine circle having a diameter which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2);
the amount of horizontal shift of the information perforations (6, 10) with respect to the background perforations (5, 9) is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2); and
the amount of vertical shift of the background perforations (5, 9) and the information perforations (6, 10) is at least 1/2 time the diameter of the perforations.

7. A truth and falsehood determination device (1, 7, 15) according to claim 5, characterized in that;

the horizontal pitch of the background perforations (5, 9) and the information perforations (6, 10) is three times the total width of each set of the color element stripes having the plurality of colors;
each of the background perforations (5, 9) and the information perforations (6, 10) is a fine el-

lipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2) and having a vertical width which is an integer multiple of the horizontal width;
the amount of horizontal shift of the information perforations (6, 10) with respect to the background perforations (5, 9) is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2); and
the amount of vertical shift of the background perforations (5, 9) and the information perforations (6, 10) is at least 1/2 time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2).

8. A truth and falsehood determination device (1, 7, 15) according to claim 5, characterized in that;

the horizontal pitch of the background perforations (5, 9) and the information perforations (6, 10) is four times the total width of each set of the color element stripes having the plurality of colors;
each of the background perforations (5, 9) and the information perforations (6, 10) is a fine ellipse having a horizontal width which is at least one time to less than twice the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2) and having a vertical width which is an integer multiple of the horizontal width;
the amount of horizontal shift of the information perforations (6, 10) with respect to the background perforations (5, 9) is at least 1/2 time to less than one time the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2); and
the amount of vertical shift of the background perforations (5, 9) and the information perforations (6, 10) is at least 1/2 time to less than two times the width of a color element stripe exhibiting any of the plurality of colors constituting the color element screen (2).

9. A truth and falsehood determination device (1, 7, 15) according to any of claims 5 to 8, characterized in that;

a plurality of perforated regions, with which binarized data composed of a combination of "1" and "0" is provided, are formed in the truth and falsehood determination device (1, 7, 15);
at least two perforated regions are extracted from the plurality of perforated regions; and

truth and falsehood are determined by deciding whether or not a predetermined correlation exists between the binarized data of the at least two extracted perforated regions.

10. A truth and falsehood determination device (1, 7, 15) according to any of claims 5 to 8, characterized in that;

a perforated region, with which binarized data composed of a combination of "1" and "0" is provided, is used as a reference block (16); four blocks, that is, the reference block as well as a block obtained (16a) by reversing the reference block up and down, a block (16b) obtained by reversing the reference block right and left and a block (16c) obtained by reversing the reference block up and down and right and left are formed simultaneously, whereby, when the truth and falsehood determination device (1, 7, 15) is inserted into an apparatus for mechanically reading the binarized data, the binarized data can be read in any of the four blocks without regulating the front surface and the back surface of the truth and falsehood determination device (1, 7, 15) as well as a direction in which the device is inserted.

11. A truth and falsehood determination device (1, 7, 15) according to any of claims 5 to 10, characterized in that the binarized data composed of a combination of "1" and "0" is provided with the truth and falsehood determination device (1, 7, 15) so that the perforations of the portion corresponding to the black color of a two-dimensional barcode is set to "1" and the perforations of the portion corresponding to the white color of the two-dimensional barcode is set to "0".

12. A truth and falsehood determination device (1, 7, 15) according to any of claims 5 to 11, characterized in that:

the binarized data composed of a combination of "1" and "0" is provided with every other row or with every several rows; and binarized data different from the above binarized data or meaningless dummy data, which cannot be read as binarized data, is provided with the remaining rows.

13. A truth and falsehood determination device (1, 7, 15) according to any of claims 1 to 12, characterized in that:

a perforated region, in which a multiplicity of fine perforations are formed in the staggered arrangement, is constructed such that perfora-

tions (19), which are shifted vertically from a predetermined reference line of each perforation row, and perforations (18), which are not shifted vertically therefrom, are disposed on each perforation row on which perforations are disposed horizontally and on every other perforation row on which the perforations are disposed horizontally so as to form perforated subregions with which only binarized data composed of a combination of "1" and "0" is provided; and

