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(54) **Title**: MODULAR PORTABLE ENERGY SYSTEM

(57) **Abstract**: The present invention relates to modular portable energy systems, specifically solar energy systems or kits. In a first embodiment, a personal solar kit is provided. A portable shelter system with power generation capabilities is provided in a second embodiment. In a third embodiment, alternative power generation systems are provided. A multi-layered solar power generation device is provided in a fourth embodiment. In a fifth embodiment an energy network system is provided that can be used with any of the previous embodiments of the present invention.

MODULAR PORTABLE ENERGY SYSTEM

SPECIFICATION

BACKGROUND OF THE INVENTION

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Serial No. 61/462,074, filed on January 28, 2011, the entire disclosure of which is expressly incorporated by reference.

FIELD OF THE INVENTION

The present invention relates generally to the field of energy production and distribution. More specifically, the present invention relates to a modular portable energy system (or kit) that can be easily transported and set up to generate electrical power in a variety of environments.

RELATED ART

Renewable energy is an important and growing field, particularly in connection with solar energy. Various systems have been implemented to harness solar energy, including solar panels installed on roofs and in other locations. However, many current solar panel applications are not easily transportable. Indeed, such systems are often large and cumbersome to set up, and are not user-friendly. Additionally, existing solar energy systems are often not intended for personal use, nor are they easily attachable or removable from permanent and/or temporary structures.

Flexible solar panel technology is known in the art. However, such systems are often deployed as "pass-through" systems, such that energy is not stored locally, i.e., at or near the point of generation. Further, such systems do not include adequate circuitry for balancing accumulated power. Moreover, known flexible solar panel systems are "stand alone" and isolated units without complex distribution systems that can send electrical energy to multiple appliances at once. Further, other flexible panel systems don't offer lightweight, high-wattage energy to power appliances for different environmental needs, i.e., survival, recreational, military, communication, etc.

Moreover, in view of existing technology in this field, what would be desirable is a system, or kit, that generates solar energy, and which is easily collapsible and transportable. Further, what would be desirable is the use of such a system with power generating and harvesting technologies, as well as in connection with other advantageous devices and/or applications, such as in connection with personal power systems, portable shelters, as well as other alternate energy sources. Even further, it would be desirable to create a scalable network of such energy systems capable of communicating with each other, such as by wireless technology, and sharing and allocating power to meet various electrical consumption needs. Accordingly, what would be desirable, but has not yet been provided, is a modular portable energy system which addresses the foregoing needs.

SUMMARY OF THE INVENTION

The present invention relates to modular portable energy systems and associated equipment. In a first embodiment, the modular portable energy system is in the form of a personal solar kit that includes a flexible solar panel, a power module in electrical communication with the flexible solar panel, one or more appliance kits in electrical communication with the power module via one or more distribution components, and a carrying unit of a sufficient size to contain at least one of the power module, the one or more distribution components, and the one or more appliance kits. The carrying unit can have many different shapes and sizes, and could be tubular in shape and comprises a central subcontainer positioned between a bottom subcontainer and a top subcontainer. The carrying unit could also be much larger, such as a suitcase. Additionally, a carrying retainer having an integral handle can be provided, and wrapped around the flexible solar panel to retain same for storage/transportation. The flexible solar panel could be foldable and tent poles could be utilized to support the flexible solar panel when in use.

In a second embodiment, the modular portable energy system comprises a portable shelter system with power generation capabilities comprising a portable and collapsible (or popup) structure having a top portion and a solar panel system attached to the top portion of the structure. The portable structure may be in the form of a tent, umbrella, gazebo, awning, lean-to, lamp, etc., and could have one or more power access points dispersed throughout, with each access point in electrical communication with the solar panel system. The solar panel system could be removably attached to the top portion or embedded in the fabric of the top portion, or at other locations. Specifically, the solar panel system could comprise a unitary removable solar attachment, or a plurality of flexible radially arrayed flexible solar panels suspended from a support frame, configured to correspond to the geometry of the top portion of the portable structure. A carrying unit of sufficient size to contain the structure and the solar panel system can be provided.

In a third embodiment, the modular portable energy system comprises an alternative power generation system that includes a transducer and/or human electricity harvesting device for generating electrical power. A power unit is coupled to the transducer or harvesting device and has circuitry for processing the electrical power generated and storing the electrical power in a battery within the power unit. The system could also include a plurality of distribution components in electrical communication with the power unit and a plurality of devices to be electrically powered, such as wireless devices, video, kitchen appliances, light, cellphone, or a battery charger.

In a fourth embodiment, the modular portable energy system comprises a thin, multi-layered solar power generation device and includes a substrate, a first layer formed on the substrate including battery electronics therein, a second layer formed on the first layer including a circuit having power electronics therein, and a third layer formed on the second layer including photovoltaic materials for generating electricity. The layers could be laminated, printed using conductive inks, and/or have interstitial wiring in between.

In a fifth embodiment, the modular portable energy system comprises an energy network system where any of the previous embodiments could be networked to share power amongst a plurality of power consuming devices. Each system in the network could have a power module or the entire network could have one power module shared among the systems. Any of the previous embodiments could further comprise wireless devices in electrical communication with the system. Also, any of the previous embodiments could be used with one or more appliance kits in electrical communication with the system via distribution components.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing features of the invention will be apparent from the following Detailed Description of the Invention, taken in connection with the accompanying drawings, in which:

FIG. 1 is a diagram showing a first embodiment of the modular portable energy system comprising a personal solar kit;

FIG. 2 is a diagram showing the personal solar kit **10** of **FIG. 1** in greater detail;

FIG. 3 is an electrical schematic showing electrical components of the power module of **FIGS. 1-2**;

FIGS. 4A-4C are views showing the personal solar kit **10** in greater detail, including a carrying retainer with an integral handle with a pouch;

FIGS. 5A-5C are views showing the power module and power distribution components of **FIGS. 1-2** in greater detail;

FIGS. 6A-8D are views showing the personal solar kit of the present invention in greater detail;

FIGS. 9-15F are views showing various possible configurations of a second embodiment of the present invention, which provides a portable shelter system with power generation capabilities;

FIG. 16 is a diagram illustrating various configurations of a third embodiment of the present invention, wherein alternative power generation systems are provided;

FIGS. 17A-17D are views of various wireless devices, human electricity harvesting technology, and transducers capable of being used with the present invention;

FIGS. 18A-18C are diagrams of a fourth embodiment of the present invention, wherein a multi-layered solar power generation device is provided; and

FIGS. 19-20 are views of a fifth embodiment of the present invention, wherein an energy network system is provided and can be used with any of the previous embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a modular portable energy system, as discussed in detail below in connection with **FIGS. 1-21**.

FIG. 1 is a diagram showing a first embodiment of the modular portable energy system comprising a personal solar kit **10**. As shown, the personal solar kit **10** includes a carrying unit **12** containing a flexible solar panel **14**, a power module **16**, one or more distribution components **18** (e.g., a plurality, for example, of 5-15), and one or more appliance kits **20**. In use, the flexible solar panel **14** generates electrical energy stored in the power module **16** which is connected to, and provides power to, one or more appliance kits **20** via one or more distribution components **18**. As discussed in greater detail below, the power module **16** includes a rechargeable battery (charged by the flexible solar panel **14**) and associated power electronics operating at and providing, for example, but not limited to, 12 volts of electricity.

FIG. 2 is a more detailed diagram of the personal solar kit **10** of **FIG. 1** showing the flexible solar panel **14** connected to a solar panel input **22** of the power module **16**. Appliance kits **20** are in communication with a distribution component output **24** of the power module **16** via distribution components **18**, where the power module is capable of providing, for example, 12 volts of electricity. The power module has a modular expansion port **26** for connecting to other systems **10** to create a network of such systems, as later shown and described in more detail.

FIG. 3 shows a circuit **27** of power module **16** of **FIGS. 1-2** including the solar panel input **22**, the distribution component output **24**, and the modular connection port **26**. As shown, the circuit **27** includes a rechargeable lithium-ion polymer battery **28a** which operates at about 4 Amperes/hour and about 12-16.8 volts, provide about 13 watts, and be fully charged when the flexible solar panel is exposed to the sun for about 12 hours. Additionally, if two or more units are connected together, the total wattage output could be increased (e.g., if six power modules are networked together the total output would be in the area of approximately 98 watts). Of course any suitable battery **28a** could be used, such as lithium-ion, alkaline, nickel-cadmium, and nickel metal hydride. Additionally, the operating parameters provided are only exemplary and the battery **28a** could operate at any other suitable parameter. The battery stores power during time periods of little or no sunlight, or when a system's power generation is greater than the power use.

The circuit **27** also comprises a volt meter **28b** displaying wattage, amperage, and/or other electrical parameters, and is analog or digital. Further, the circuit **27** comprises a number of electronic components, discrete and/or integrated, including diodes **28c**, **28d**, a potentiometer **28e**, comparators **28f**, **28g**, transistors **28h**, **28i**, and resistors **28j**. Such electronic components could include a 12 volt Fairchild semiconductor Zener diode **28c**, a 16.8 volt Vishay Siliconix Zener diode **28d**, Linear Technology micropower dual comparators **28f**, **28g**, high voltage and/or low voltage analog switch power metal-oxide-semiconductor field-effect transistors (MOSFET), and a 1000 Ohm resistor **28j**. As these electronic components are only exemplary, any manufacturer or suitable type of diode, comparator, transistor, or resistor could be used, and additionally, the specifications of such components could be varied as desired.

The power module **16** and circuit **27** can perform one or more of the following functions: control uniform, fast, and safe charging of the battery; cycle the display of state of charge of the battery; detect and prevent overcharging; enable user selectable display of LEDs; detect minimum allowed battery voltage and prevent discharge below that level; detect overheating during both charge and discharge cycles; disable battery charging when heat or charge levels are inconsistent with battery specifications; change solar panel voltages to match battery module charging requirements and appliance discharge requirements; prevent damage to solar panel by preventing excessive current backflow; and prevent excessive current between power modules. Additionally, the power module could utilize meters and LEDs to display information, such as by using LEDs to display the state of charge of the battery.

Shown in **FIGS. 4A-4C** are views of the personal solar kit **10** in greater detail. **FIG. 4A** depicts the flexible solar panel **14** and power module **16** of the present invention. The flexible solar panel **14** rolls up into a compact cylindrical shape. Examples of flexible solar panels **14** that could be used with the present invention include those provided by Konarka, Ascent, UniSolar, or PowerFilm, or any other suitable manufacturer. It is also anticipated that the flexible solar panel **14** could be rigid or foldable, such as those provided by SunForce, PowerFilm, or Brunton. As shown in **FIGS. 4B-4C**, the flexible solar panel **14** could be rolled up and secured within a carrying retainer **30** having a handle **32**, where the carrying retainer **30** is wrapped around the flexible solar panel **14**. The carrying retainer **30** could include a pouch to hold the distribution components **18**, and a canister **34** could also be provided. For example, the flexible solar panel **14** is made of weather proof Power Plastic, bendable to a two inch radius, 27 x 44 inches, 0.97 pounds, produces up to 22 volts, 0.8 amps, and 13 watts under a full bright sun and no load. Of course, other panels could be used, if desired.

FIGS. 5A-5C are views showing the power module **16** and power distribution components **18** in greater detail. **FIGS. 5A-5B** show the power module **16** with distribution component output **24** and distribution components **18** connected thereto, where the power module **16** provides, for example, 12 volts of electricity. **FIG. 5C** shows a variety of appliance kits **20** connected to the distribution components **18**. As shown, the distribution components **18** of **FIG. 1** include USB hub **36**, 12 volt socket adapter **38**, cabling expansion **42**, and 12 volt socket/USB combination power hub **44**. Also as shown, appliance kits **20** of **FIG. 1** include a light **40**, cellphone **46**, a smartphone **48**, a battery charger **50**, a tablet computer **52**, and a fan **54**. Of course, other appliances could be provided, depending upon the application, e.g., survival, recreation, military, or technological applications. The power module could be of various sizes depending on the type of usage required, such as heavy duty, medium duty, or lightweight. For example, an ultra-lightweight kit could provide sufficient power for 3 days, a lightweight kit could provide power for 10 days, and a midweight kit could provide power for 3 weeks.

Shown in **FIGS. 6A-8D** are various embodiments of the personal solar kit with carrying unit **12** or carrying retainer **30**. The carrying unit could be waterproof and made of nylon or other suitable material. The sizes of the carrying unit **12** will depend on the length of the trip and the number of appliance kits **20**, and any other materials that may be required. In one embodiment, the system, as shown in **FIG. 6A**, includes a lightweight pouch **56**, which may be best suited for daily use or short trips. Shown in **FIG. 6B** are further embodiments of the personal solar kit comprising a computer case **57a** or backpack **57b**, which are intended for longer trips and to store appliances kits **20** or other supplies.

Referring to **FIGS. 7A-7B**, one embodiment of the carrying unit is shown, although the figures are not to scale and are for illustrative purposes only. The carrying unit **57c** comprises solar panel subcompartment **58** containing flexible solar panel **14**, power module subcompartment **59** containing power module **16**, distribution component subcompartment **60** containing distribution components **18**, appliance kit subcompartments **62** containing appliance kits **20**, as well as other subcompartments **64** for general usage. The carrying unit **57** also comprises a retractable handle **66**. This carrying unit **57** is larger than the lightweight pouch **56** and thus can hold more material and appliance kits **20** for longer trips.

Referring to **FIGS. 8A-8D**, another embodiment of the carrying unit is shown. As shown in **FIG. 8A**, a duffel bag **122**, or any other suitable container, could be used with the carrying unit **112** to hold extra distribution components **18**, appliance kits **20**, or any other components or devices. As shown generally in the assembled view of **FIG. 8B** and the exploded view of **FIG. 8C**, the carrying unit **112** is tubular in shape and comprises a strap **114** and a central subcontainer **116** positioned between a top subcontainer **118** and a bottom subcontainer **120**. The carrying unit **112** and subcontainers **116**, **118**, and **120** contain a flexible solar panel **14**, power module **16**, socket splitter **40**, electrical wire **76**, plug **78**, and a variety of components for supporting and positioning the flexible solar panel, such as industrial Velcro **68**, cord **70**, ground stakes **72**, and poles **74**. **FIG. 8D** is a general view of the carrying unit **112** comprised of subcompartments **113a-113h** which contain and organize various components and devices of the present invention.

Turning now to **FIGS. 9-15F**, the second embodiment of the present invention, relating to a portable shelter system with power generation capabilities, will now be described.

Referring to **FIG. 9**, shown generally is the portable shelter system **124** with power generation capabilities comprising carrying unit **125** containing portable structure **126**, solar panel system **127**, power module **128**, and appliance kits **129**. The portable shelter system **124** has various possible configurations that include a variety of portable and collapsible (or popup) structures, such as umbrellas, tents, awnings, and lean-tos.

FIG. 10A-10D show unitary removable solar attachments **132**, **142** configured to match the geometry of a top of a portable structure such as a lamp or an umbrella. The top of the portable structure is one of a variety of shapes, such as a square, hexagon, or octagon. The unitary solar attachments **132**, **142** are preferably a flexible copper solar panel, although other materials, including more rigid materials, could be used. When used with a lamp **134**, as in **FIG. 11A**, the solar attachment **132** would preferably charge a battery during the day, which would then power the lamp **134** at night.

FIGS. 10B-10D show a portable shelter system **150** with power generation capabilities, comprising a unitary solar attachment **142** used with an umbrella comprising a top **152**, a pole **154**, and a stand **156**. A power module **144** could be located within the stand **156** and connected to the solar attachment **142** via wiring **158** running from the stand **156** through the interior of the pole **154** and to the top **152**. The umbrella could comprise one or more power access points **160**, or power outlets, dispersed throughout allowing a user to connect and power an electronic device. The umbrella is collapsible (or popup) and thereby easily transportable with the solar attachment **142**. As a result, the portable shelter system **150** and umbrella may be part of a kit **146** which includes a carrying case **148** capable of housing the solar attachment **142** and at least parts of the umbrella, among other things.

FIG. 11A-11B is a portable shelter system **161** with power generation capabilities comprising a removable solar attachment **166** having a plurality of flexible solar panels **168** radially arrayed and suspended from a support frame **170**. The support frame **170** is rigid or flexible and configured to fit the top **152** of an umbrella. The unitary solar attachment **142** of **FIGS. 10A-10D** could be used in combination with the radially arrayed solar attachment **166**. As with the previous embodiments, the solar attachment **166** could be part of a kit **162** comprising a carrying case **164**. The solar attachment **166** could have any number of solar panels and be one of a variety of shapes, such as a square solar attachment **166a**, a hexagonal solar attachment **166b**, and an octagonal solar attachment **166c**.

