United States Patent [19]

Jacobson

[11] **3,722,109**

[45] **Mar. 27, 1973**

[54] **FINE AND GRAPHICS ARTS PRODUCTS FOR ENABLING AMATEURS AND OTHERS TO SELECT AND-UTILIZE COLOR MATERIALS WITH OPTICAL RESULTS OF INCREASED PREDICTABILITY**

[76] Inventor: **Nathaniel J. Jacobson,** One Holden Street, Brookline, Mass. 02146

[22] Filed: **Sept. 15, 1971**

[21] Appl. No.: **180,701**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 78,644, Oct. 6, 1970, Pat. No. 3,628,260, which is a continuation of Ser. No. 694,736, Dec. 29, 1967, abandoned.

[52] **U.S. Cl.** **35/28.5**

[51] **Int. Cl.** **G09b 11/00**

[58] **Field of Search** 35/28.3, 28.5

[56] **References Cited**

UNITED STATES PATENTS

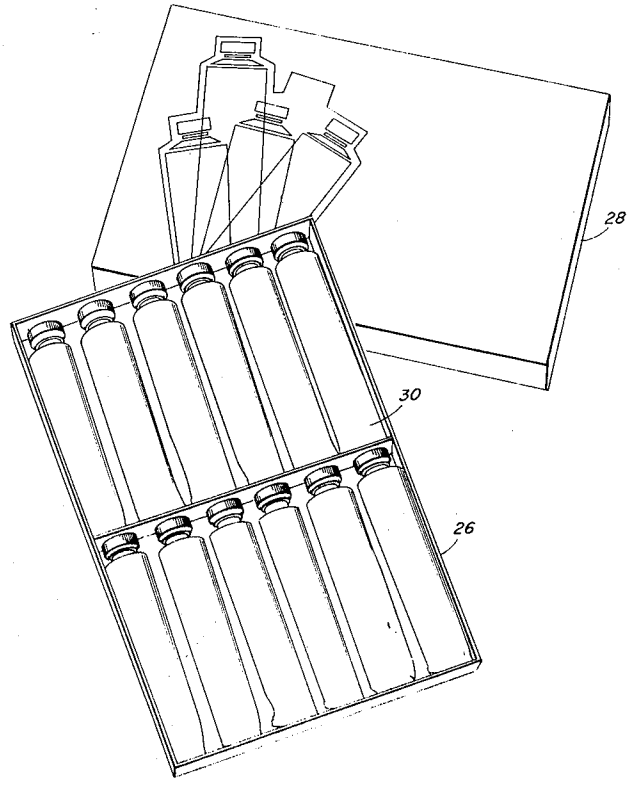
3,628,260 12/1971 Jacobson 35/28.5

Primary Examiner—Harland S. Skogquist
Attorney—Morse, Altman & Oates

[57] **ABSTRACT**

A limited number of predetermined, systematically identified color materials are predeterminedly arranged in an array of distinguishable groups of colors of like "value," with reference to the terms "hue," "value" and "chroma" as used in the "Munsell Color System" (or with reference to equivalent terms as used in analogous systems). The user, in working with the array, efficaciously is enabled to create a particular color of predicted optical character by mixing given colors from a particular group of premixed colors of like "value."