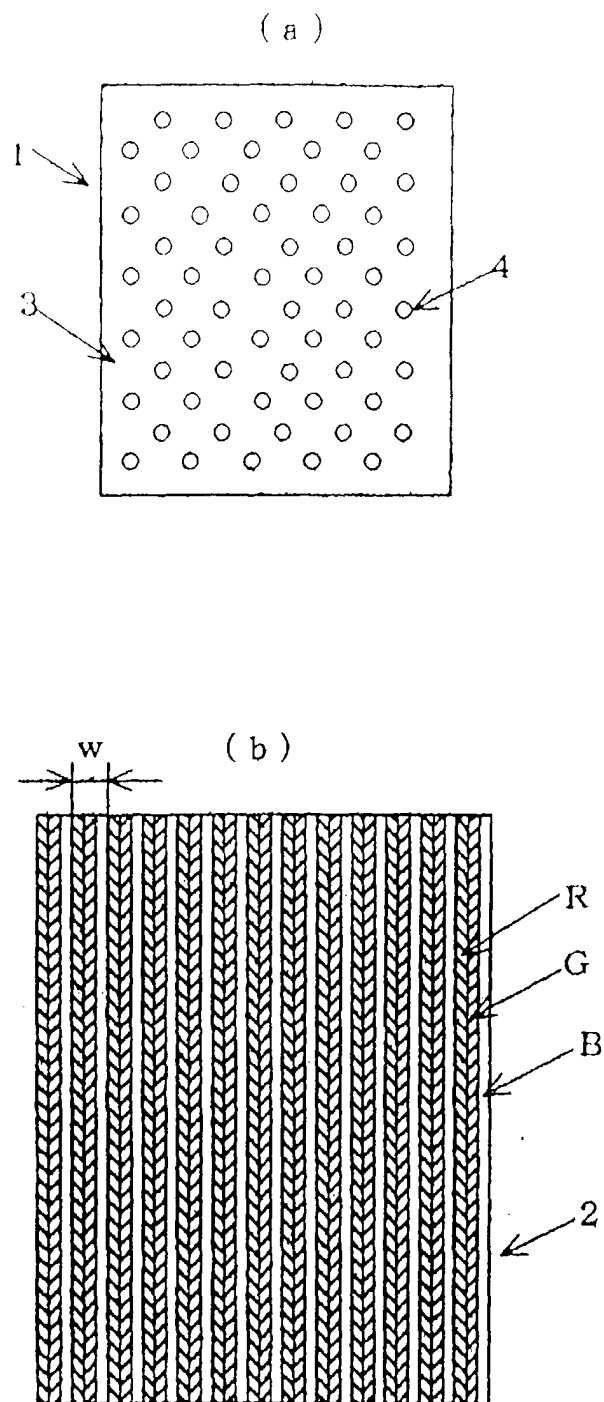
the perforations shifted vertically and the perforations not shifted vertically are discriminated based on the relative positional relationship thereof to four perforations (17), which are adjacent to the above perforations in an obliquely upward left direction, obliquely downward left direction, obliquely upward right direction and obliquely downward right direction in the perforated region with which only the binarized data is provided to thereby read the binarized data.

14. A truth and falsehood determination device (1, 7, 15) according to any of claims 1 to 13, characterized in that the multiplicity of fine perforations are formed by laser beams.

15. A truth and falsehood determination device (1, 7, 15) according to any of claims 1 to 14, characterized in that the color element screen (2) is any of a liquid crystal panel or CRT having the color element stripes, a transparent film or a paper excellent in light transmittance on which the color element stripes are printed, and a substrate (3, 8) on which the color element stripes are printed with fluorescent ink.

16. A truth and falsehood determination device (1, 7, 15) according to claim 15, characterized in that the liquid crystal panel is a commercially available liquid crystal panel or a color liquid crystal panel dedicated for determination of truth and falsehood on which a color element screen (2) is formed in accordance with the size of the multiplicity of fine perforations.

