(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 031 681 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.08.2000 Bulletin 2000/35

(51) Int Cl.[7]: **E04H 12/00**

(21) Application number: **99830096.6**

(22) Date of filing: **23.02.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **CODRA MEDITERRANEA S.r.l.**
85100 Potenza (IT)

(72) Inventor: **Cartolaro, Francesco**
73100 Lecce (IT)

(74) Representative: **Sarpi, Maurizio**
Studio FERRARIO
Via Collina, 36
00187 Roma (IT)

(54) Environment-friendly rapid-installation sighting tower

(57) The present invention relates to sighting and observation towers with particular reference to towers for sighting forest fires.

The tower consists of three essentially rectilinear beams or pillars of preimpregnated laminar wood projecting from the ground. Such beams, which can be made of one-piece or composite members with suitable shape, are provided with couplings and are arranged essentially as a pyramid provided with suitable guy ropes. They supports a raised platform provided with a cover (10) against bad weather and hot sun.

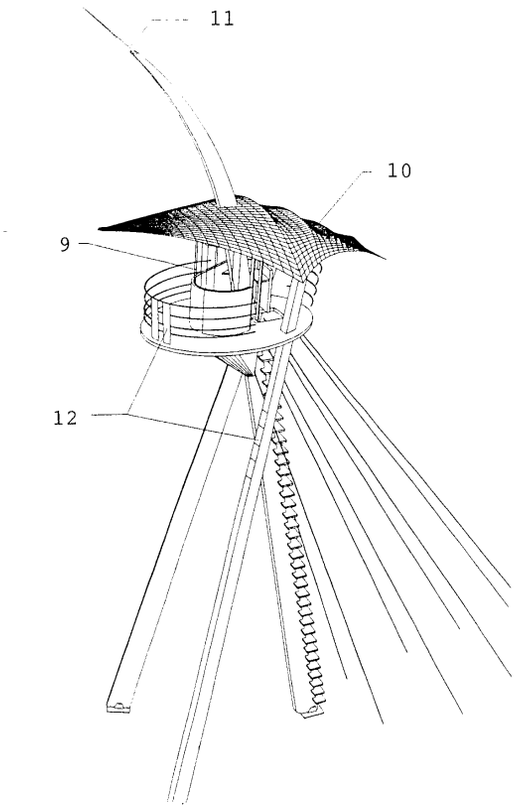

FIG. 16

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Description

[0001] The present invention relates to sighting and observation towers with particular reference to towers for sighting forest fires.

[0002] Current sighting towers with middle-high height are made of steel or concrete. Even if such constructions are practical, they have high cost in terms both of materials and installation and above all maintenance. Moreover, the sighting towers of the above-mentioned type are not environment-friendly as they do not match at all the territorial environment where they are installed.

[0003] A first object of the present invention is to provide an environment-friendly construction that matches the surrounding environment, mainly national parks, forests, and naturalistic areas and beaches.

[0004] Another object of the invention is to provide a modular, lightweight, readily installed sighting tower that can be easily used with reduced cost of maintenance and installation.

[0005] According to the invention the tower consists of three essentially rectilinear beams or pillars of preimpregnated laminar wood projecting from the ground. Such beams, which can be made of one-piece or composite members with suitable shape, are provided with couplings and are arranged essentially as a pyramid provided with suitable guy ropes. They supports a raised platform provided with a cover against bad weather and hot sun.

[0006] Such a construction is designed for the sighting both by an operator and the use of technology such as remote sensing systems and rests on fully buried small-size concrete foundation plinths to which it is connected by anchor means consisting of a plate and a counterplate. In addition, the construction has remarkable characteristics of flexibility and may have a height of 3 to 25 m as needed.

[0007] According to its characteristics the construction can be widely used, for example, as bird watching, sea watching, beach watching, fire sighting, watching of wide areas or sport grounds, etc.

[0008] A better understanding of the invention will ensue from the following detailed description with reference to the accompanying drawings that show some preferred embodiments by way of a not limiting example.

[0009] In the drawings:

Fig. 1 shows the arrangement of the ground couplings to be prepared for the sighting tower according to the invention;

Figs. 2 to 10 show the following tower assembling steps;

Figs. 11 and 12 are bottom and top perspective views, respectively, of an embodiment of the invention with an intermediate platform and an equipped shelter at the base;

Fig. 13 is a top view of a tower provided with an intermediate platform according to the invention;

Fig. 14 is a perspective front bottom view of a tower according to the invention having only the sighting platform;

Fig. 15 shows a tower with two intermediate platforms and an equipped shelter; and

Fig. 16 is a perspective view of the tower of Fig. 14 showing the arrangement of solar panels.

[0010] With reference to the figures the construction of sighting tower 1 has a very particular, novel shape capable of matching the environment in which it is installed but at the same time having remarkable characteristics of identification and localization. The beams of the tower run along the corners of an isosceles or equilateral triangular pyramid, the two beams 2 being equal to each other and the third beam 3 being opposite to the former.

