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SmartSafe V2.0 Remote Intelligent Bike Safety Helmet

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ABSTRACT:

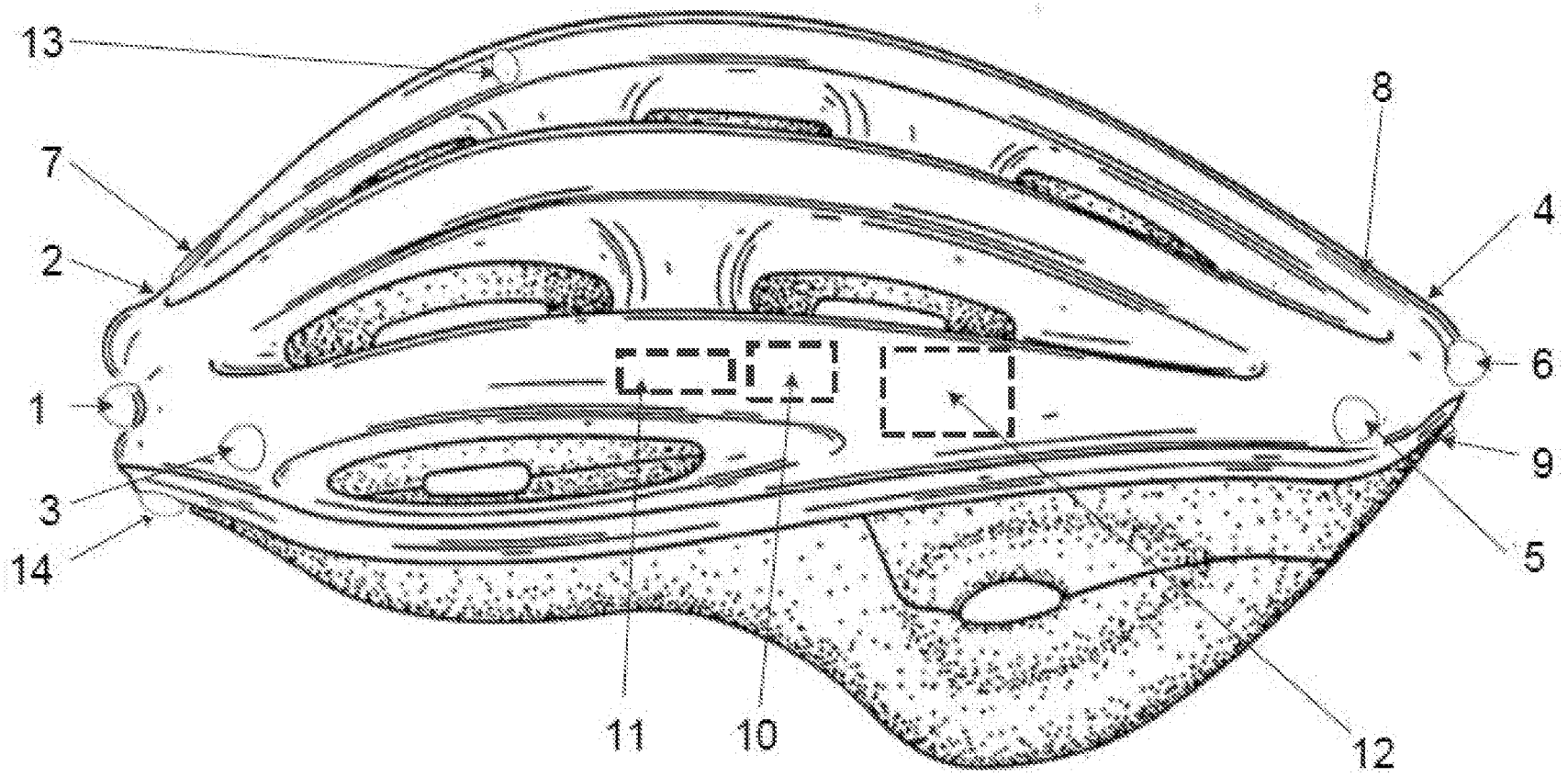
The benefits of this Innovative Invention are widespread for the entire Australian community, where protective bike helmets are compulsory when riding on State and Territory roads, pathways and pavements. Cyclists will become more visible in the daylight, and be illuminated at night for easy identification of direction and intentions of turning, be able to warn oncoming traffic and pedestrians of their approach, and draw attention to themselves, by being Illuminated and able to warn others with a horn.

In Event of an accident, data can quickly be downloaded from the RFID NFC Tag via a Smartphone, to enable speedy Emergency response.

The long battery life and easy operation and lightweight components will ensure the cyclists would wear the Innovative SmartSafe Intelligent Protective Bike Safety Helmet.

The SmartSafe V2.0 Remote Intelligent Bike Safety Helmet prototype is available for testing.

FIGURE 3 LEFT HAND SIDE VIEW 3/7



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TITLE: SmartSafe V2.0 Remote Intelligent Bike Safety Helmet

TECHNICAL FIELD: Electronic Microprocessor Remote Controlled Intelligent Bike Safety Helmet.

BACKGROUND OF INVENTION:

(0001) This innovative Invention relates to an Remote Operated, Intelligent, self-contained, protective bicycle helmet that will increase the visibility and presence of cyclists on public roads and pathways in Australia, and enable quick identification of the rider, in event of an accident.