4 Claims, 4 Drawing Figures



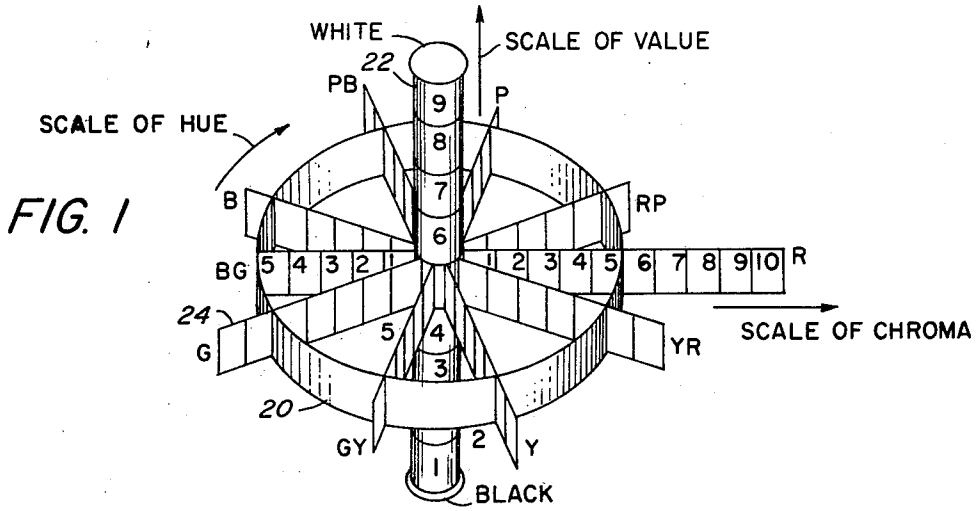

WHITE
22
SCALE OF VALUE
PB
P
9
8
7
6
SCALE OF HUE
B
RP
BG
5 4 3 2 1
1 2 3 4 5 6 7 8 9 10
R
24
G
5
4
3
YR
SCALE OF CHROMA
20
GY
2
Y
1
BLACK

