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Tamol

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[54] **EDUCATIONAL GAME DEVICE**

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[51] **Int. Cl.²** **A63B 9/06**; A63H 33/26

[58] **Field of Search** ..... 273/1 M, 1 L; 46/238–240; 35/22 R

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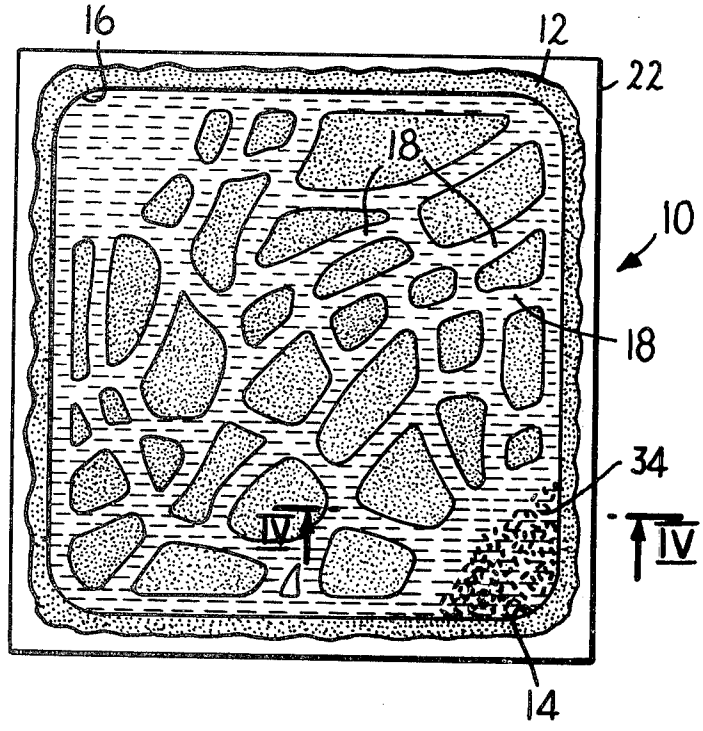
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Primary Examiner—Paul E. Shapiro
Attorney, Agent, or Firm—Watson Leavenworth Kelton & Taggart

[57] **ABSTRACT**

There is disclosed an educational game device which includes a pair of reservoirs connected by a flow transport course, there being a magnetically displaceable colloidal suspension normally disposed in one of said reservoirs and which can be transported under the influence of a directional magnetic force from the said one reservoir through the flow transport course to the other reservoir.

