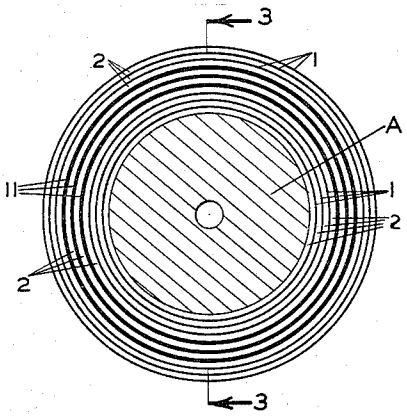
Aug. 22, 1950 J. DE MENT 2,519,825

MESSAGE FORMING SEA MARKER

Filed Jan. 20, 1947

Fig 2



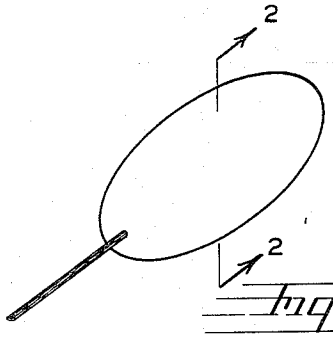


Fig 1

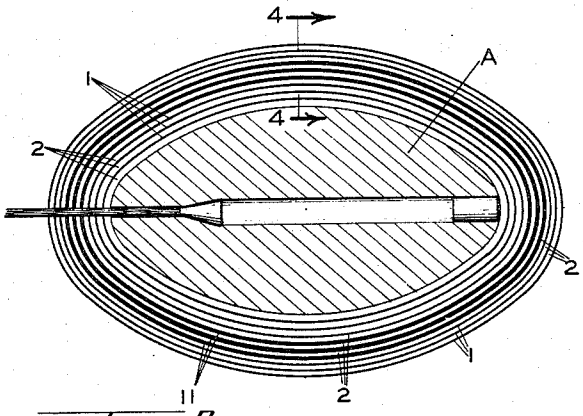


Fig 3

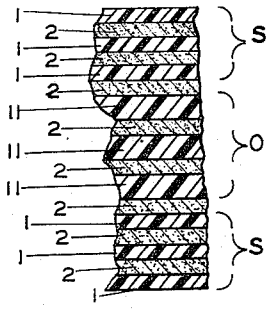
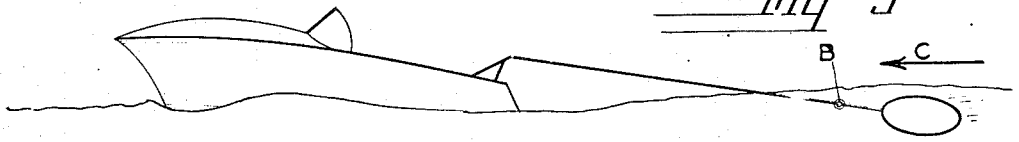


Fig 4

Fig 5



INVENTOR.

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BY Jack De Ment

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2,519,825

MESSAGE FORMING SEA MARKER

Jack De Ment, Portland, Oreg.

Application January 20, 1947, Serial No. 723,192

9 Claims. (Cl. 250—71)

1

The present invention relates to an improved sea marker and means for producing same which bears and forms upon employment a message or signal upon the surface of the water which is capable of observation and intelligent interpretation from a distance.

It is an object of the present invention to make available an improvement in the sea marking art whereby signals, messages, codes or a large number and wide variety of intelligence may be produced upon, within, or near the surface of a body of water such as the ocean.

It is among the objects of the invention to overcome the limitations of the present sea marking and sea signaling via distinctive water marking by fluorescent and/or colored compositions like dyestuffs, by making practicable an article and composition for sea marking that possesses the virtues and merits of forming upon employment a message capable of observation and interpretation from a distance, say several miles in the air.

It is another object to produce for military, naval, novelty and entertainment or other purposes, means by which the surface of the water can be distinctively altered so that a message or code or intelligence can be conveyed.