Fig 1



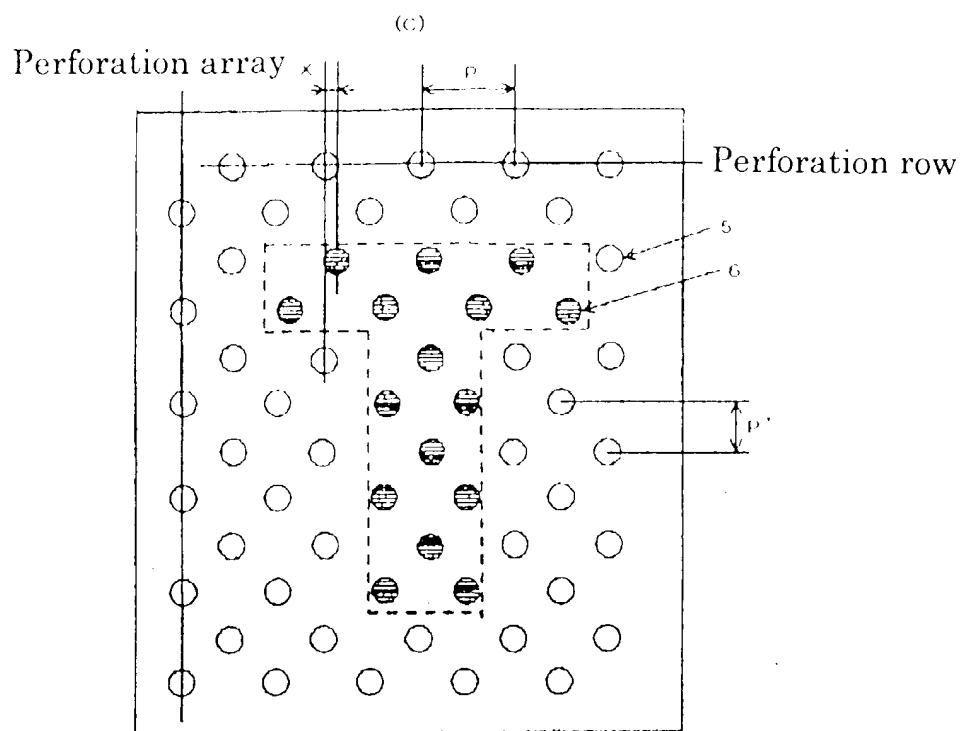
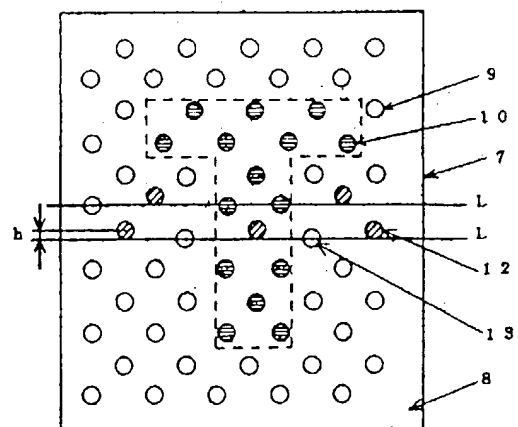