[0011] As already mentioned, the material used is preferably laminar wood both for environment-friendly purposes and a variety of technical reasons such as the light weight and the many-purpose use that give the construction the possibility to be made in factory with a number of geometric shapes without any restraint of length and to assemble the same on site as well as to guarantee a cheap transportation.

[0012] In the preferred embodiment disclosed the three beams or pillars are made of class 1 laminar wood according to DIN 1052 stuck by impregnating, transparent and/or coloured resorcinol glues according to DIN 68800.

[0013] The height of the disclosed sighting tower 1 may advantageously be changed by varying the position of central beam 3, i.e. shifting the same forward and/or backward and securing it to further, properly arranged anchor means 13 so that the apex angle of the pyramid formed by the three carrying beams 2 and 3 is changed. A horizontal sighting platform 4 located near the top of the carrying structure is accessible through a ladder 5 running from the base of the single central carrying beam 3 opposite to the two side beams 2.

[0014] In constructions higher than 10 m, ladder 5 is provided with rest platforms 6 every about 5 metres and the user is prevented from falling down by a shoulder protection cage over the whole height of the ladder as well as handrails and banisters 7 at each half space and platform 4. The latter made of laminar wood for scaffolds can be reached through a trapdoor at the end of ladder 5.

[0015] A cab 8 for the operator having a carrying structure of laminar wood is placed above such platform

4 and is provided with laminated panels formed of outside layers of wood and inside layers of insulating material as well as transparent panels 9 of polycarbonate that guarantees optimum technical performances particularly as far as light weight and anti-breaking property is concerned.

[0016] Platform 4 and cab 8 according to the invention are protected from the sun by a light cover 10 made of a material having a differentiated permeability such as a non-woven fabric of the type used in agriculture for the nets, microperforated PVC, or a membrane of treated fire-retarding polyester fabric coated with PVC. Thus, shadow is provided and sail-effect is avoided, and at the same time humidity and the consequent mould is reduced.

[0017] The top of sighting tower 1 is formed with a yard 3A, at the highest point of which an antenna and/or a lightning rod 11 is installed.

[0018] The power supply is provided by a solar energy system capable of make the construction self-contained. Such a system has a number of solar panels 12 placed on banisters 7 of the platform and/or on the three beams 2 and 3. A little generating set capable of supplying the tower with the power needed in case of emergency or when the solar energy is not enough in case of particular weather conditions is associated to the solar energy system. The tower may also be supplied with power by conventional systems if it is possible to connect it to the power mains in the area of installation.

[0019] As far as useful life and maintenance is concerned, it should be appreciated that the tower is treated by an impregnating agent to block the wood decomposition process. Under these conditions the life of the tower is guaranteed for 30 years without any maintenance intervention. However, if an ordinary maintenance program consisting of a wood treatment with suitable protection paints every 5 years is carried out, the life of the tower is theoretically unlimited. According to a further peculiar feature of the invention, the sighting tower has a differentiated fire resistance: at the base, where the possibility of a direct contact with fire is higher, the carrying beams are sheathed with wood panels having a thickness of 7,5 cm which increase the fire resistance to 180 minutes. The remaining part of the tower has a fire resistance of 120 minutes.

[0020] In order to prevent the base of the tower from undergoing vandalic acts by cutting tools such as saws, crosscut saws, hatchets, etc., the sheathing of the base for increasing the fire resistance is additionally covered by an outside layer made of steel sheet for preventing the material from being cut. A further protection from vandalic acts and intrusions of unauthorised persons consists of removing the steps of the ladder to the sighting platform. The inaccessibility of such platform can be further enhanced by providing a safety lock for the trapdoor. Additionally, an acoustic alarm against effraction and/or vandalic acts is also provided.

[0021] Another important environment-friendly aspect of the invention is that, in the unfortunate case of fire, the total destruction of the tower does not leave at all traces of its former presence. To this end, the tower is made of materials that are completely consumed after having exceeded the predetermined endurance time so that it is no longer needed to provide heavy vehicles at the site of installation to remove the relict construction.

[0022] The cheap transportation and the easy assembling of the tower at the site of installation are further peculiar, novel features of the invention essentially consisting of a sectional structure. In addition, the little number of assembled components requires less transport vehicles at the site of installation with the consequence of a greater care of the environmental conditions.

[0023] In case of a construction with a height h=15 m, the tower has an upper platform and two intermediate platforms. The assembling components include a number of laminar wood pieces and a plurality of fittings. The assembling components of laminar wood are:

- No. 3 essentially rectilinear shaped beams provided with couplings and having a preferably tapered, rectangular section of 30x90 cm (base) and 30x60 cm (top);
- No. 6 horizontal stiffening struts at the height of 5-10 m having a rectangular section of 24x30 cm and included in the rest platforms;
- No. 3 fire protection coverings of the base up to the height of 5 m;
- No. 2 rest platforms with a thickness of the scaffold of 7,5 cm;
- No. 1 scaffold sighting platform with a thickness of 7,5 cm;
- No. 60 steps of laminar wood with dimensions 30x80 cm and a thickness of 7,5 cm;
- No. 1 cab for the operator equipped with sleeping accommodation, kitchenette, and accessories as well as a soundproofing room for the generating set.