FIGS. 12A-12C are views of a portable shelter system **176** with power generation capabilities comprising a unitary solar attachment **172** applied to a tent. The solar attachment **172** connects to a power module **174** and is shaped to attach to the top **178** of a tent having a plurality of poles **180**. Preferably, the tent also further comprises one or more tables **182** and the power module **174** is stored underneath the table **182**. Although a tent is specifically mentioned, it should be appreciated that the present invention could be used with any number of structures including gazebos and pavilions.

FIGS. 13-15F show a variety of applications of solar energy system **200** of the present invention applied to other structures. Specifically, **FIGS. 13-14** show the present invention applied to awnings. The awnings could be retractable or collapsible and the solar energy system **200** is removably attached or embedded in the fabric. The system is utilized with awnings as used by pools, restaurants, apartment buildings, trucks, boats, or trailers. Specifically, **FIGS. 15A-15F** show the solar system **200** applied to boat awnings and truck awnings, as well as tents, lean-tos, and bunkers.

Referring to **FIG. 16**, shown is a diagram illustrating various configurations of a third embodiment of the present invention comprising alternative power generation systems **300** used with wireless devices **302**, transducers **304**, and/or human electricity harvesting devices **306** (e.g., by Microchip Technology, Inc.). Wireless devices **302** include Bluetooth, Zigbee, WiFi, WiMax, or other wireless technology, which communicate with other systems, sensors, or devices. The wireless technology could be embedded such as an embedded Zigbee/mesh network (e.g., by EnOcean, Inc.). Further, the alternative power generation system **300** could be used with wireless devices for home automation, such as for use with video, architectural features, kitchen appliances, or TV/radio. It is also contemplated that wireless devices **302** could include those devices capable of wirelessly transmitting power. The alternative power generation system **300** could also be used with embedded LED systems, remote controls, worldwide data, and environmental monitoring systems, such as those that measure rain, air pressure, CO_2, or light.

Further, the alternative power generation system **300** could also be used with transducers **304**, such as components and/or sensors, which include technology related to steady state and scavenged vibration, linear motion, waste energy, electromagnetic fields, fluid flow fluctuation (such as from rain, tides, waves, or wind turbines), machine oscillations (such as from a car/truck, airplane, or train), and piezoelectric transducers (such as provided by MicroGen).

Still further, the alternative power generation system **300** could be used with human electricity harvesting devices **306** which include thermoelectric generators, electrostatic energy harvesters, conductive body technology, scalp tapping, mitochondria energy pulsation, hand, feet, and body exercise electrical converter, power skins (including fabric and paper), and fiber conductive electronic fabrics (Eeonyx Corp.). The power skins are formed from printed or laminated multi-layer structures, as discussed in greater detail below. To the extent any power can be conducted or generated by the human body, the alternative power generation system **300** can be used with any electricity harvesting device capable of utilizing such power. The alternative power generation system **300** can also be used with hand power energy printers to print the circuit, such as provided by Methode Electronics.

Shown in **FIGS. 17A-17D** are various depictions of the types of devices and technology, as discussed above, that can used with the system of the present invention including body conductivity, Zigbee communication, piezoelectric disk (e.g., for a guitar pick), and wireless sensor network.

Referring to **FIGS. 18A-18C**, shown are diagrams of a fourth embodiment of the present invention, wherein a multi-layered solar power generation device **400** is provided. The multi-layered solar power generation device **400** could be used in connection with any of the previous embodiments, where the device **400** would provide the same functionality as the flexible solar panel **14** and power module **16**. As shown in **FIG. 18A**, the device **400** could comprise a layer of substrate **408** with a first layer **406** formed on the substrate including battery electronics therein, a second layer **404** formed on the first layer and including power electronics therein, and a third layer **402** formed on the second layer and including photovoltaic material for generating electricity. The multi-layered solar power generation device **400** is lightweight and is produced by layering solar cells, batteries, circuits, and sensors into a multi-layered, thin device to create an integrated energy delivery system. Referring to **FIG. 17B**, the multi-layered solar power generation device **400** could be flexible and wrapped around a tent pole, umbrella stand, human appendage, or other objects. The multi-layered solar power generation device **400** could be made into a large scale roll to wrap around building columns, posts, and beams. As referenced in **FIG. 17C**, the printed power device could be printed using conductive inks (such as silver, copper, or carbon) that can print solar cells; batteries, circuits, and sensors onto plastic slices, paper, curved glass, fabric, or foil, such as provided by Vorbeck Materials. The layers can be laminated individually or laminated together with bi- and tri- laminates that comprise layers of moisture resistant translucent film with electronic connection capabilities embedded in each layer.

Referring to **FIGS. 19-20**, shown are views of a fifth embodiment of the present invention, wherein an energy network system is provided and can be used with any of the previous embodiments of the present invention. As shown generally in **FIG. 20**, an energy network system **420** comprises a plurality of flexible solar panels **14** and a plurality of power modules **16** in electrical communication with one another by a distribution bus **422**, which are connected by the modular connection port **26** of the power module **16** as discussed above. Such cabling can be carried within carrying unit **12**. Such a network system has the advantage of sharing and allocating power among the various energy systems **10**, which is advantageous if one of the systems **10** malfunctions, if one of the flexible solar panels **14** is temporarily blocked from sunlight, or if one system **10** produces more energy than it requires at that time. Referring to **FIG. 21**, an alternative is to create an energy network system **430** where each system of the present invention shares one power module **16**, rather than each system having its own power module.

The modular portable energy system, in all of the embodiments disclosed herein, has many applications including recreational activities, military applications, etc. For example, the modular portable energy system can be attached to trees, tent roofs, cars, or boats, or can be worn over a person's body as a poncho. Moreover, the system could be used to provide energy in situations where a home must be evacuated, or power has been cut off or disrupted, by a flood, hurricane, tornado, earthquake, or any other disaster situation. It could be used by staffed personnel, evacuees, or others to provide energy quickly and effectively to power medical equipment, communication equipment, cooking equipment, and/or any other electronic device. Additionally, the system could be used in military applications. For instance, it may be necessary to set up and take down camp quickly and efficiently, especially when in foreign territory, thus requiring an effective means to provide energy to soldiers, officers, or other military personnel to power communications equipment, monitoring equipment, personal devices, and/or other electronic devices. To this end, the system could be used with large military tents or smaller personal tents. Importantly, the modular portable energy system represents an entirely new platform for generating electrical energy with scaleability and flexibility to accommodate the power needs of not only one person, but indeed, entire communities of people.

Having thus described the invention in detail, it is to be understood that the foregoing description is not intended to limit the spirit or scope thereof. What is desired to be protected is set forth in the following claims.

CLAIMS

What is claimed is:

1. A modular portable energy system, comprising:

a flexible solar panel;

a power module in electrical communication with the solar panel;

one or more appliance kits in electrical communication with the power module via one or more distribution components; and

a carrying unit for housing and transporting the flexible solar panel and at least one of the power module, the one or more appliance kits, and the one or more distribution components.

2. The modular portable energy system of Claim 1, wherein the carrying unit further comprises a carrying retainer having an integrated handle and wrapped around the flexible solar panel for storage or transportation.

3. The modular portable energy system of Claim 1, wherein the carrying unit further comprises a body component having storage sub-compartments and a telescoping handle attached thereto.

4. The modular portable energy system of Claim 1, wherein the carrying unit is tubular in shape and comprises a central subcontainer positioned between a bottom subcontainer and a top subcontainer.

5. The modular portable energy system of Claim 1, further comprising poles supporting the solar panel in use.

6. The modular portable energy system of Claim 1, wherein the power module is networkable to a plurality of energy systems.

7. The modular portable energy system of Claim 1, further comprising one or more wireless devices in electrical communication with the modular personal energy system.

8. A portable shelter system, comprising:

a portable and collapsible structure having a top portion;

a solar panel system attached to the top portion of the structure;

a power unit in communication with the solar panel system for processing electrical power generated by said solar panel system and storing said electrical power in a battery within said power unit; and

a plurality of distribution components in electrical communication with said power unit and a plurality of devices to be electrically powered.

9. The portable shelter system of Claim 8, wherein the structure further comprises one or more power access points dispersed throughout the structure and in electrical communication with the solar panel system.

10. The portable shelter system of Claim 8, further comprising a carrying unit of sufficient size to contain the structure, the solar panel system, the power unit, and the plurality of distribution components for storage or transportation.

11. The portable shelter system of Claim 8, wherein the solar panel system is removably attached to the top portion.

12. The portable shelter system of Claim 8, wherein the solar panel system comprises a unitary, removable solar attachment shaped to correspond to the geometry of the top portion of the structure.

13. The portable shelter system of Claim 8, wherein the solar panel system comprises a plurality of radially arrayed solar panels suspended from a support frame.

14. The portable shelter system of Claim 8, wherein the solar panel system is embedded in fabric of the top portion of the structure.

15. The portable shelter system of Claim 8, wherein the structure is a tent or umbrella.

16. The portable shelter system of Claim 8, wherein the power unit is networkable to a plurality of energy systems.

17. The portable shelter system of Claim 8, further comprising appliance kits in electrical communication with the solar panel via the distribution components.

18. The portable shelter system of Claim 8, further comprising one or more wireless devices in electrical communication with the solar panel system.

19. An alternative power generation system, comprising:

a transducer for generating electrical power from a human body;

a power unit coupled to said transducer including circuitry for processing electrical power generated by said transducer and storing said electrical power in a battery within said power unit; and

a plurality of distribution components in electrical communication with said power unit and a plurality of devices to be electrically powered.

20. The alternative power generation system of Claim 19, further comprising a carrying unit to house at least the transducer for storage and transportation.

21. The alternative power generation system of Claim 19, networkable to a plurality of power units each including respective transducers for generating electrical power from human bodies.

22. An alternative power generation system, comprising:

a portable electricity harvesting device for generating electrical power;

a power unit coupled to said portable electricity harvesting device including circuitry for processing electrical power generated by said portable electricity harvesting device and storing said electrical power in a battery within said power unit; and

a plurality of distribution components in electrical communication with said power unit and a plurality of devices to be electrically powered.

23. The alternative power generation system of Claim 22, further comprising a carrying unit to house at least the harvesting device for storage or transportation.

24. The alternative power generation system of Claim 22, networkable to a plurality of power units each including respective electricity harvesting devices for generating electrical power.

25. A power generation device, comprising:

a layer of substrate;

a first layer formed on the substrate and including battery electronics therein;

a second layer formed on the first layer and including power electronics therein; and

a third layer formed on the second layer and including photovoltaic materials for generating electricity.

26. The power generation device of Claim 25, wherein the first layer, second layer, and third layer are laminated.

27. The power generation device of Claim 25, wherein the first layer, second layer, and third layer are printed using conductive inks.

28. The power generation device of Claim 25, wherein the first layer, second layer, and third layer have interstitial wiring in between.

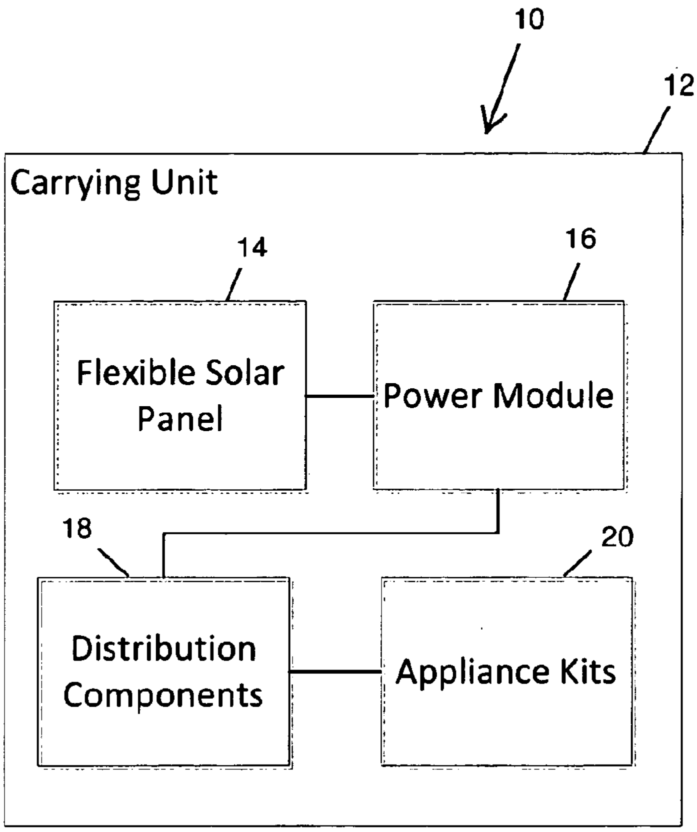

10
12
Carrying Unit
14
16
Flexible Solar Panel
Power Module
18
20
Distribution Components
Appliance Kits