18 Claims, 4 Drawing Figures



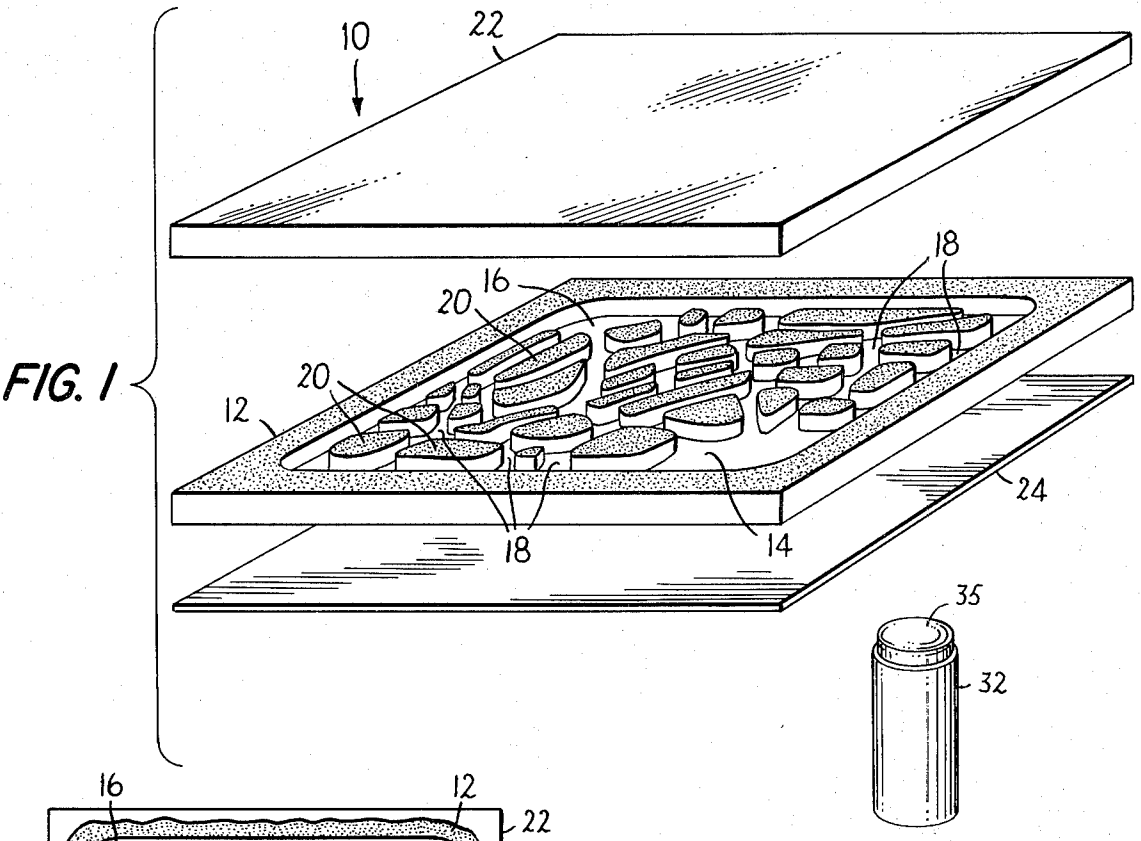


FIG. 1

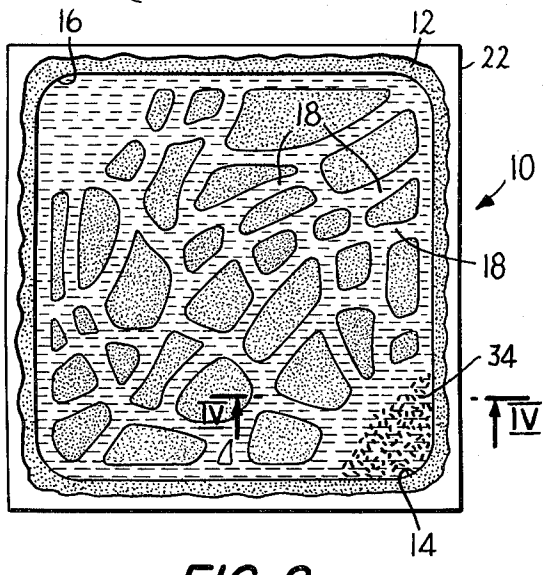


FIG. 2

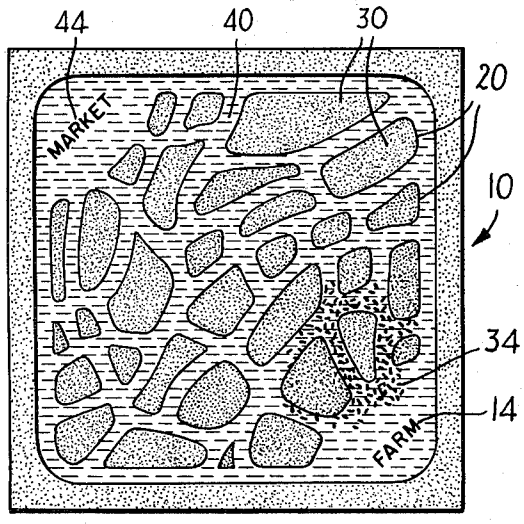


FIG. 3

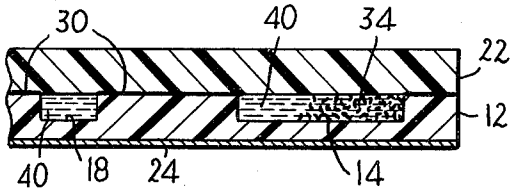


FIG. 4

EDUCATIONAL GAME DEVICE

BACKGROUND OF THE INVENTION

Educational and game devices are known in the art which devices employ the principle of magnetism to produce an intelligence message, design or other aesthetic effect for a particular purpose. Such devices generally involve moving a magnet or magnetic stylus across a surface for the purpose of transporting a magnetic material in an intended pattern to convey a message or other result. The magnetic material most conventionally is provided in the form of iron filings, a suitable quantity thereof being provided within or on a marking board or like device. Representative of such devices are those disclosed in U.S. Pat. Nos. 2,589,601; 3,103,751; 3,106,042; 3,509,644 and 3,526,975. Known forms of devices have the disadvantage that smooth, uniform appearance of movement of iron filings or like particulate form of ferromagnetic material is difficult to achieve. Additionally individual ones or small groups of such particles readily adhere to surface imperfections in a transport course making it difficult to move a desired quantity of such material as a contiguous mass thereof if transport of such mass in such manner is sought for a particular purpose associated with the use of the device. It is believed that there has never been heretofore used in such devices a ferrofluid or a magnetically displaceable fluid as the component which is transported to produce a desired effect. Magnetically displaceable fluids, for example, ferrofluids, are well known, U.S. Pat. Nos. 3,764,540 and 3,215,572 being representative of such types of ferrofluids.

SUMMARY OF THE INVENTION

The present invention is concerned with an educational game device which can be used to demonstrate the rudimentary principles of attraction or repulsion of magnetism as well as to provide the user with a toy or game device requiring a relatively high degree of manipulative skill, perception and patience to transport the magnetically displaceable component along an intended course, such as a tortuous course or maze of passages extending between game points of origin and destination.

In accordance with the present invention, the educational game device includes a housing which can comprise a relatively broad surface substantially flat base member in which there is formed in one face thereof, a pair of reservoirs, such reservoirs conveniently being formed as enlarged groove areas at locations in said one face remote one from the other. In the instance where the device is made in rectangular plan outline, such reservoirs can be located at diametrically opposed corners of the housing. Additionally, other grooves can be formed in the base member as a plurality of groove branches at least certain of which are disposed to provide communicative connection or a flow transport course between the two reservoirs. A cover member can be provided, desirably being generally coextensive with the base member and received in contact with the said one face of the base member to form an essentially fluid and liquid tight sealed housing, the cover member advantageously being provided as a transparent component of glass or a suitable thermoplastic material. A magnetically displaceable colloidal suspension is present within the device and normally disposed in one of