FIG. 1

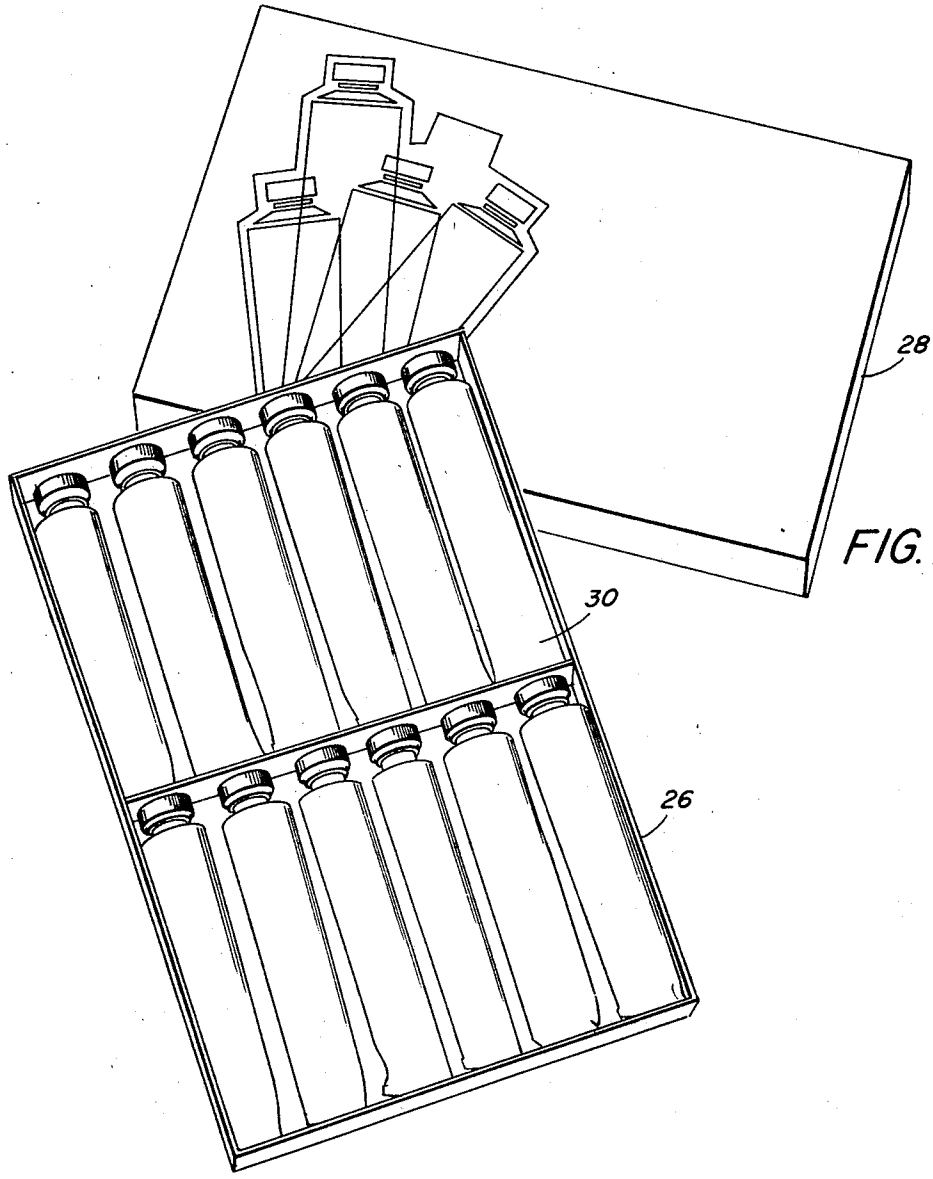

28
30
26

FIG. 2

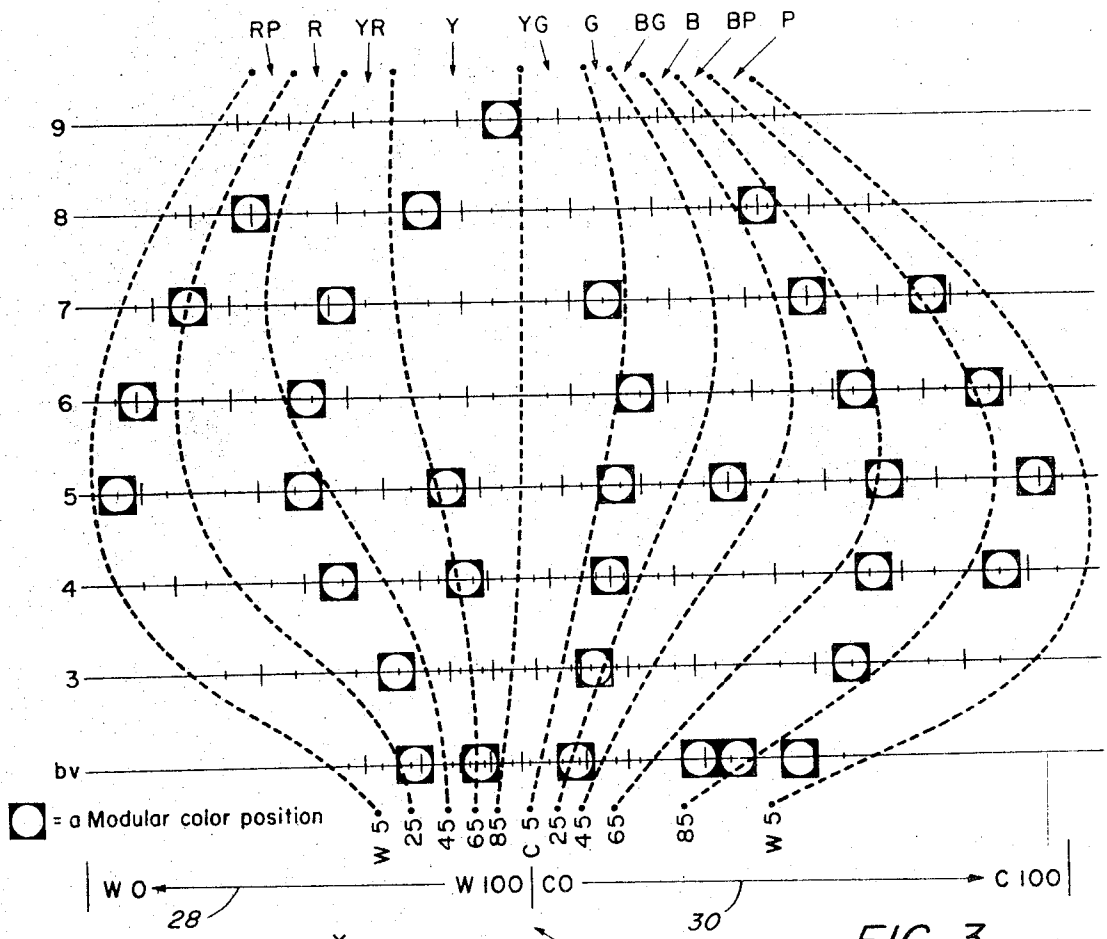

RP R YR Y YG G BG B BP P
9
8
7
6
5
4
3
bv
= a Modular color position
W 5 25 45 65 85 C 5 25 45 65 85 W 5
W 0
W 100
C 0
C 100
28
30