FIG. 1

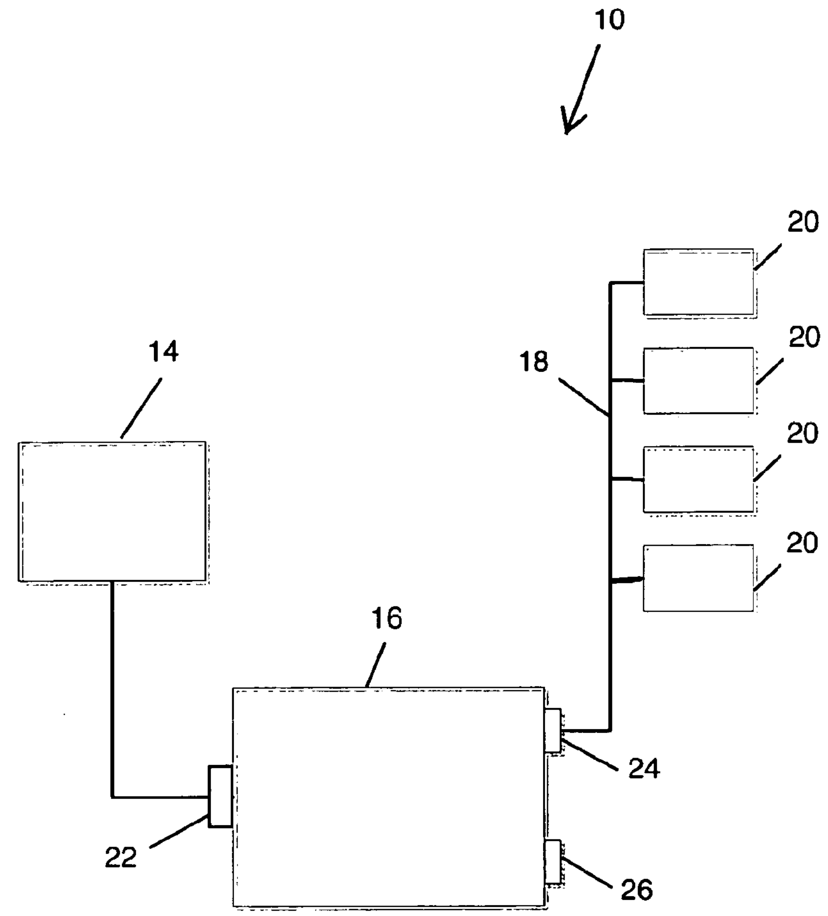


FIG. 2

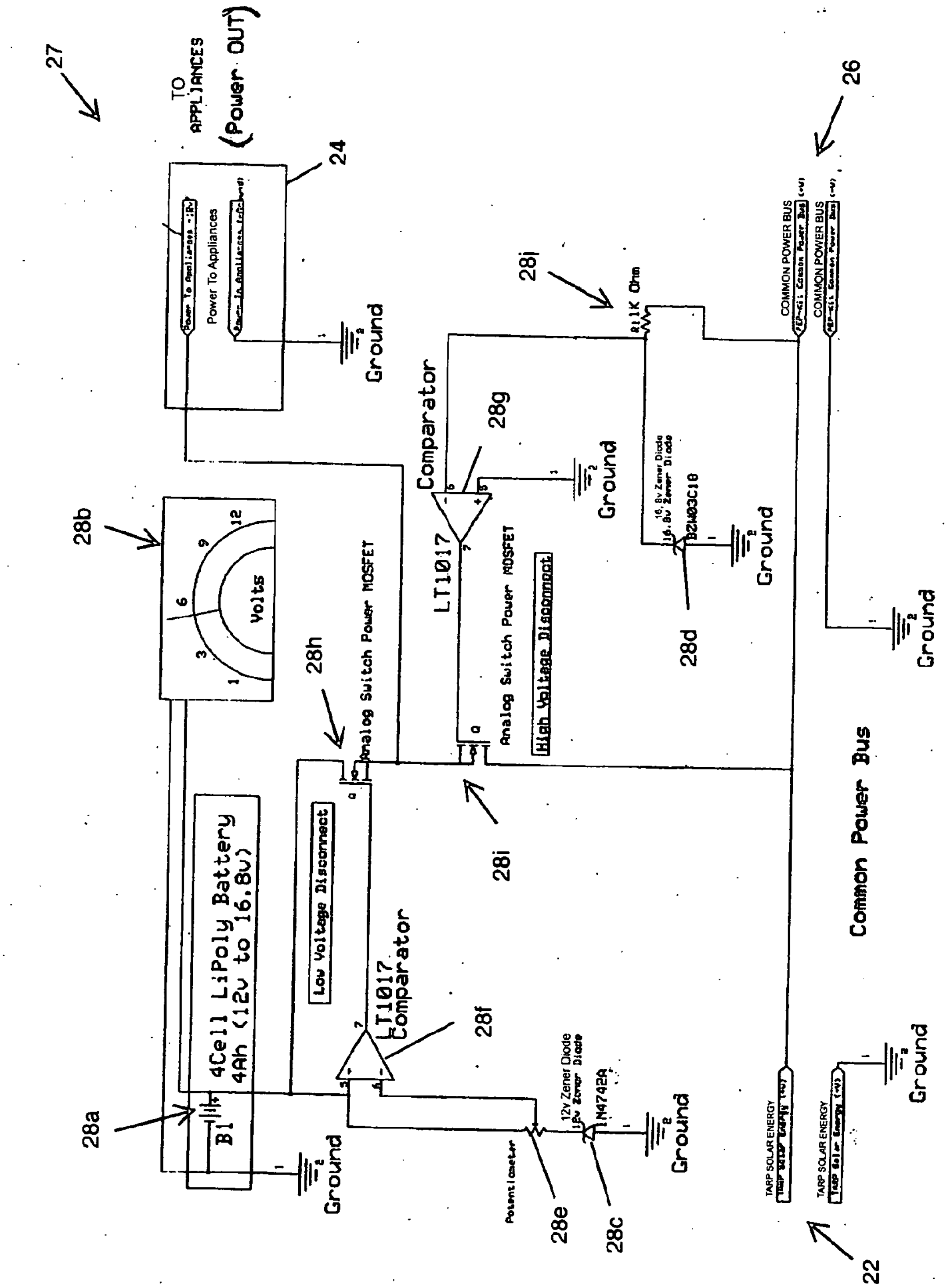

27
TO APPLIANCES
(Power OUT)
Power To Appliances
24
28b
Volts
28h
Analog Switch Power MOSFET
LT1017 Comparator
28g
Ground
28j
R11K Ohm
COMMON POWER BUS
26
16.8v Zener Diode
BZW03C18
28d
High Voltage Disconnect
28i
Low Voltage Disconnect
4Cell LiPoly Battery
4Ah (12v to 16.8v)
B1
28a
28f
12v Zener Diode
1N4742A
Potentiometer
28e
28c
Common Power Bus
TARP SOLAR ENERGY
22