the reservoirs, the magnetically displaceable colloidal suspension, preferably being a ferrofluid. To use the device, a magnetic stylus or magnet is placed at the underface of the base member to apply a directional magnetic force to the magnetically displaceable colloidal suspension for the aim and purpose of transporting it as a relatively contiguous mass thereof, by way of the flow transport course to the other reservoir, a relatively exacting level of skill being required to displace the suspension without allowing portions thereof to break away from the applied magnetic force.

The invention also provides that there can be provided in addition to the colloidal suspension, a carrier liquid which fills any portion of said one reservoir not occupied by said colloidal suspension, the other reservoir as well as the grooves which define the flow transport course, with the colloidal suspension desirably being immiscible with the carrier liquid and of a different density than that of the carrier liquid, most desirably being of greater density than the latter although it also bcan be of lesser density than the carrier liquid.

The colloidal suspension if a ferrofluid can comprise submicron-sized ferromagnetic and ferrimagnetic particles suspended in a carrier fluid selected from the group consisting of hydrocarbons, silicones, fluorocarbons, chlorinated solvents and water. The carrier liquid, on the other hand, can be selected from the group consisting of hydrocarbons, e.g., kerosene, and water.

In a particularly advantageous form of the invention, the base member and cover member are provided as relatively expansive susbtantially flat plate members, one of the plate members having enlarged groove areas and the said other grooves formed therein as by moulding. The advantage of moulding the groove areas in the plate member is that the groove branches which can be arranged in a desired, e.g., random array between the two reservoirs can be formed as smooth surfaced courses devoid of any projections or like protuberant structure as frequently result when grooves are machined in a structure.

As indicated, the cover member is desirably provided as a transparent component, and can be made of glass or any suitable thermoplastic material. Similarly, the base member can be formed as a transparent component of the same material as the cover. The cover and base member desirably are fixedly secured one to the other in superposition as by means of sonic welding or by use of an adhesive, which sonic weldment or adhesive can function to delineate the expanse of the various surface portions of the base member other than those in which the enlarged groove areas and other or flow transport course grooves are formed. In this manner, the user is able to visually discern the outline of the flow transport course connecting the two reservoirs. On the other hand and to add to the degree of complexity which may be required to play the device, the adhesive can be of a type such as to leave no contrast in the surface portions of the base member one face. Accordingly, the viewer can not readily discern the outline of the transport course so that the employment of the device requires a greater degree of skill to transport the magentically displaceable fluid in a single contiguous mass without allowing any break away of portions thereof during transportation of the mass from one to the other reservoir. The carrier liquid can be provided in colorless form to further add to the complexity of playing with the device. On the other hand the colloidal suspension can have embodied therewith a coloration

component to give the suspension a predetermined color.