FIG. 3

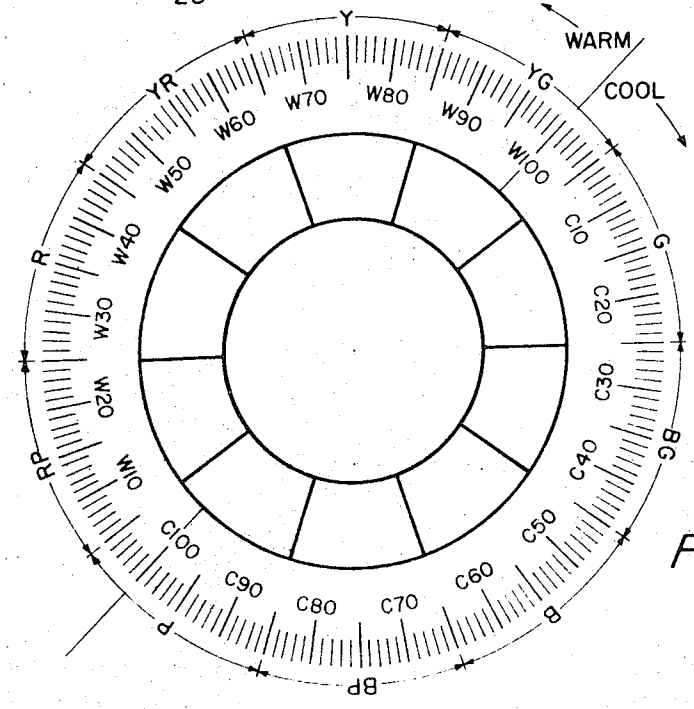

WARM
COOL
Y
YG
G
BG
B
BP
P
RP
R
YR
W10
W20
W30
W40
W50
W60
W70
W80
W90
W100
C10
C20
C30
C40
C50
C60
C70
C80
C90
C100

FIG. 4

FINE AND GRAPHICS ARTS PRODUCTS FOR ENABLING AMATEURS AND OTHERS TO SELECT AND-UTILIZE COLOR MATERIALS WITH OPTICAL RESULTS OF INCREASED PREDICTABILITY

RELATED APPLICATION

The present application is a continuation-in-part of application Ser. No. 78,644, filed Oct. 6, 1970, now U.S. Pat. No. 3,628,260, issued Dec. 21, 1971, which in turn is a continuation of application Ser. No. 694,736, filed Dec. 29, 1967 now abandoned.

TERMINAL DISCLAIMER

The final term of this patent, following Dec. 21, 1988 is disclaimed.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to the fine and graphic arts and, more particularly, to products for enabling amateurs and others to select and utilize color materials, with visual results of increased predictability.

Although the science of color has undergone considerable development, difficulties have been encountered in enabling amateurs and others to apply existing theoretical knowledge in a practical manner. An amateur painter, for example, typically has acquired a supply of different pigments, whose range of colors have been limited by the inherent chemical characteristics traditionally available. This range of colors bears little direct relationship to either recent visual-chemical advances or to a conceptual understanding of the order of color and its theoretical possibilities in composition. Only after long and costly experience in dealing with the complexity of mixing random pigments or like materials is the painter able to achieve his desired color objectives. The present invention contemplates enabling a user to apply existing theoretical knowledge inherently by the provision of a specific organization of premixed, measured, color materials. Many systems have been developed for the purpose of making a theoretical organization of the characteristics of color. These have involved the establishment of common terms for color notation and communication. While this invention is compatible with all systems of measured color arrangements, the specific notations presently employed in identifying the visual color factors of color media are identical with those used in the Munsell Color System. The physical terms "hue," "-value" and "chroma," as defined in the Munsell Color System, are used below to characterize the color materials described — hue referring to the position of a color sensation of the spectrum (e.g. blue, blue-green, etc.), value referring to the luminosity of a color in comparison with a measured standard of varying degrees of light and dark (i.e., ability to evoke the sensation of brightness in the human eye), and chroma referring to the purity of a color (i.e., the degree of departure of a color sensation from neutral gray toward the most intense color sensation of a particular position in the spectrum). Again it will be understood that analogous terms of other color systems could be substituted for the terms used herein.