FIG. 3

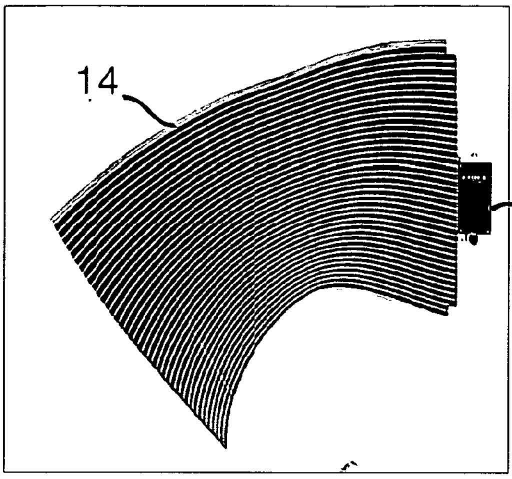


FIG.4A

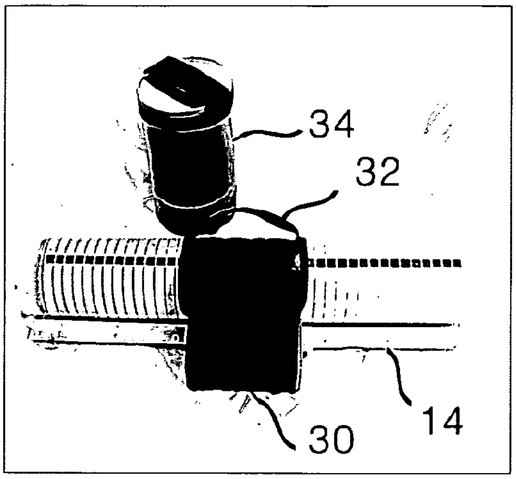


FIG.4B

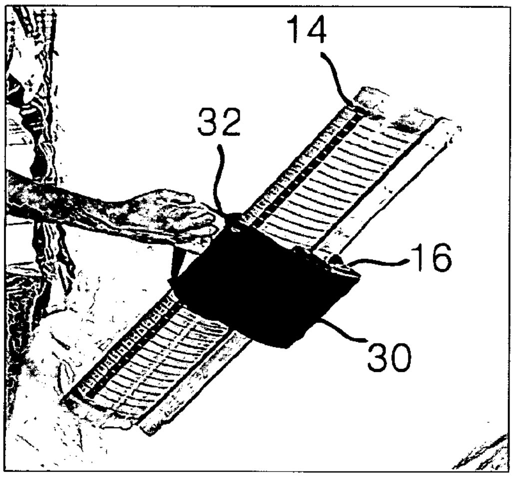


FIG.4C

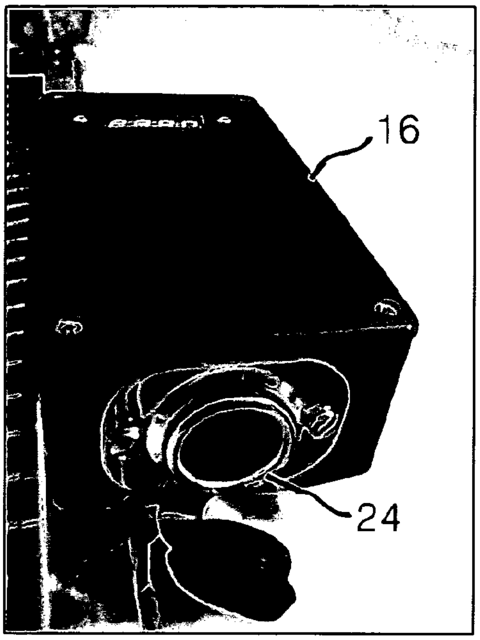


FIG.5A

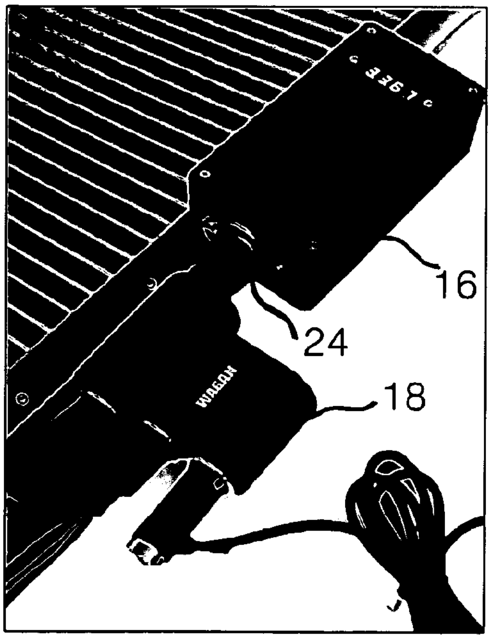


FIG.5B

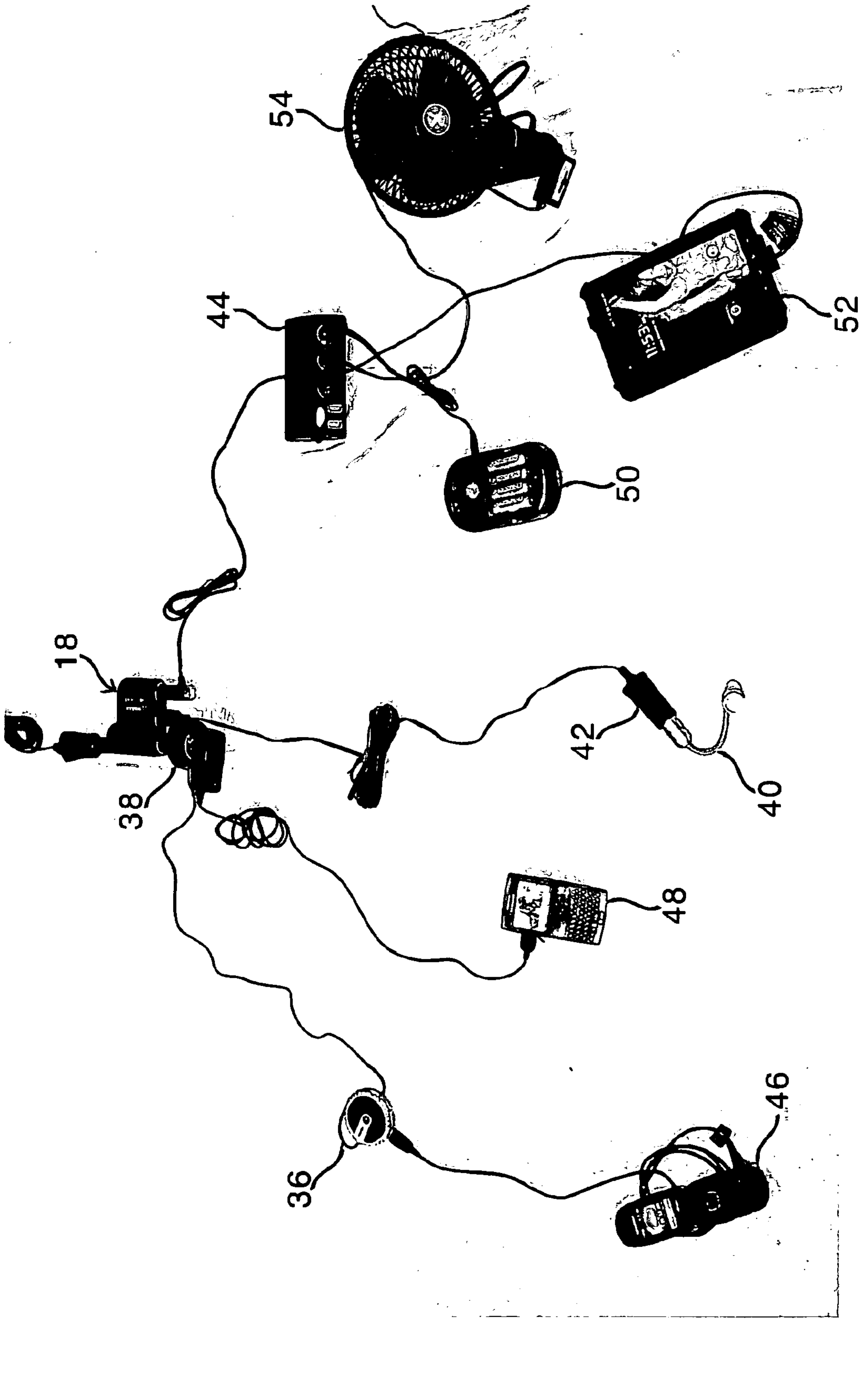


FIG.5C

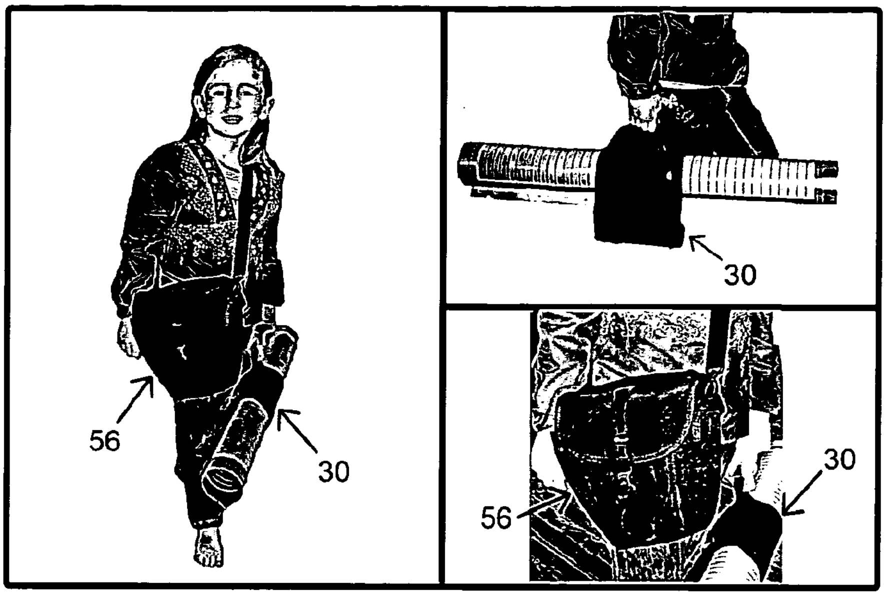


FIG. 6A

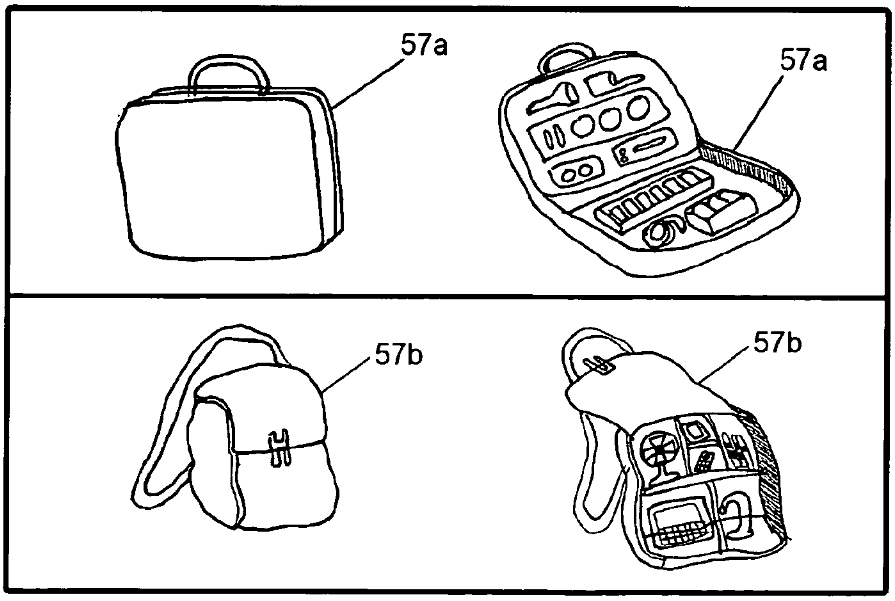


FIG. 6B

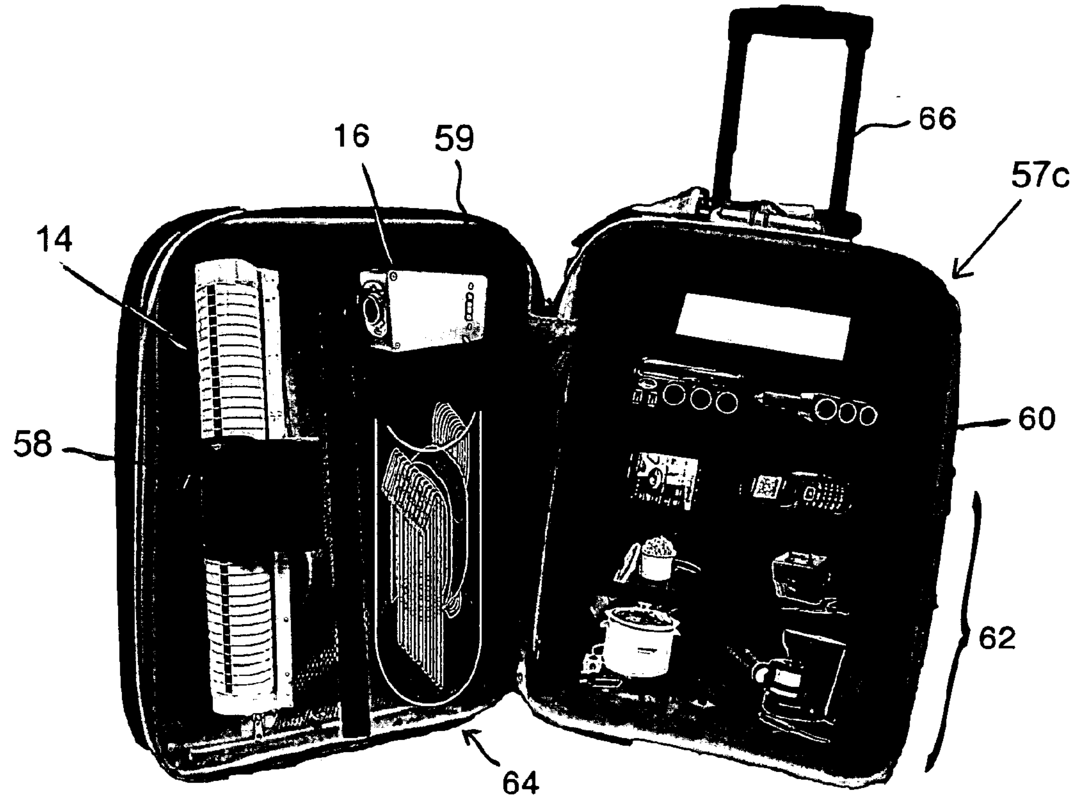


FIG. 7A

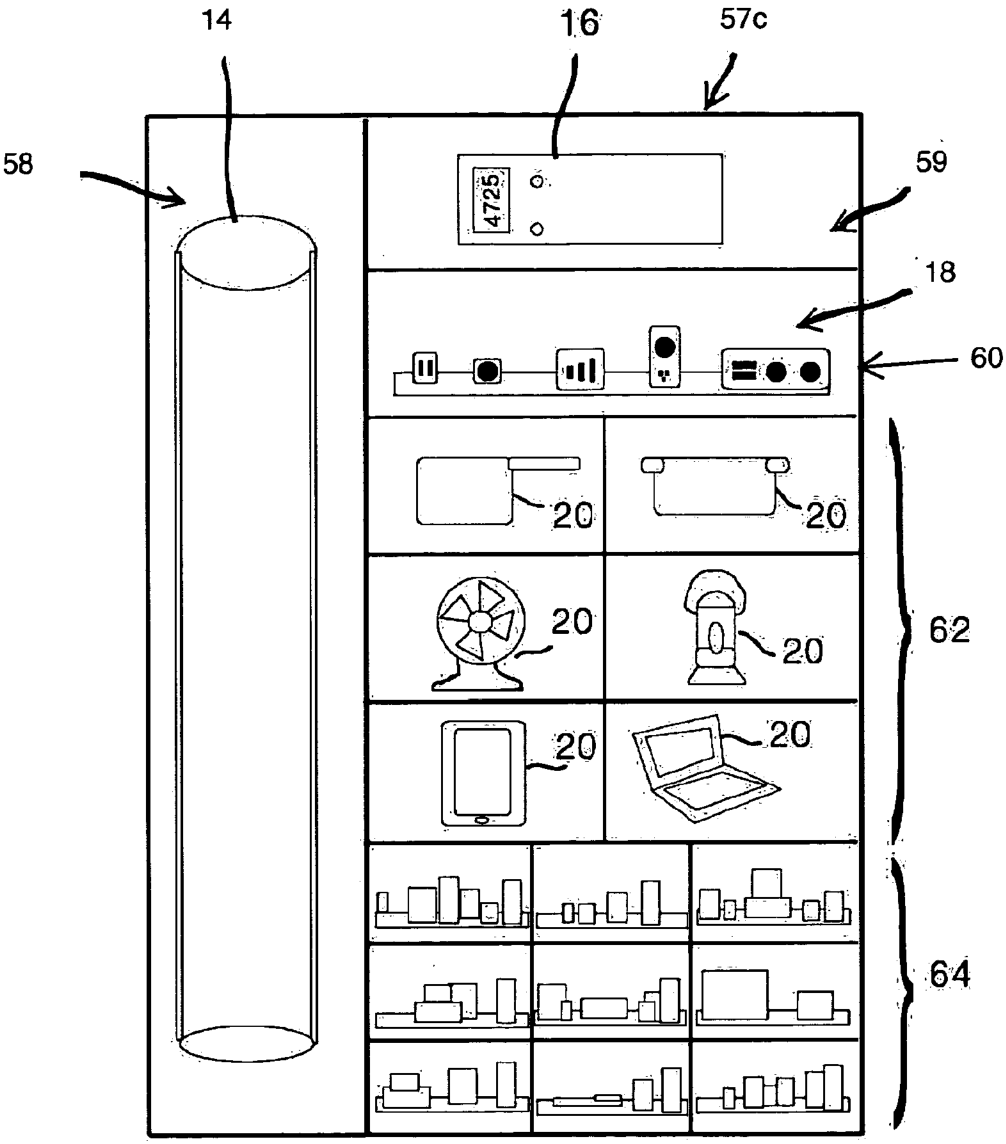


FIG. 7B

