DIAL DEVICE FOR DETERMINING RELATIONSHIPS SUCH AS CHEMICAL REACTIONS

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ABSTRACT

A dial device which has upper and lower dials pivoted to each other and having two pairs of windows in the upper dial, one for exposing colors from arc portions on the lower dials and the other for exposing bits of information, such as chemical reactants, and relationships of bits of information, such as chemical products, respectively. The upper dial has thereon colored portions and related color indicators of a different color which together indicate further bit of information, such as a further chemical reactant or chemical reaction process, such as heating. The colors and color indicators on the upper dial are related to the colors appearing through the color exposing windows so that the relationship, such as the chemical reaction, appearing in the second of the windows in the upper dial is the relationship, such as the reaction, between the bit of information in the first window and the bit of information represented by the corresponding color indicator and colored portion on the upper dial.

10 Claims, 7 Drawing Figures
DIAL DEVICE FOR DETERMINING RELATIONSHIPS SUCH AS CHEMICAL REACTIONS

This invention relates to a dial device for determining relationships of pieces of information, and more particularly relates to a dial device for determining reactions of chemicals with each other.

Dial devices are known which have a dial with information printed thereon and a spindle thereon on which an apertured cover plate is rotatably mounted and through the apertures or apertures thereof the information printed on the dial is exposed through the cover plate. While such devices can be made in large sizes, the larger the device the more difficult it becomes to find and correlate the bits of information, and when the bits of information require a relatively large space to display them, the device must be made so large that it becomes unwieldy.

It is an object of the present invention to provide a dial device for determining relationships of pieces of information such as chemical reactants and their chemical products, which device is compact yet which can provide information on many hundreds of reactions.

It is another object of the present invention to provide such a device which is easy to use and which includes color codes to assist the user in determining the relationships of the bits of information on the device.

These objects are achieved by providing a dial device which has upper and lower dials pivoted to each other and two pairs of windows in the upper dial, one for exposing colors from arc positions on the lower dials and the other for exposing bits of information, such as chemical reactants, and relationships of bits of information, such as chemical products, respectively. The upper dial has thereon colored portions and related color indicators of a different color which together indicate a further bit of information, such as a further chemical reactant or chemical reaction process such as heating. The colors and color indicators on the upper dial are related to the colors appearing through the color exposing windows so that the relationship such as the chemical reaction, appearing in the second of the windows in the upper dial is the relationship, such as the reaction, between the bit of information in the first window and the bit of information represented by the corresponding color indicator and colored portion on the upper dial.

The invention will now be described in greater detail in connection with the accompanying drawings, in which:

FIG. 1 is a plan view of a first embodiment of the device of the present invention;
FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;
FIG. 3 is a plan view of a part of the device of FIG. 1;
FIG. 4 is a plan view of a second embodiment of the device of the present invention;
FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4;
FIG. 6 is a plan view of a part of the device of FIG. 4; and
FIG. 7 is a sectional view similar to that of FIGS. 2 and 4 showing a third embodiment of the device.

Referring first to FIGS. 1—3, the embodiment shown therein is a simple form of the device according to the invention. The device comprises an upper dial 10 and a lower dial 11 pivotally secured together by a pivot member 12, here shown as a nut and a bolt.

At least one of the dials, in the embodiment shown the lower dial 11, has a handle 35 thereon for holding the lower dial 11 while the upper dial 10 is rotated relative thereto. If desired, such a handle can be provided on both dials, or one dial can be given a larger diameter than the other, or both.

The upper dial has printed thereon a plurality of inner segmented arc portions 13a—13j preferably aligned around an inner circle. These portions are colored in a manner to be described hereinafter. An inner window 14 is provided in the upper dial 10 which preferably lies on the circle on which the inner segmented arc portions 13a—13j lie. The upper dial 10 also has printed thereon a plurality of outer segmented arc portions 15a—15j, each of which corresponds to one of the inner segmented arc portions 13a—13j, and each of which has printed therein a legend 16a—16j and a color indicator 17a—17j, here shown in the shape of a dot. The indicators are colored in a manner to be described hereinafter. The legends 16a—16j in this embodiment are descriptive of a chemical reactant, such as an element or a compound, or of a type of reaction, such as heating or boiling.

Radially outwardly of and radially aligned with the inner window is a reactant window 18 which lies outside the outer periphery of the outer segmented arc portions 15. In the space between the inner window 14 and the reactant window 18 is a plus sign 19. In the embodiment shown, diametrically opposite the windows 14 and 18 and diametrically aligned therewith is an arrow 20 and radially outwardly of the arrow 20 and radially aligned therewith is a reaction window 21, and radially outwardly of the reaction window 21 and radially aligned therewith is an outer window 22. In the embodiment shown, the outer window 22 is an outward extension of the reaction window 21 in order to keep the device as compact as possible, although it obviously could be spaced outwardly of the reaction window 21, if desired. The reaction window 21 is spaced radially outwardly from the pivot member 12 a distance such that the inner end thereof is further from the pivot member than the outer end of the reactant window 18.