It is also an object to provide greater versatility and applicability of the superior kinds of sea marking compositions or compounds such as sodium fluoresceinate or uranine which possess inherent lack of versatility due to a single visual characteristic, which lack of versatility is unfortunate in view of the fact that the other properties, such as fluorotinctorial and chromotinctorial powers may be far superior to other substances now available.

It is also an object to take advantage of the sea marking compound called uranine or sodium fluoresceinate which inherently possesses the yellow-green color and fluorescent characteristic that corresponds to greatest relative visibility which theory sets on any color other than yellow-green and therefore any substance possessing any color other than yellow-green. Thus, it would appear that a paramount difficulty in securing a dyestuff or other compound having the visual characteristics of uranine, other than color, would lie in the inherent and unchangeable limitations which the theory and knowledge of relative visibility sets on any color other than yellow-green. Further, in this vein, the spectral sensitivity curve for the eye is approximately a Gaussian or skewed one, which means for example that orange or green colored dyes would appear

2

about half as intense to the light-adapted eye as a dye like uranine which shows yellow-green.

It is another object to provide for naval and similar signaling and intelligence purposes a sea marker which forms upon use vari-colored areas upon the water, such characteristic not now being provided by any single sea marker, and produceable only by the employment of a plurality of single sea markers or devices.

It is among the objects of the present invention to provide for naval and similar signaling and intelligence purposes a sea or water or liquid marker which forms upon use (1) a sea or water mark which is invisible in visible light but visibly fluorescent in ultraviolet light or filtered near-ultraviolet, commonly known as "black light," which is irradiated thereby, or, (2) a sea or water or other liquid marker which possesses one color in visible light and yet another color under invisible ultraviolet light, or, (3) a sea marker which possesses a combination of visible light color and ultraviolet light color (fluorescent) characteristics, the latter of which may be either visible or invisible in visible light, as may be desired in a given application.

Referring to the accompanying schematic figures which are illustrative only of the principal features of the present invention:

Figure 1 illustrates one preferred design and over-all form of my invention, in the shape of an ellipse or at least ovoid, wherein the arrows 2—2 designate that axis of the invention parallel to the normal or perpendicular,

Figure 2 schematically shows an end-on or cross-section view of the bodily structure and interior of the invention,

Figure 3 schematically shows a similar internal structure view but at right angles to that of Figure 2, that is, a side-wise view,

Figure 4 illustrates certain of the novel features of the arrangement, structure and positioning of the sea marking composition, chemical or dyestuff comprising an integral part of the present invention, and,

Figure 5 shows one form of the present invention in actual use, such as towed behind a small boat with the invention riding on the surface of or just beneath the water.

Briefly, the present invention resides in the formation of layers of sea marking material, such as will be hereinafter described in full, upon other layers of the same or similar material with or without the same properties or layers of material lacking given sea marking characteristics but are nevertheless of value in expediting the pro-

duction of a distinctive, meaningful or intelligent pattern or message upon the surface of the water. Thus, a plurality of these layers are so formed and positioned that upon use in the water the outer-most layer first dissolves off or is released by the action of water, then the next layer is released, and so on sequentially. The sum of such a process is the production of definite areas upon the water corresponding to each layer which has dissolved off or has been released into or upon the water.

In sequence, for example, a series of layers corresponding first to a layer of uranine, then a layer of water soluble material like glue or sugar or gelatine, and then another layer of uranine will produce upon solution or release first a patch or colored area corresponding to the uranine, then no distinctive patch or a space upon the water which corresponds to the layer of non-colored material like the gelatine or glue or sugar, and finally, a second patch corresponding to the uranine layer spaced apart from the first by the layer of glue or sugar or the like. Such an effect is made linear by virtue of rectilinear motion of the body comprising this plurality of layers of materials. Moreover, by varying the thickness of the layers of colored or fluorescent or other distinctive sea marking material, which amounts to the sea marker material content of such a layer, and assuming uniform rectilinear motion, thin layers will produce small or short areas upon the surface of the water, whereas thicker layers containing more material will result in larger or longer areas upon the water, assuming uniform motion.