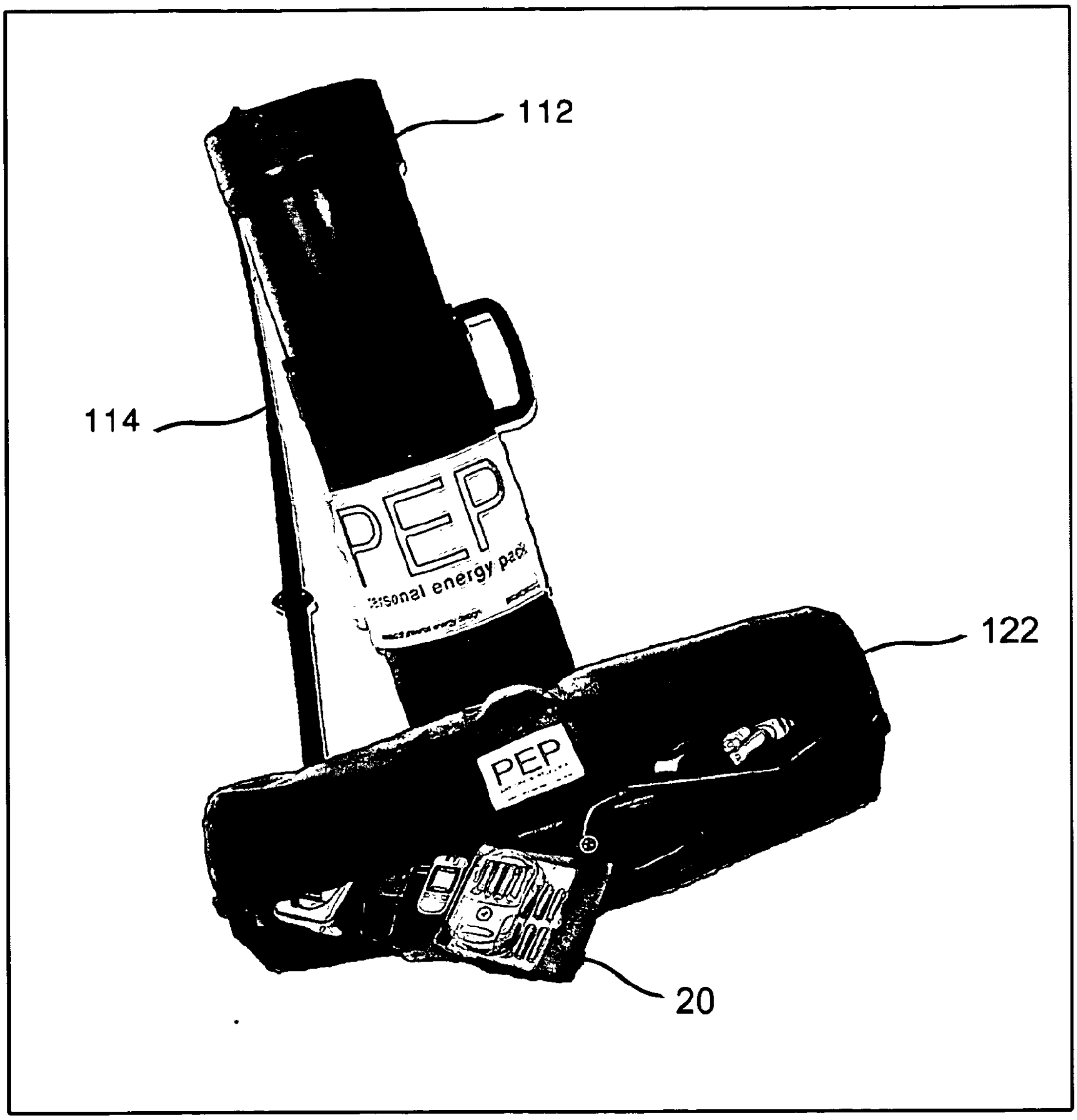


FIG. 8A

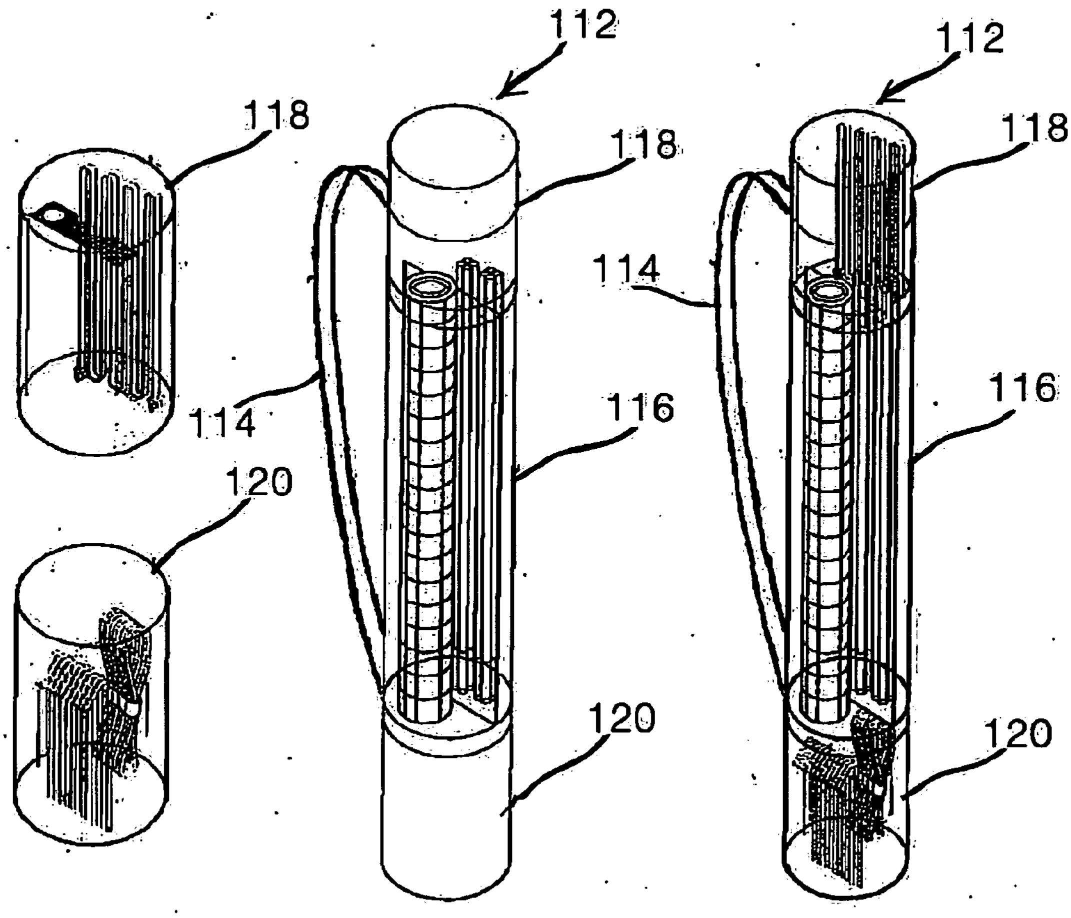


FIG. 8B

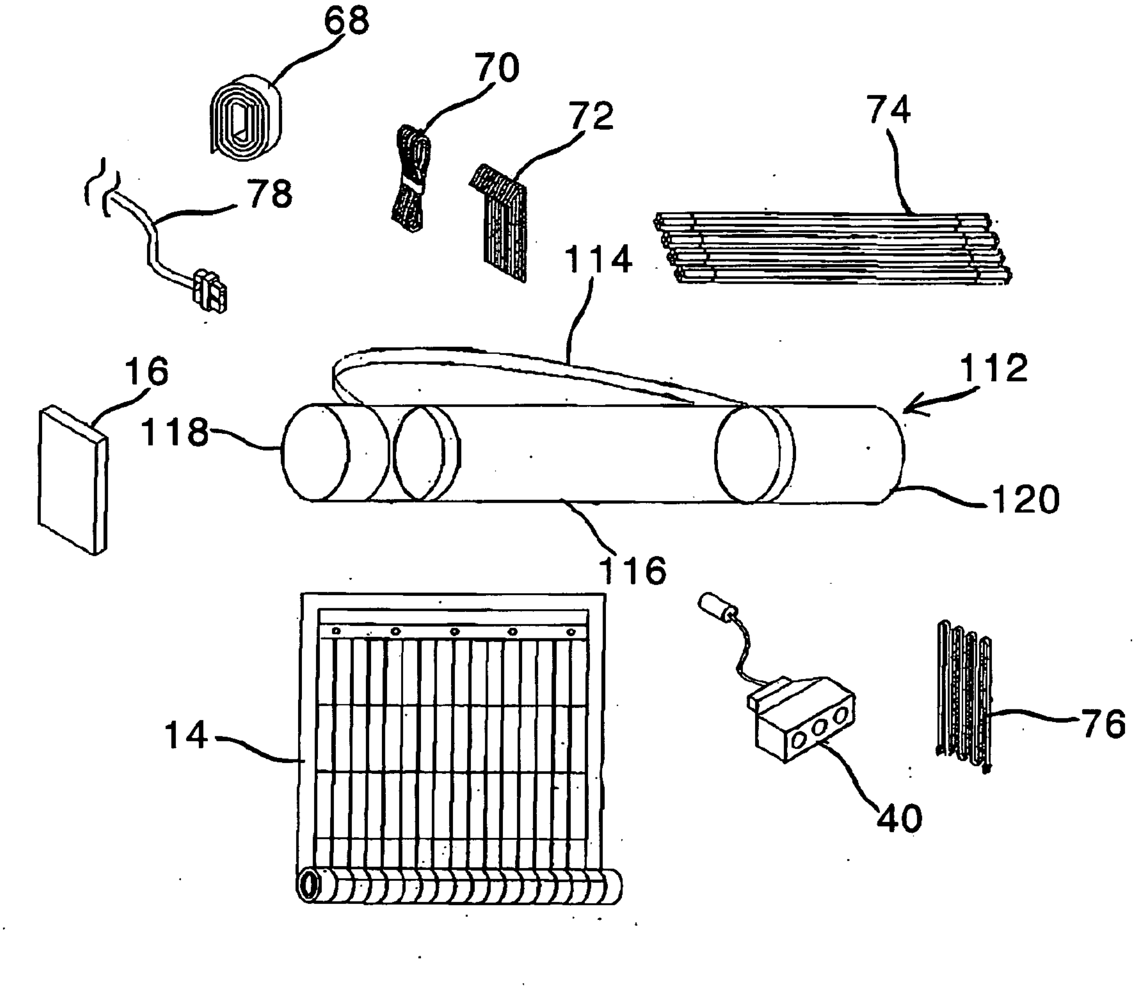


FIG. 8C

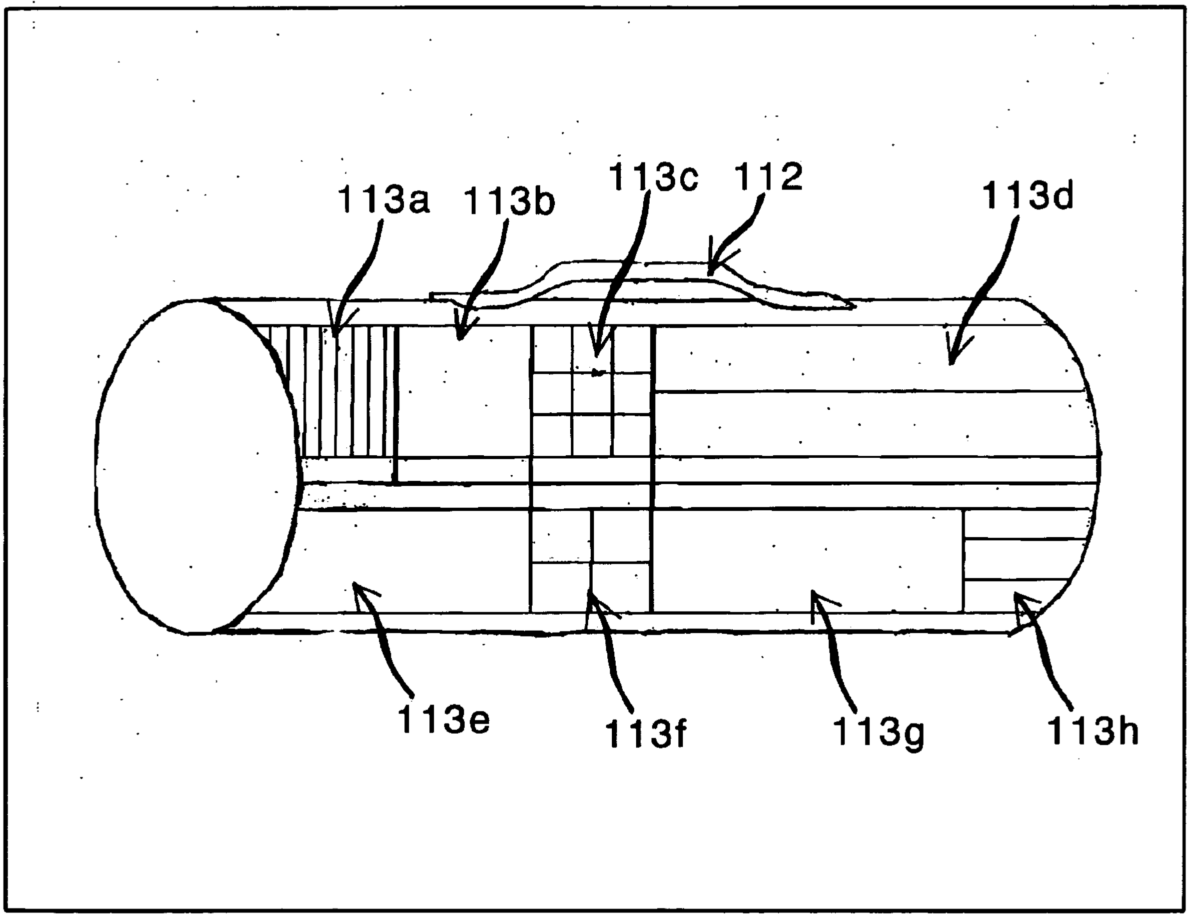


FIG. 8D

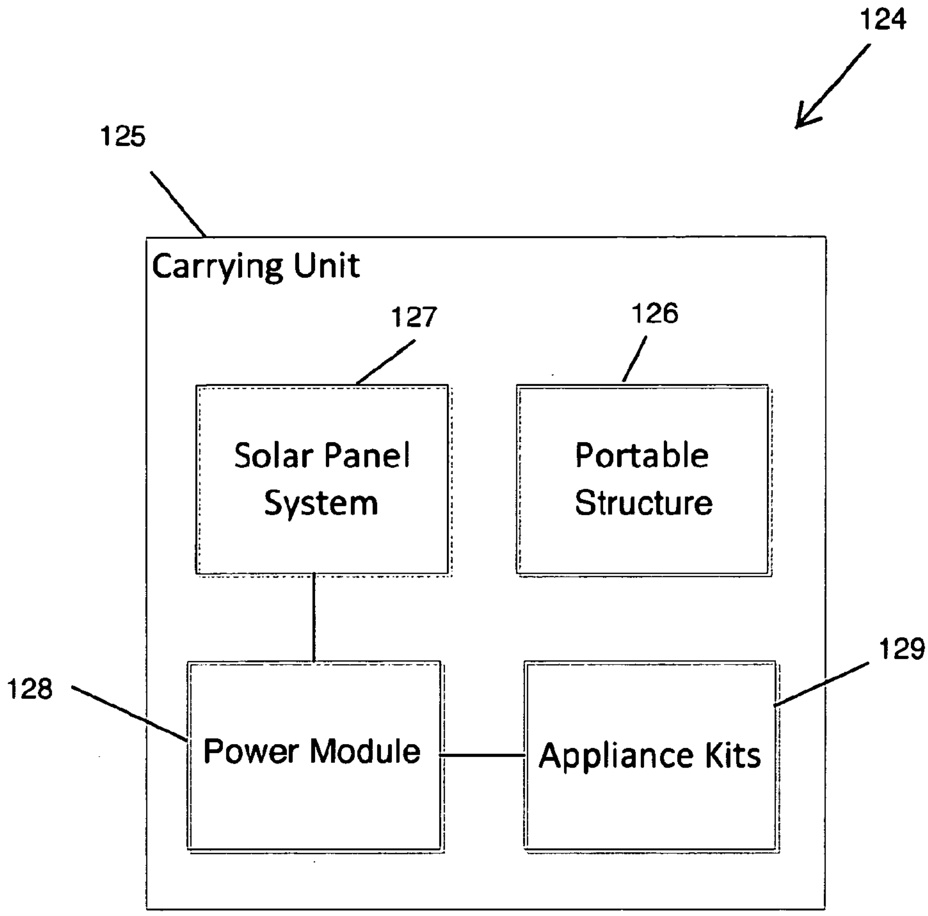

124
125
Carrying Unit
127
126
Solar Panel System
Portable Structure
128
129
Power Module
Appliance Kits

FIG. 9

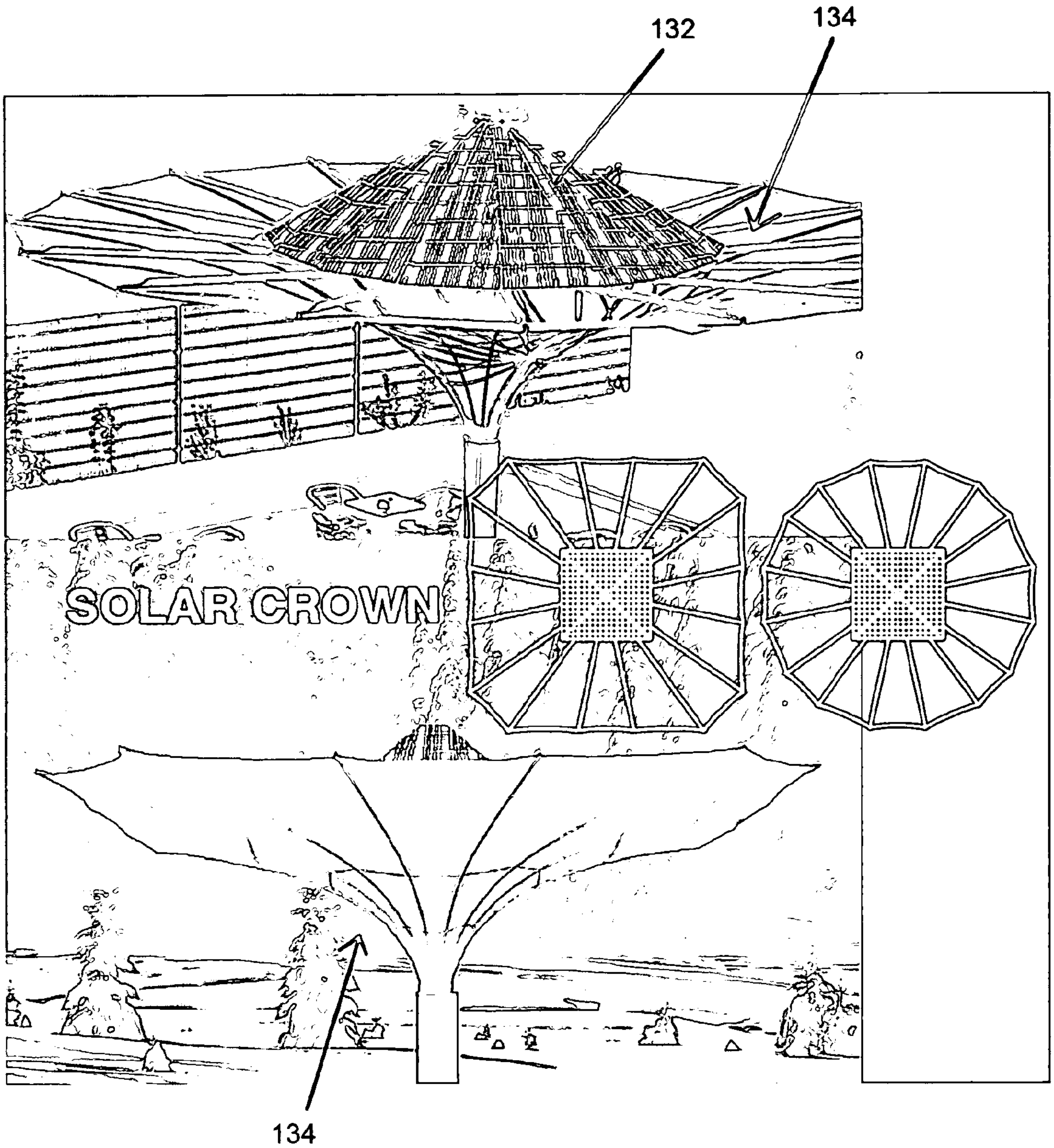


FIG. 10A

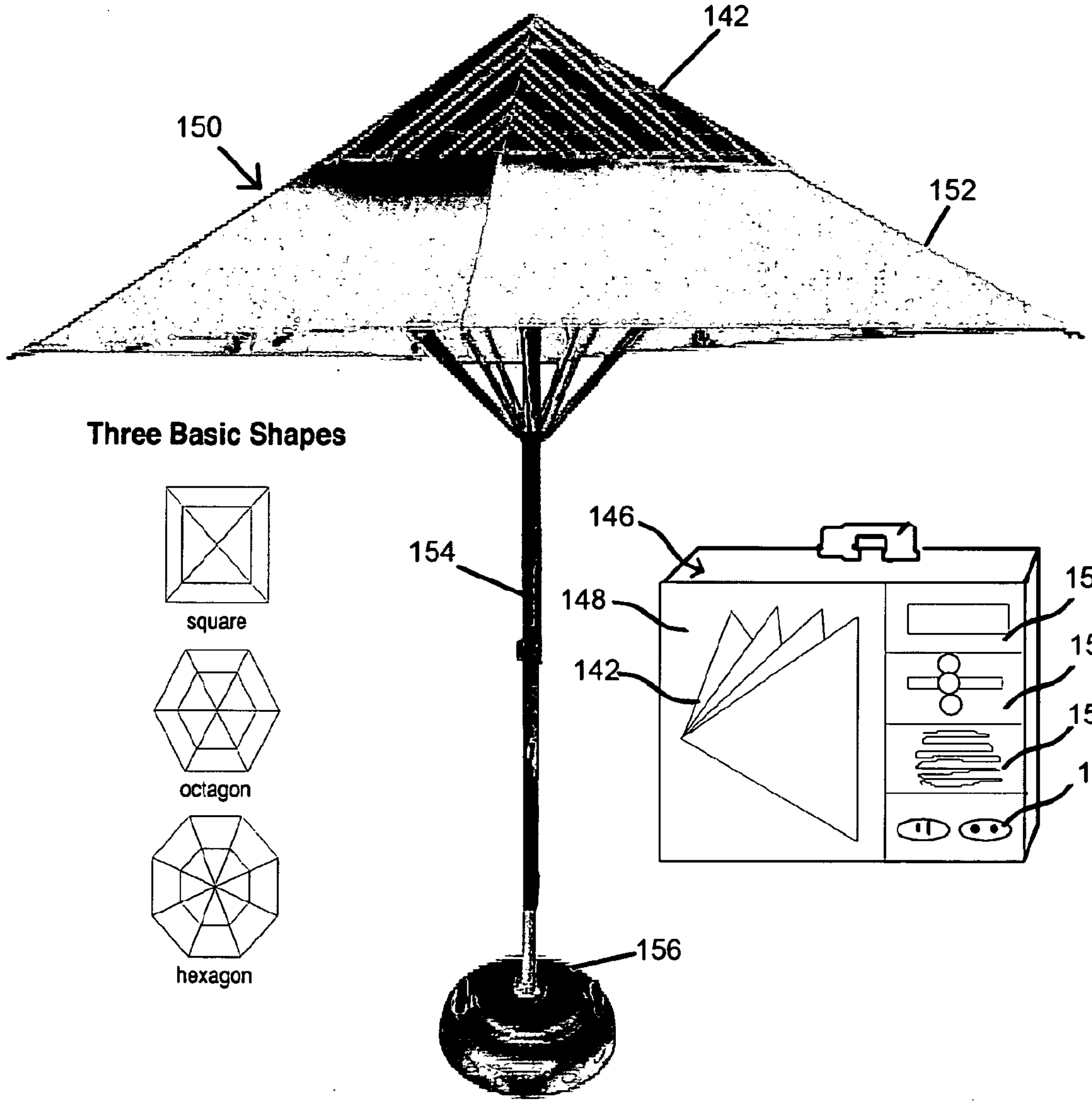

142
150
152
Three Basic Shapes
square
octagon
hexagon
154
146
148
142
156
154
158
18
156

