

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
26 October 2006 (26.10.2006)

PCT

(10) International Publication Number  
**WO 2006/113393 A2**

(51) International Patent Classification:  
*B60Q 1/26* (2006.01)

(21) International Application Number:  
PCT/US2006/013984

(22) International Filing Date: 13 April 2006 (13.04.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/107,389 14 April 2005 (14.04.2005) US

(71) Applicant and

(72) Inventor: **ALTMAN, Bradford** [US/US]; 9952 Frances  
Folsum Drive, King George, Virginia (US).

(74) Agent: **SLAVIN, Michael, A.**; McHale & Slavin, P.A.,  
2855 PGA Blvd., Palm Beach Gardens, FL 33410 (US).

(81) Designated States (*unless otherwise indicated, for every  
kind of national protection available*): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,  
LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI,  
NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG,  
SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US,  
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every  
kind of regional protection available*): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,  
RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— *without international search report and to be republished  
upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance  
Notes on Codes and Abbreviations" appearing at the beginning  
of each regular issue of the PCT Gazette.*



**WO 2006/113393 A2**

(54) Title: HAZARD MARKER KIT

(57) Abstract: A hazard marker kit has several components including a hazard light, a base for supporting the light in different angular orientations on different surfaces, a translucent cone, and a staff with attached pennant. The hazard light is housed within a disc shaped high impact plastic housing, an upper portion of which is transparent. A plurality of LEDs are circularly disposed proximal to the side of the upper portion. A ring counter provides signals to transistors that sequentially drive the LEDs. Excitation provided to the ring counter is controlled to cause a desired current through the LEDs to simulate a rotating beacon, a flashing beacon or a continuous light.

## HAZARD MARKER KIT

1

2

**BACKGROUND OF THE INVENTION**

## 1. Field of Invention

This invention is in the general field of warning devices and, more particularly, is a hazard marker kit that provides an aimed illumination device and accessories.

8

## 2. Description of the Prior Art

A hazard marker is typically placed near a problem area created by a mishap or breakdown. Reasons for placing the marker include protection of people against injury, discouraging people from either walking or driving in the problem area, discouraging intrusion into emergency medical treatment of injuries resulting from the mishap and discouraging intrusion into clean up activity. The hazard marker may, for example, be a flare, a sequentially illuminated arrow, a message sign, a wooden barricade that carries a blinking warning light or an orange cone.

The flare has an advantage of being easily visible at night. However, a motorist who drives past one or more flares may be temporarily blinded by their brightness, thereby endangering the motorist and people in the vicinity of the motorist. The flare is particularly dangerous to use where an automobile collision causes a spillage of gasoline on a roadway. Among other undesirable aspects of the flare is that a person charged with igniting the flare risks being burned and having their clothing burned. The flare additionally releases noxious fumes when it burns.

The orange cone is one of the most commonly used hazard markers. The cone frequently has a light and a battery mounted near its apex. The light cannot readily be seen outside of an immediate area where the cone is placed, particularly in poor weather conditions. The light and the battery make the cone top heavy, thereby destabilizing the cone. Even in the absence of the destabilizing, the cone is frequently destroyed or badly damaged when inadvertently

1 struck by a motor vehicle.

2 In the boating industry, flares are typically used to  
3 indicate a vessel in peril. The use of a flare on a gasoline  
4 powered boat is very dangerous since a boat in peril is not  
5 moving, thus the opportunity for gasoline vapor accumulation  
6 is high. Once a flare is lit, the flare must be held over  
7 the side of the boat to prevent the hot molten materials from  
8 entering the vessel. Further, unlike a road side situation,  
9 a flare cannot be set down safely within a boat.

10

#### 11 **SUMMARY OF THE INVENTION**

12 Accordingly an objective of the present invention is to  
13 provide a hazard marker kit with components which are not  
14 necessarily usable simultaneously but would be available  
15 depending on the situation. The components include a hazard  
16 light and a base connected by a link which allows the light  
17 to be oriented in different planes of illumination. The kit  
18 also includes a translucent cone and a pennant with staff.

19 Another objective of the invention is to provide a  
20 hazard light in the general shape of a disc which includes a  
21 transparent upper housing and a lower housing that are made  
22 from a high impact plastic. The upper and lower housings form  
23 a waterproof seal when joined together.

24 Another objective of the present invention is to provide  
25 the hazard marker light including a plurality of light  
26 emitting diodes (LEDs) that have a circular disposition  
27 within the housing. The LEDs are oriented either to provide  
28 light that can be seen by a motorist at a substantial  
29 distance from the hazard marker or provide light that can be  
30 seen by an aircraft flying above the hazard marker.

