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(54) **Transceiving satellitar terrestrial station, particularly suitable for movable stations**

(57) The transceiving satellitar terrestrial station, named MobSat, is usually installed on a two-wheel off-road trailer sturdy carriage. It has reduced dimensions and weight, is equipped to be also transported by helicopter, being organised to permit a soft landing. It can be remote controlled by satellite, fixed or mobile phone line, wireless and like. It is provided with sensors, magnetometer, inclinometer, GPS for measuring attitude and position. It optimises the automatic sighting procedure during the transmission. It permits every transceiving sat-

ellitar communication, including DVB, SATCOM, SNG, multimedia services, VOIP phone channels, xDSL broad band distribution, e-mail service (with on board server), files transfer, connection with informative systems, VLAN, multimedia files, videoconference, large amount of data to the fixed network, restoring and increasing GSM/GPRS connections with inner radio bridge. It generates electric power necessary for its operation. It can be removed from the carriage to become a fixed station. Presence of an operator is not required.

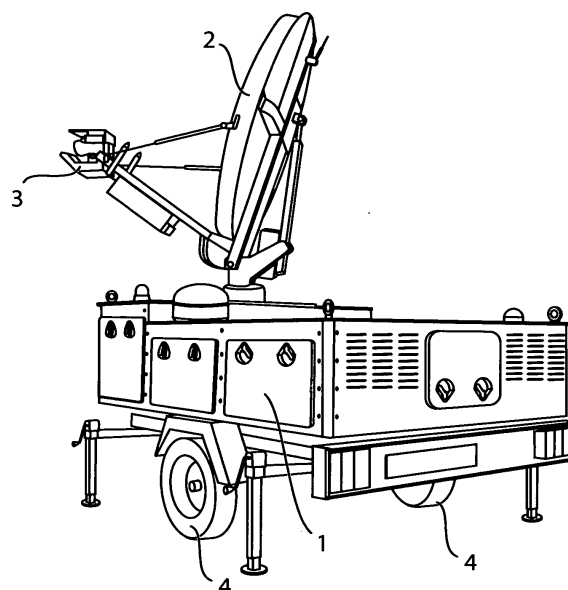


Fig. 1

Description

FIELD OF APPLICATION

[0001] Inventors begin their specification giving some information to the invention for a transceiving satellitar terrestrial station, specifying that the presently preferred but not limitative application field, is that of bi-directional earth - satellite telecommunication. A field where, for nowadays community needing, it is important progressively expanding communications among individuals, nations and continents to satisfy the growing request, but it is even more important that in case of sudden necessity, in every place and condition, said communications are immediately restored. Main part of information, commercial phone communications and other informatics data deemed to be of vital importance run in an analogical or digital form through a dense network of terrestrial connections by phone cable, optic fibre or other kind of connection. In other words, all sensible connections are easily interrupted. These are some of the reasons comprising the main object of the present invention aiming to an easy transportation.

DESCRIPTION

[0002] Present invention is included within the general field of satellitar communications and refers to a complex and ambitious applied search project by which the inventive solution has been developed. It concerns the industrial realisation of a powerful transceiving apparatus for earth - satellite communication that, being particularly of reduced sizes and with a limited weight, permits reaching the required result, i.e. easy transportability. The solution by which the whole apparatus of the Mobile Satellitar station, including the parabolic antenna, can be installed and perfectly fixed on a small two-wheel standard carriage, suitably fitted and designed, permits a fast and easy transportation by every road vehicle with a towing hook. Carriage is homologated for freely circulating even on roads where it is usually not permitted passing with weight and bulky satellitar communication systems. Mobile Satellitar station and two-wheel towing carriage assembly, designed separately, then developed and assembled, are the ideal solution for quickly facing both the request of a stable or temporarily station, for technically solving every needing for communicating from every impervious position using every orbiting satellite.

[0003] Structure of the transceiving satellitar Mobile Satellite Station apparatus has been designed for obtaining the possibility of managing different missions at the same time. All the units comprising the basic apparatus, i.e. paraboloid, radiofrequency, as well as electric power generator, respect the strictest automation and reliability requirements according to MIL.HDBK.217. The whole system is automatic and for every configuration needing, it can be manoeuvred and obtained by radio remote control.

[0004] As to a possible stable station, also Mobile Satellite station contributes to the evolution of terrestrial communication structures, providing broadband connections, the services of which are deemed to be politically strategical. Mobile Satellite Station sustains and increments economic competitiveness level in order to accelerate transition of small and medium enterprises toward new business models. All the above is economically possible due to the low cost of a small but powerful system, Mobile Satellite Station, having the same performances of first and second generation large apparatuses.

TECHNICAL FIELD

[0005] Main problem to be solved, and not solved until today, but with a large request, is easiness of transportation of every satellitar station. At present, analysing the existing national and international solutions, it is not known the existence of a small station having full and high features as those offered by the solution according to the present invention. The present invention, also named MobSat Station, can very well be compared with large fixed terrestrial stations, characterised by a large weight and large paraboloids that cannot be moved. In other words, it is known to every body that transportable satellitar stations installed on medium and large displacement vehicles are widely used and are usually employed by on-board personnel for sport and other actuality events. None of these motorised stations could be transported e.g. by a helicopter in order to solve civil and military needings, with particularly complies operative scenarios, as it is possible by the inventive solution. An accurate search within the national solutions has evidenced the existence of only two companies that could compete with the present invention solution. No solution similar to the inventive MobSat Station exists.

1) a first Italian Company offers a transported satellitar station with separated units on-board a medium displacement vehicle with a compact and integrated unit by UP-Link Satellitar DVb and VSAT, with some flexible solutions for the user, but requiring the presence of at least two operators. One operator for direction and another one for manoeuvring the antenna system. It is particularly a system useful for TV networks and ISP. Multicamera systems with on-board direction, Mpeg4 playout and streaming services and DSNG and multimedia services.

2) a second Italian Company offers, since 2002, a satellite antenna system, named "Shot Antenna VSAT 1.8 Mt MediaNET", offering bi-directional satellitar connection. It can be observed that the so called "transportable" portion is destined only to the parabola, while the whole ODU electronic unit, that is heavy and bulky, is housed within a large covered vehicle, such as a roulotte or caravan, wherein more than 1 person can stay. Inventors deem that said dimensions of the vehicles cannot ensure a fast eco-

conomic use everywhere and with every condition as it is possible with the MobSat station. The most interesting part of the ODU system, is the coupling between the high performance parabolic antenna and ODU unit, comprised of a high gain receiving LNB and of a SSPA, available with different powers and configurations. These are only performances that, even very good, cannot be claimed since available to the public since many years and making part of the known technique.