The invention accordingly comprises the educational game possessing the features, properties and relation of elements which will be exemplified in the device hereinafter described and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of the invention will be in part obvious and will in part appear from the following detailed description taken in conjunction with the accompanying drawings, wherein like reference numerals identify like parts throughout and in which:

FIG. 1 is an exploded perspective view of an educational game device constructed in accordance with the principles of the present invention, the magnetically displaceable colloidal suspension not being shown, there being shown additionally, a magnetic stylus with which magnetic directional force can be applied when using the device.

FIG. 2 is a top plan view of the device shown in FIG. 1, with portions of the cover member broken away for purposes of clarity, the magnetically displaceable colloidal suspension being shown located in one of the two reservoirs, the other reservoir and grooves which communicate the two reservoirs being shown filled with a carrier liquid which is immiscible with the colloidal suspension.

FIG. 3 is a top plan view of the device of the present invention showing the colloidal suspension at a location of transport intermediate the two reservoirs and to which it has been transported by a directional magnetic force.

FIG. 4 is a fragmentary sectional view on enlarged scale as taken along the line IV—IV in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1 of the drawings, the educational game device 10 of the present invention comprises a housing which includes a relatively broad surfaced substantially flat plate base member 12, the base member in a particularly advantageous form being rectangular shaped in plan outline, one face of the base member being provided with a pair of enlarged groove areas 14, 16 located, for example, at diametrically opposed corners of the device. The respective enlarged groove areas define reservoirs in the device and the said one face of the base member 12 additionally is provided with other grooves 18 and which can be arranged in any desired array, as for example a random maze of plural groove branches, the important consideration being that such other grooves 18 establish and define a flow transport course communication between the reservoirs 14 and 16. The portions 20 of the said one face of the base plate member 12 other than where grooves are formed in said face constitute islands or obstructions to flow transport of a colloidal suspension from one to the other of the reservoirs thus requiring, as will be described in greater detail, exercise of a certain degree of skill to effect under influence of a magnet, movement of the colloidal suspension along the said other grooves 18 as a relatively contiguous mass to change location of the colloidal suspension between the reservoirs. The said surface portions 20, as will be noted in FIG. 1, are relatively flat and are arranged in planar alignment. Advantageously, the grooves or recesses defining reservoirs 14 and 16 are formed in the depicted embodiment in the shape of a quadrant sector. In one form, the base member 12 is made of transparent material and the respective enlarged groove areas defining the reservoirs 14 and 16 as well as the said other grooves 18 are formed in the base member by moulding. The advantage of moulding these grooves in the base structure is that there remains no residue in the formed grooves as would present obstruction or impediment to the smooth transport of the colloidal suspension therealong. The device 10 also includes a transparent substantially flat cover member 22 which is generally coextensive with the base member 12 and is received in covering contact on the said one face of the base member. Additionally, a backing sheet 24 of suitable opaque material, for example a paper sheet, can be fixedly secured to the under face of base member 12.

With additional reference now to FIGS. 2–4, the cover member 22 can be fixedly secured to base member 12 in any suitable manner, as for example by means of sonic weldment or an adhesive applied as at 30 to the marginal areas and flat portions 20 of the said one face of plate member 12. The weldment or adhesive thus secures the two plate members in an encircling course of connection that establishes relatively fluid and liquid tight seal therebetween around the edges of the device so that the after described colloidal suspension and carrier liquid can not leak or pass outwardly from the interior of the device, or be reduced in quantity as by evaporation. If it is desired to mark the outline of the islands defined by portions 20 as depicted in FIG. 3 so as to delineate the flow transport course to the user of the device, a type of adhesive can be used which will, when dry, provide a certain transluscence appearance in the device. The sonic weldment also could be effected so as to achieve the same purpose. On the other hand, if it is desired to make the device more complex to play with, and since moulding can be effected in such manner as to not be apparent when looking through the cover member at the base member, an adhesive can be used which will not, when dried, give any appearance of the respective points of adhesive connection. Accordingly, the observer is required to exercise a high degree of perception to determine what the flow transport course is so that he may correspondingly manipulate the magnetic stylus 32 (FIG. 1) to apply a magnetic direction force to the suspension and thus cause transport of the colloidal suspension along an intended course.