31 A further objective of the invention is to provide an  
32 simulated rotating or flashing beacon using an oscillator  
33 driving an input of a ring counter. Outputs of the ring  
34 counter sequentially or simultaneously drive the LEDs.  
35 Current through the LEDs passes through a sampling resistor,  
36 thereby providing a sampling voltage. A reference voltage is  
37 compared to the sampling voltage. An excitation voltage

1 applied to the ring counter is changed in response to a  
2 difference between the reference voltage and the sampling  
3 voltage. The change in the excitation causes a corresponding  
4 change in the drive at the output of the ring counter that  
5 results in the reference and sampling voltages being  
6 substantially equal.

7 Yet another objective of the invention is to provide a  
8 waterproof battery compartment in the lower housing for  
9 securing the batteries in operative connection regardless of  
10 the orientation of the hazard marker.

11 A further objective of the invention is to provide a  
12 double walled housing to reinforce the hazard marker against  
13 crushing.

14 Another objective of the invention is to provide a  
15 hazard marker that can be secured to slippery housings, such  
16 as boat surfaces.

17 Another objective of the invention is to provide an  
18 attachment on the housing for mounting the hazard marker on  
19 different angled surfaces.

20 A further objective of the invention is to provide a  
21 internal jumper switch to permit the LEDs of the hazard  
22 marker to fire simultaneously, as a flash, or sequentially,  
23 as a rotating beacon, or continuously for providing steady  
24 light.

25 Other objectives, features, and advantages of the  
26 invention should be apparent from the following description  
27 of the preferred embodiment thereof as illustrated in the  
28 accompanying drawing.

29

### 30 **BRIEF DESCRIPTION OF THE DRAWING**

31 FIG. 1 is an exploded side view of the preferred  
32 embodiment of the hazard light of the present invention;

33 FIG. 2 is a top plan view of the embodiment of FIG. 1;

34 FIG. 3 is a side view of the base of the hazard light of  
35 the present invention;

36 FIG. 4 is a top plan view of the base of Fig. 3;

37 FIG. 5 is a side view of the belt clip of the present

1 invention;

2 FIG. 6 is a top plan view of the link of this invention;

3 Fig. 7 is a perspective of the cone of this invention;

4 Fig. 8 is a perspective of the pennant and staff of this  
5 invention; and

6 FIG. 9 is a schematic showing of elements that cause  
7 illumination of the LEDES of this invention.

8

#### 9 **DESCRIPTION OF THE PREFERRED EMBODIMENT**

10 As shown in FIGS. 1 and 2, a hazard marker 10 has a  
11 general shape of a disc. The marker 10 includes a lower  
12 housing 12 and an upper housing 14 that are made from a high  
13 impact plastic. The upper housing 14 is transparent. A bolt  
14 16 passes through the lower housing 12 and screws into the  
15 upper  
16 housing, whereby the lower housing 12 and the upper housing  
17 14 are held together. The transparent upper housing 14 has  
18 a depending circular wall 11, shown in FIG. 1, with a  
19 diameter slightly smaller than the upstanding wall 13 of the  
20 lower housing 12. This double walled construction allows the  
21 hazard marker to be sealed against leakage. Also, a  
22 circumferential ring seal 15 supported by the upstanding wall  
23 13 contacts upper housing 14 so that when the upper housing  
24 and the lower housing are bolted together they form a  
25 watertight joint.

26 Visible through the upper housing 14 is circular board  
27 19, shown in Fig. 2, whereon LEDES 20-A through 20-J are  
28 circularly disposed. As explained hereinafter, the LEDs 20-A  
29 through 20-J transmit light through the wall 14. The LEDs  
30 20A - 20-J are oriented on the upper housing such that the  
31 emitted light may be seen for a considerable distance. The  
32 LEDs may have different emitted colors, such as white, red or  
33 blue, with other colors being possible. Red providing the  
34 traditional emergency color. However, white lighting may be  
35 used in direct sunlight providing a brilliant visual light.

36 The hazard marker 10 includes a latch 21 attached to the  
37 lower housing 12 by screws 22A and 22B. The latch is formed

1 in a narrow elongated planar shape ending in a tongue 23.  
2 Also mounted on both sides of the latch 21 near the center on  
3 the lower surface are hoops 25. On either side of the hoops  
4 25 are blades 27A and 27B sized and shaped to securely fit in  
5 catches 28A and 28B on base 26 when the hazard light 10 is  
6 parallel to the base 26. The tongue 23 is sized and shaped to  
7 securely fit between the upstanding walls 24A and 24B of the  
8 catch 28A when the hazard light is at a 45 degree angle to  
9 the base 26. The tongue 23 is secured in the catch 28B when  
10 the hazard light is normal to the base 26.

11 A link 29, as shown in Fig. 6, is rotatably coupled to  
12 the hoops 25 by upper pintles 30. Pintles 31 are rotatably  
13 secured in the loops 32 in the base 26. The hazard light 10  
14 can be pivoted through an arc of 90 degrees relative to the  
15 base 26 by pivoting the link 29 and rotating the pintles 30  
16 and 31 in the hoops 25 and loops 32.