It has been found that predicting the color that will result from mixing two or more known colors is relatively simple and easy when the known colors being premixed are of the same value and is relatively complex and difficult when the known colors are not of the same value. The present invention takes advantage of this fact by organizing color materials in such a way as to inherently program the selection of given colors for mixing in order to achieve predicted color results. The primary object of the present invention is to provide a kit of containers of color materials, a palette supporting color materials, a chart displaying color materials, or the like, in which the color materials are related colorimetrically in an array of visually isolated groups of different colors, the values of the colors within any group being substantially the same, the values of the colors of different groups being different, and the hues of the different groups being selected for maximum feasible chroma. It has been found that a specific master group of 35 colors, predeterminedly selected in accordance with the present invention, enables the selection therefrom of sub-groups of at least four colors plus black and white, from which a variety of other colors may be predictably mixed. Preferably each such sub-group contains the colors yellow, blue-purple, red and green, which have been found to possess extreme versatility for mixing, when of like value.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

The invention accordingly contemplates the products characterized by components, characteristics and relationships, the scope of which will be indicated in the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

For a fuller understanding of the nature and objects of the present invention, reference is to be had to the following detailed description, taken in connection with the accompanying drawings, wherein:

FIG. 1 illustrates certain principles of color notation upon which the present invention is based;

FIG. 2 is a kit of pigments embodying the present invention;

FIG. 3 is a color chart embodying principles of the present invention; and

FIG. 4 is a color chart, with reference to which further principles of the present invention are illustrated.

DETAILED DESCRIPTION

As suggested above, the Munsell Color System is a scientific technique for describing and analyzing color in terms of three physical attributes, identified as hue, value and chroma. This system, as described in U.S. Pat. No. 824,374, June 26, 1906 in the name of Albert H. Munsell for Color Chart or Scale, arranges the three attributes of color into orderly scales of equal visual steps, so that the attributes are dimensions or parameters by which color may be analyzed and described accurately under standard conditions of illumination. FIG. 1 diagrammatically illustrates the relationships among these physical attributes in three dimensions. Hue is shown as a circular band 20 in a horizontal plane. The hue of a color indicates its relation to the five principal hue terms, red, yellow, green, blue and

purple, which with five sub-divisions, yellow-red, green-yellow, blue-green, purple-blue and red-purple, constitute the 10 major hue terms. Value is shown as an axial post **22** in vertical relation to the plane of band **20**. The value of a color indicates the degree of lightness or darkness of a color in relation to a neutral gray scale, designated by N which extends from a theoretically pure black symbolized by N 0/ to a theoretically pure white symbolized as N 10/. A gray or a chromatic color that appears visually half-way in lightness between pure black and pure white has a value notation of 5/. Lighter colors are indicated by numbers ranging from five, while darker ones are indicated by numbers ranging below five. Chroma is shown as angularly radiating spokes **24** extending from post **22** through band **20**. Chroma indicates the saturation or degree of departure of a particular hue from a neutral gray of the same value. The scales of chroma extend from /0 for a neutral gray out to /14 or farther, depending upon the strength of the individual color. A color classified popularly as "vermillion" might have a chroma as strong as /12 while another color of the same hue and value classified popularly as "rose" might have a chroma as weak as /4. The complete notation for any chroma color is written hue value/chroma, or symbolically H V/C. A particular sample of vermillion might then have Munsell notation of R 5/12.

The kit of FIG. **2** consists of a container having a base **26** in the form of an open top box and a closure **28** in the form of an open bottom cover. Both the base and the cover are composed, for example, of cardboard. Within base **26** are a series of tubes **30** containing a series of at least six acrylic emulsion pigments selected from a larger group of 35 pigments to be described below. It has been found that the facilitated color relationships of the present invention are especially significant in connection with acrylic emulsion pigments because of their tendency to dry fairly rapidly before and during use. Each tube **30** is composed of a flexible metallic or plastic sheath having a threaded mouth, which is closed by the knurled screw cap. On the label of each tube are specified Munsell designations of hue, value and chroma, selected from the charts now to be described in connection with FIGS. **3** and **4**.