FIG. 10B

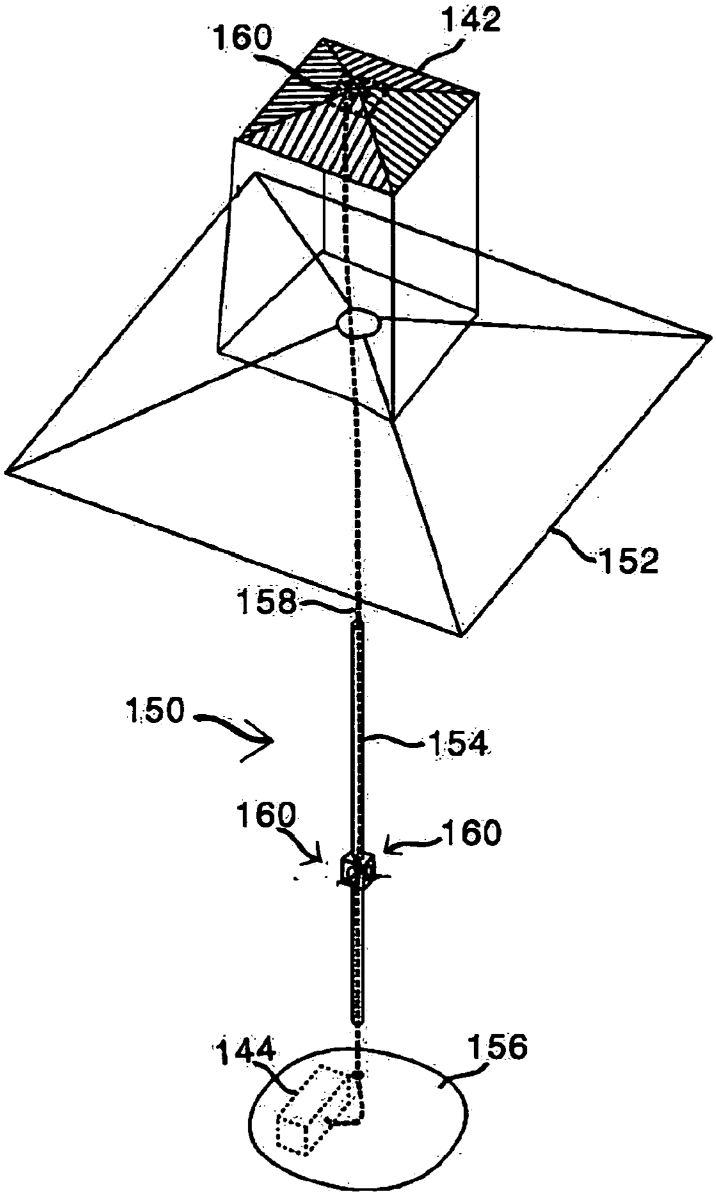


FIG. 10C

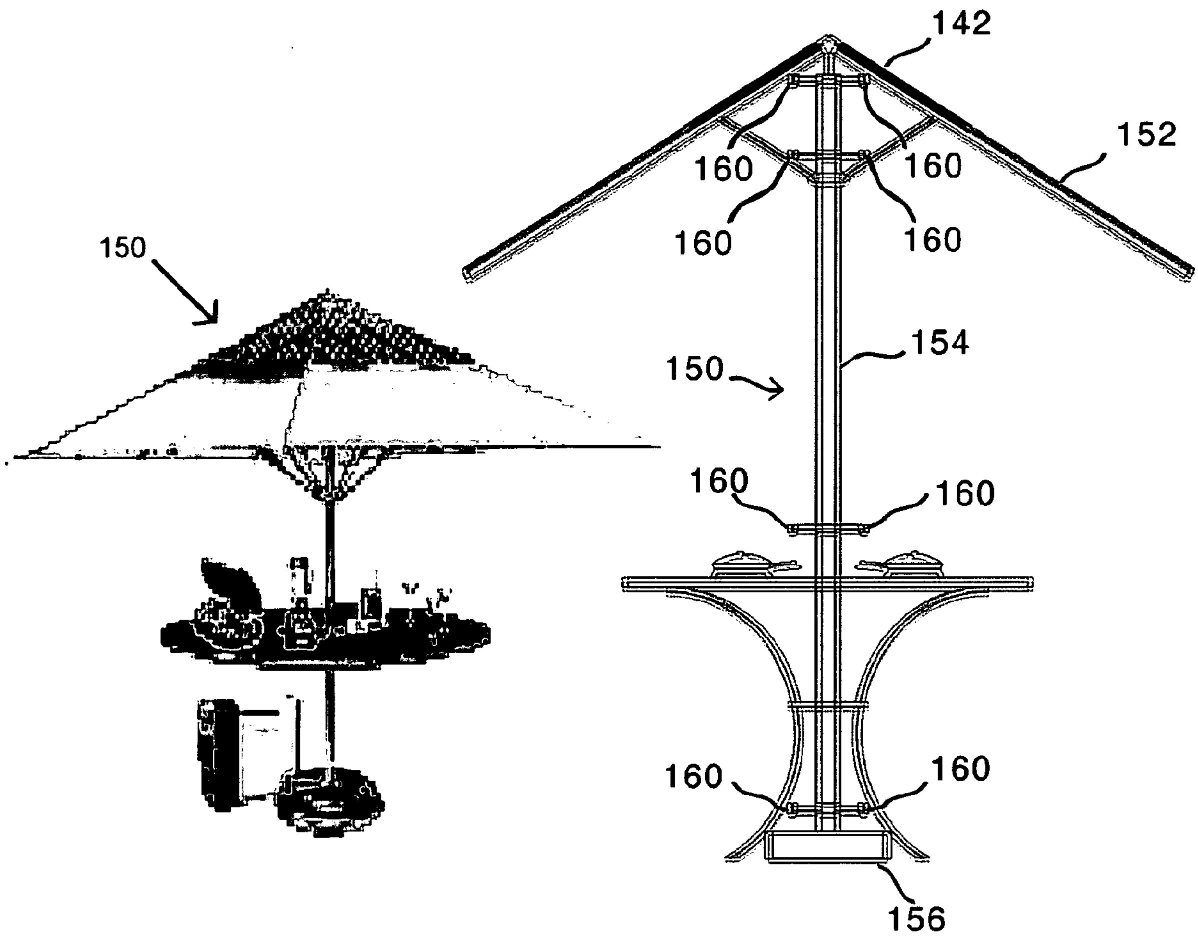


FIG. 10D

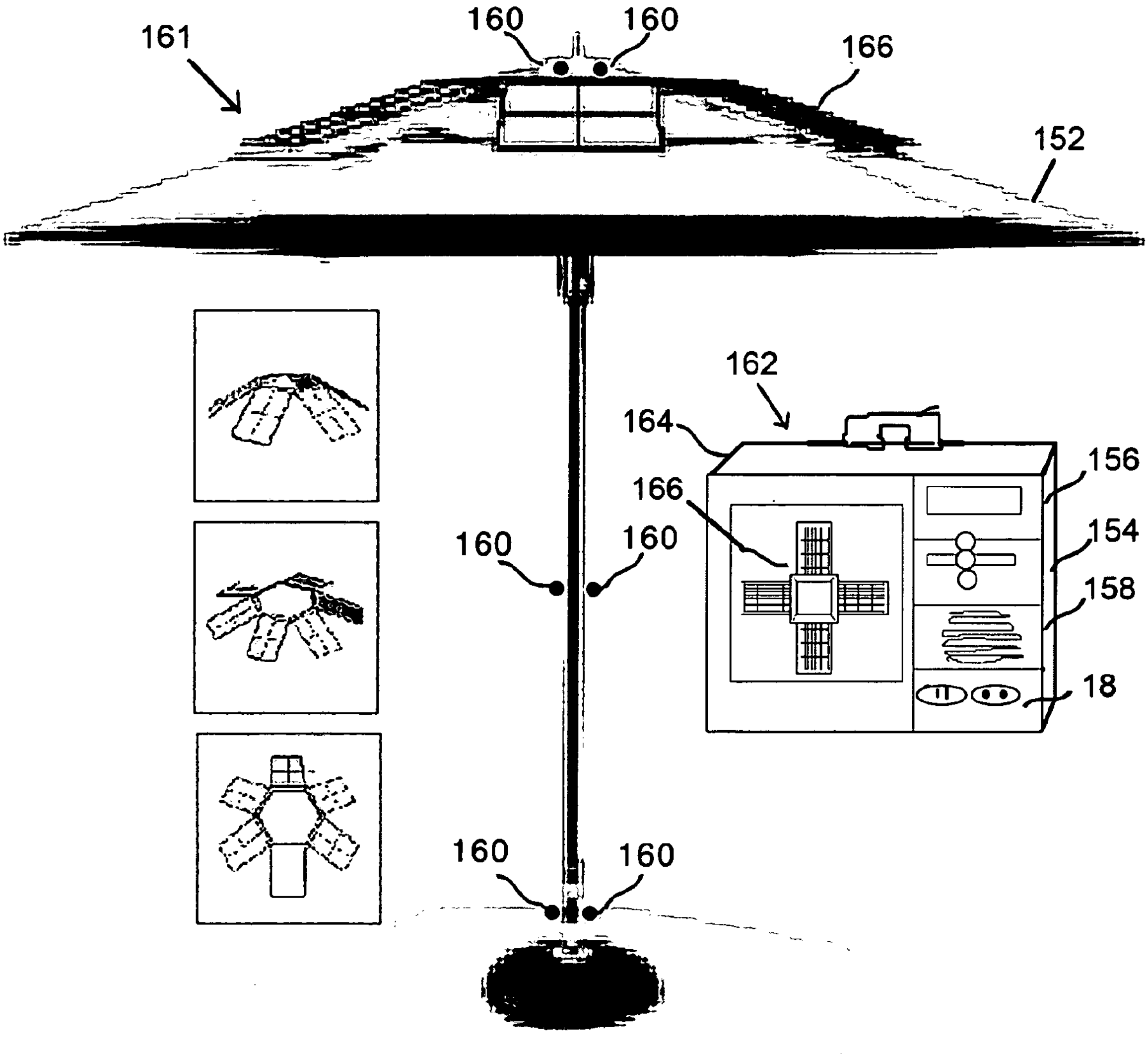


FIG. 11A

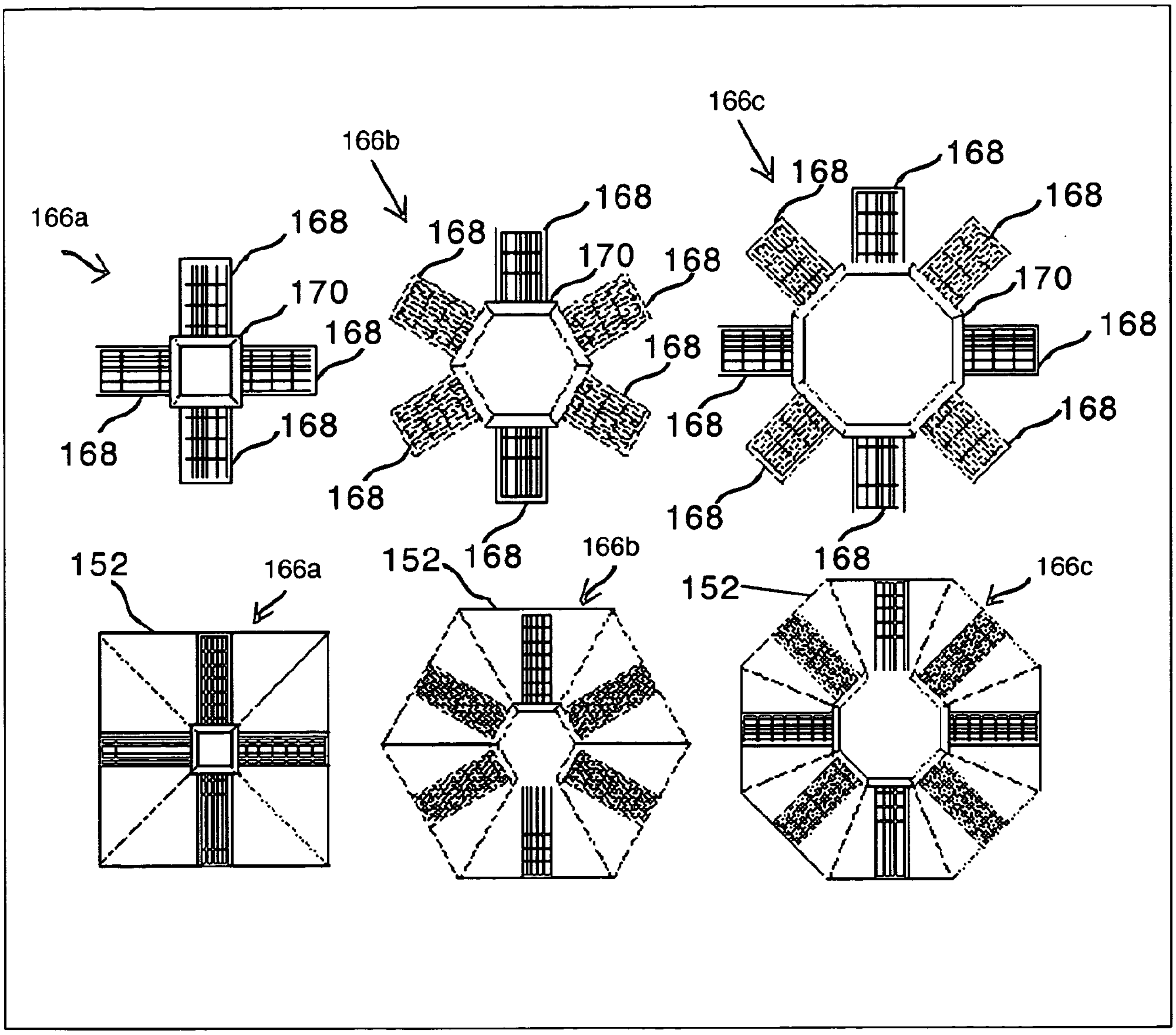

166a
168
170
168
168
168
166b
168
168
170
168
168
168
168
168
166c
168
168
168
170
168
168
168
168
168
152
166a
152
168
166b
152
166c