Thus, it can be understood that thin layers of sea marking material, interspaced by say equivalent layers of non-sea marking material will dissolve off in sequence to correspond to a series of dots in the Continental Code, and that thick layers of sea marking material, likewise interspaced by say equivalent layers of non-sea marking material will dissolve off in sequence to correspond to a series of dashes in the Morse or other code, whenever the article comprising a contiguous arrangement of such layers is moved through or upon the surface of the water.

As an illustration, suppose the present invention is desired in a form to convey or produce the signal "SOS" or "Dot-dot-dot-dash-dash-dash-dot-dot-dot," then the sequence of layers in the body of the present invention, outer-most or top to inner-most or lower, would be as follows:

Layer Number From Top or Surface	Layer	Code	Over-all Meaning
1	Thin SM	Dot	"S"
2	NSM	Space	
3	Thin SM	Dot	
4	NSM	Space	
5	Thin SM	Dot	
6	NSM	Space	
7	Thick SM	Dash	"O"
8	NSM	Space	
9	Thick SM	Dash	
10	NSM	Space	
11	Thick SM	Dash	
12	NSM	Space	
13	Thin SM	Dot	"S"
14	NSM	Space	
15	Thin SM	Dot	
16	NSM	Space	
17	Thin SM	Dot	

wherein in the above-given table the letters SM stand for "sea marking material" and the letters NSM stand for "non-sea marking material," examples of both kinds being hereinafter described in full.

The various aspects and features will be made clear by reference to the details of the accompanying schematic and illustrative drawings. Initially, however, it is emphasized that wide departure may be made in the geometry and spatial modifications of the present invention, so these illustrations must be taken to be approximate only, and to show only the more elemental features of a simpler form of the present invention.

Referring now to the figures:

Figure 1 shows one preferred design and over-all form of my invention, in an ovoid or ellipsoid shape, wherein the arrows **2—2** indicate that axis of the invention parallel to the perpendicular and at right angles to the surface of the water or liquid upon which or through which the invention is moved either rectilinearly, circularly or in any other form of movement or motion that may be necessary to success in its application and use.

Figure 2 illustrates an end-on or cross-section view of the body structure and interior of the form of the invention shown as Figure 1. The center lines in Figure 2 designated by the numerals **3—3** indicate the symmetry of the body of the invention taken from an end-on view. Likewise in Figure 2, the letter A designates a core or center or forming-expediting material of a wide variety of substances including cork, wood, rubber, metal or plastic, as hereinafter described; the numerals **1**, **11**, and **2** designate successive layers of sea marking ("SM") and non-sea marking ("NSM") materials or compositions, as set out in detail hereinafter, and described and shown in more detail in Figure 4 which is described following:

Figure 3 illustrates a view of the interior of the invention similar to that of Figure 2, except that in Figure 3 the view is taken cross-sectionally and lengthwise or at right angles to that of Figure 2, briefly, sidewise.

Further in Figure 3, the letter A corresponds to a core material, that described by the same letter in Figure 2, and the numerals **4—4** indicate the sequence of layers of material upon the core A that are shown in detail in Figure 4.

Figure 4 illustrates the detail enclosed by 4—4 in Figure 3, wherein the numerals **1** refer to a relatively thin layer of sea marking or sea marker or SM material; **11** to the same or similar or analogous SM material as described in detail hereinafter, where suitable combinations, variations and choices of SM material are had if desired, but of greater thickness; **2** to non-sea marking or sea marker or NSM material of a nature hereinafter disclosed.

Figure 5 shows one mode of application of the present invention, though definitely not the only one. In Figure 5 the invention is towed in direction C behind a small boat or raft or the like for employment, and is secured to a rope or wire or other towing means by a knot or link or bolt and nut at B.

This securing and placing in motion of the present invention is preferably accomplished for most applications by towing behind a self-propelled water vehicle, raft or the like, and in Figure 3, within the core A, there is illustrated a simple male-female tube and screw means well known in the art for the purpose of attaching the invention to a tow line or the like. Instead of such means, a strong wire or sheet of metal or other attachable member may extend beyond

the outer surface of the present invention from core A, and be secured therein.