Colorimetrically, this kit contains a replete selection of basic colors from which a large variety of intermediate colors may be synthesized. More specifically, the kit contains a minimum selection of the four colors yellow (Y), blue-purple (BP), red (R) and green (G), the selection being based on the following considerations. BP, R and G may be considered the primary colors of light so that all parts of the spectrum can be produced by their selected admixtures. In the physical mixtures of most pigments presently available, Y does not result in a strong chroma when the two components R and G are mixed to form it. Thus Y is added to the palette selection. Not all colors appear at their greatest chroma strength (intensity) at the same value level. For example, blue is visually strongest at about value 4 or value 5. When a lighter blue is needed, it is necessary to accept a blue that is somewhat reduced in chroma. Other colors, such as yellow, are only very strong when they are light in value. The darker yellows, or "-browns," of course, are not very intense. In accordance with the present invention, each pigment at any selected value is presented in its strongest possible chroma.

With reference now to FIG. **4**, there is illustrated a natural band of colors ranging from red through purple, which band has been turned through a circle so that its ends are contiguous. This circle has been based upon the consistent natural fact that certain colors seem to "-vibrate" when they are placed side by side. Illustrating this active relationship of opposite colors, it can be seen that red and blue-green "vibrate" when placed alongside each other. These complementary colors, when mixed, weaken each other's intensity. Thus red and blue green directly neutralize each other. It has been found that when at the same value level, color vibrations most effective and chroma loss is most acceptable.

With reference now to FIG. **3**, the color chart shows all of the colors available in the color list of the present invention in reference to the color sequence of FIG. **4**. as extended linearly at **28**, **30** from W0 to W100 and from C0 to C100. They are displayed in related visual hue sequences on equal value levels. From these 35 essential paints the artist can make his choice of those effective for this painting technique. The special interrelationships of these colors are most useful in subgroups of more than six of these pigments. Yet, as a single color, or in small groups, they also give the artist the distinct advantage of having precise color identification from which he can recognize the color relation to this other paints.

As seen in the chart of FIG. **3**, the hue sequence from one value level to the next departs from a vertical line in order to allow for real conditions of color strength and visual color spacing. This selection fits most directly the pallette color needs of the artist. By having the highest chroma at each value level, the artist can easily mix the lower chromas from neutralizing colors of the same value. He can achieve a hue not previously provided by mixing adjacent colors of the same value when there is an adequate range (five or more colors). To make changes in light and dark, the various values of a given color can be combined. Beyond that, it may be necessary to use mixtures with white or black paint for lighter or darker color, respectively.

In this discussion of how to use the colors of the present invention, the chart of FIG. **3** is an empirical expression of the artist's practical color needs. Prior charts have been characterized by symmetrical hue spacing for all value levels. In contrast, the chart of FIG. **3** is characterized by hue positions which follow curved lines as they change from value to value. More specifically, assuming horizontal lines representing colors of equal values, these colors are disposed vertically along lines representing somewhat different hue to roughly the same color, these lines being expanded outwardly in the vicinity of values 5 and 6 and being constructed inwardly at their upper and lower extremities.

With reference to FIGS. **1**, **3** and **4**, the numerical designations of the specific colors of TABLE I are highly preferred as constituting the group from which the particular pigments of FIG. **2** are selected. These numerical designations can vary to some extent but preferably the variation, i.e., the tolerance should be no greater than plus or minus 0.5 for hue, no greater than

plus or minus 0.1 for value, and no greater than minus 0.5 for chroma (there being no upper limit for chroma).

The chart of FIG. 4 shows which colors are juxtaposition and which colors are opposite (complementary). The calibrated circle includes 100 graduations for the warm colors and another 100 graduations for the cool colors. With this chart it is very convenient to locate exact complementary positions. Thus, *w*15 (red-purple) is exactly opposite *c*15 (green). With this knowledge available, the artist has greater freedom of choice and more creative power in his control of color. In accordance with the present invention, instead of working with memorized combinations of paint ingredients, color changes can be controlled visually. The artist can depend upon the built-in relationships of the available colors to achieve consistently predictable effects. By observing the position of the hue on the color circle, the artist can know how to neutralize or reduce chroma, how to intensify color relationships and how intermediate hues can be created. Standard color mixing advice usually begins with the suggestion to combine the strongest available red, yellow and blue. Using these three "primaries" many of the different