The windows 14 and 18 and the windows 21 and 22 need not be on radii which are aligned along a diameter of the upper dial 10, i.e. are at an angle of 180°. They can be at a smaller angle, either obtuse or acute. However, their being at 180° facilitates use of the device, as will be made clear hereinafter.

The lower dial has a plurality of inner segmented arc portions 23a—23j lying on a circle which is the same radius as the inner circle on which the inner segmented arc portions 13a—13j of the upper dial lie. The lower dial inner segmented arc portions 23a—23j, however, together constitute a complete circle, and each corresponds to one of the segmented arc portions 13a—13j. They are further colored in colors the same as the colors of the corresponding arc portions 13a—13j. With the upper and lower dials assembled as shown in FIG. 2, the colors of the arc segments 23a—23j will appear through the inner window 14.

Printed in a circle concentric with the circle of the inner segmented arc portions 23 are a series of legends, in this embodiment groups of reactants 24, the reactants 24 lying on a circle having a radial dimension the
same as the radial dimension of the reactant window 18, and each reactant being printed in a space having a radial and circumferential dimension equal to the corresponding dimensions of the window 18, so that as the dials are rotated relative to each other, the reactants 24 will appear successively in the window 18. The groups of reactants correspond to the respective segmented arc portions 23a–23j.

Printed in a circle concentric with the circle of reactants 24 are a series of legends, in this embodiment groups of reactions 25, the reactions 25 lying on a circle having the same radial dimension as the radial dimension of the reaction window 21, and each reaction being printed in a space having a radial and circumferential dimension equal to the corresponding dimensions of the reaction window 21. The groups of reactions correspond to the respective segmented arc portions 26a–26j.

Finally, the lower dial has a plurality of outer segmented arc portions 26a–26j each corresponding to one of the arc portions 23a–23j and lying on a circle which is the same radius as the radial distance of the outer window 22 from the pivot member 12. The lower dial outer segmented arc portions 26a–26j together constitute a complete circle, and they each subtend an angle equal to the angle subtended by the corresponding arc portion 23a–23j. The respective arc portions 26a–26j and 23a–23j are at the same angle relative to each other as the radius on which the windows 21 and 22 lie is to the radius on which the windows 14 and 18 lie. They are further respectively colored the same as the colors of the corresponding color indicators 17a–17j.

The colors of the respective upper dial inner segmented arc portions 13a–13j can be the same or different from each other, although it is preferred for easy visibility to have the adjacent segmented arc portions different colors, i.e. the color of 13a is different from the color of 13b. Likewise, the color indicators 17a–17j can be the same or different colors. However, it is essential that a color pair of segmented arc portion and a corresponding color indicator be different from each of the other color pairs of arc portions and color indicators. That is, if the color of the segmented arm portion 13a is grey and the color of the corresponding color indicator 17a is blue, there may not be another combination of a grey segmented arc portion and blue color indicator. The next color pair can be, for example, blue and orange, respectively, or grey and orange, respectively, or orange and blue, respectively. Therefore, because the lower dial inner segmented arc portions 23a–23j which correspond to the upper dial inner segmented arc portions 13a–13j have the same colors, these colors will appear successively through the window 14. Because the lower dial outer segmented arc portions 26a–26j have the same colors as the corresponding color indicators 17a–17j, these colors will appear successively through the window 22. Finally, because the arc segments 23a–23j correspond to the arc segments 26a–26j, when a color the same as one of the colors of one of the upper dial inner segmented arc portions appears in the window 14, a color the same as the color of the corresponding color indicator will appear in window 22. Thus, referring to the specific grey-blue color pair described above, when the segmented arc portion 23a is in under window 14, segmented arc portion 26a is under window 22, and thus grey appears in window 14 and blue will appear in window 22.

The reactants 24 printed on the lower dial 11 along any one of the inner segmented arc portions 23a–23j are all reactants which will react with a single other reactant corresponding to the legend which is printed in the corresponding outer segmented arc portion 15a–15j on the upper dial, or are reactants which will react when subjected to the reaction condition printed in the corresponding outer segmented arc portion 15a–15j. The reactions 25 printed along the corresponding outer segmented arc portion 26 on the lower dial are the reactions which result from the reaction of reactant 24 and the single reactant, or are reactions which result from subjecting the reactant 24 to the reaction condition. The reactions are placed in angular positions along the outer segmented arc portion 26a–26j corresponding to the angular position of the reactant 24 along the inner segmented arc portion 23a–23j. As a result, when a reactant 24 is lined up with the window 18, the resulting reaction thereof with a reactant represented by one of the legends 16a–16j will appear in the window 21. The color appearing in the window 22 will be that of the corresponding color indicator 17a–17j.