The applicant does not exclude other means of placing the present invention in application: Representative of these include fabricating the present invention so that it may comprise the warhead or part of the warhead of a water-traversing torpedo of the usual kind. Such a torpedo may be designed for launching or release from a small boat or raft or from aircraft. Likewise, such propellent means may be utilized for application of the present invention to the surface of the water; to the region just beneath the surface; the motion may be in a tangential trajectory originating at the surface or in the air, or from any desired depth beneath the surface of the water; in addition, such a trajectory may comprise perpendicular ascension or descension. In connection with the design, configuration, geometry and size of the present invention, wide latitude is possible, depending upon the specific purpose for which the invention is to be had. Thus, the present invention may be in the form of a sphere, an oblate-spheroid, ellipsoid or ovoid, square, rectangular or the like. It may even be cylindrical or comprise departures in design and geometry to conform to streamlining, and designs which permit greater surface to be washed or affected by water. In every case it is desirable to have the layer of SM or NSM contiguous.

Likewise, the intelligence conveyed by employment of the invention may be widely varied. In its simpler form merely two layers of uranine or one of uranine and another of a dissimilar SM, interspaced by a NSM may be employed. Moreover, given amounts of SM may be employed to advantage for dots and dashes, say one half to one pound per layer for a dot and twice this amount for a dash, or similar proportion; or, by regulating the spacing between the dots and dashes. It is understood that the SM and NSM layers may be of any thicknesses and the variation between thicknesses limited only by the application and size of the invention.

The present day sea marker comprises powdered uranine or sodium fluoresceinate which, for use, is sprinkled or poured upon the surface of the water. This dyestuff spreads over the water's surface, often reaching an area of an acre or more, coloring it a bright yellow or yellow-green. The color possesses a vividness which is due to the fluorescent characteristic of uranine. By way of note, uranine is one of the most powerfully fluorescent substances known, one part in tens of millions of parts of water being visible to the eye. Such a sea marker makes it possible for those in a life-raft to place out upon the water's surface for observation a signal that can be seen upwards of eight miles distance from an airplane during the daytime, and for several miles on a brightly moonlit night.

Substitutes for the sea marker have been proposed at various times, but none has found the wide application of uranine. However, for purposes of the present invention substances other than the sodium salt of fluorescein can be employed for specific and special uses. These include any of the alkali metal fluoresceinates, lithium and potassium fluoresceinates, as well as that of sodium. The alkali metal fluoresceinates are soluble in water, though other metallic derivatives usually are not and are therefore generally useless. Still other compounds include either the yellow amorphous or the red-crystalline-green iridescent form of fluorescein itself, both of which are sparingly soluble in water, this fact enabling a slow solution of the material during use so as to insure against immediate solution and too quick a dissipation, making for a longer lifetime of the signal.

Fluorescein (not "fluorescin") is dihydroxyfluoran mixed with hydroxy-o-carboxyphenylfluorone and is designated in the "Colour Index" of the Society of Dyers and Colourists (England) as No. 766, commonly CI No. 766. The sodium salt is uranine. In England uranine is often called fluorescein. It is variously stated to be visible with the unaided eye in water solutions of between 1:10 million and 1:200 million.

The dye known as chrysoline (CI No. 767) as well as various halogenated relatives and derivatives of CI No. 767 can be employed in the present invention, as described subsequently, though these are not always preferred. The latter include eosine (CI No. 768), eosine BS (CI No. 771), erythrosine (CI No. 772), phloxine (CI No. 774), rose bengal (CI No. 777), though it must be emphasized that certain of these possess color only, and those that do possess fluorescence in addition to color do so in lesser degree in general than uranine or fluorescein, and therefor may be suited to special applications only.

Practically any of the common water-soluble dyestuffs possessing great tinctorial values can be employed in the present invention as bearers of color, should this be desired instead of color and fluorescence as in the case of uranine, and representative dyes include the following (all identified by their "Colour Index" or CI number): methyl violet (CI Nos. 680 and 681), nigrosine (CI No. 865), rhodamine (CI No. 749) and so on. The dyestuff called nigrosine (CI No. 865) is nearly black in water solution and has virtues as a so-called shark-repellent.