3) two systems have been individuated abroad, that could in some way compete with the inventive solution. The first one is known as PRARE, realised on 1995 by Dornier GmbH, Nortel, Dasa GmbH, Friedrichshafen, and substantially is comprised of a parabolic plate with a diameter of 60 cm, fully movable in azimuth and in vertical directions (weighting 42 kg) and of the electronic part (weight about 35 Kg). It is substantially a simple but scarce system comprised of two or three elements, without power generator, that must be transported by the man, assembled *in situ*, and continuously manoeuvred, surveyed and protected.

The second foreign system, 50 of which have already been realised in US, is named LEOLUTs ate USM-CC. It is a mobile LUT with support operative apparatuses (OSE). It is housed within a van, occupying 100% of the passenger space, and the remaining part is housed within a four-wheel trailer. The whole LUT system, which is heavy and bulky, has been realised to be transported on board a cargo airplane in US and then quickly used all over the world, as in large free spaces present in US or in other war zones, but surely not in those lands where a complex orography exists as in Italy and Europe.

4) finally, searching among international patents, by the database of the Italian Patent and Trademark Office, has not revealed patented solutions to be compared with the present invention. Using the keywords "earth satellite station" among the most remarkable fixed stations it has been individuated only the US patent n° 4172257, having title "Antenna of the ground station for satellite telecommunication systems". Reading the abstract, it is clear that it is a mechanical improvement of the ground antenna parabolic sighting performances, and not a full system to compete with MobSat station.

SPECIFICATION OF THE INVENTION

[0006] After having described the drawbacks of the known art, mainly due to the difficult transportability of the different sizes terrestrial stations, it will described the present invention, underlining the most important features of the innovative elements comprising the inventive solution:

- The inventive solution, named MobSat Station, has

been suitably realised to overcome the problems of the known solutions, which are expensive, bulky and that is difficult positioning;

- Under the technological point of view, the invention overcomes the old solutions and has been developed in view of a concrete market foreseen able to replace the fixed stations, both as retrofitting and new systems;
- It can be noted from the photos that the inventive solution uses an helicoidal parabola with small diameter of 100 x 120 cm with respect to the stations employing very big parabolas. It would seem a limitation, but it is not. In fact, it is today possible realising illuminators, heads and satellitar receivers having, with respect to the previous models of the ninety's, much higher sensitivity and immunity. This is due also in view of the remarkable improvement of the signal/noise ratio of MobSat station;
- Besides the above performances of the MobSat Station, having reduced weight and dimensions, inventors have not ignored other important particulars, such as:

- saving;
- autonomy with electric power motor-generator;
- thermal conditioning of apparatuses;
- hooks for lifting and/or transportation by helicopter;
- air or gas cushion for soft landing.

[0007] All the above represents the most important basic structure of the inventive solution and having ascertained that no known patent, system of method have the same inventive features, thus in the following will be described by photos and drawings the details necessary to easily understand and realise the inventive solution.

DESCRIPTION OF THE OPERATION ACCORDING TO THE FIGURES

[0008] The present invention is now described on the basis of its operation and on the basis of the figures clearly showing the basic solutions comprising the assembly that, in view of the technical teaching summarised and set forth in the present description, so that one skilled in the art can easily realise the inventive solution.

FIGURE 01. It is the main figure of MobSat Station showing the full apparatus with the lifted antenna open, ready for operation. It is possible individuating: basic apparatus 1 containing all operation modules and apparatuses: parabolic antenna 2 open, with illuminator 3: a special two-wheel towing carriage for transportation 4.

FIGURE 02. It shows the whole apparatus 1 on the carriage 4 with the antenna 5 closed. Carriage is hitched for transportation to a small displacement vehicle 6.

FIGURE 03. It shows the technical realisation drawing 7. Dimensions and weight of the apparatus with antenna are indicated.

FIGURE 04. It shows the door open to access the control synoptic panel module 8 for general operation setting.

FIGURE 05. It shows the door open and ACU (Antenna Control Unit) module 9 for controlling antenna.

FIGURE 06. It shows the door open and module known as RF Combine & Power" 10 for managing radio frequency signals.

FIGURE 07. It shows the door open with the standard rack space 11 empty for containing user modules and apparatuses.

FIGURE 08. It shows the conditioning system 12 for maintaining uniform the inner temperature of apparatuses with respect to outside temperature.

FIGURE 09. It shows the electric power motor-generator 13 that, in case of lack or of sudden fall of main power, it is sufficient for the MobSat station. Including other modules, apparatuses and tool for user.

FIGURE 10. It shows the large fuel reservoir 14 for electric power motor-generator 13.

FIGURE 11. It shows one of the hooks 15 for *in situ* lifting by crane or helicopter transportation for imper-vious installation.

FIGURE 12. It clearly shows that basic apparatus 1 is installed on a standard carriage, suitably designed. It is also noted the automatic telescopic rod 16 that can be vertically installed by the user for the possible earth/earth communications. Carriage is equipped with suitable stabilizers 17 to obtain rigidity of Mob-Sat Station flat and to maintain the sighting of parabolic antenna 2. Inventors declares that "antishock absorbed" and a suitable self-inflatable air or gas cushion are installed in not shown background of apparatus 1 for soft landing.

FIGURE 12. It shows the technical synoptic control panel 18, where all the possible general operation settings already described for installed module 8 are shown.

[0009] Now, inventors, will shortly describe some features of the invention that are deemed important and that must be protected and claimed:

- the system is substantially comprised of a basic apparatus 1 unifying in a single container all the modules for necessary functions, including a suitable electric power motor-generator.
- Basic apparatus, parabolic antenna 2 and carriage 4 comprise an assembly the utility of which is an original invention for an indivisible operation and transportation, without detached parts, easy and ready to use.

[0010] For a better explanation, it is concluded that fig-

ures, drawings and descriptions have indicated the most significant parts, and indicated for sake of simplicity, the use of standard components or what is necessary, have been used for setting forth the operation principle of the present invention. The inventive solution is in any case claimed even if different components or other systems are used, including different terminology and different values of the supply tension and frequency with respect to the standard values indicated on labels and use manual. Text of use manual, enclosed to every apparatus, is subjected to possible modifications only by the manufacturer. Every text is given only for time exemplificative purpose to make installation easier and every modification made by a third party does not give him the right to make claims or to exploit the invention without a specific authorisation.