As shown in FIGS. 2–4, the device further includes a magnetically displaceable colloidal suspension 34 present in the device and normally disposed in one of the reservoirs therein. Broadly, the magnetically displaceable colloidal suspension comprises particles of a material subject to being magnetized, e.g., iron particles, which particles are suspended in a suitable fluid carrier. Conveniently the colloidal suspension can be a ferrofluid, such magnetic fluids being well known in the art. Ferrofluids can be defined as magnetic fluids which are Newtonian liquids that retain their fluidity in the presence of an external magnetic field. Such fluids are ultrastable colloidal suspensions of submicron-sized ferromagnetic or ferrimagnetic particles in liquid carriers such as hydrocarbons, silicones, water and fluorocarbons. Further reference is made to Bureau of Mines report number 7702 for a more detailed description of these ferrofluids. The carrier fluid component of the ferrofluid also can include chlorinated solvents.

In using the educational game device, the user will employ the magnet 32 by bringing it into contact with the underside of the device in the region of reservoir 14 wherein is disposed the magnetically displaceable colloidal suspension 34 and then by manipulating the magnetic stylus or magnet along the under surface of the device to attract and transport the colloidal suspension as a contiguous mass thereof through the tortuous course defined by the grooves 18 in order to displace the colloidal suspension to the other reservoir 16. The strength and size of the magnet can of course vary in accordance with the type and quantity of magnetically displaceable fluid present in the device. Generally, the surface part 35 of the magnet which is placed in contact with the underside of the device will be about the same as the area of the reservoir occupied by the colloidal suspension when the said suspension is fully disposed within such reservoir. The present invention also provides that a suitable coloration component such as a pigment dye can be incorporated in the colloidal suspension to give a particularly desired predetermined color to such suspension.

A preferred embodiment of the present invention includes in addition to the colloidal suspension, a carrier liquid 40 which is present in the device in sufficient quantity to fill any portion of reservoir 14 not filled with suspension 34, the other reservoir 16 and all of the grooves 18. The colloidal suspension should be immiscible in the carrier liquid and have a different density than the carrier liquid 34, preferably a greater density than the carrier liquid although it also could have a lesser density. Advantageous forms of carrier liquid include hydrocarbons and water. In keeping with the purpose of requiring the user to employ a high degree of skill in playing the game, the carrier liquid preferably is colorless so that the presence of the carrier liquid in the device does not contribute to delineating the flow transport course along which the user is required to move the colloidal suspension.

Examples of the combinations of colloidal suspension and liquid carriers can include:

A. Ferrofluid water in a hydrocarbon carrier such as kersene, Varsol, etc.

B. Ferrofluid chlorinated solvent such as perchlorethylene, or carbon tetrachloride in a water carrier.

C. Ferrofluid water in a vegetable oil of lower than one density.

D. Ferrofluid fluorocarbon base in a water carrier.

In playing the game it is believed that it is quite apparent from the foregoing description how the user is obliged to employ the magnetic stylus to transport the colloidal suspension from one to the other of the reservoirs 14 and 16. As can be seen in FIG. 3, the inner face of the backing sheet 24 visible through both the base 12 and cover 22 can be provided with indicia 44 to, for example, simulate the aspect of a farmer transporting his produce from the farm to a market.

In using the game, the complexity can be increased by having only one or two possible flow course paths between the respective reservoirs. Thus, for example, obstructions (not shown) could be provided in certain of the grooves 18 so as to constitute dead-ends in the transport course. Additionally, the dimensions of the grooves can be varied to provide relatively narow constricted flow transport course grooves which would increase the possibility of portions of the colloidal suspension breaking away from the influence of the magnet and becoming lost. The purpose of the game, of course, would be to transport the colloidal suspension in a relatively contiguous mass form thereof from one to the other of the two reservoirs. Further, the game can be played from an initially oriented horizontal position and slowly changed to a vertical orientation as the transport of the suspension from one to the other reservoir is taking place—it being a most demanding task to keep the suspension together in contiguous mass form under such circumstances.