In the above-given list of examples of sea marking substances which can be employed in the present invention for water marking, one important class is not thus far illustrated. This class comprises fluorescent substances which are lacking in color in visible light but are brightly fluorescent in ultraviolet light. Such compounds that can be employed include: beta-methyl umbelliferone, colorless water-soluble flavones and the like. It is preferred that beta-methyl umbelliferone be employed in utilization of this phase or form of the present invention.

Moreover, all of the afore-mentioned substances which have been given as more or less typical of practicability in connection with the present invention have the common property of solubility in water. While the present applicant prefers the employment of water-soluble substances, he does not exclude other substances which may prove of value and which are not soluble in water. These include such luminescent and/or colored or colorless substances as the following: alkaline earth, zinc and cadmium derivatives of 8-hydroxyquinoline, white substances in an exceedingly fine form such as titanium dioxide, metallic soaps, barium sulfate and aluminum oxide, elemental substances like iodine and graphite, both of which would possess utility other than for conveying messages or codes upon the water's surface at very great distances but which may prove of value in specialty work and scientific studies in the hydraulics and hydrodynamics laboratories. Also exceptionally thin flakes or particles of broken sheets of glass which may or may not be mirrored or of the so-called glass-form well known to the art (to provide buoy-

ancy) may be included in this category. Moreover, particles dispersible into or upon water, which may present a distinctive appearance in visible light or in invisible radiations, namely, micro-waves or radar or ultrasonic radiations, include coated base media like cork, plastic or rubber, which may or may not float or sink in water, provided with electrodeposited or vacuum evaporated metal films over their surface of metals like aluminum, or even exceptionally thin films of metals in a small particle or flake size like those of aluminum.

In addition, other substances include alkali metals like sodium in sheet or particle form, as pointed out hereinafter, or of reactive elements or compounds like white phosphorus. Obviously when such materials are employed in the present invention the article must be suitably stored, say in water in the case of white phosphorus and kerosene in the case of alkali metals.

Moreover, the insoluble phosphors which are not decomposed overly quickly by the action of water can be employed for certain special applications of the present invention: these include both fluorescent and phosphorescent substances and visible light emitting and infrared light emitting and ultraviolet light emitting phosphors or compounds such as alkaline earth tungstates with or without metallic impurity, e. g., lead, activation, zinc or beryllium silicates (with manganese activation), alkaline earth sulfide phosphors, platinocyanides, cadmium sulfide and so on.

It is apparent that all materials which are insoluble in water should be in small particle form or in very thin sheets so that they can float upon the water's surface after dispersion or will undergo only slow settling at most. Many departures may be made in choice of materials of an insoluble nature and composite materials and mixtures can be utilized in order to secure buoyancy and the like. Such means of promulgating buoyancy include the use of rubber and glass foam or minerals like pumice, and materials like cork and light wood as substrate or base elements upon which the essential ingredient may be carried. The formulation and manufacture of such articles can be carried out by methods and means well-known in the art, and the present application claims nothing distinctive or novel in this regard.

The fabrication of the present invention may be accomplished by several means, all of which are more or less common and well known in the art. In general, there are two phases to the production of the present invention: (1) Preparing the sea marking or non-sea marking material or composition in a form so that the material will fullfill its designated function upon employment but at the same time will be sufficiently durable and substantial and possess other properties so that the invention itself can be cheaply and quickly made on a large scale and so that the product will withstand shock and rough handling and the like. (2) The actual forming of the invention itself and especially the formation of layers or lamellae of the desired size and configuration. Each of these phases can be dealt with as follows:

(1) There are two general types of materials which are employed in the fabrication of the present invention: (*a*) the sea marking material and (*b*) the non-sea marking material:

(*a*) In forming layers of sea marking material certain substances depending upon well known chemical and physical properties can be utilized

in a fused form or be employed for purposes of making up the present invention by heat treatment corresponding to sintering so that a bonded mass of sea marker material can be formed. Such properties, however, are not possessed by the more important of the sea marking material. uranine or fluorescein, so some other means must be used to achieve bonding. I have found that blocks or masses or layers or coatings of uranine, fluorescein, or any other dyestuff or sea marking material can be easily formed from the powdered material by adding a few per cent or less by weight of glue, water soluble starch, gelatine, agar, or sugar to the powdered dye and working a few per cent of water into the mixture so that a thick damp or slightly wet mass is formed. When this is allowed to dry it hardens into a more or less compact mass whose strength depends upon the amount of water-soluble bonding agent used. Such masses of sea marking material release the active agent into the water at a rate which depends upon the nature and amount of binding agent employed in forming the mass. Glue is a preferred and economical material.