17 The base 26, illustrated in Fig.s 3 and 4, is preferably  
18 a planar rectilinear shape with feet 33 at the corners.  
19 However, the outline of the base is a matter of choice.

20 The base 26 has a key hole opening 34 in one end.  
21 Removably inserted into the key hole opening is a suction cup  
22 35 which is slidably secured by a button 36 frictionally held  
23 in the small end of the key hole opening. The suction cup 35  
24 will secure the hazard light 10 to all smooth surfaces, such  
25 as glass, plexiglass, and finished painted or unpainted  
26 surfaces in either the vertical or horizontal plane.

27 A magnet 37, shown in Fig. 3, is mounted on the bottom  
28 surface of the base 26. The magnet 37 may be snap-fit into  
29 a retainer 38 or permanently affixed to the base. The magnet  
30 37 permits the hazard light to be attached to magnetizable  
31 metal surfaces, such as steel, at any orientation.

32 A spring steel clip 43, shown in Fig. 5, is magnetically  
33 attached to the magnet 37 which allows the hazard light 10 to  
34 be attached to clothing, such as a collar, waistband or a  
35 belt or a line by compression between the opposing arms 44  
36 and 45.

37 Batteries (not shown) are connected in series. More  
38 particularly, the batteries are placed in the battery  
39 compartment to form an electrical connection from the battery

1 compartment to the terminals connected to the circuit board  
2 19.

3 To replace or recharge the batteries, the upper and  
4 lower housings must be disassembled and reattached using bolt  
5 16. Of course, there could be a sealed door in the lower  
6 housing 12 connecting to the battery compartment for ease of  
7 battery replacement.

8 A sealed switch 41 is mounted on the lower housing 12  
9 and projects through the upper housing 14 for manual  
10 activation of the hazard light. The switch 41 is connected  
11 to the electrical battery circuit in the compartment. By  
12 manipulating the switch power is interrupted or connected  
13 between the batteries and the circuit board 42, shown  
14 schematically in Fig. 9. The hazard marker may operate in a  
15 rotating mode with the LEDs firing sequentially or in the  
16 flash mode with the LEDs firing simultaneously or in the  
17 continuous mode. The circuit board has a microprocessor  
18 controlling the different modes. The mode is selected by  
19 manipulation of the switch 41.

20 The upper housing 14 has radial depressions 66 therein  
21 that diffuses light from the LEDs 20-A through 20-J that  
22 passes therethrough. The diffused light does not cause a  
23 glare that temporarily blinds a passing motorist. The LEDs  
24 20-A through 20-J are positioned to transmit light vertically  
25 through a horizontal wall portion of the upper housing 14.  
26 The vertically transmitted light is used to indicate a scene  
27 of a mishap to an aircraft.

28 As shown in FIG. 9, there is a connection between the  
29 batteries and switch 41. When the switch 41 closes, thereby  
30 providing a voltage to a contact which is connected to an  
31 operational amplifier and an oscillator, whereby the voltage  
32 is provided to the operational amplifier and the oscillator.

33 The oscillator provides a train of pulses with an 18  
34 millisecond period. The oscillator is connected to a ring  
35 counter at a clock input. A first pulse and a second pulse  
36 of the train of pulses cause an output of the ring counter to  
37 provide an 18 millisecond pulse. The second pulse and a third  
38 pulse cause an output of the ring counter to provide an 18  
39 millisecond pulse. It should be understood that the pulse

1 ends simultaneously with a beginning of the pulse. In a  
2 similar manner, 18 millisecond pulses are provided at other  
3 outputs, respectively, of the ring counter. From the  
4 explanation given hereinbefore the pulses are provided in a  
5 serial manner, one at a time. It should be understood that  
6 the amplitude of the pulses is directly related to a voltage  
7 applied to an excitation input of the ring counter. The  
8 application of the voltage to the excitation input is  
9 described hereinafter.

10 The outputs are connected to bases of NPN transistors ,  
11 respectively. The transistors have their collectors  
12 respectively connected to LEDs 20-A, 20-C, 20-E, 20-G, 20-I,  
13 at their cathodes, anodes thereof being all connected to the  
14 contact. The transistors have their emitters respectively  
15 connected to the LEDs 20-B, 20-D, 20-F, 20-H, 20-J, at their  
16 anodes, cathodes thereof being all connected through a  
17 sampling resistor to ground and to the operational amplifier  
18 at an inverting input thereof, whereby a sampled voltage is  
19 provided to the amplifier.

20 When the switch 41 is closed, substantially equal  
21 currents flow through the LEDs 20-A in response to the pulse  
22 being provided to the transistor, thereby causing an emission  
23 of light from the LED 20A. In a similar manner, current flows  
24 through the LEDs 20-C, 20-D, the LEDs 20-E, 20-F, the LEDs  
25 20-G, 20-H, the LEDs 20-I, 20-J, in response to the pulses  
26 respectively, to cause emissions of light therefrom.