Claims

1. Transceiving satellitar terrestrial station, particularly for transportable stations, comprising:

a basic unit (1), having an upper surface substantially flat, said basic unit (1) being provided with a plurality of spaces for containing a plurality of modules for operation and energetic autonomy of said satellitar terrestrial station;

a parabolic antenna (2) provided with the relevant illuminator (3) for transceiving radio signals; articulated mechanical means connected with said parabolic antenna (2) and with said upper surface of said basic unit (1) suitable to permit closure of said parabolic antenna (2) and of said illuminator (3) so as to have a reduced dimensions;

coupling means (15), provided on said upper surface of said basic unit (1) by which said satellitar terrestrial station can be lifted and transported *in situ*; and

tired towing means (4), e.g. a carriage, on which said basic unit (1) is fixed, permitting ground transportation of said station.

2. Transceiving satellitar terrestrial station according to claim 1, **characterised in that** said towing means are comprised of a carriage (4) that can be hitched to a vehicle (6); and **in that** it comprises a synoptic panel module (8), installed in said basic unit (1); one or more containment spaces (11); a conditioning system (12) for cooling parts contained within said basic unit (1); a fuel reservoir (14) for containing fuel to supply an generator set; a telescopic rod (16); stabiliser (17) for obtaining rigidity of transceiving satellitar terrestrial station on a plane and maintaining sighting of the parabolic antenna (2); and a scheme of the "Energy Distribution Apparatus" synoptic module (18).

3. Satellites terrestrial station according to one of the previous claims, **characterised in that** it comprises an antenna control module ACU (9) by which antenna is piloted to make the required movement until reaching the chosen satellites receiving calculated point.
4. Satellites terrestrial station according to claim 3, **characterised in that** said antenna (2) control ACU module (9) can also receive level signals for continuously making automatic search of maximum receivable signal for optimisation and maintaining sighting.
5. Satellites terrestrial station according to one of the previous claims, **characterised in that** attitude and stability of antenna (2) are independent from geographical position of the station.
6. Satellites terrestrial station according to one of the previous claims, **characterised in that** carriage (4) comprises suitable stabiliser (16) suitable to maintain rigidity of the station along a plane and sighting of the parabolic antenna (2).
7. Satellites terrestrial station according to one of the previous claims, **characterised in that** antenna (2) opening and storage (5) operations are fully automatic.
8. Satellites terrestrial station according to one of the previous claims, **characterised in that** it comprises a synoptic panel (8) by which it is possible setting automatic electric supply means; said automatic electric supply means comprising a battery, a motor-generator (13) and a direct electric main.
9. Satellites terrestrial station according to claim 8, **characterised in that** all the power sources are automatically switchable without jeopardising operativity of telecommunications.
10. Satellites terrestrial station according to one of the previous claims 8 or 9, **characterised in that** said synoptic control panel (8) can be remote controlled for making actuations and taking all the general information of the station condition, including the used power supply, fuel level and working temperatures.
11. Satellites terrestrial station according to one of the previous claims, **characterised in that** it comprises a radio frequency module or "RF Combiner & Power" module (10), that can be remote controlled for monitoring and diagnostic radio frequency level and control.
12. Satellites terrestrial station according to claim 11, **characterised in that** said radio frequency module or "RF Combiner & Power" module (10) for managing radio frequency signals can be remote managed for realising all the satellites connections, including the telephone, WiFi and similar connections.
13. Satellites terrestrial station according to one of the previous claims, **characterised in that** it has a physical architecture organised on a single level only so as to be easily transportable, being comprised of the basic unit (1) group with modules and fittings and of a fully open (2) or stored (5) parabolic antenna, the whole unified and assembled on a two-wheel transportation carriage (4).
14. Satellites terrestrial station according to one of the previous claims, **characterised in that** it is provided of set connections for camera, lights, tools and accessories.
15. Satellites terrestrial station according to one of the previous claims, **characterised in that** it comprises an air or gas self-inflatable cushion provided on the bottom of said basic unit (1) to permit a soft landing.
16. Satellites terrestrial station according to one of the previous claims, **characterised in that** it comprised antishock supports for absorbing vibrations, said basic unit (1) resting on said supports when placed on said tired hitching means (4).
17. Satellites terrestrial station according to one of the previous claims, **characterised in that** said coupling means comprise two or more hooks (15) for permitting lifting and transportation by helicopter.
18. Satellites terrestrial station according to one of the previous claims, **characterised in that** it is comprised of a single unit comprising all the components necessary to unify the different functions and performances.
19. Satellites terrestrial station according to one of the previous claims, **characterised in that** it is realised in such a way not to have any divided part.
20. Satellites terrestrial station according to one of the previous claims, **characterised in that** said basic unit (1) and said tired hitching means (4) are integral each other, thus realising a single assembly.
21. Satellites terrestrial station according to one of the previous claims 1 - 19, **characterised in that** said basic unit (1) and said tired hitching means (4) are integral each other, so that said satellites terrestrial station can be also configured and installed as stable telecommunication transceiving satellites terrestrial station.
22. Satellites terrestrial station according to one of the

previous claims, **characterised in that** it can be used both in the earth/satellite stable communications and in emergency cases.

23. Satellites terrestrial station according to one of the previous claims, **characterised in that** it can be remote controlled by satellite, fixed or mobile phone line, wireless and similar systems and **in that** it comprises detection means, such as sensors, magnetometer, inclinometer, GPS, to permit measuring attitude and position. 5 10
24. Satellites terrestrial station according to one of the previous claims, **characterised in that** it permits every transceiving satellites communication, including DVB, SATCOM, SNG, multimedia services, VOIP phone channels, xDSL broad band distribution, e-mail service (with on board server), files transfer, connection with informative systems, VLAN, multimedia files, videoconference, large amount of data to the fixed network, restoring and increasing GSM/GPRS connections with inner radio bridge. 15 20