Fig 2



ASCIIコード

1010000 :P
 1010010 :R
 1001001 :I
 1001110 :N
 1010100 :T
 1001001 :I
 1001110 :N
 1000111 :G

14

Fig 3

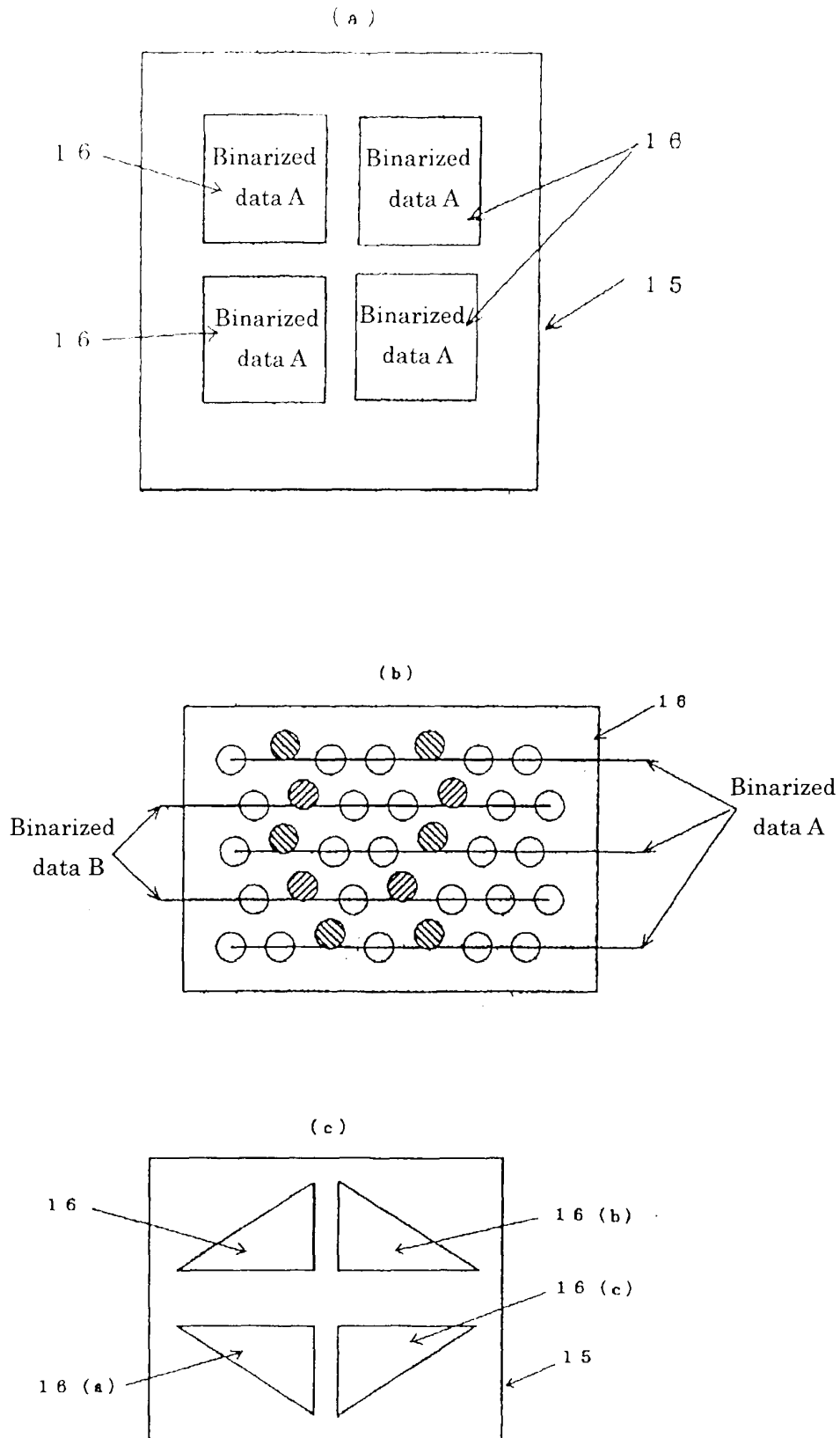
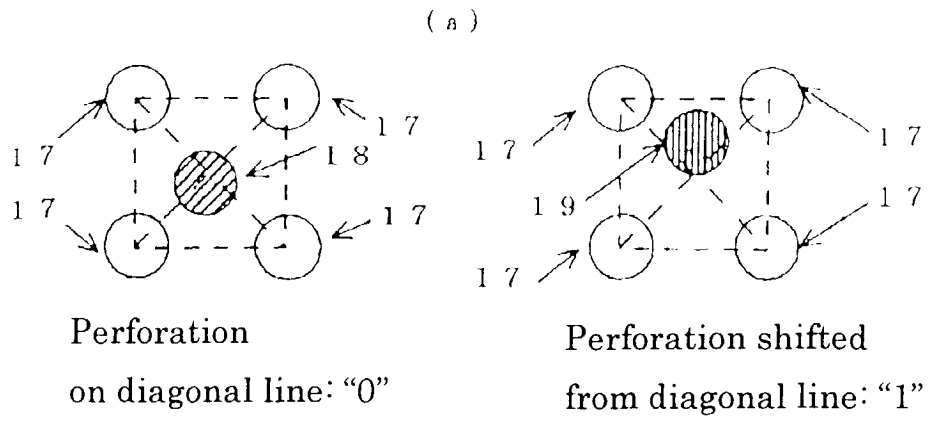


Fig 4



(b)