(0002) Cyclists generally ride on shoulders of the roads, pavements, or pathways in the cities around Australia, often early in the mornings, and at dusk when commuting to and from work, exercising, and socially rides with family. The visibility and presence of cyclists to pedestrians and motor vehicles is very limited, even in full daylight, and this invention aims to increase the visibility and presence of Cyclists wearing the V2.0 Remote Intelligent Bicycle Helmet, thus possibly saving hundreds of possible bicycle related accidents across Australia per year, and possibly saving lives, and assisting in providing vital personal information in event of an accident.

SUMMARY OF INVENTION:

(0003) The V2.0 Remote Intelligent Bicycle Helmet is the solution to increase visibility and presence of cyclists, from the front, rear and side viewing angles, and has direction indicators fitted to the front and rear of the bicycle helmet, including a warning horn, which can all be operated from a Remote control switch fitted to the handlebars of the bicycle. A battery Low warning indication LED warns the cyclist when the battery requires recharge, and allows another 2 hours working time on the Helmet. There is current working prototype of the V2.0 Remote Controlled Intelligent Bicycle Helmet.

(0004) The V2.0 Remote Intelligent Bicycle Helmet can store the cyclist's emergency contacts and medical information that can be read by anyone with a Smartphone.

BRIEF DESCRIPTION OF DRAWINGS:

FIGURE 1 SmartSafe V2.0 Remote Intelligent Bike Safety Helmet – Top view description:

1. Front Headlight - White LED (Optional flashing or solid beam)
2. Right Hand Front Indicator – Orange LED
3. Left Hand Front Indicator – Orange LED
4. Right Hand Rear Indicator – Orange LED
5. Left Hand Rear Indicator – Orange LED
6. Rear Taillight – Flashing Red LED
7. Audible Horn(15m Range)
8. RFID Tag (Under Shell)
9. Mini USB Charger Module(Charging socket Exposed)
10. Indicator on Warning Buzzer
11. Battery Low Indicator – Blue LED

FIGURE 2 SmartSafe Intelligent Bike Safety Helmet – Right side view description:

1. Front Headlight - White LED (Optional flashing or solid beam)
2. Right Hand Front Indicator – Orange LED
3. Left Hand Front Indicator – Orange LED
4. Right Hand Rear Indicator – Orange LED
5. Left Hand Rear Indicator – Orange LED
6. Rear Taillight – Flashing Red LED
7. Audible Horn(15m Range)
8. RFID Tag (Under Shell)
9. Mini USB Charger Module(Charging socket Exposed)
10. Indicator on Warning Buzzer
11. Battery Low Indicator – Blue LED

FIGURE 3 SmartSafe Intelligent Bike Safety Helmet – Left side view description:

1. Front Headlight - White LED (Optional flashing or solid beam)
2. Right Hand Front Indicator – Orange LED
3. Left Hand Front Indicator – Orange LED
4. Right Hand Rear Indicator – Orange LED

5. Left Hand Rear Indicator – Orange LED
6. Rear Taillight – Flashing Red LED
7. Audible Horn(15m Range)
8. RFID Tag (Under Shell)
9. Mini USB Charger Module(Charging socket Exposed)
10. Microprocessor Control Unit
11. Remote Receiver Control Unit
12. Rechargeable 3.7v DC Lithium Ion Battery
13. Indicator on Warning Buzzer
14. Battery Low Indicator – Blue LED

DESCRIPTION:

(0005) The Front Light of the Intelligent Bicycle Helmet is a 500mW (0.5W) bright white LED with120 degree viewing angle, mounted in the centre front of the helmet, and has the Remote User Selected Switching option of enabling the light as a solid light, or a pre-set 450 m/second flashing light, should the cyclist require additional Visibility, or travel at higher speeds on congested roads or City areas. The Front Light will be controlled to stop flashing and have a solid beam, should the indicator function be activated, to prevent confusion of signals to other road users, and resume the last selected user option, once the indicators have been reset to the off position. The light is not intended to replace the headlight of the bicycle at night, due to the head movement of the rider not always being in the same forward facing position, but will make the cyclist more visible to oncoming road users and pedestrians during the day and night.

(0006) The Rear Flashing Tail Light of the Intelligent Bicycle Helmet is a 500mW (0.5W) bright Red LED with120 degree viewing angle, mounted to the centre rear of the helmet, and has a pre-set, 350 m/second continuously flashing red light. The Tail Light will be controlled to stop flashing and have a solid beam, should the indicator function be activated, to prevent confusion of signals to other road users, and resume flashing once the indicators have been reset to the off position. The light is not intended to replace the Taillight of the bicycle at night, due to the head movement of the rider not always being in the same forward facing position, but will

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make the cyclist more visible to oncoming road users from the rear approach, and pedestrians, during the day and night.