27 The contact is connected through a resistor to a non-  
28 inverting input of the amplifier. A resistor is connected  
29 from the non-inverting input to ground. In other words, the  
30 resistors are a voltage divider that provides a reference  
31 voltage to the non-inverting input. An output of the  
32 amplifier is connected to an excitation input of the ring  
33 counter whereby an excitation input voltage is provided to  
34 the ring counter.

35 When, for example, the pulse is provided, an emitter  
36 current of the transistor passes through the resistor,  
37 thereby providing the sampled voltage. In response to the  
38 sampled voltage being greater than the reference voltage, the  
39 excitation input voltage is reduced, thereby reducing the



1 amplitude of the pulse to cause a reduction of the emitter  
2 current of the transistor. Correspondingly, in response to  
3 the sampled voltage being less than the reference voltage,  
4 the excitation input voltage is increased, thereby increasing  
5 the amplitude of the pulse, to cause an increase of the  
6 transistor emitter current, whereby the amplitude of the  
7 pulse is regulated. In a similar manner, the amplitudes of  
8 the pulses are regulated.

9 In an alternative embodiment, the diodes 20-A, 20-C, 20-  
10 E, 20-G, 20-I, and 20-K, are omitted and the collectors of  
11 transistors are connected to the contact. Thus there is  
12 described herein a hazard marker and distress signal that is  
13 especially suited for marking a problem area created by a  
14 mishap or mechanical failure.

15 In addition the hazard light 10, and the attached  
16 accessories, the hazard marker kit also includes a  
17 transparent or translucent cone 50. The cone 50 is similar  
18 to a conventional traffic cone except that it is lighted from  
19 within when it is placed over a hazard light. The  
20 illuminated cone 50 may be used with the hazard light in any  
21 mode particularly in roadside situations. The cone 50 may be  
22 fabricated from films with other colors, such as blue, red,  
23 yellow or orange, to attract attention or distinguish the  
24 hazard from other lights nearby. The cone has an aperture 51  
25 in the apex.

26 The cone 50 may be combined with the telescoping staff  
27 52 extending through the aperture 51. This is particularly  
28 useful in marine and helicopter operations where knowledge of  
29 the wind direction is necessary for proper approach to the  
30 scene. A pennant 53 is attached to one end of the staff to  
31 indicate wind direction. The hazard light projecting up  
32 through the cone will illuminate the pennant 52.

33 The cone 50 and staff 52 may be used with or without the  
34 lens 54 which is sized and shaped to fit within aperture 51.  
35 The lens 54 will focus the light from the hazard light to  
36 provide a vertical beam useful in aerial location of a site.

37 A number of embodiments of the present invention have  
38 been described. Nevertheless, it will be understood that  
39 various modifications may be made without departing from the

1 spirit and scope of the invention. Accordingly, it is to be  
2 understood that the invention is not to be limited by the  
3 specific illustrated embodiment but only by the scope of the  
4 appended claims.

5

6

7

8

9

10

11

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39

Claims

What is claimed is:

1. A hazard marker comprising a waterproof disc shaped hazard light with a lower housing and a transparent upper housing, a waterproof seal between said upper housing and said lower housing, a circuit board mounted in said lower housing, a waterproof battery compartment and a plurality of light sources circularly disposed within said upper housing proximal to a wall thereof operatively connected with said circuit board, and means for causing emission of light from said light sources.

2. The hazard marker of claim 1 wherein each of said plurality of light sources is an LED.

3. The hazard marker of claim 1 wherein said plurality of light sources are activated in sequence.

4. The hazard marker of claim 3 wherein said sequence simulates a rotating beacon.

5. The hazard marker of claim 1 wherein said plurality of light sources are activated simultaneously.

6. The hazard marker of claim 5 wherein said plurality of light sources are activated intermittently.

7. The hazard marker of claim 1 wherein a said circuit board includes:

an oscillator;

a ring counter having a clock input connected to said oscillator at an output thereof, a plurality of outputs of said ring counter each providing a voltage having an amplitude directly related to a voltage applied to an excitation input of said ring counter;

means for generating currents directly related to voltages provided at said ring counter outputs, said generated currents being respectively provided through a

1 plurality of LEDs;

2 a sampling resistor that provides a return path for  
3 current that passes through said LEDs;

4 a reference voltage source; and

5 an operational amplifier that has inverting and non  
6 inverting inputs connected to said sampling resistor and said  
7 reference voltage source, respectively, and an output  
8 connected to said excitation input of said ring counter.

9

10 8. The hazard marker of claim 7 wherein each of said  
11 circuit board comprises an NPN transistor with its base  
12 connected to an output of said ring counter, its emitter  
13 connected to an anode of one of said LEDs and its collector  
14 connected to a source of excitation.