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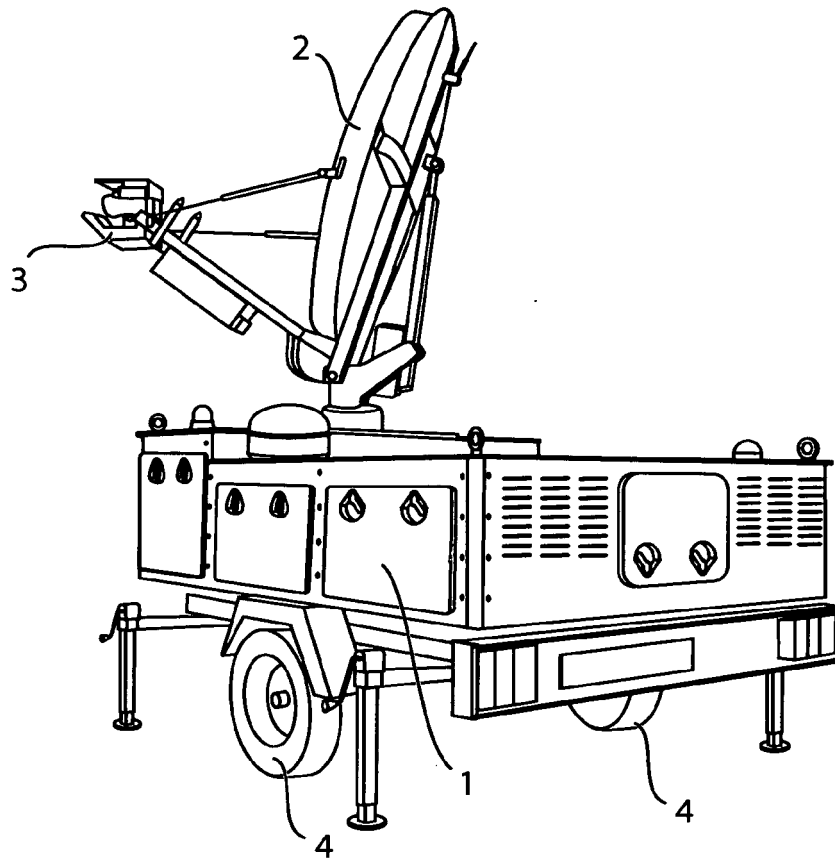