(0007) The Direction Indicators are 500mW (0.5W) bright yellow/orange LED's with120 degree viewing angle, mounted on the Left Rear, Right Rear, Left Front and Right Front of the helmet, offset by about 80mm from the centre of the helmet, to clearly indicate the direction the cyclist intends to manoeuvre or turn to. The indicators are operated by pressing the Remote User Selected Switch option, selecting the direction the cyclist intends to turn. Once selected, a slightly audible buzzer will sound for the duration of the10000 m/s pre-set indication period, in sequence with the 650m/sec LED indication flashing cycle. The indicators will automatically turn off after 10 seconds, and the cyclist does not need to manually turn the indicators off. There is an option to operate the indicators manually on and off, when the cyclist is in City areas, that do not require long indication periods.

(0008) The Direction Indicators are interlocked in the software, and cannot be switched for the duration of the indication cycle, preventing confusion of the switching cycle and preventing false switching indications on the helmet. Once the indication direction has been selected, the software ignores any other inputs to the indicators, until the indication cycle has completed. The Front and Tail Light will be controlled via software, to stop flashing and have a solid beam, should the indicator function be activated, to prevent confusion of signals to other road users, and resume the normal selected state they were in, once the indicators have been reset to the off position.

(0009) The Intelligent Bicycle Helmet includes a Horn function to warn pedestrians and other Cyclists of the oncoming bicycle, or any other possible dangerous situations. The Horn is a low level sound, to prevent damage to the cyclists hearing, considering the close proximity of the helmet to the ears, but audible enough to alert others up to about 15m.

(0010) The V2.0 Remote Intelligent Bicycle Helmet has a Waterproof PVC Label RFID NFC Tag mounted in or on the rear of the helmet shell. The NFC Tag operates on the standard 13.56 MHz frequency, has a 1kb storage capacity, and contains a S50 MF1 Smart IC as the storage device, and is 18mm in diameter. This NFC Tag can store any information the cyclist would like to include for emergency conditions,

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to enable the emergency services to easily identify the cyclist, contact his family or next of kin, and include specific medical details, if required. The NFC tag can be programmed from any mobile phone device, by the helmet user and updated at any time. The tag can be read by any person who has a NFC compatible Smartphone device. There is a 20mm Red warning sticker placed over the position of the NFC Tag to indicate the position of the NFC Tag.

(0011) The Intelligent Bicycle Helmet is self-powered from a rechargeable 1000mAhr, 3,7v DC PCB protected Lithium Ion battery, which can be recharged from any standard USB port device, or any 5V DC power source, including Laptops and Computers. The helmet has a TP 4056 charge protection module and regulator mounted in the rear centre of the helmet, with the charge point Mini USB socket exposed to the rear, This socket will be protected from the elements with a rubber plug that can be removed for charging and replaced after use. The single charge life of the helmet in operation is over 30 hours running time.

(0012) The Intelligent Bicycle Helmet has a 0v line head contact switch, which only turns the helmet on when it is placed on the head, and switches off automatically when the helmet is removed, adding valuable use time to the helmet and reducing recharge frequency. The microprocessor takes about 2 seconds to restart, and the helmet becomes active.

(0013) The Microprocessor is mounted within the shell of the Intelligent Bicycle Helmet, just above the Multi-Purpose Membrane Switch, on the left hand side of the helmet, and positions of this may vary, according to helmet styles and shapes.

(0014) The only user interface switches on the V2.0 Remote Intelligent Bicycle Helmet is the Remote Handlebar Mounted 4 Button, 4 Channel, 433 MHz Transmitter Control, with limited range and has programmed channels, which is removable from the handlebar mount, controls the Indicators, Horn and Flashing Front Light functions. The Remote Handlebar Mounted 4 Button Transmitter Control has a Two by two button layout, with the top two indicator buttons been larger and clearly marked, and the two smaller lower buttons, clearly marked accordingly, for the Horn and Flashing/Steady Front Light Control. The Transmitter send the appropriate signal to the matched and paired remote Receiver module mounted

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within the helmet, and this Receiver unit is connected to, and controls the appropriate inputs for the Microprocessor via an internal cable.

(0015) The Microprocessor Software program is C+ based, and written to the Microchip within the Processor board, and is held within the memory, thus being able to re-start seamlessly with the on and off action of the helmet. The Software Program will always remain within the Microprocessor, regardless of whether there is power to the Microprocessor Board. The software monitors all the conditions continuously and has internal interlocks to prevent indication confusion, and cycles endlessly while powered. Low power to the Microprocessor causes the LED's to dim, and eventually. Indicators will not start the cycle. A battery Low warning indication LED warns the cyclist when the battery requires recharge, and allows another 2 hours working time on the Helmet. The Microprocessor continuously monitors the state of the battery through an analogue circuit, and turns on a dimly flashing blue light, mounted within the Cyclists peripheral vision. The light flashes for 500 m/s, then delays for 20000 m/s, as not to be an irritation, but to keep the cyclist aware that a recharge of the helmet is required. The unit must then be recharged to resume safe and efficient functioning of the software, and the Intelligent Bicycle Helmet will resume functioning as designed.

(0016) The V2.0 remote Intelligent Bicycle Helmet has an Integrated Wire Frame Bus Support System added to increase the strength of the helmet, making up for the quantity of Polystyrene or foam structure that would be removed to include the Intelligent Bicycle Helmet components, and secures the LED's in a fixed position for ease of mass manufacturing. The Integrated Wire Frame Bus Support System conducts the 0v to the components within the helmet, and is currently a single strand of 4mm2 copper wire. This system may not be required or integrated for the manufacturing of higher quality helmets, made from products other than polystyrene, as the addition support will not be required to meet Australian Standards.