TABLE I

Color		Hue	Chroma
Value 9	YELLOW	*w*82Y	10
Value 8	RED	*w*35R	6
Value 8	YELLOW	*w*69Y	12
Value 8	BLUE	*c*55B	5
Value 7	RED PURPLE	*w*25RP	9
Value 7	YELLOW RED	*w*55YR	14
Value 7	YELLOW GREEN	*w*100YG	11
Value 7	BLUE	*c*55B	7
Value 7	PURPLE	*c*86P	8
Value 6	RED PURPLE	*w*15RP	11
Value 6	YELLOW RED	*w*49YR	12
Value 6	GREEN	*c*8G	10
Value 6	BLUE	*c*60B	8
Value 6	PURPLE	*c*86P	9
Value 5	RED PURPLE	*w*10RP	13
Value 5	RED	*w*42R	15
Value 5	YELLOW	*w*67Y	5
Value 5	GREEN	*c*10G	10
Value 5	BLUE GREEN	*c*35BG	8
Value 5	BLUE	*c*65B	10
Value 5	PURPLE	*c*89P	10
Value 4	RED	*w*40R	13
Value 4	YELLOW	*w*67Y	3
Value 4	GREEN	*c*15G	8
Value 4	BLUE PURPLE	*c*70BP	10
Value 4	PURPLE	*c*88P	11
Value 3	RED	*w*38R	9
Value 3	GREEN	*c*20G	5
Value 3	BLUE PURPLE	*c*80BP	12
Base Value	RED	*w*33R	7
Base Value	YELLOW (BROWN)	*w*66Y	2
Base Value	BLUE GREEN	*c*30BG	5
Base Value	BLUE PURPLE	*c*74BP	5
Base Value	BLUE PURPLE	*c*82BP	11
Base Value	PURPLE	*c*92P	8

colors of the spectrum can be produced in fairly high chroma. Seeing how far apart these colors are in value it is then necessary, in order to arrive at a desired color, to add some white or black. In accordance with the present invention, it is much more direct and convenient to use the selected colors that have already been adjusted in value at their highest achievable chroma. With such colors, it no longer is necessary to adhere to the conventional three "primaries." Instead the strongest colors for use in each mixing problem can be chosen. In other words, color that is closest to the value and hue need can be chosen, then other colors of the same value level can be added to adjust hue and chroma. The farther apart the colors are on the color circle, the greater the loss of chroma in color mixtures. Where the colors used for mixing are extremely far apart, the mixture tends to a neutral. In the lightest value levels, for example, yellow is an essential mixing color. As yellow loses its chroma and degrades into the darker brown of the lower value levels, the strongest mixing colors are yellow-reds and yellow-greens. This phenomenon can be seen in connection with Value 7 using red-purple, yellow-red, yellow-green and blue as "primary" mixing colors. In practice, the artist can choose four or five "primary" mixing colors in the lower value levels to produce an unprecedently brilliant range of related colors.

The present invention, in effect, provides ordered combinations of standardized, premixed, measured colored media for versatile use and programmed data for specific guidance. Since certain changes may be made in the foregoing disclosure without departing from the scope of the invention hereof, it is intended that all matter contained in the above description and shown in the accompanying drawing be interpreted in an illustrative and not in a limiting sense.

What is claimed is:

1. A product for use in the fine and graphic arts, said product comprising:

a. an organized array of color media of predetermined hues, values, and chromas, symbolized by the notation H V/C;

b. each of said hues, as quantitatively defined in accordance with the Munsell Color System, referring to the position of a color sensation in the spectrum, the hue of any indicating-its relation to the ten major hue terms, viz., red, yellow, green, blue, purple, yellow-red, green-yellow, blue-green, purple-blue and red-purple;

c. each of said values, as quantitatively defined in accordance with the Munsell Color System, referring to the reflectance luminosity of a color in comparison with a measured standard in the form of a neutral a theoretically pure black symbolized by V = 0 to a theoretically pure white symbolized by V = 10;

d. each of said chromas referring to the purity of a color in the sense of degree of departure for neutral grey toward the most intense color sensation of a particular hue, the scales of chroma extending from C = 0 for a neutral grey out to C = 14 or farther for the pure color;

e. selected groupings of selected color media being isolated from other groupings of color media, each of said color media in any such selected grouping being characterized by the same value as so quantitatively defined;

f. said color media being of approximately maximum chroma at any predetermined value;

g. said groupings each including at least four media, respectively designated by hue terms including yellow, blue-purple, red and green;

h. said hues, when considered as varying from value to value, extending along lines that extend outwardly in the vicinity of V = 5/ and that are constricted inwardly in the vicinity of V = 2/ and V = 10/.