Fig. 1

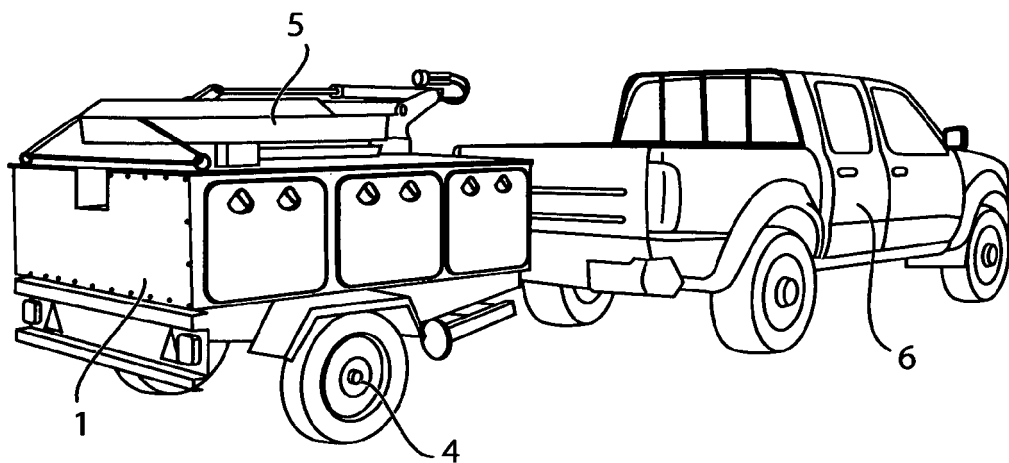


Fig. 2

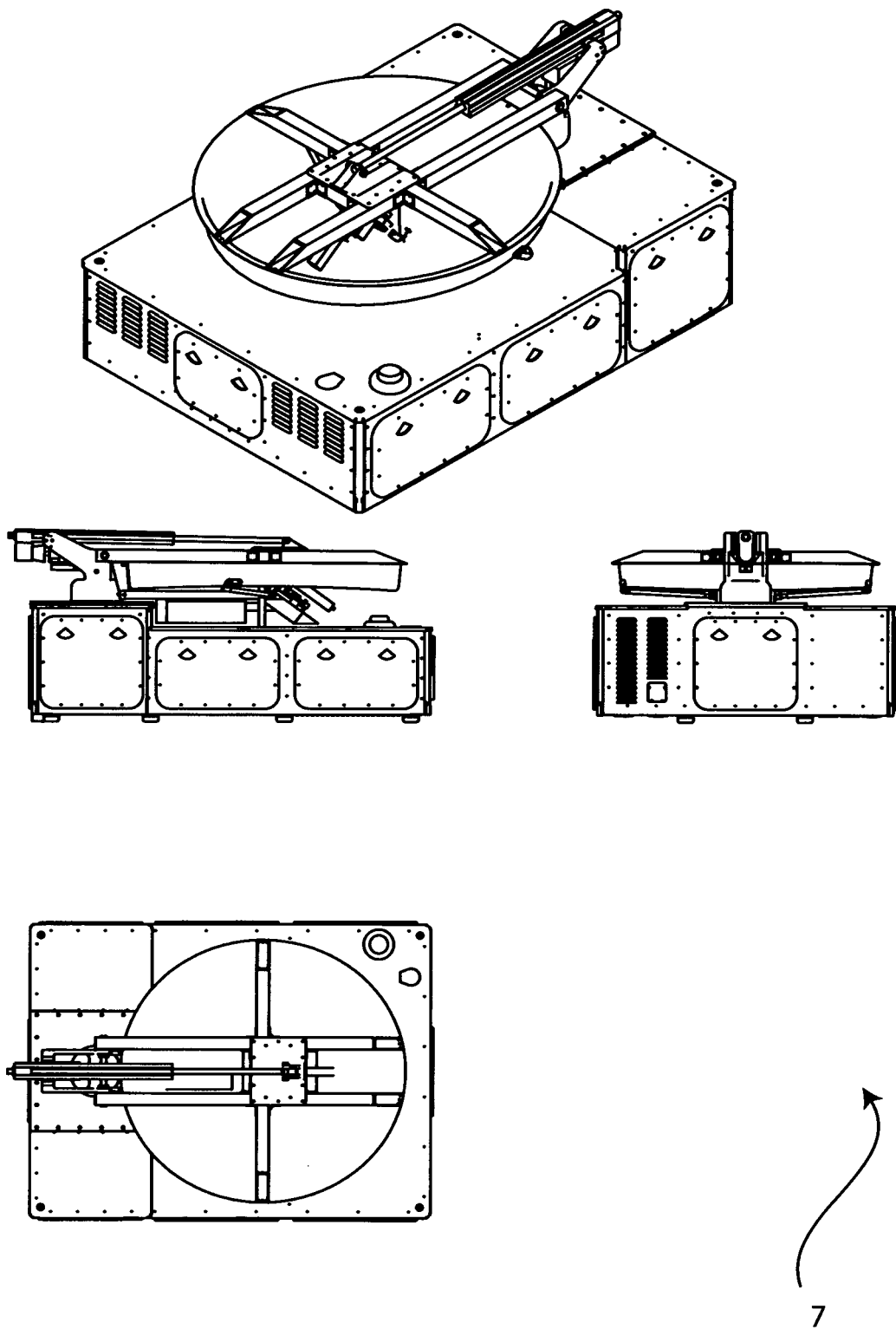


Fig. 3

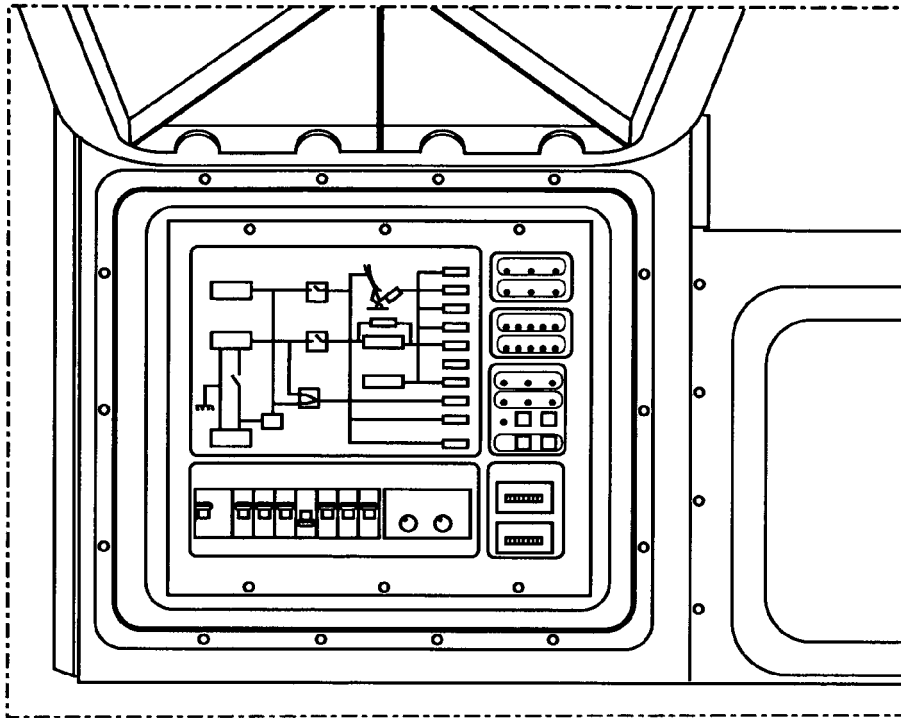