(0017) All components are integrated within the current type of Australian approved protective bicycle helmet designs, and mounted within the polystyrene or foam shell of the helmet, besides the top of the LED's, the Charger unit and the Membrane switch.

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(0018) SOFTWARE PROGRAM DETAIL

SmartSafe V2.0 Remote Intelligent Bike Safety Helmet Software Program:

```
/*
V2.0 SMARTSAFE REMOTE INTELLIGENT CYCLIST PROTECTION HELMET.
 V2.0 Patent Program Submission
  */
#define HX_ONZ 650
#define HX_OFZ 650
#define TX_ONZ 350
#define TX_OFZ 350
#define HX_DZ 10000
#define HX_ONZ 450
#define HX_OFZ 450
#define BX_ONZ 150
#define BX_OFZ 500
#define LX 0
#define RX 1
#define FZ 0
#define RZ 1
#define HZ 2
#define HX 3
const int HX[][2] = {{6, 8}  , {5, 7}};
const int TX = 9;
const int HZ = 11;
```

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```
const int SZ[4] = {4, 2, 3, 12};
const int HX = 13;
const int HXBZ = 10;
const int BZW = 14;
const int BZS = A1;
unsigned long RE[2];
boolean SXST[4] = {
  false, false, false, false};
boolean IFZ = false;
void setup() {
  pinMode(HX[LX][FZ], OUTPUT);
  pinMode(HX[LX][RZ], OUTPUT);
  pinMode(HX[RX][FZ], OUTPUT);
  pinMode(HX[RX][RZ], OUTPUT);
  pinMode(TX, OUTPUT);
  pinMode(HZ, OUTPUT);
  pinMode(HX, OUTPUT);
  pinMode(HXBZ, OUTPUT);
  pinMode(BZW, OUTPUT);
  pinMode(SZ[LX], INPUT);
  pinMode(SZ[RX], INPUT);
  pinMode(SZ[HZ], INPUT);
  pinMode(SZ[HX], INPUT);
}
```

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```
void loop() {
  digitalWrite(TX, millis() % (TX_ONZ + TX_OFZ) < TX_ONZ);
    for(int i=LX; i<=RX; i++) {
    if(RE[i]) {
      digitalWrite(HX[i][FZ], millis() % (HX_ONZ + HX_OFZ) < HX_ONZ);
      digitalWrite(HX[i][RZ], millis() % (HX_ONZ + HX_OFZ) < HX_ONZ);
      digitalWrite(HXBZ, millis() % (HX_ONZ + HX_OFZ) < HX_ONZ);
      if(millis() > RE[i]) {
        digitalWrite(HX[i][FZ], LOW);
        digitalWrite(HX[i][RZ], LOW);
        digitalWrite(HXBZ, LOW);
        RE[i] = 0;
      }
    }
  }
  if(!(RE[LX] + RE[RX])) {
    for(int i=LX; i<=RX; i++) {
      SXST[i] = DB(i);
      if(SXST[i]) {
        RE[i] = millis() + HX_DZ;
        break;
      }
    }
  }
```

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```
  SXST[HZ] = DB(HZ);
  digitalWrite(HZ, SXST[HZ]);
    SXST[HX] = DB(HX);
  if(SXST[HX]) IFZ = !IFZ;
  if(!IFZ) digitalWrite(HX, true);
  else digitalWrite(HX, millis() % (HX_ONZ + HX_OFZ) < HX_ONZ);
  unsigned int BSV = analogRead(BZS);
  BSV = analogRead(BZS);
  long Voltage = (BSV / 1023.0 * 1.0154) * RVC();
  if(Voltage >= 3400L) digitalWrite(BZW, false);
  else digitalWrite(BZW, millis() % (BX_ONZ + BX_OFZ) < BX_ONZ);
}
boolean DB(int thisSX) {
  boolean CT = digitalRead(SZ[thisSX]);
  if (SXST[thisSX] != CT) {
    delay(5);
    CT = digitalRead(SZ[thisSX]);
  }
  return CT;
}
long RVC() {
  long result;
  ADMUX = _BV(REFS0) | _BV(MUX3) | _BV(MUX2) | _BV(MUX1);
  delay(2);
```

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```
  ADCSRA |= _BV(ADSC);
  while (bit_is_set(ADCSRA,ADSC));
  result = ADCL;
  result |= ADCH<<8;
  result = 1126400L / result;
  return result;
}
```

…END OF PROGRAM.

DESCRIPTION OF EMBODIMENTS: Not Used.

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CLAIM:

1. Increased Cyclist visibility and presence using this invention will prevent accidents and save Australian cyclists and other road user's lives.

2. Existing Australian vehicle warning lighting colour will ensure current licenced drivers and pedestrians will immediately identify cyclist direction of travel, and intended turning direction.