Certain of the dyes, chemical compounds and in general the sea marking materials can be formed into masses or layers by the application of pressure and temperatures below the melting or decomposing point. Uranine seems not to be amenable to such a treatment, since it decomposes if the temperature exceeds several hundred degrees.

Numerous methods of bonding or binding and forming masses of material are available from the knowledge of the present art, and nothing exceptionally novel is claimed for this aspect.

(*b*) The water-soluble bonding or binding agent which is used for forming the sea marking layer or mass can be used in forming the non-sea marking layer or mass. As with the binder for case (*a*) the only requisite is that the binder must be more or less soluble in water. Thus, for such purposes a thin coating of animal glue, gelatine, starch or sugar, from solution or from a molten mass of the substance should its characteristics permit such a procedure serves quite satisfactorily. In forming such layers it is suggested for example, the certain of the knowledge of the candy-making art be relied upon, for in this art it is often necessary to form an article with successive layers of candy or sugar.

The same treatment holds for both water-soluble and water-insoluble sea marking agents as herein disclosed and described. Wetting agents in dry form, like "Aerosol," may be added to the compositions, by means well known in the art, to enhance water action.

(2) In the actual forming of the invention itself, I prefer the use of a core, central, or center base material, indicated by the letter A in Figures 2 and 3, upon which the layers of SM and NSM may be sequentially formed in the reverse of the manner in which they are to be released. Such a core or center material, A, may be of some lighter than water substance, like cork or pine or balsam wood, or it may consist of a durable rubber bladder inflated to the desired size with a gas like helium or stuffed with pieces of cork or kapok, or simply a light, gas-tight aluminum can.

However, it is pointed out that the core of the invention, A, is optional, and depends upon the form of the invention and the preferences and requirements in the manufacture of a given kind or design and size of the present invention.

In forming the layers of SM and NSM material upon the core, several methods well known in the art can be employed. These are not novel and include such representative ones as follows: (I) Dipping in a sufficiently thin mixture or solution or mass of SM and NSM until the layer has been built to a desired thickness; (II) hand-application of thick, pliable and plastic masses of the undried and unbonded SM or NSM; (III) placing the core material or a small block or sphere or ovoid block of the innermost material, say comprised of SM, into a centrifugal coating machine which revolves said core in the presence of the coatable SM or NSM material and results in the forming of a layer of either SM or NSM; (IV) the pre-fabrication by molding or similar means of either SM and/or NSM by the usual means so that shells of each layer material are formed, say as one-half of the body of the invention (corresponding to one layer), and then the assembling by hand or machine by merely nesting the various said pre-formed layers or shells together according to sequence and size, and finally treating the outer-most one with a coating of binding agent that is thin but at the same time will hold all the shells together and prevent their breaking apart; (V) the layers of SM or NSM may be formed in sequence by merely painting a thick, viscid mixture or solution of SM or NSM upon previous layers of the same or different materials or core, A, with a brush or applying them with a mechanical spray-gun or machine until a layer of suitable thickness of SM or NSM containing mass or quantity is formed. In each application it is recognized that thorough drying is necessary before the subsequent layer can be applied or formed by this and similar means, and infrared or other heat drying means can be employed efficaciously.

As will be apparent to those acquainted with the art, each of these illustrative forming or invention-producing procedures has its advantages and disadvantages, depending upon the materials being worked with.