Fig. 4

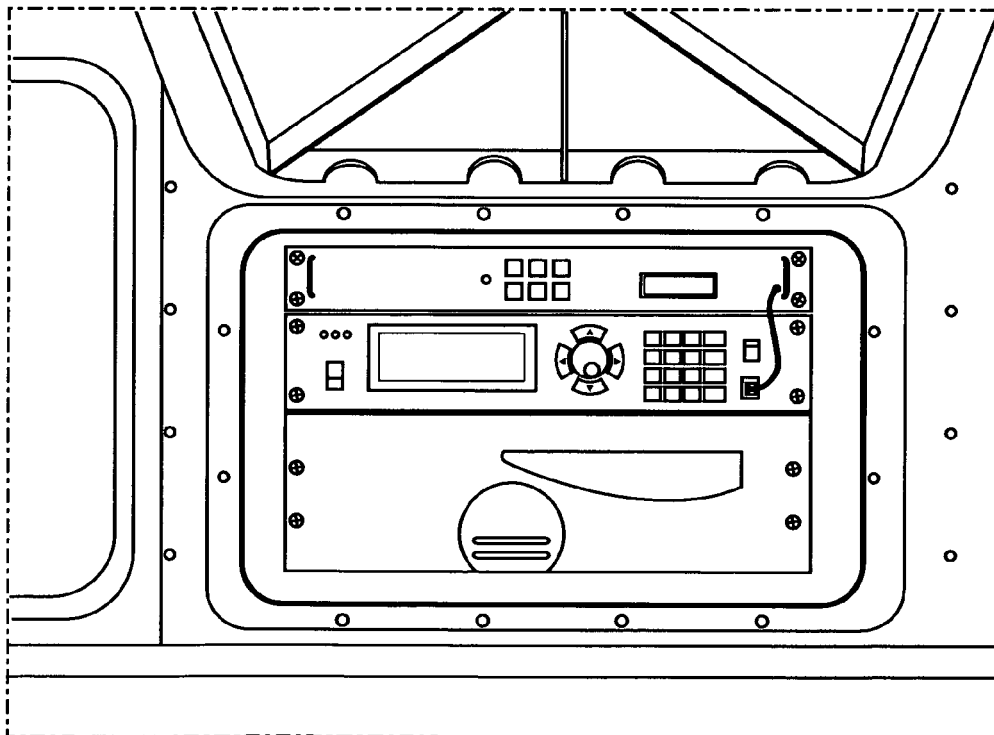
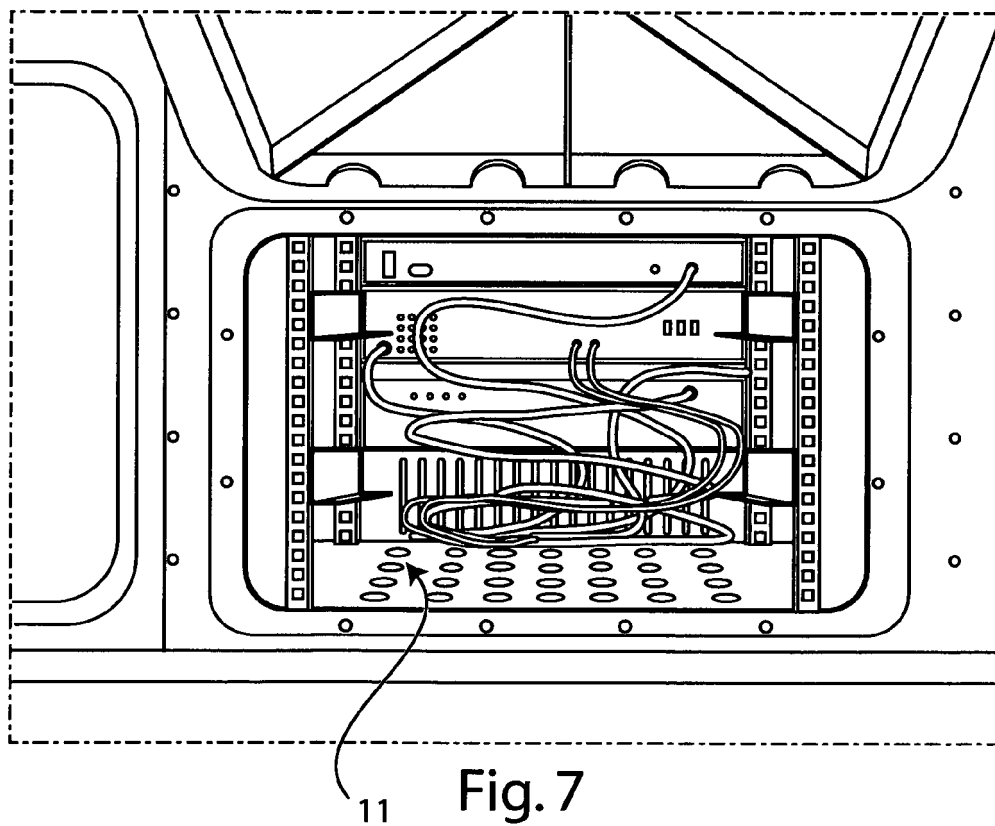
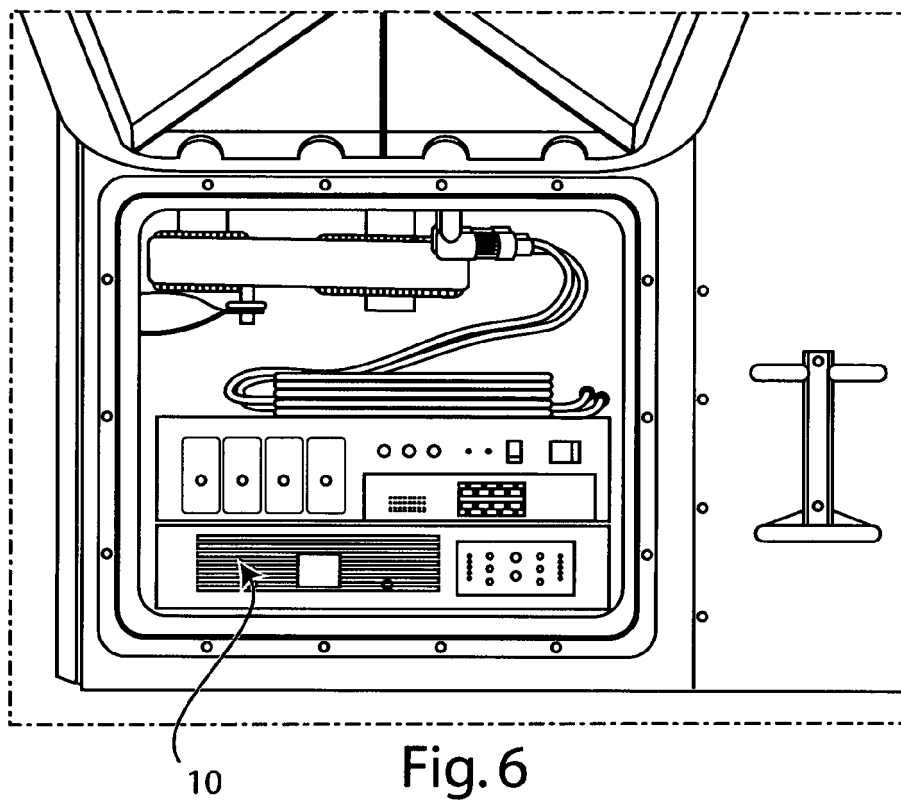