3. NFC RFID Tag includes capability for the storage of cyclists Emergency Contact and Medical information.

4. Failsafe Microprocessor Lighting, Horn and Indicator control.

5. Hat on, Power on, Hat off, Power off – Power saving feature.

6. Lightweight and self-contained within the Bike Safety Helmet.

7. Indicator On audible warning to cyclist.

8. Easy to use, Remote Handlebar Mounted Control Switch.

9. Warning Horn to prevent collisions by the surprise of a Cyclist approaching from the rear.

10. 30 hours battery life between charges.

11. Easy and Safe Recharging of Bike Safety Helmet – up to 400 recharge cycles.

12. Battery Low Warning system.

DRAWINGS: 1/7

FIGURE 1 TOP VIEW

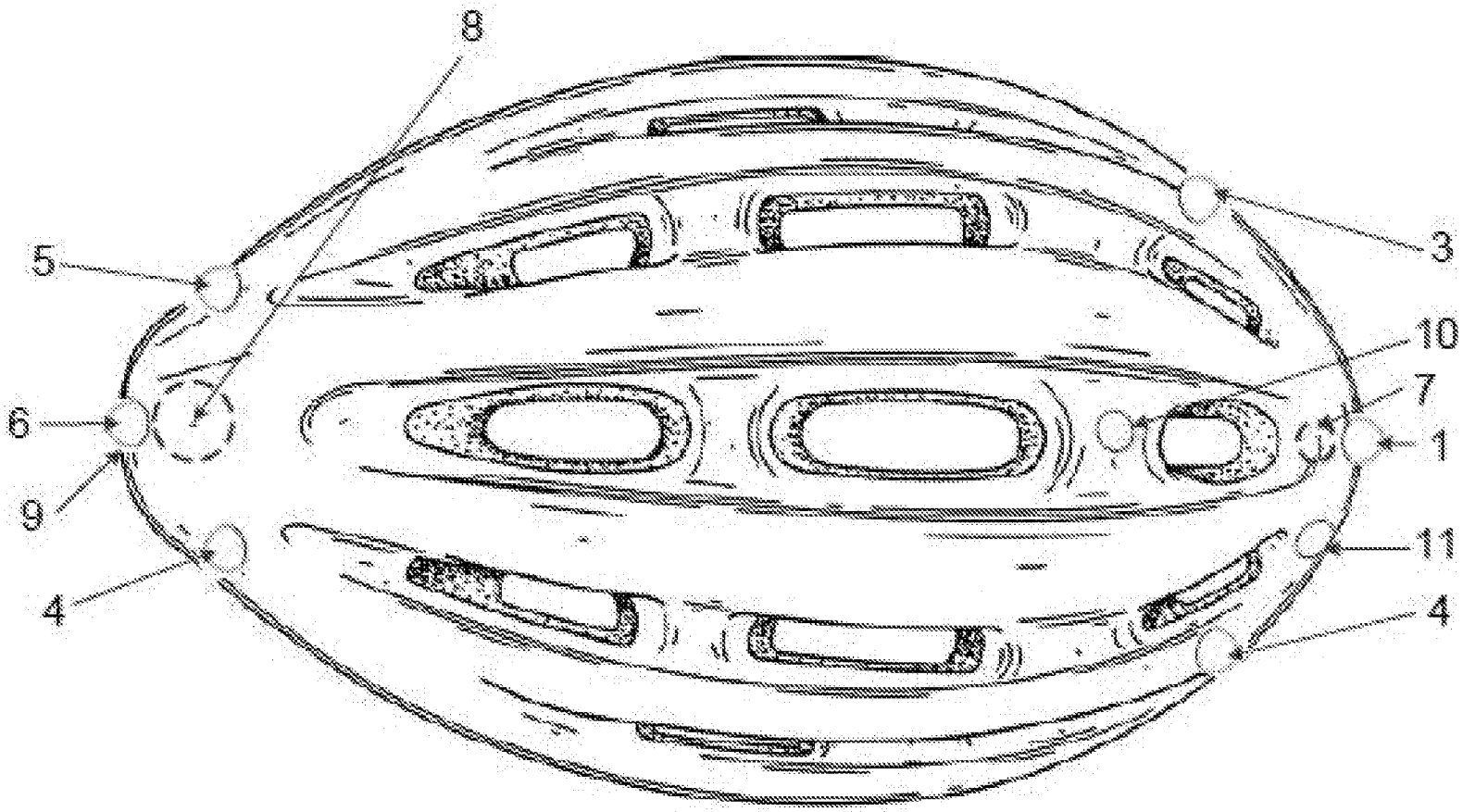

FIGURE 2 RIGHT HAND SIDE VIEW 2/7

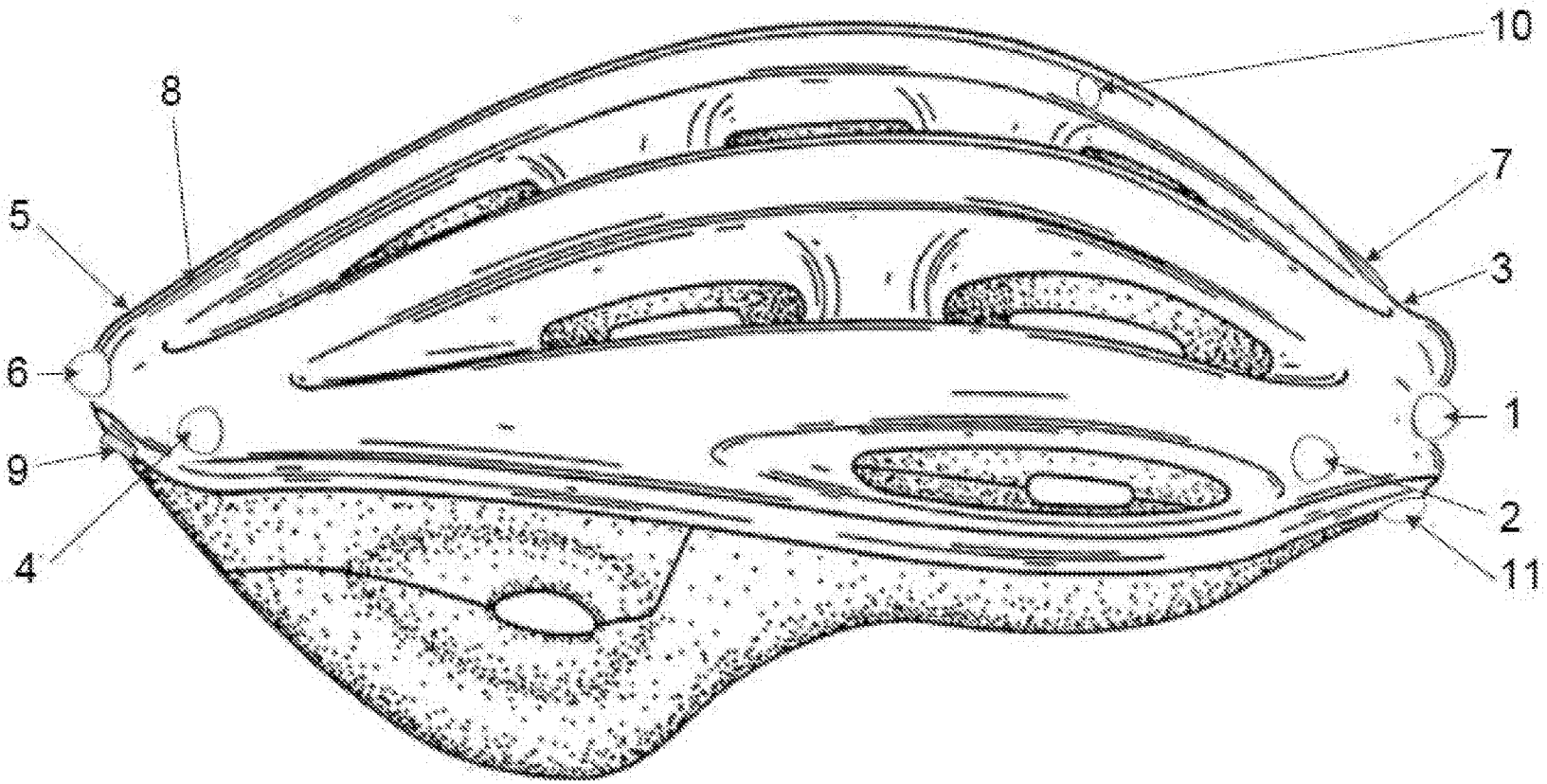

FIGURE 3 LEFT HAND SIDE VIEW 3/7

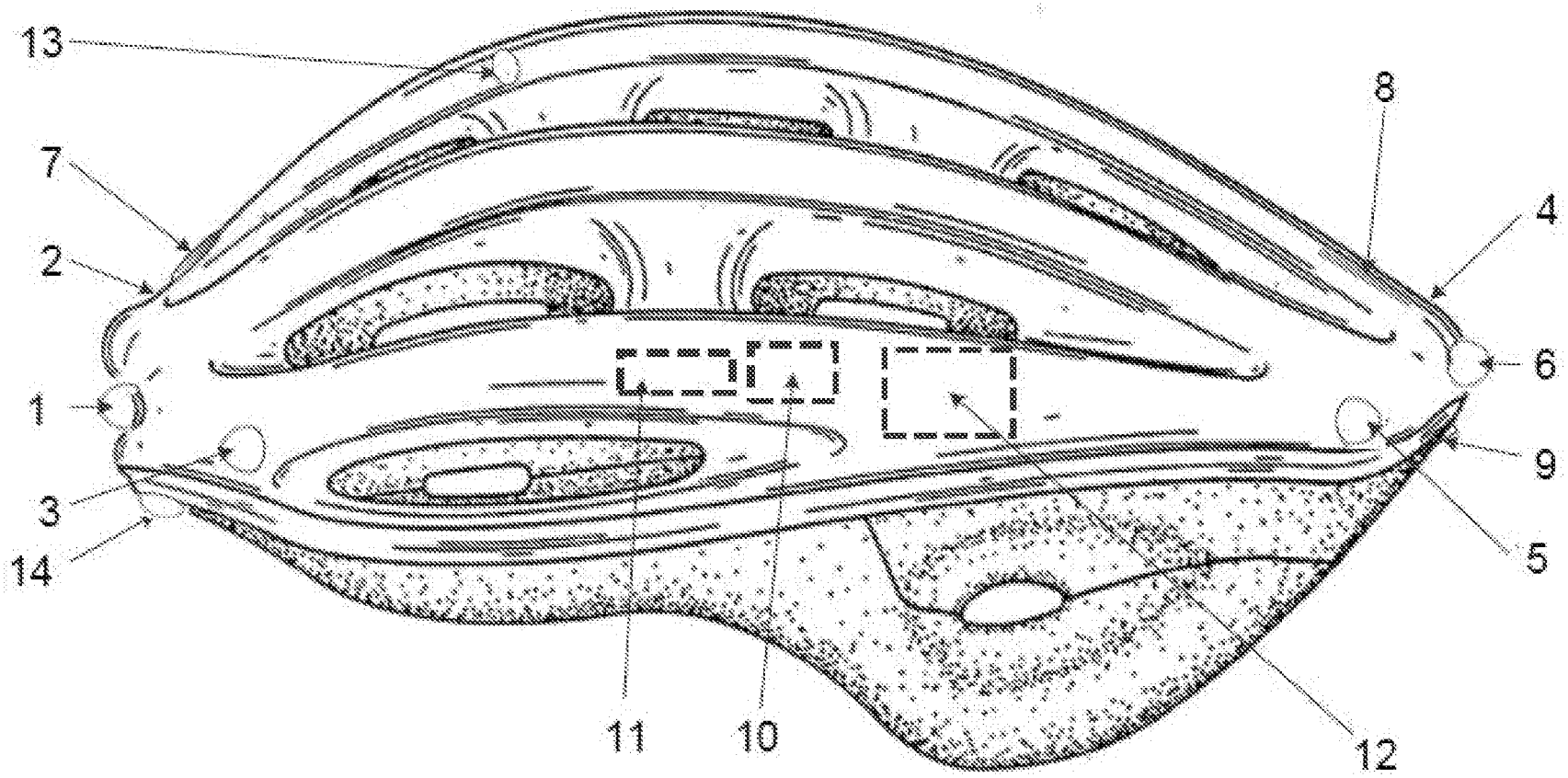

FIGURE 4 MICROPROCESSOR ATMEGA 328 SCHEMATIC DRAWING