In making the device, as indicated above, it is desirable that the cover member and base member be made from transparent material. For example, glass can be employed to that end or a suitable thermoplastic material such as an acrylic or an acrylic styryne copolymer could be used.

While there is above disclosed only certain embodiments of the educational game of the present invention it will be apparent from a reading of the foregoing description that certain modifications can be made therein without departing from the scope of the invention concept herein disclosed.

WHAT IS CLAIMED IS:

1. An educational game device comprising

a relatively broad surfaced substantially flat base member,

means defining a pair of reservoirs in one face of said base member, each reservoir being disposed at a location remote from the other, there further being means in said one face defining a flow transport course communication between said reservoirs,

a cover member generally coextensive with said base member and received in contact with said one face of said base member, and

a magnetically displaceable colloidal suspension present within said device and normally disposed in one of said reservoirs,

said magnetically displaceable colloidal suspension being selectively transportable from said one reservoir to the other along said flow transport course under the influence of a directional magnetic force.

2. The educational game device of claim **1** in which said base member and said cover member are respectively first and second substantially flat plate members, the means defining said reservoirs being enlarged groove areas formed in said one face of said first plate member, the means defining a flow transport course communication between said reservoirs being other grooves in said one face of said first plate member,

there further being a carrier liquid filling any portion of said one reservoir not occupied by said colloidal suspension, the other of said reservoirs and said other grooves, said magnetically displaceable colloidal suspension being immiscible with said carrier liquid, the density of said magnetically displaceable colloidal suspension being different than that of said carrier liquid.

3. The educational game device of claim **2** in which said magnetically displaceable colloidal suspension is a ferrofluid.

4. The educational game device of claim **3** in which said ferrofluid comprises submicron-sized ferromagnetic and ferrimagnetic particles suspended in a carrier fluid selected from the group consisting of hydrocarbons, silicones, fluorocarbons, chlorinated solvents and water.

5. The educational game device of claim **4** in which the said carrier liquid with which said ferrofluid is immiscible is selected from the group consisting of hydro-

carbons and water.

6. The educational game device of claim **5** in which said carrier liquid is colorless.

7. The educational game device of claim **2** in which said other grooves are arranged in a random array comprised of a plurality of groove branches at least certain of which are disposed to provide communicative connection between said two reservoirs.

8. The educational game device of claim **2** in which the density of said magnetically displaceable colloidal suspension is greater than that of said carrier liquid.

9. The educational game device of claim **2** in which said second plate member is of transparent material, the enlarged groove areas and said other grooves in said first plate member being smooth surfaced and devoid of any protuberant structure.

10. The educational game device of claim **9** in which said first plate member is of thermoplastic material, said enlarged groove areas and said other grooves being moulded in said first plate member.

11. The educational game device of claim **9** in which said second plate member is fixedly connected to said first plate member is superposed contact therewith.

12. The educational game device of claim **11** in which the surface portions of said one face of said first plate member other than where said enlarged groove areas or other grooves are formed are flat and in planar alignment one with the other, there further being provided means for delineating the expanses of the respective ones of said surface portions.

13. The educational game device of claim **11** in which said second plate member is adhesively secured to said first plate member, the means for delineating the said planar surface portion of said one face of said first plate member comprising said adhesive.

14. The educational game device of claim **9** in which said first plate member is of transparent material, there being provided a backing sheet of non-transparent, non-translucent material in covering fixed contact at the other face of said first plate member.

15. The educational game device of claim **14** in which said backing sheet is provided with intelligence indicia visible through both said first and second plate members.

16. The educational game device of claim **2** in which said magnetically displaceable colloidal suspension embodies a coloration component to provide said suspension with a predetermined color.

17. The educational game device of claim **2** in which said first and second plate members each have opposed pairs of side edges, said first and second plate members being connected together at least around the edge portions in a continuous encircling course of connection whereby the edges of said device are substantially impervious to liquid and fluid flow therethrough.

18. The educational game device of claim **1** in which the base member and cover member are of generally rectangular plan outline, said reservoirs being located at diametrically opposite corners of the device.

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