Fig. 5



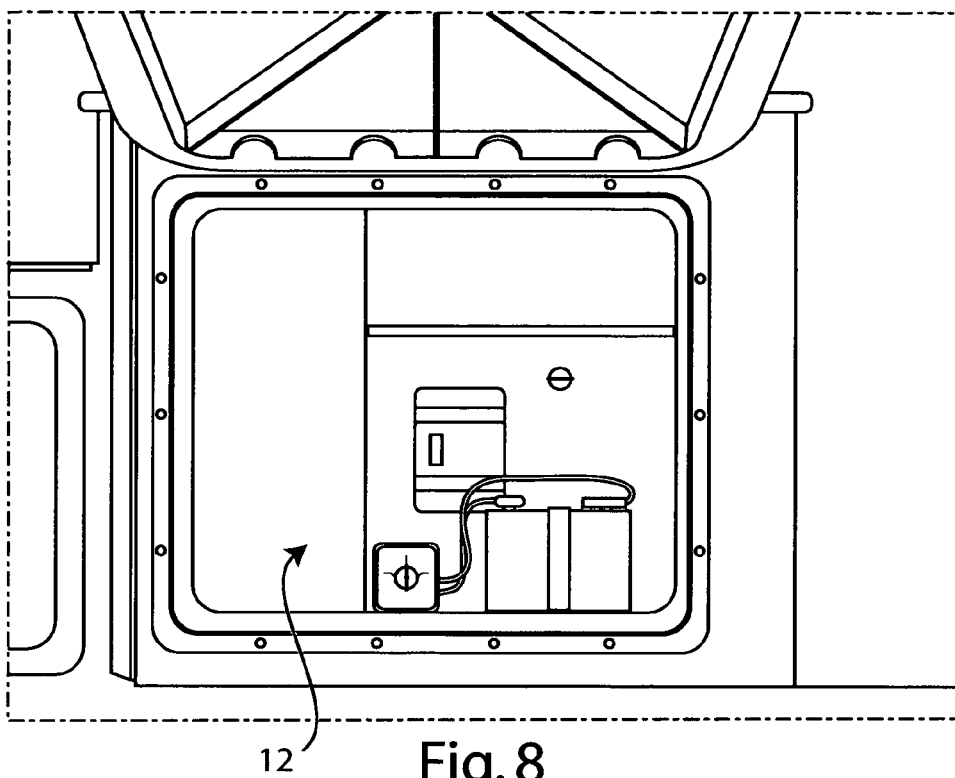


Fig. 8

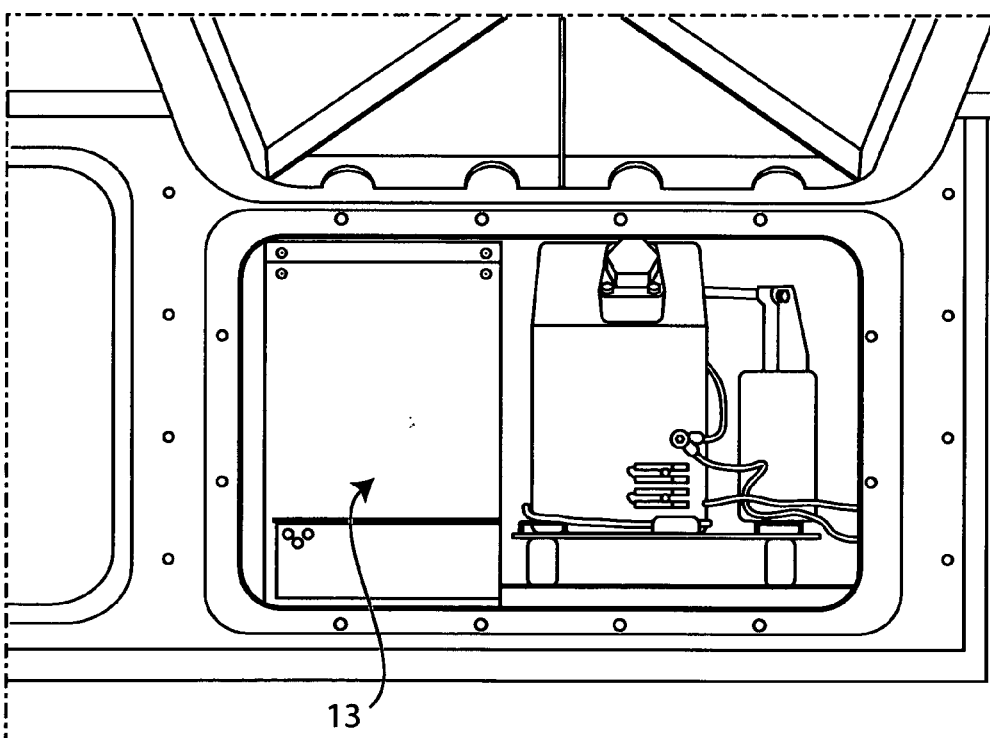


Fig. 9

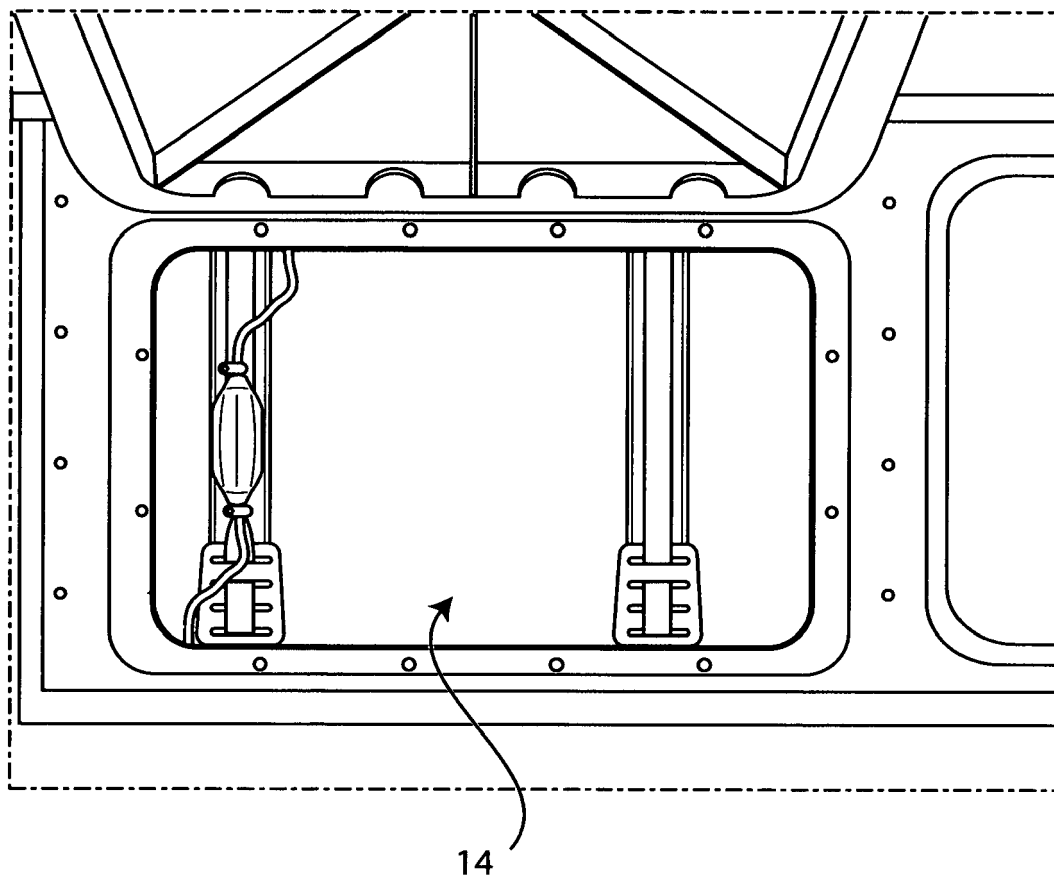


Fig. 10

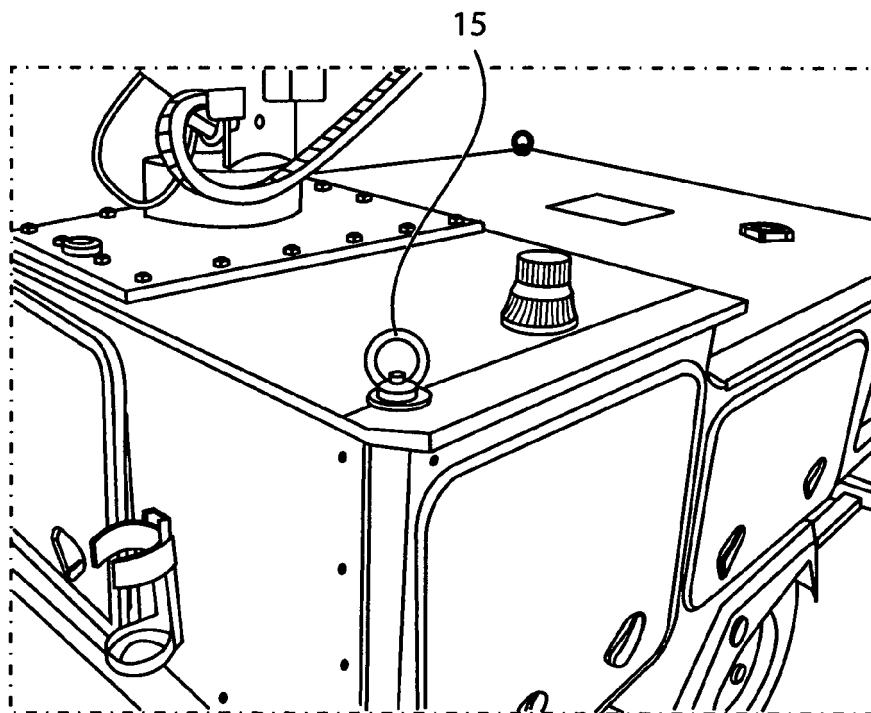