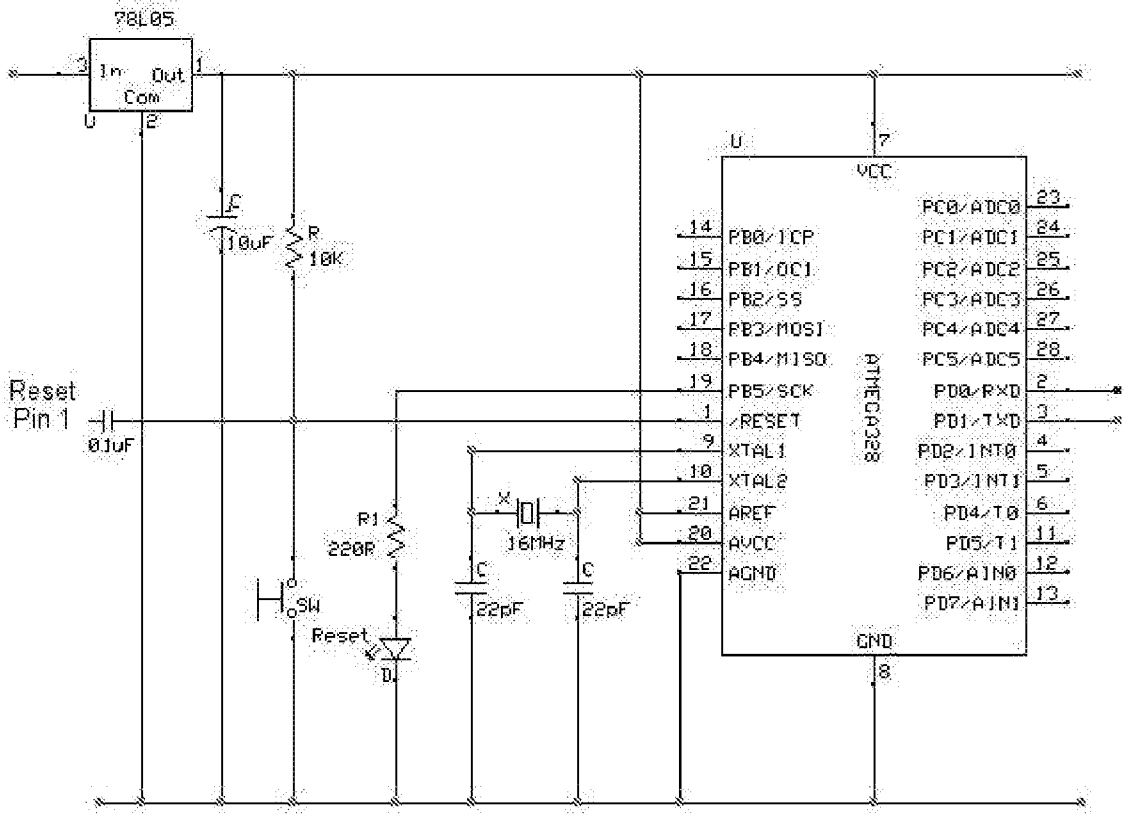

FIGURE 5 CHARGER MODULE TP 4056 SCHEMATIC DRAWING

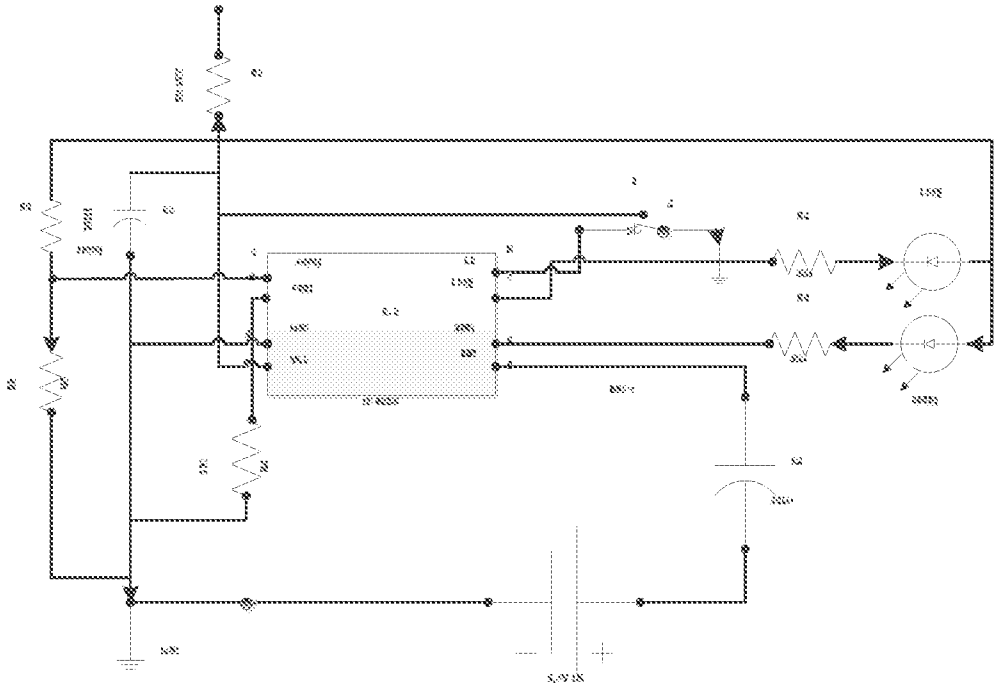

FIGURE 6 433 MHz REMOTE RECIEVER SCHEMATIC DRAWING

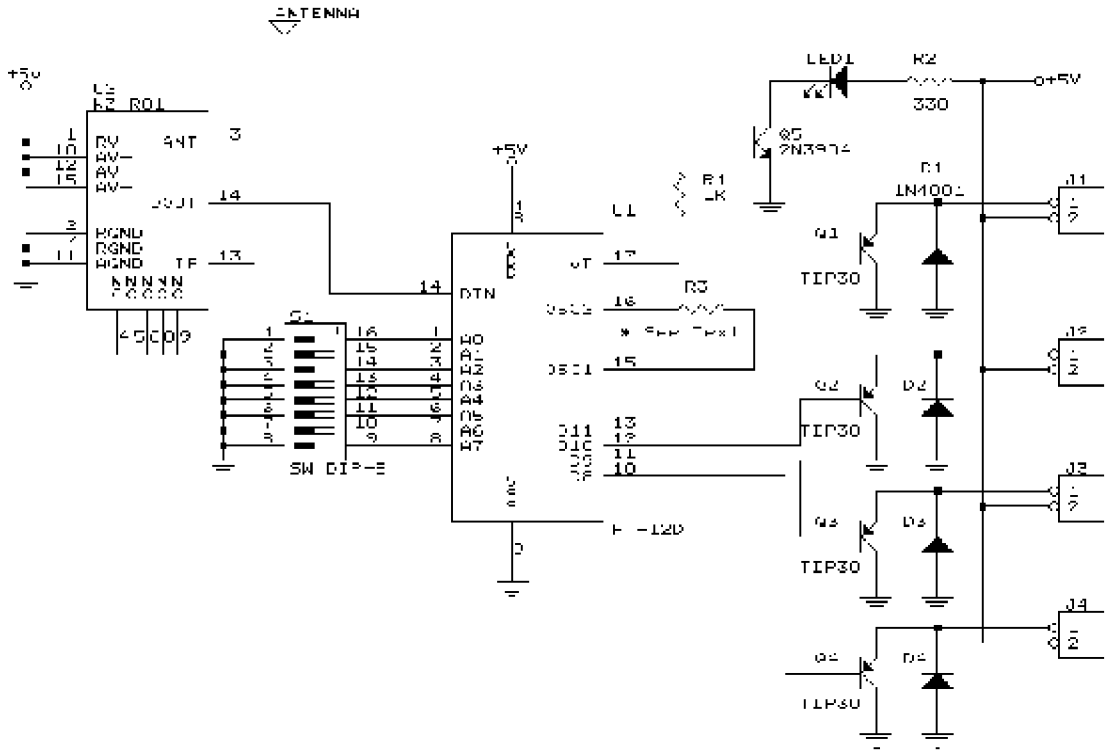

FIGURE 7 433 MHz REMOTE TRANSMITTER SCHEMATIC DRAWING