15

16 9. The hazard marker of claim 8 wherein said collector  
17 is connected to said source of excitation through one of said  
18 LEDs having its cathode connected to said collector.

19

20 10. A hazard marker for providing a warning light  
21 comprising a disc shaped marker having a translucent upper  
22 housing and a bottom housing, said upper housing having a  
23 depending wall, said bottom housing having an upstanding  
24 wall, said depending wall and said upstanding wall forming  
25 concentric circles in contact with each other, said  
26 concentric circles reinforcing said disc shaped housing and  
27 increasing crush resistance, a circuit board in said marker,  
28 a circular array of LEDs in said upper housing electrically  
29 connected to said circuit board, said circuit board having  
30 means for energizing each LED of said array, a latch attached  
31 to said lower housing, said latch rotatably connected to a  
32 link, and a base for supporting said disc shaped marker  
33 rotatably connected to said link.

34

35 11. A hazard marker of claim 10 wherein said circuit  
36 board has means for energizing each LED in said array  
37 simultaneously and intermittently for producing a visible  
38 light that appears to flash.

39

1

2

3           12. A hazard marker of claim 10 wherein said circuit  
4 board has means for energizing each LED in said array  
5 sequentially and intermittently for producing a visible light  
6 that appears to rotate.

7

8           13. A hazard marker of claim 10 wherein said housing is  
9 made of high impact plastic.

10

11           14. A hazard marker of claim 10 wherein said upper  
12 housing has a depending wall, said bottom housing having an  
13 upstanding wall, a circular waterproof seal between said  
14 upstanding wall and said depending wall.

15

16           15. A hazard marker of claim 10 wherein said base  
17 includes a magnet for holding said marker on magnetizable  
18 surfaces.

19

20           16. A hazard marker of claim 15 wherein said base  
21 includes a suction cup for holding said marker on smooth  
22 finished surfaces.

23

24           17. A hazard marker of claim 10 wherein said base  
25 includes a suction cup for holding said marker on smooth  
26 finished surfaces.

27

28           18. A hazard marker kit for providing a warning light  
29 comprising a disc shaped marker having a translucent upper  
30 housing and a bottom housing, said upper housing having a  
31 depending wall, said bottom housing having an upstanding  
32 wall, said depending wall and said upstanding wall forming  
33 concentric circles in contact with each other, said  
34 concentric circles reinforcing said disc shaped housing and  
35 increasing crush resistance, a circuit board in said marker,  
36 a circular array of LEDs in said upper housing electrically  
37 connected to said circuit board, said circuit board having  
38 means for energizing each LED of said array, a latch attached  
39 to said lower housing, said latch rotatably connected to a

1 link, and a base for supporting said disc shaped marker  
2 rotatably connected to said link, a magnet in said base for  
3 holding said marker on magnetizable surfaces, a suction cup  
4 for holding said marker on smooth finished surfaces, said  
5 base including a plurality of catches whereby said latch and  
6 said link support said marker at an angle from said base when  
7 said latch is engaged in said plurality of catches.

8

9 19. A hazard marker kit of claim 18 wherein said kit  
10 includes a hollow cone of a size and shape to surround said  
11 marker, said cone being translucent whereby said cone is  
12 illuminated when said LEDs are energized.