As a specific example, assuming that the legend 16a is silver (Ag), the color of the segmented arc portion 13a is grey, and the color of the color indicator 17a is blue, and one of the reactants 24 printed along the segmented arc portion 23a is oxygen (O₂), when the dials are rotated so that O₂ shows in window 18, and the color grey of segmented arc portion 23a shows in window 14, the color blue of the segmented arc portion 26a will show in the window 22, and the product Ag₂O will appear in the window 21.

It will, of course, be understood that other information concerning the reaction can be printed in the spaces which will be visible through the windows 18 and 21, such as, for example, in the above case the temperature of the reaction, 120°C, and the four moles of silver required also written inside a bracket, like (4), can be printed.

As a further specific example, assuming that the legend 16c is "boiling", the color of the segmented arc portion 13c is orange, and the color of the color indicator 17c is red, and one of the reactants 24 printed along the segmented arc portion 23c is H₂SO₄, when the dials are rotated so that H₂SO₄ and the temperature required, 333°C, show in window 18 and the color orange of the segmented arc portion 23c shows in window 14, the color red of the segmented arc portion 26c will show in the window 22, and the products SO₃+H₂O will appear in the window 21.

The reason for having the outer segmented arc portions 26a–26j on the lower dial and the color indicators 17a–17j is to expand the range of combinations of reactants. If only the basic colors and black, grey and white were used for the inner segmented arc portions, only nine reactants could be put on any one dial system. By using the combinations of two colors, i.e. a color of a segmented arc portion 13a–13j and a color indicator 17a–17j, it is possible in theory to have over 70 reactants.

The foregoing embodiment is the simplest embodiment of the invention. The system can be duplicated on a two dial system as shown in the embodiment of FIGS. 4–6. In this embodiment the same system of inner seg-
mented arc portions, outer segmented arc portions, windows, etc., have been duplicated in a ring concentric around the system of FIGS. 1-3. Corresponding parts have similar reference numbers, but in the hundreds. Thus, the upper dial inner segmented arc portions are numbered 113a-113n, the indicators are numbered 117a-117n, the windows are numbered 114, 118, 121 and 122, etc. For ease in reading, the alignment of the windows 114, 118, 121 and 122 is along a diameter which is at an angle to the diameter along which windows 14, 18, 21 and 22 lie.

It will also be clear to those skilled in the art that by adding a dial to the back of the device as shown in the above figures, one or more concentric systems can be placed on the back of the device. Such an embodiment is shown in section in FIG. 7, in which dial 10u, which is the same as dial 10, is pivotally mounted on the back of lower dial 11. The same windows, colored segmented arc portions, etc. are provided on dial 10a and the back face of lower dial 11, thereby doubling the capacity of the device. A handle 235 is attached to both dial 10 and 10a to hold both while dial 11 is rotated by handle 135. Other changes can be made in the specific structure of the device without departing from the spirit and scope of the invention. For example, the inner window 14 and lower dial inner segmented arc portions 23a-23j need not lie within the circular space in which the reactants 24 are placed, and the outer window 22 and lower dial outer segmented arc portions 26a-26j need not lie outside the reactions 25. The important requirement is that these respective parts be aligned with each other on the upper and lower dials and that they be out of alignment with the circles of reactants 24 and reactions 25, respectively, i.e. that they be at different radial distances from pivot member 12 than the circles of reactants 24 and reactants 25.