FIG. 11B

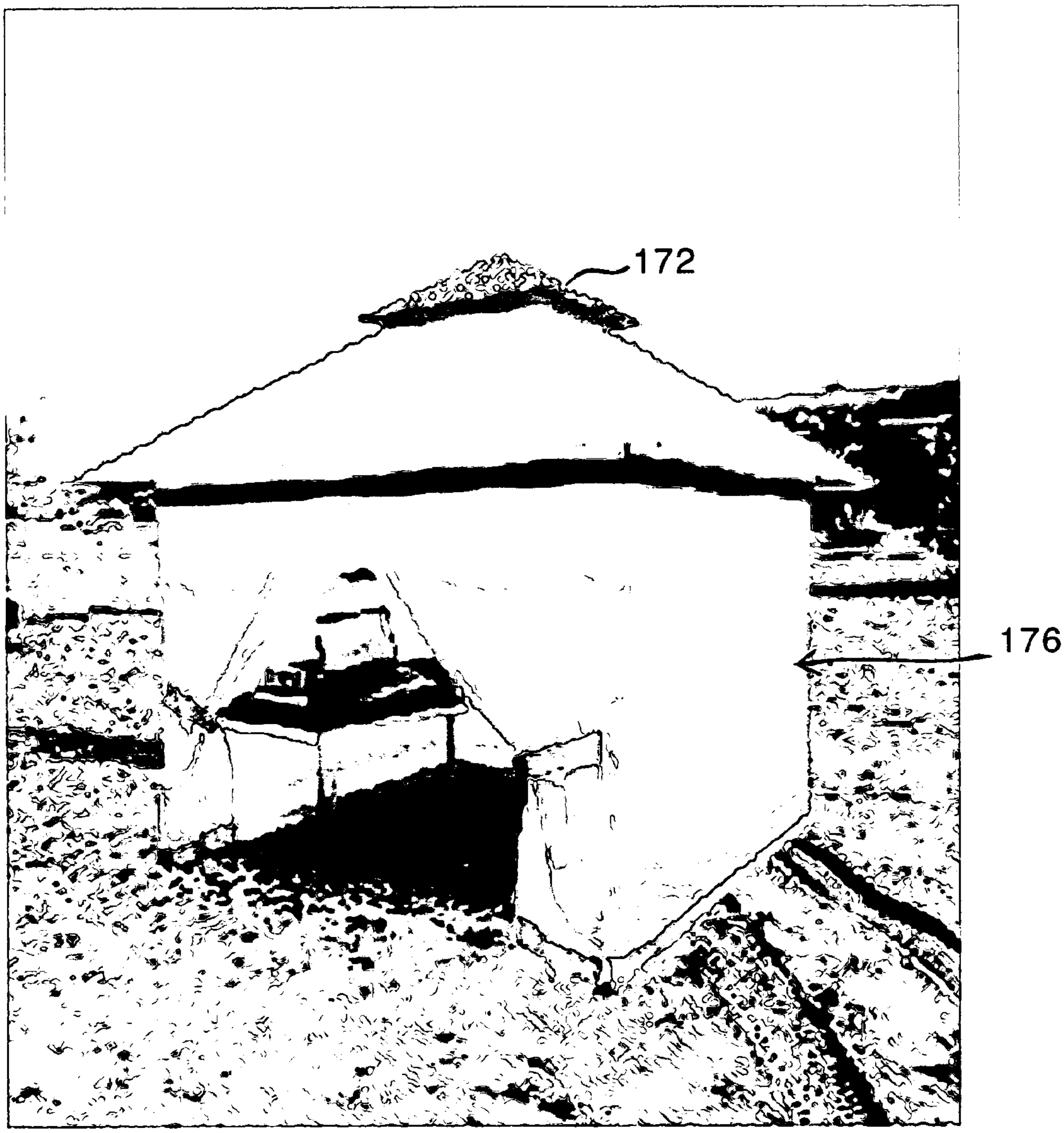


FIG. 12A

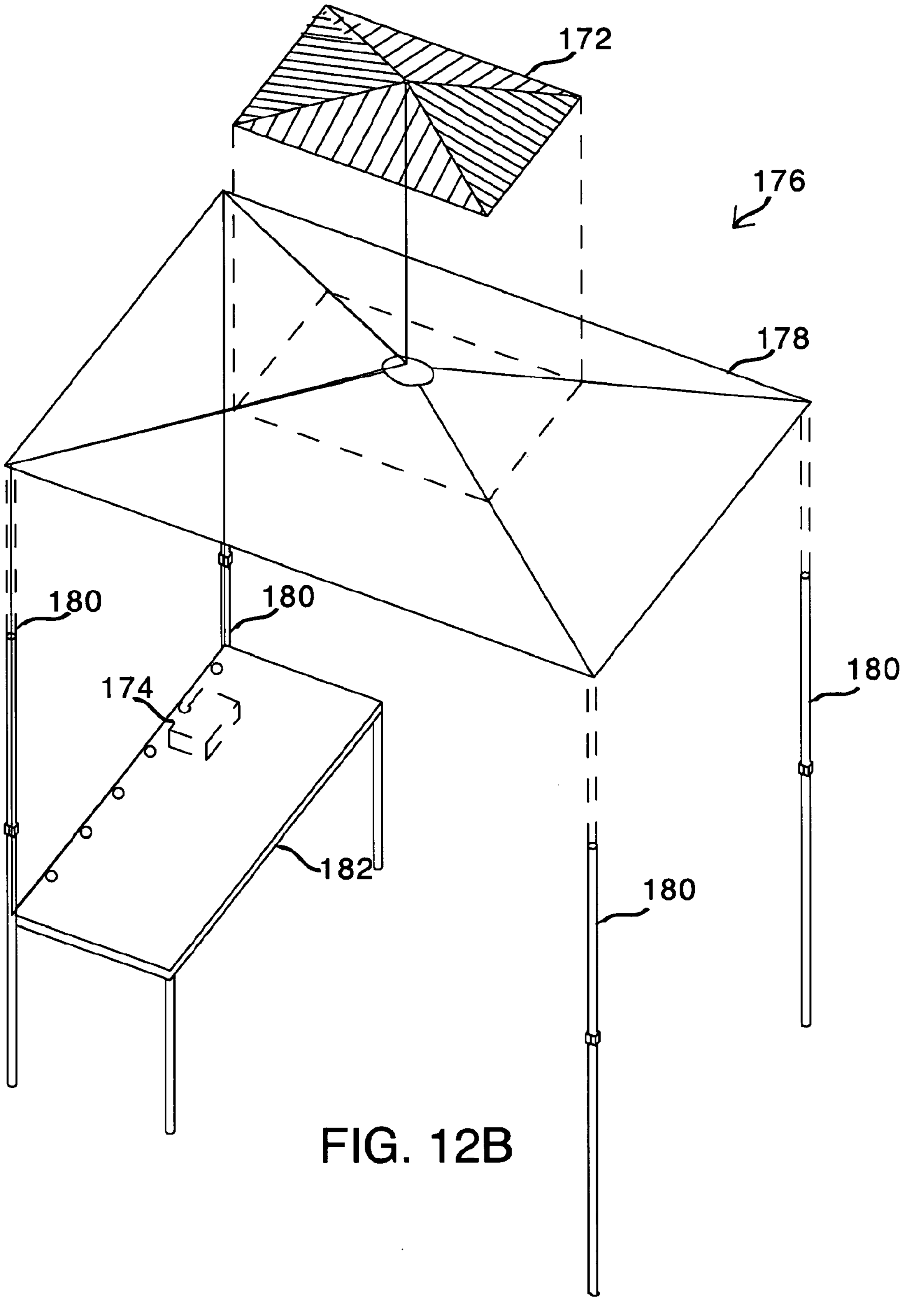


FIG. 12B

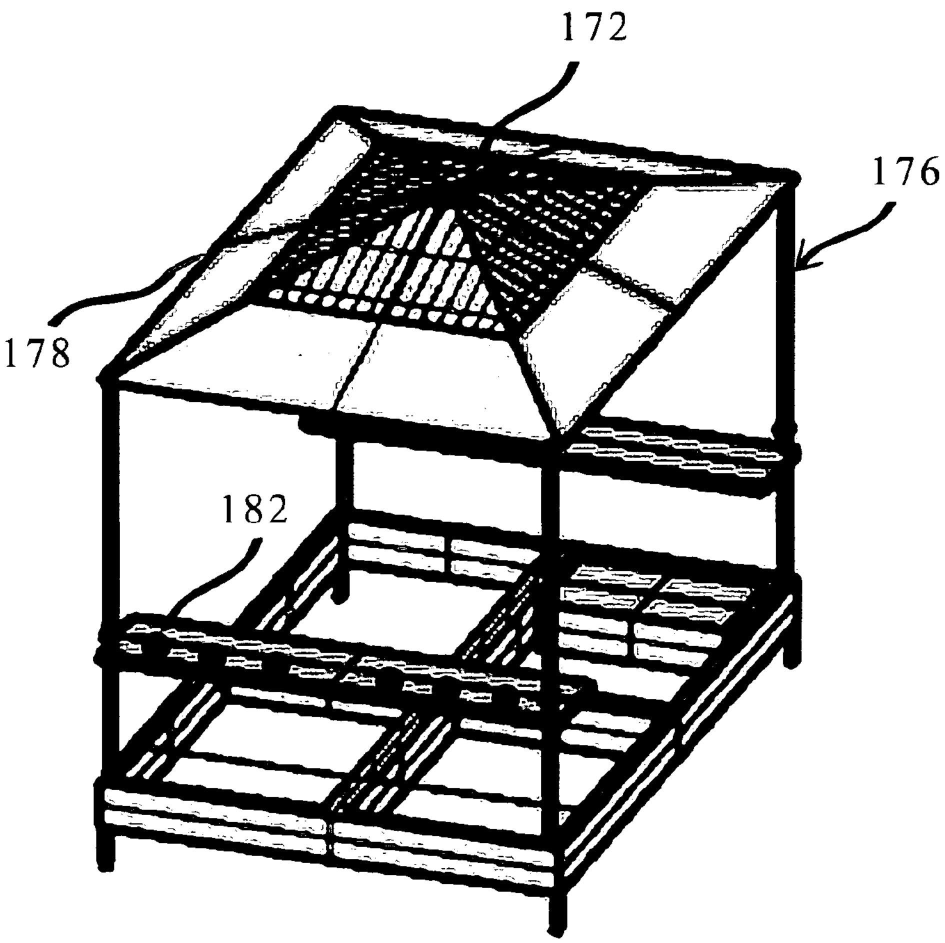


FIG. 12C

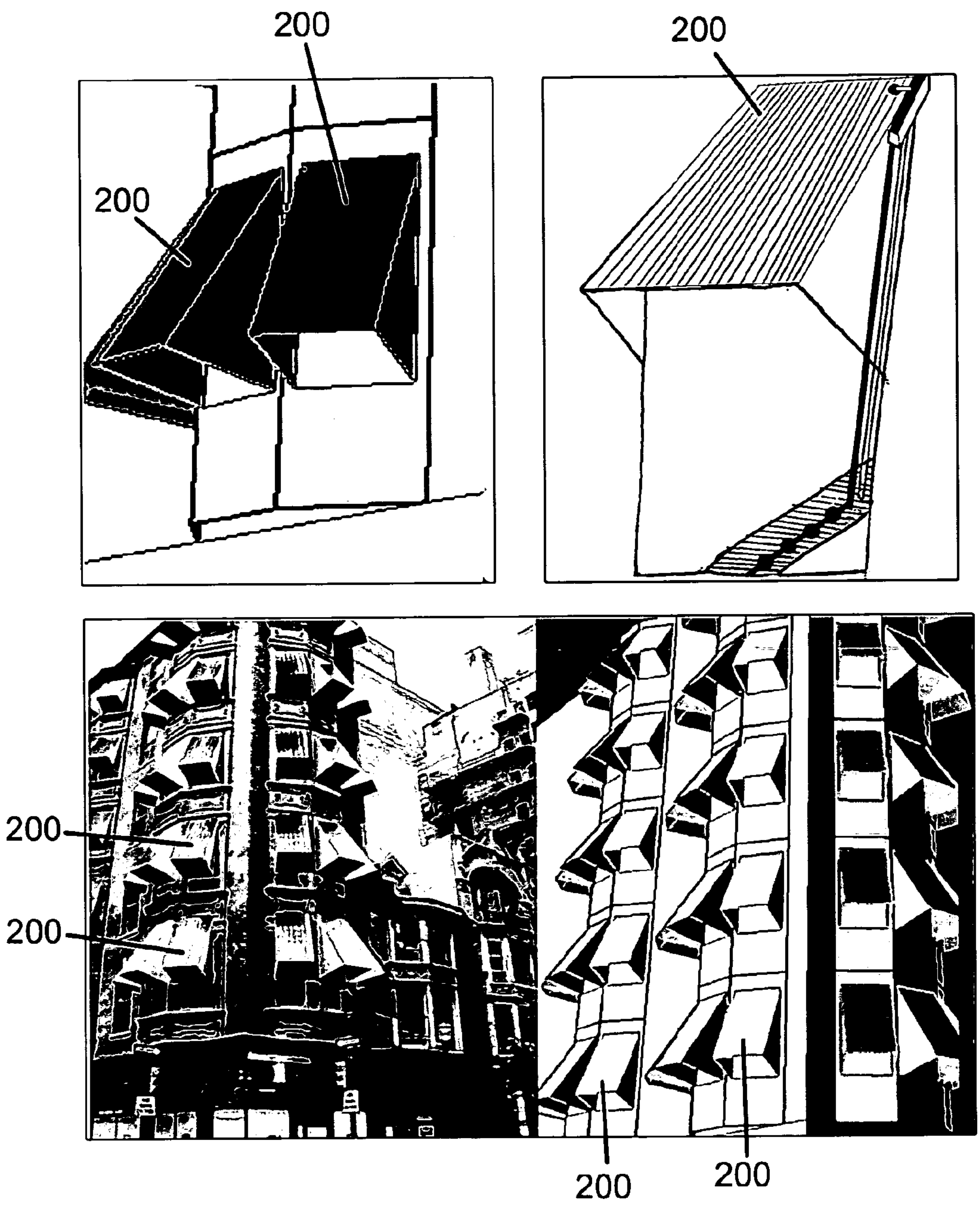
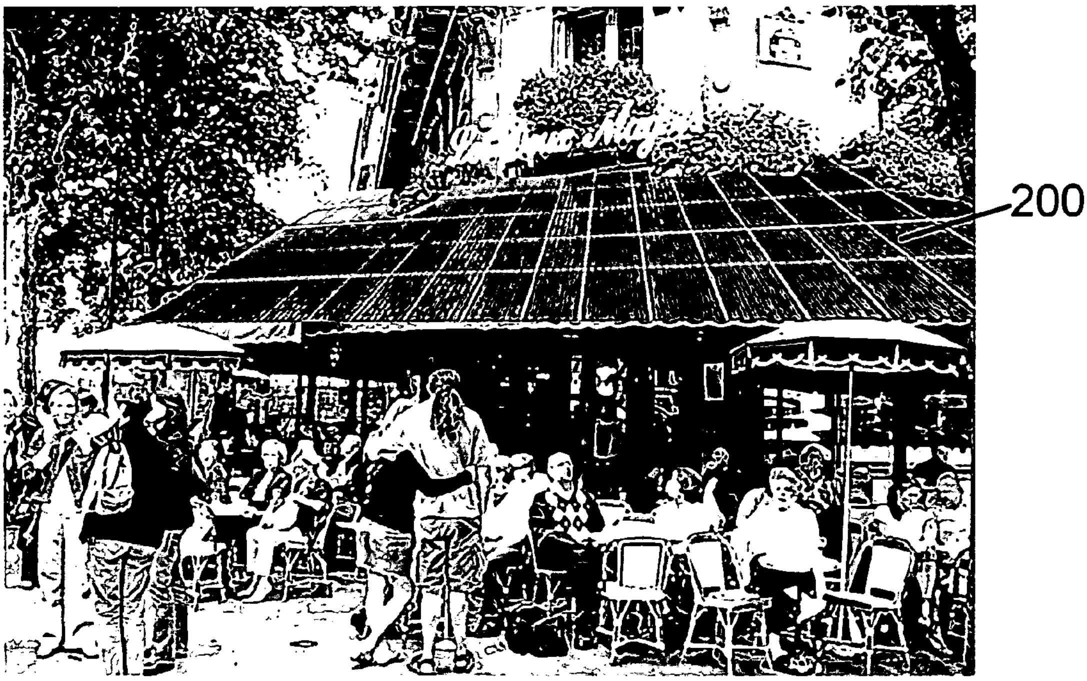