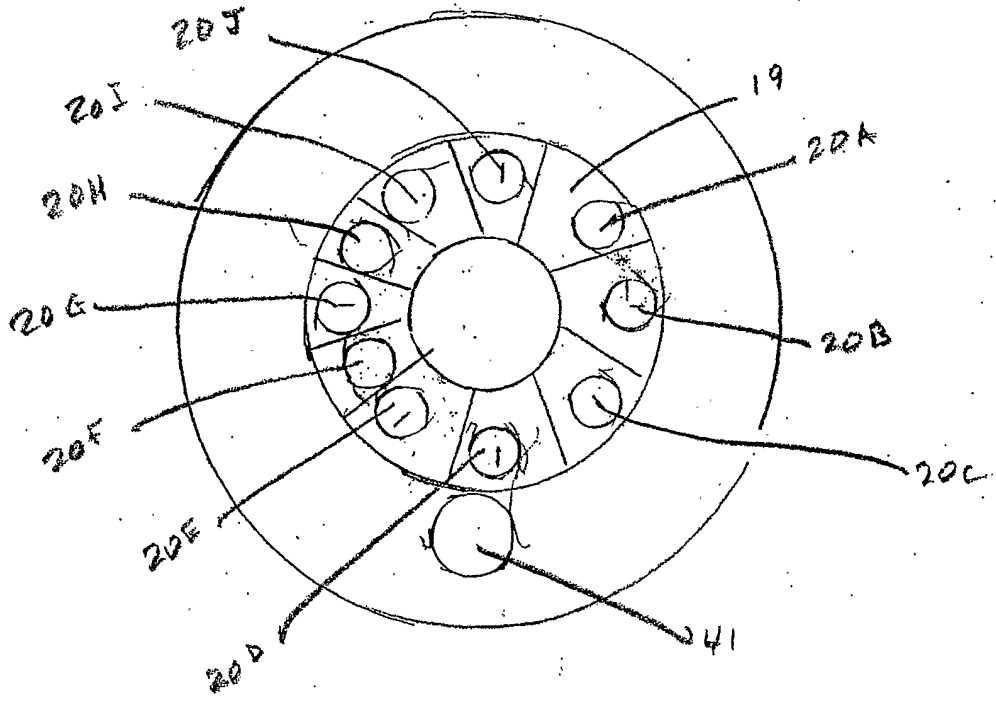
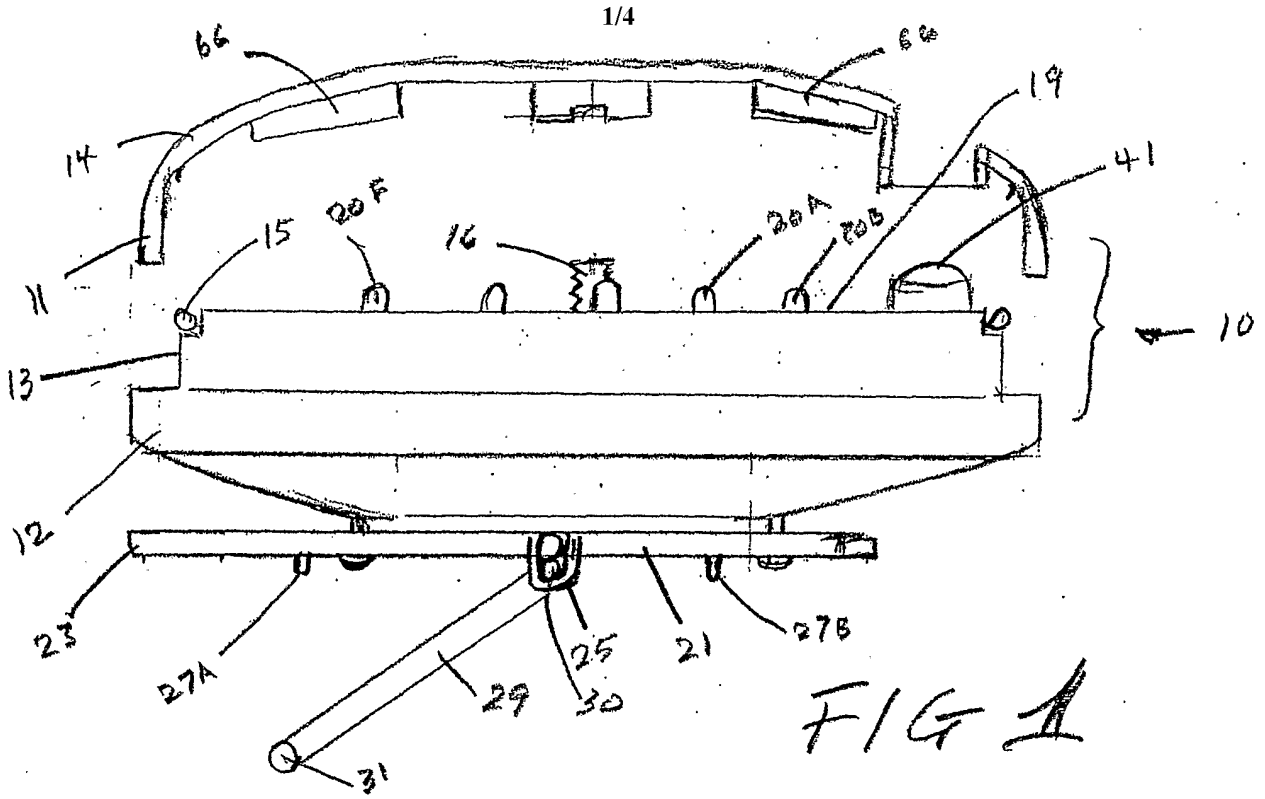
13

14 20. A hazard marker kit of claim 19 wherein said kit  
15 includes a telescoping staff, said cone having an aperture at  
16 inserted in said aperture, a pennant attached to one the  
17 other end of said staff for indicating wind direction.

18

19 21. A hazard marker kit of claim 19 wherein said kit  
20 includes a lens, said lens of a size and shape to fit within  
21 said cone, said lens adapted to project light vertically from  
22 said cone.