What is claimed is:
1. A chemical reaction finding device comprising:
a. an upper dial member;
b. a lower dial member;
c. pivot means pivotally connecting said dial members for relative rotation;
d. said upper dial member having at least one plurality of distinctly colored inner segmented arc portions aligned along a fixed circular path;
e. said upper dial member having at least one lower inner window therein;
f. at least one plurality of outer segmented arc portions on said upper dial member each corresponding to and in adjacent radial alignment with one of said inner segmented arc portions;
g. a legend and a colored indicator in each of said outer segmented arc portions, each said legend representing a chemical reactant or a type of reaction;
h. each inner segmented arc portion and the colored indicator in a corresponding outer segmented arc portion comprising a color pair the colors of which are different from the colors of each of the other color pairs;
i. said upper dial member having at least one reactant window therein positioned at a different radial distance from said pivot means than said inner window and aligned along a common radius with said inner window;
j. said upper dial member having at least one reaction window along a radius of said upper dial and spaced a distance from said pivot means different from said reactant window and said inner window;
k. said upper dial member having at least one outer window aligned along a common radius with said reaction window and spaced from said pivot means a different distance than each of said aforementioned windows, said reaction window and outer window being on a radius which is at an angle to the radius on which said inner window and said reactant window lie;
l. said lower dial member having thereon at least one plurality of inner segmented arc portions aligned along a fixed circular path and corresponding in number and color to the respective upper dial inner segmented arc portions, said lower dial inner segmented portions being at the same radial distance from said pivot means as said inner window and being visible therethrough;
m. said lower dial member having thereon at least one series of groups of reactants, the groups of reactants corresponding to and being in adjacent radial alignment with the lower dial inner segmented arc portions and further being at the same radial distance from said pivot means as said reactant window and being visible therethrough the reactants of each group being those which will react with the reactant or reaction condition represented by said legend in one upper dial outer segmented arc portion which is adjacent to an upper dial inner segmented arc portion having the same color as the lower dial inner segmented arc portion with which the reactant group is aligned;
n. said lower dial member having thereon at least one series of groups of reactions aligned along a fixed circular path at the same radial distance from said pivot means as said reaction window and being visible therethrough, the reactions in each group of reactions being the reactions of the reactant in the group of reactants in adjacent radial alignment with a lower dial inner segmented arc portion having the color of one of the colors of a color pair and the reactant or type of reaction in the upper dial outer segmented arc portion associated with the colored indicator having the other color of a color pair, and such group of reactions further being at the same angle relative to such group of reactants as are the radii on which the reactant window and reaction window lie, and the individual reactions in each group of reactions being positioned in the same order in the direction of the circular path as the order of the individual reactants in the corresponding group of reactants along the circular path;
and
o. said lower dial member having thereon at least one plurality of colored outer segmented arc portions aligned along a fixed circular path and corresponding in number to the respective lower dial inner segmented arc portions and further being in adjacent radial alignment with said groups of reactions and further being at the same radial distance from said pivot means as said outer window and being visible therethrough, the color of each lower dial outer segmented arc portion being the same as the color of the colored indicator in the upper dial outer segmented arc portion which is one color of a color pair and being associated with the reactant which will produce, with the reactants of the group...
of reactants in adjacent radial alignment with the lower dial inner segmented arc portion having the other color of the said color pair, the group of reactions with which the lower dial outer segmented arc portion is in adjacent radial alignment, whereby when the lower dial member is moved to a position in which a color is visible in said inner window, and a reactant is visible in said reactant window, the resultant reaction will be visible in said reaction window if the color pattern visible through the inner window corresponds to the color on the upper dial inner portion and the color indicator adjacent the corresponding inner portion color matches the color visible through the outer window.

2. A device as claimed in claim 1 further comprising a further plurality of upper dial inner segmented arc portions, a further plurality of upper dial outer segmented portions with legends and colored indicators, a further inner window, a further reactant window, a further reaction window, a further outer window, a further plurality of lower dial inner segmented arc portions, a further series of groups of reactants, a further series of groups of reactions and a further plurality of lower dial outer segmented arc portions, all of said further named elements being in the same positional and color relationship as the corresponding first recited elements and being on said dial members in a space radially outwardly of said outer window and said lower dial outer segmented arc portions.

3. A device as claimed in claim 2 further comprising a second upper dial member pivotally mounted by said pivot means on said lower dial member on the opposite side of said lower dial member from said firstmentioned upper dial member, the opposite side of said lower dial member and said second upper dial member having thereon two further pluralities of upper dial inner segmented arc portions, two further pluralities of upper dial outer segmented portions with legends and colored indicators, two further inner windows, two further reactant windows, two further reaction windows, two further outer windows, two further pluralities of lower dial inner segmented arc portions, two further series of groups of reactants, two further series of groups of reactions and two further pluralities of lower dial outer segmented arc portions, all of said still further named elements being in the same positional and color relationships as the corresponding first recited elements on the first-mentioned upper dial member and the side of said lower dial on which said firstmentioned dial member is located.

4. A device as claimed in claim 3 further comprising a handle on said lower dial, and a handle connected between said first and second upper dials.

5. A device as claimed in claim 1 in which said inner window is aligned with said upper dial inner segmented arc portions.

6. A device as claimed in claim 1 in which said upper dial has a plus sign thereon between said reactant window and said inner window and an arrow radially inwardly of said reaction and outer windows.

7. A device as claimed in claim 1 in which said inner window is radially inwardly of said reactant window, and said outer window is radially outwardly of said reaction window, and said reaction and outer windows are radially outwardly of said inner and reactant windows.

8. A device as claimed in claim 1 in which said windows are all aligned on a diameter of said upper dial.

9. A device as claimed in claim 1 in which said outer window and said reaction window open into each other.

10. A device as claimed in claim 1 further comprising handle means on at least one of said dials for holding said dial while the other of said dials is rotated.

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