Fig. 11

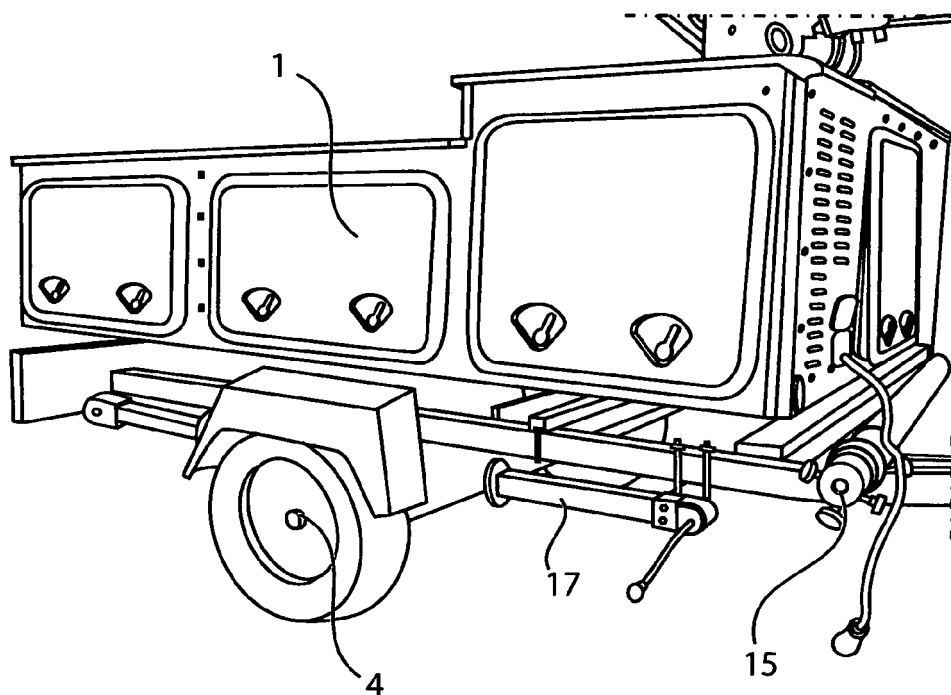


Fig. 12

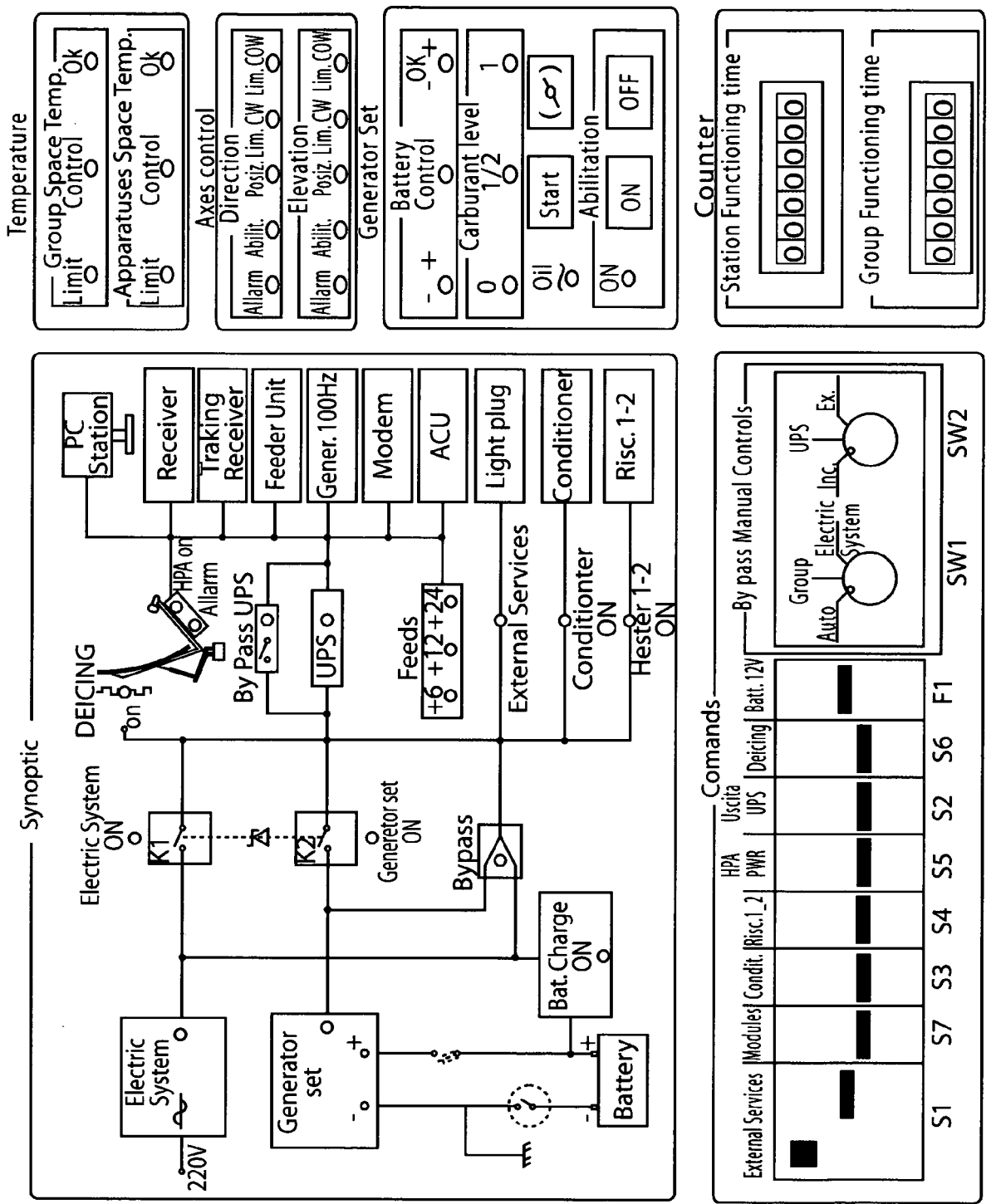


Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4172257 A [0005]