23



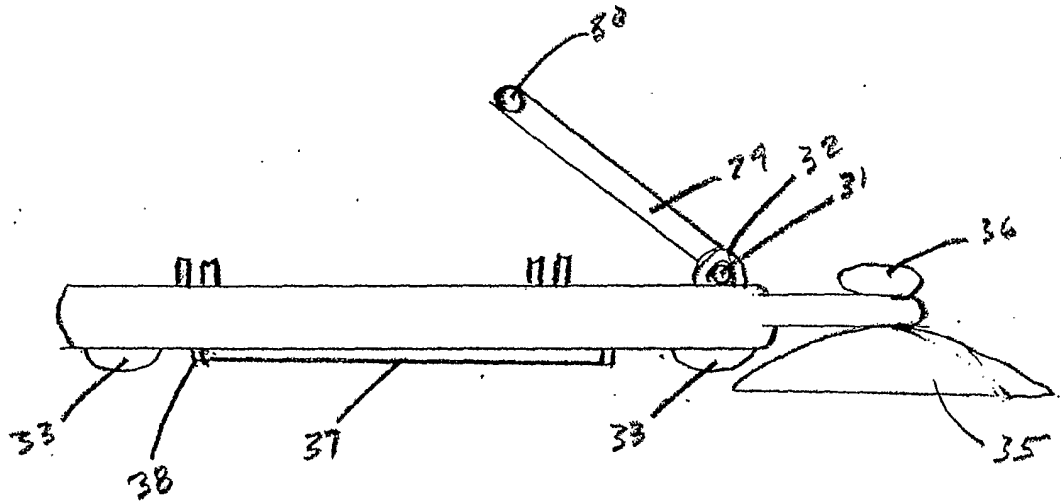


FIG. 3

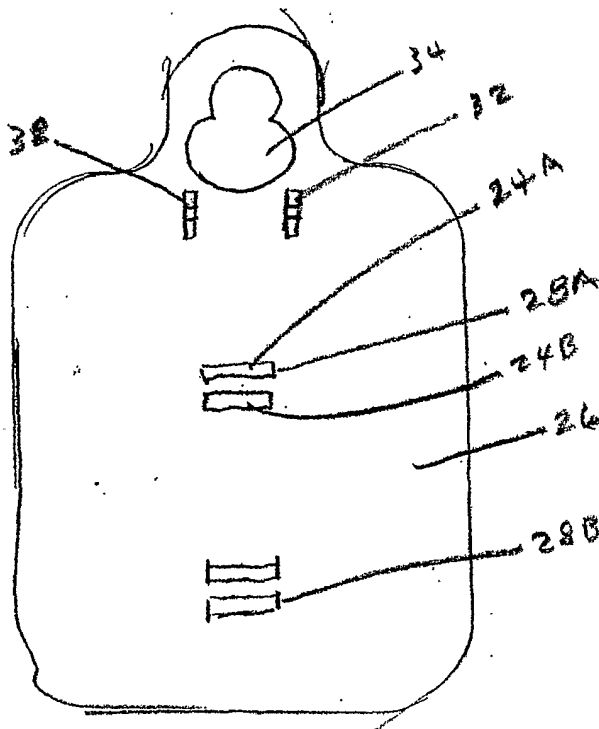


FIG. 4



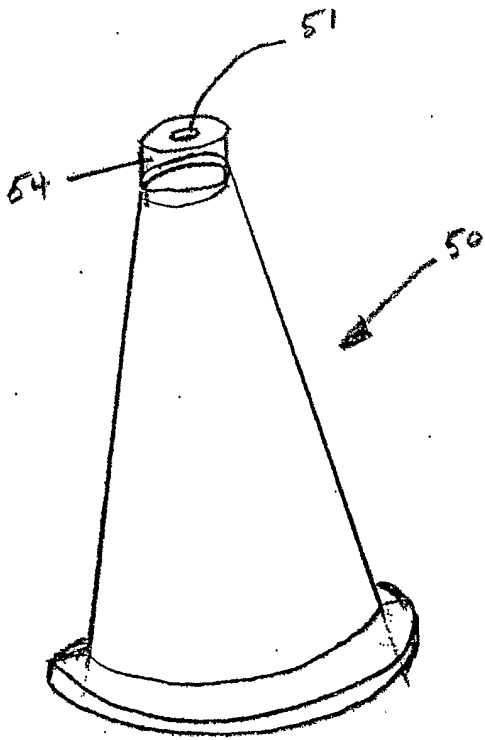


FIG. 7