FIG.13



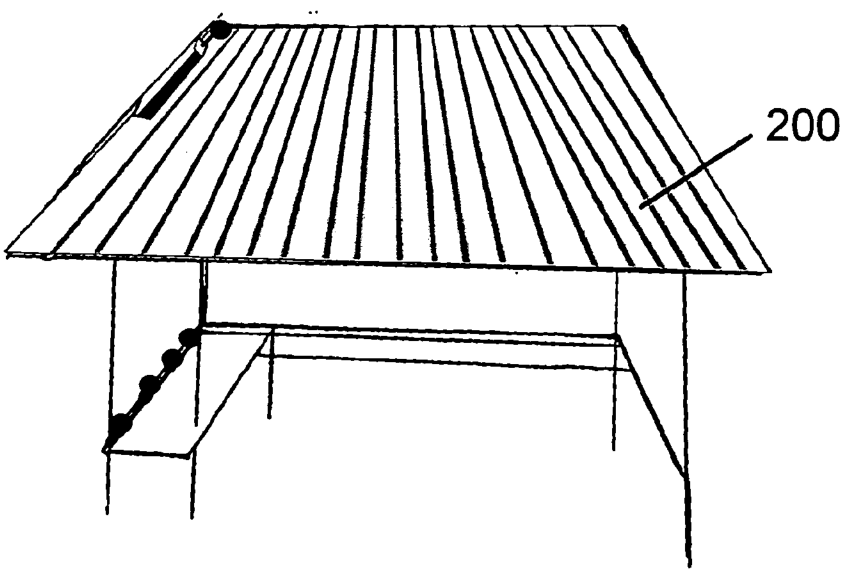


FIG. 14

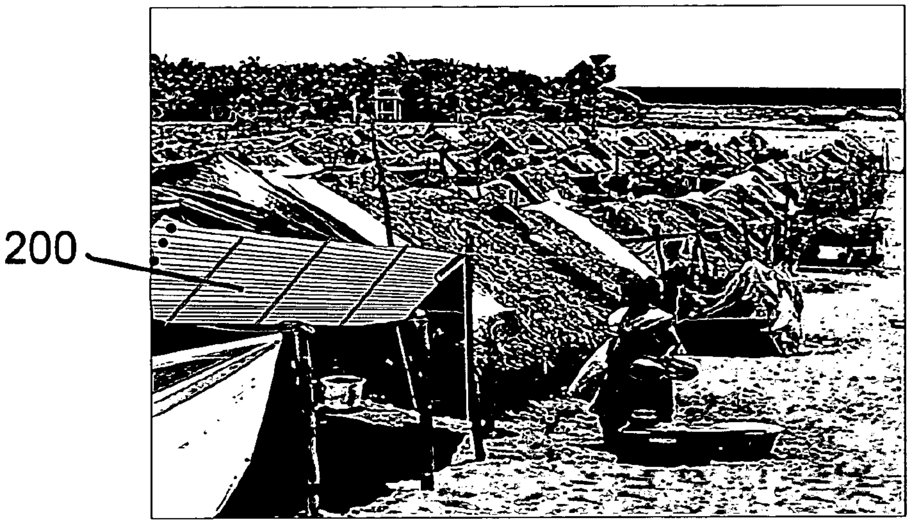


FIG. 15A

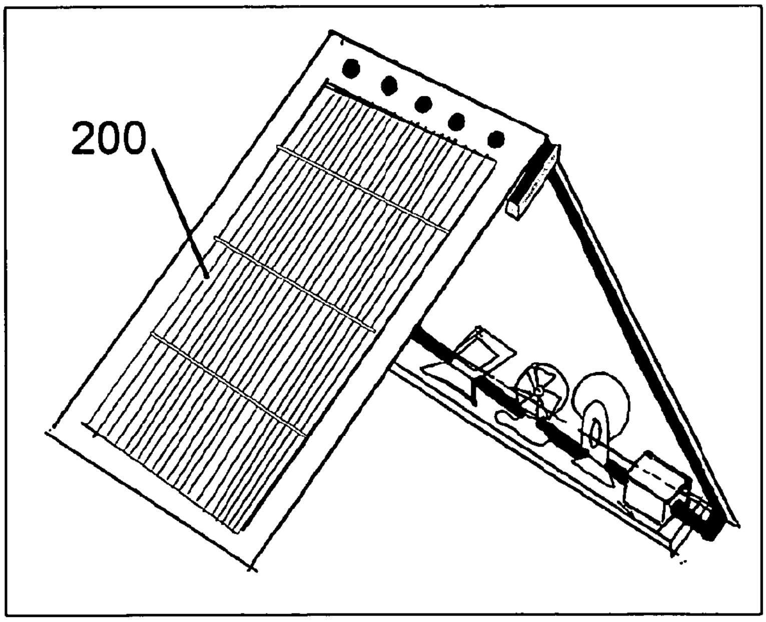


FIG. 15B

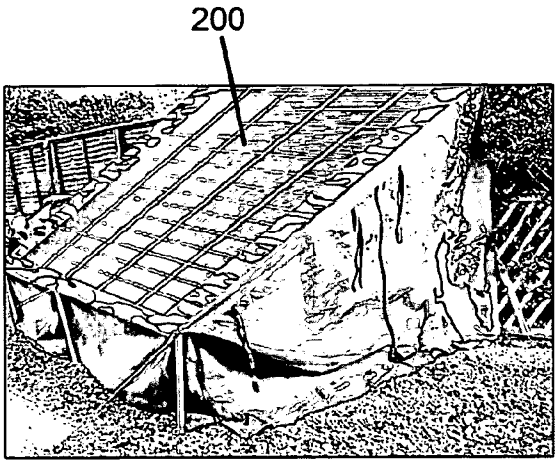


FIG. 15C

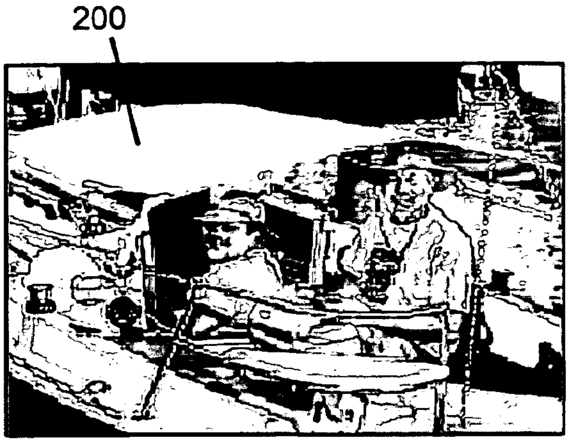


FIG. 15D

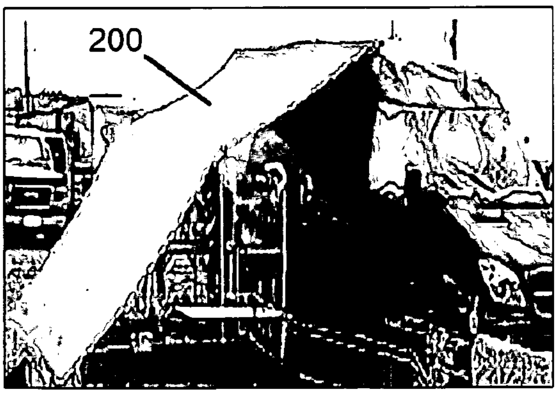


FIG. 15E

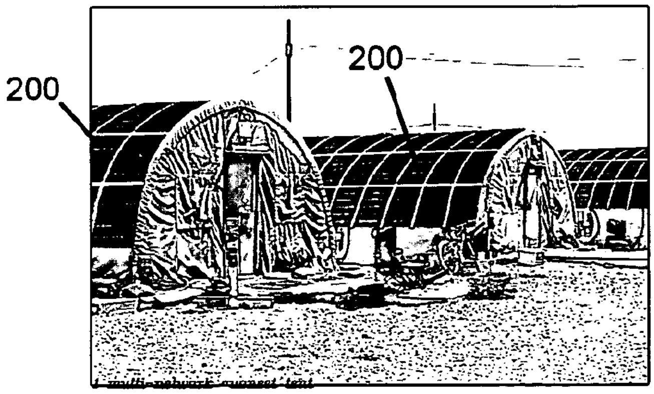


FIG. 15F

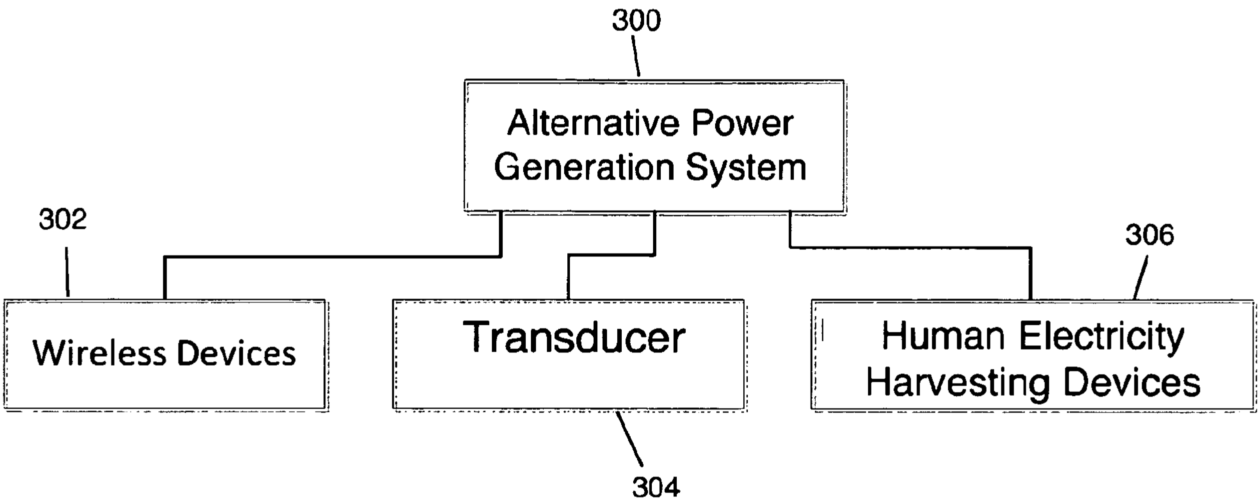

300
Alternative Power Generation System
302
306
Wireless Devices
Transducer
Human Electricity Harvesting Devices
304

FIG. 16

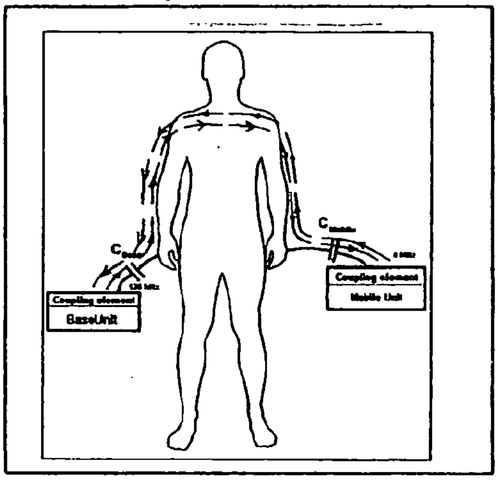


FIG. 17A

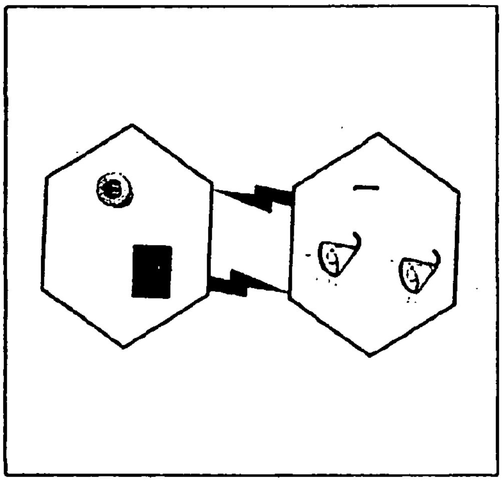


FIG. 17B

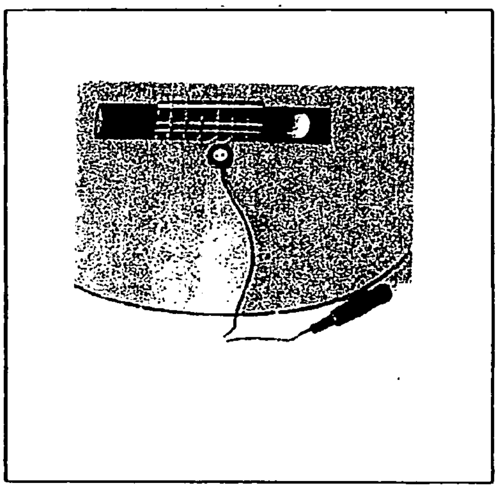


FIG. 17C

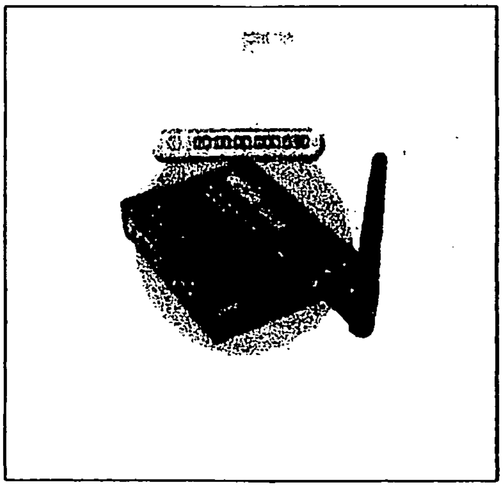


FIG. 17D

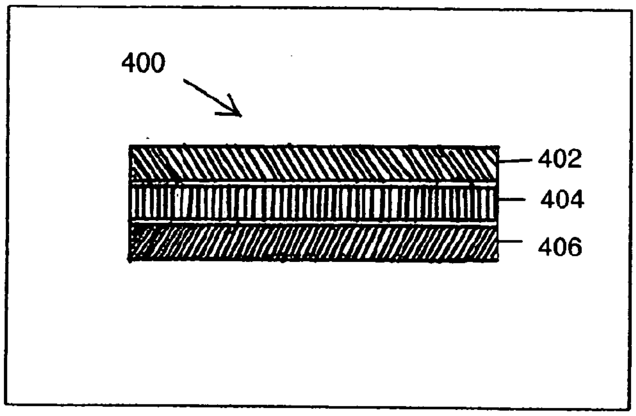


FIG. 18A

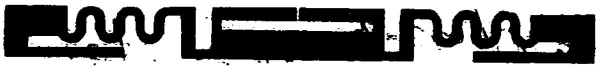


FIG. 18C

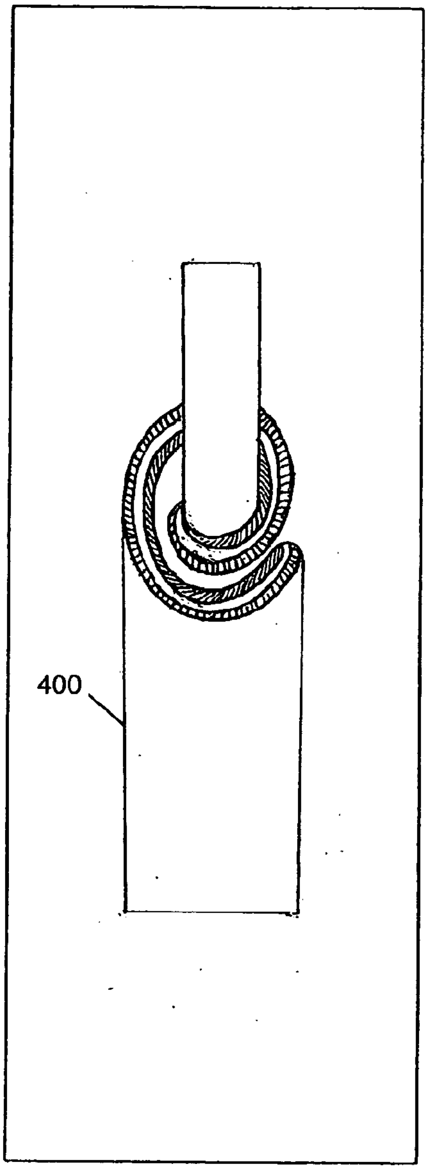


FIG. 18B

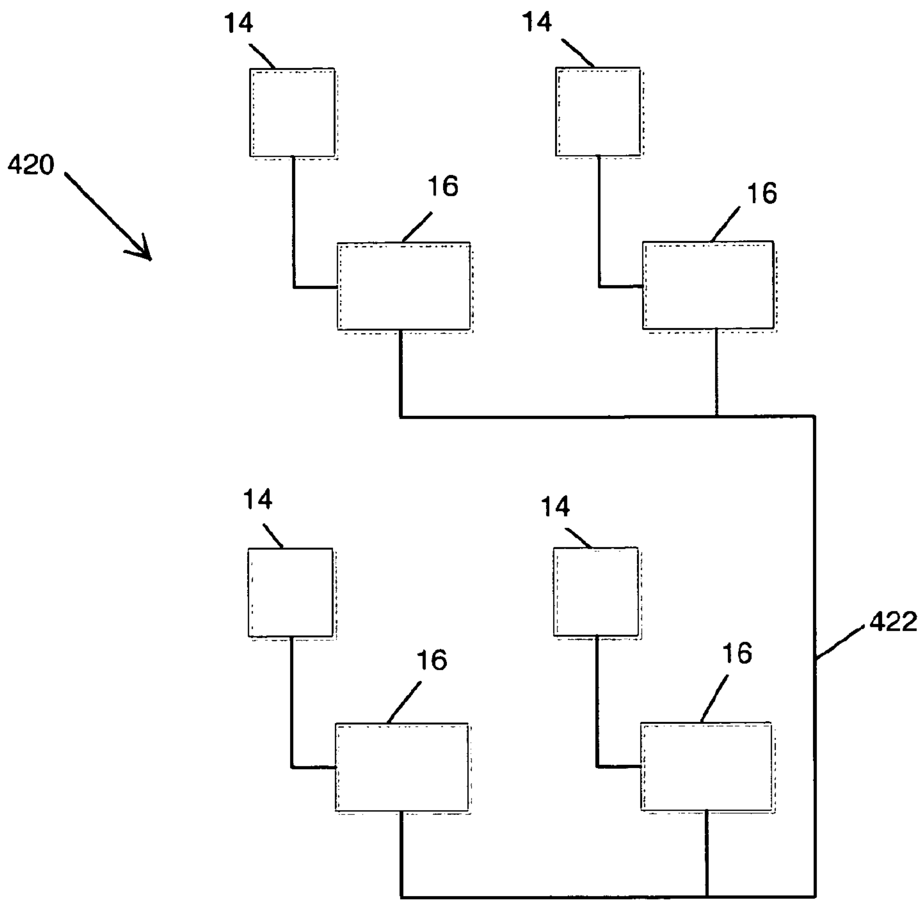


FIG. 19

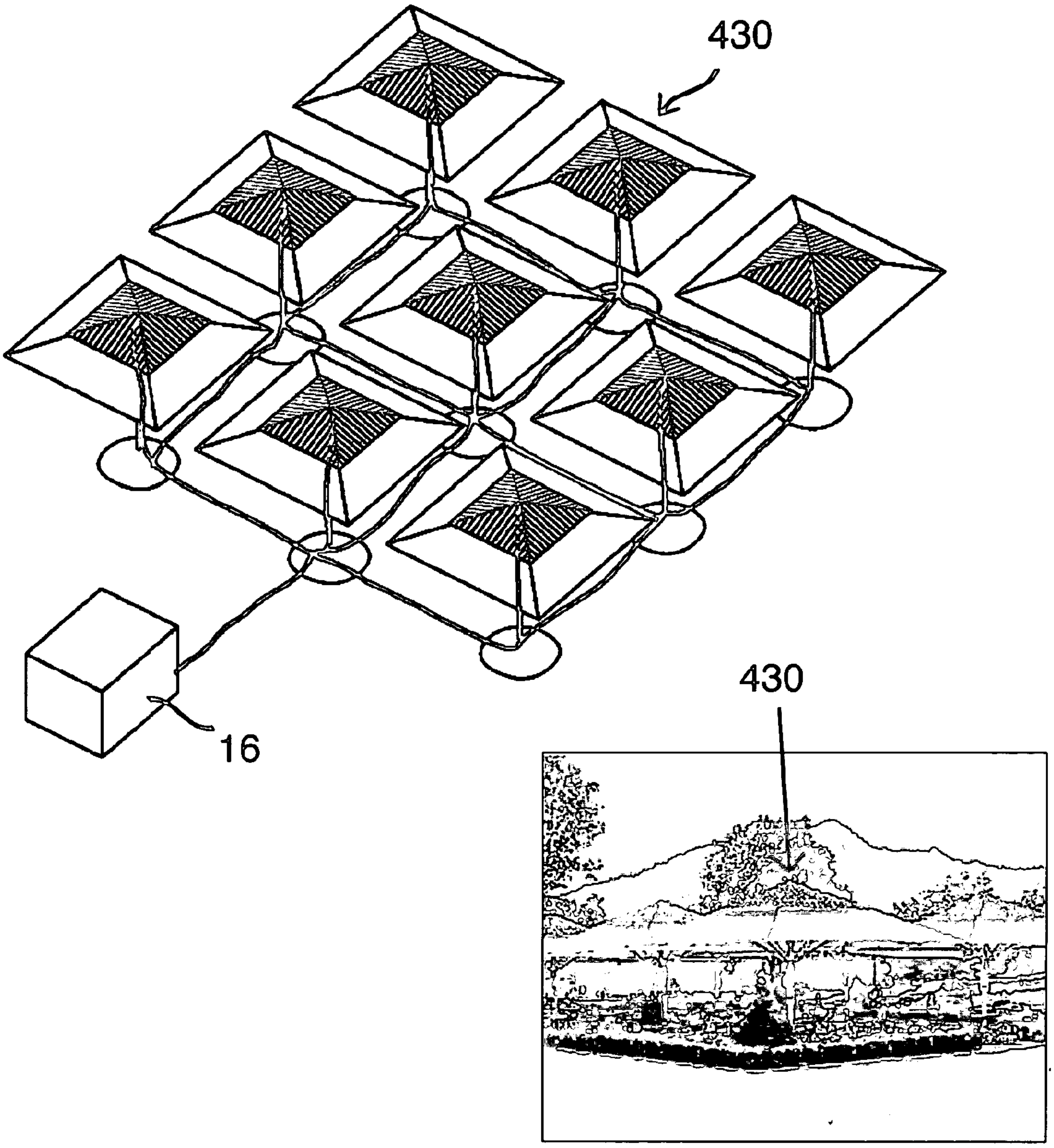


FIG. 20