I claim:

1. A sea marking device comprising a consolidated solid body of concentric layers of sea marking material and water dissoluble filling material, whereby upon passage of water over the said body the said layers are sequentially released from the surface of the body and the release of the sea marking material is spaced by the release of the filling material, the thickness of the layers comprising the sea marking material corresponding to the sea marking produced in the movement of the water over the body, and the thickness of the layers of filling material corresponding to the space produced between the release of the sea marking material.

2. An apparatus for conveying water borne intelligence comprising a mass of laminated, concentric layers of dissoluble sea marking material and dissoluble filler material, the said mass having a central core member, the said layers being sequentially dissoluble inwardly from the surface of the mass upon movement of the mass through water, whereby to successively release the said materials comprising the layers, the release of the sea marking material being spaced by the release of the filler material, such that in the release of a plurality of layers of filler material a spaced succession of sea markings is produced upon the water.

3. An apparatus for conveying water borne intelligence comprising mounted upon a core member a consolidated body of laminated layers of sea marking material and dissoluble filler material, the said layers being concentrically arranged upon the core member, the said core member having means for placing the said apparatus in communication with means for moving the apparatus through a body of water, the said layers being sequentially dissoluble inwardly from the surface of the body upon movement of the apparatus through water, whereby to successively release the said materials comprising the layers, the release of the sea marking material being spaced by the release of the said filler material, such that in the release of a plurality of layers a filler-spaced succession of sea markings is formed upon the water.

4. An apparatus in the form of a spheroid block for producing distinctive sea markings comprising a body of separate layers of sea marking means and water dissoluble means, the said layers having a concentric arrangement inwardly from the surface of the said body, whereby upon passage of the apparatus through water the said layers are released successively from the body, with the release of the sea marking means spaced by the release of the water dissoluble means, the thickness of the layers comprising the said dissoluble means being of uniform water dissoluble filler material content, and the thickness of the layers of the said sea marking means being of material content at least the same as the said filler, so as to convey upon release a marking corresponding to a dot in code, and the sea marking means being of material content a multiple of the content of the said filler, so as to convey upon release a marking corresponding to a dash in code, whereby upon the successive release of a plurality of layers into water a spaced series of dot-and-dash coded sea markings is formed.

5. A sea marking signal device characterized by a solid body of a series of concentric layers of fluorescein sea marking material and water dissoluble, substantially colorless filling material, whereby upon movement of water over the device the said layers are released successively from the surface of the said body with the intermittent release of sea marking material spaced by the release of the said filling material.

6. A sea marking device characterized by a body member and a core member therefor, the said body member comprising a series of concentric layers of luminescent material and water dissoluble material, said dissoluble material being non-luminescent, whereby upon movement of the said device over the surface of a body of water the layers are released successively from the surface of the said body member, whereby to sequentially release the luminescent material spaced by the release of the non-luminescent material.

7. A sea marking device characterized by a body member and a core member therefor, the said body member comprising a series of concentric layers of dyestuff and water dissoluble, substantially colorless material, whereby upon movement of the said device over the surface of a body of water the layers are released successively from the surface of the body member, whereby to sequentially release the dyestuff spaced by the release of the dissoluble material.

8. A sea marking device characterized by a body member and a core member therefor, the said body member comprising a series of concentric layers of radiation absorbing material

and radiation reflecting material, both of the said materials being water dissoluble, whereby upon movement of the said device over the surface of a body of water the layers are released successively from the surface of the body member, whereby to sequentially release the radiation absorbing material spaced by the release of the radiation reflecting material.

9. A sea marking device characterized by a body member and a core member therefor, the said body member comprising a series of concentric layers of radiation emitting material and water dissoluble material, whereby upon movement of the said device over the surface of a body of water the layers are released successively from the surface of the said body member, whereby to sequentially release the radiation emitting material spaced by the release of the water dissoluble material.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
481,818	Prescott	Aug. 30, 1892
1,117,189	Jackson	Nov. 17, 1914
2,196,901	Ham	Apr. 9, 1940
2,418,397	Collyer et al.	Apr. 1, 1947

FOREIGN PATENTS

Number	Country	Date
20,726	Great Britain	1910
164,178	Great Britain	June 9, 1921
314,149	Great Britain	June 27, 1929