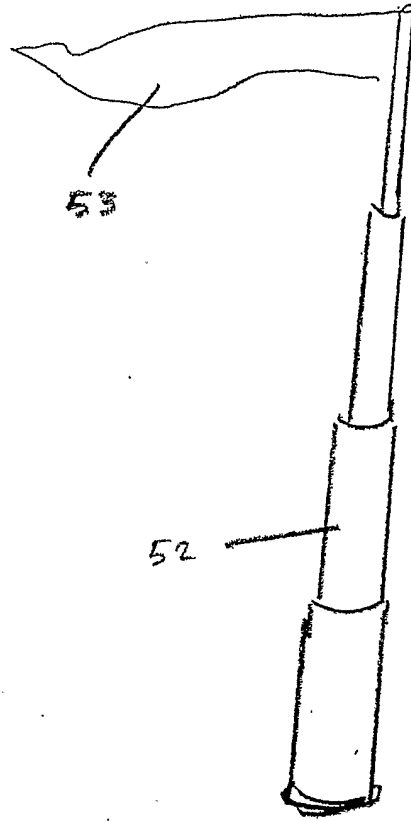


FIG. 8

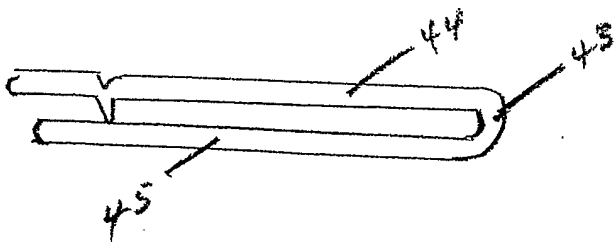


FIG. 5

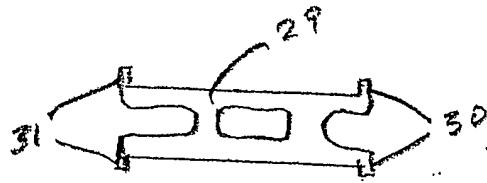


FIG. 6

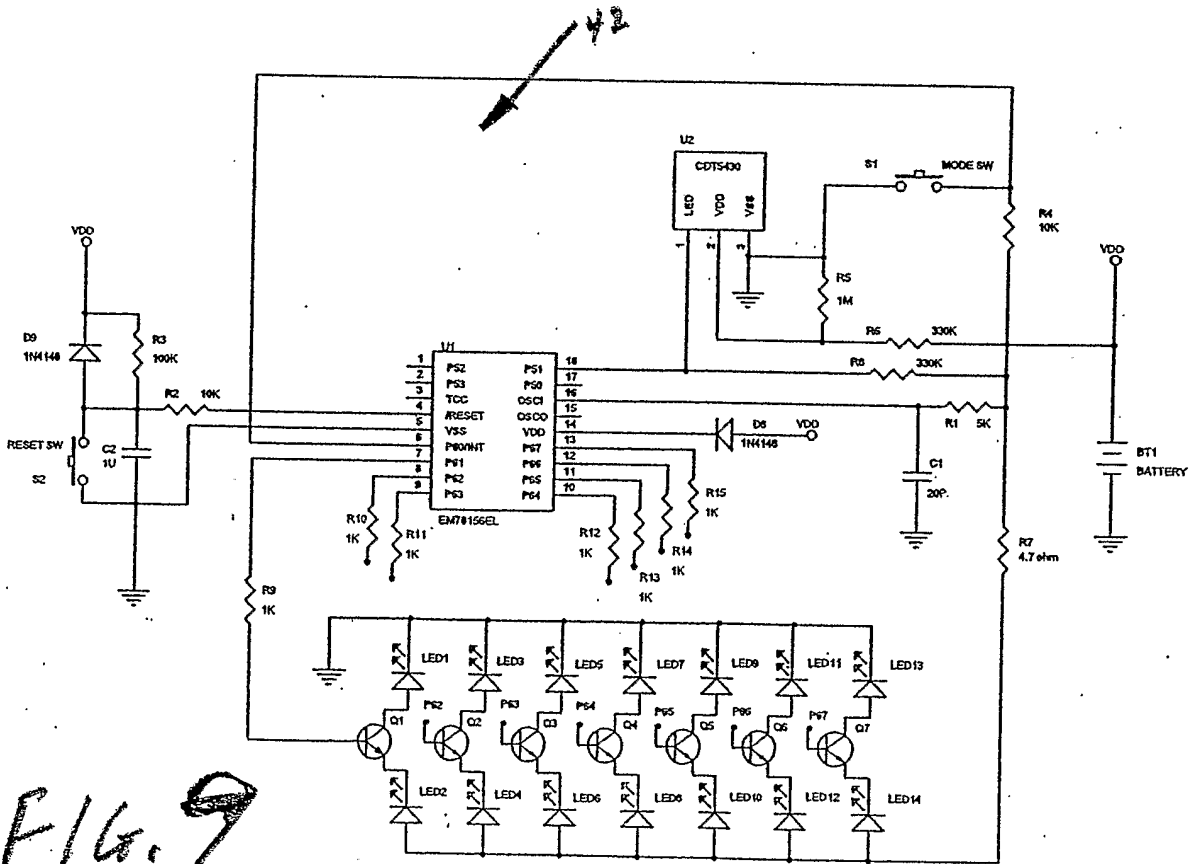


FIG. 9