2. The product of claim 1, wherein said media are in the form of acrylic emulsion pigments.

3. A product for use in the fine and graphic arts, said product comprising:

a. an organized array of color media of predetermined hues, values, and chromas, symbolized by the notation H V/C;

b. each of said hues, as quantitatively defined in accordance with the Munsell Color System, referring to the position of a color sensation in the spectrum, the hue of any indicating-its relation to the 10 major hue terms, viz., red, yellow, green, blue, purple, yellow-red, green-yellow, blue-green, purple-blue and red-purple;

c. each of said values, as quantitatively defined in accordance with the Munsell Color System, referring to the reflectance luminosity of a color in comparison with a measured standard in the form of a neutral a theoretically pure black symbolized by V = 0 to a theoretically pure white symbolized by V = 10;

d. each of said chromas referring to the purity of a color in the sense of degree of departure from neutral grey toward the most intense color sensation of a particular hue, the scales of chroma extending from C = 0 for a neutral grey out to C = 14 or farther for the pure color:

e. selected groupings of selector color media being isolated from other groupings of color media, each of said color media in any such selected grouping being characterized by the same value as so quantitatively defined;

f. said groupings each including at least four media, respectively designated by hue terms including yellow, blue-purple, red and green;

g. said hues, when considered as varying from value to value, extending along lines that extend outwardly in the vicinity of V = 5/ and that are constricted inwardly in the vicinity of V = 2/ and V = 10/;

h. said color media having the following numerical designations of hue, value and chroma:

Color		Hue	Chroma
Value 9	YELLOW	*w*8 2Y	10
Value 8	RED	*w*35R	6
Value 8	YELLOW	*w*69Y	12
Value 8	BLUE	*c*55B	5
Value 7	RED PURPLE	*w*25RP	9
Value 7	YELLOW RED	*w*55YR	14
Value 7	YELLOW GREEN	*w*100YG	11
Value 7	BLUE	*c*55B	7
Value 7	PURPLE	*c*86P	8
Value 6	RED PURPLE	*w*15RP	11
Value 6	YELLOW RED	*w*49YR	12
Value 6	GREEN	*c*8G	10
Value 6	BLUE	*c*60B	8
Value 6	PURPLE	*c*86P	9
Value 5	RED PURPLE	*w*10RP	13
Value 5	RED	*w*42R	15
Value 5	YELLOW	*w*67Y	5
Value 5	GREEN	*c*10G	10
Value 5	BLUE GREEN	*c*35BG	8
Value 5	BLUE	*c*65B	10
Value 5	PURPLE	*c*89P	10
Value 4	RED	*w*40R	13
Value 4	YELLOW	*w*67Y	3
Value 4	GREEN	*c*15G	8
Value 4	BLUE PURPLE	*c*70BP	10
Value 4	PURPLE	*c*88P	11
Value 3	RED	*w*38R	9
Value 3	GREEN	*c*20G	5
Value 3	BLUE PURPLE	*c*80BP	12
Base Value	RED	*w*33R	7
Base Value	YELLOW (BROWN)	*w*66Y	2
Base Value	BLUE GREEN	*c*30BG	5
Base Value	BLUE PURPLE	*c*75BP	5
Base Value	BLUE PURPLE	*c*82BP	11
Base Value	PURPLE	*c*92P	8

i. said numerical designations varying no more than plus or minus 0.5 for hue, no more than plus or minus 0.1 for value, and no more than minus 0.5 for chroma, there being no upper limit to chroma.

4. The product of claim 3 wherein said media are in the form of acrylic emulsion pigments.

* * * * *

Disclaimer

3,722,109.—*Nathaniel J. Jacobson*, Brookline, Mass. FINE AND GRAPHIC ARTS PRODUCTS FOR ENABLING AMATEURS AND OTHERS TO SELECT AND UTILIZE COLOR MATERIALS WITH OPTICAL RESULTS OF INCREASED PREDICTABILITY. Patent dated Mar. 27, 1973. Disclaimer filed May 31, 1973, by the inventor.

Hereby disclaims the portion of the term of the patent subsequent to Dec. 21, 1988.

[*Official Gazette July 10, 1973.*]