[0024] All of laminar wood components are provided with coupling devices for the connections.

[0025] It should be appreciated that the fittings both of metal materials and wood are designed for a rapid and easy installation and are provided with couplings for their assembling. Such fittings are:

- shoulder protection cage for the ladder;
- banisters for the sighting platform;
- lightning rod;
- antenna;
- cab 8 on the sighting platform consisting of:
  - a construction of laminar wood uprights and outside and inside multilayered wood panels with interposed insulating material;
  - transparent panels 9 of polycarbonate;
  - coverings of outside and inside multilayered

wood panels with interposed insulating material;
- wood window frames;
- upper sun breaker cover;
- furniture;
- equipments;
- installations;
- cavity under the platform.

[0026] As far as metal materials subject to weather is concerned, high-quality stainless steel is preferably used. The selection of the other materials is preferably directed to those with the greatest reliability and the least maintenance for the use concerned.

[0027] Now, it is important to explain in detail the main assembling steps of the tower. The assembling method is particularly advantageous because of the peculiar features of the invention.

[0028] Once the site of installation of sighting tower 1 according to the invention is selected and the height of the tower is determined as a function of the specific morphological characteristic of such site of installation, plinth 13 or anchor means are cast for the two side beams 2 and the central beam 3 opposite to the former, as shown in the example of Fig. 1. Once the plinths are set, it is possible to install the whole construction after transportation of the assembling components to the site of installation.

[0029] After the end of such preliminary step, the real assembling of the tower components may begin.

a) The two side beams 2 forming the main structure of the tower are mounted on plinths 13 by means of hinges at the base of the beams (Fig. 2);
b) The third central beam 3 opposite to the former two beams is arranged on the ground and is connected thereto at its top by means of a hinge pin 14 (Fig. 3);
c) After such preliminary assembling steps, the lifting step of the tower is carried out by jack 15 placed under top hinge pin 14 connecting the three beams (Fig. 4);
d) Now, the following components are assembled: the steps, the shoulder protection cage, a pulley for lifting the finishing materials and those for assembling the rest platform, upper platform 4, operator's cab 8, and any material for finishing the construction (Fig. 5);
e) The lifting step is carried out by a manual and/or mechanical winch 16 which brings the base of the third beam 3 near its anchor plinth with the aid of a guide wheel 17 placed at the lower end of beam 3 (Figs. 6 and 7);
f) When the lower end of third beam 3 reaches its anchor plinth, the coupling joints of tower 1 are tightened and the tower is ready to be provided with all of the accessories for its stability such as vertical guy ropes of steel 19 and any horizontal bracing of laminar wood as well as the functional accessories such as rest platform 6, working platform 4, operator's cab 8, cover 10, etc. (Figs. 8, 9 and 10) .

[0030] After the end of such assembling steps, the construction is ready to be used. Equipments needed from time to time for specific employements may be added, if necessary. To this end, it should be appreciated that the assembling described above requires the minimum amount of equipments, i.e. only those for the transportation of materials. Of course, the assembling is easier if there is provided a means such as a crane truck or a lifting apparatus for hoisting the tower but advantageously such machines are not needed.

[0031] As clearly shown in the exemplifying drawings and already mentioned in the assembling steps, the construction has horizontal bracings of laminar wood and vertical guy ropes of steel. Of course, the higher the tower, the greater the amount of such elements. Particularly, the horizontal bracings consist of three horizontal beams in the form of a triangle connecting the three main beams to one another.

[0032] It should be appreciated that the present invention may also provide a shelter 18 at the base of the tower for lodging the operator so that a further stiffening of the construction because of the ballast effect of such shelter is obtained.

[0033] According to a further peculiar feature of the invention, upper sighting platform 4 and intermediate platforms 6 are assembled only after tower 1 has been lifted to the working position and fastened. All of the necessary anchor means for assembling the plurality of components as well as the pulley for lifting at the desired height the accessories of the platforms are connected to main beams 2 and 3 before lifting the tower so as to guarantee a safe operation and to avoid additional equipments.

[0034] Finally, it should be noted that two or three further triplets of plinths or anchor means 13 may be provided on the ground so that the height of tower 1 can be changed in a second time for adapting it to the environment changes such as the height of the trees. It is self-evident from the foregoing that the sighting tower according to the invention is a real example of the so-called environment-friendly biological architecture. The shape conceived as a yard of a sailing ship is extremely slender and essential and allows the tower to be used in any situation even if the base for the installation of the plinths is small. For this reason, in case of a thick wood, the sighting tower of the invention can be installed by sacrificing only a few trees unlike other towers with a rather large base.

[0035] A further advantage of the invention is that it offers a very low resistance to the wind so that it can also be used in places where the wood is rather thin such as the Mediterranean maquis because of its extremely slender shape with respect to similar towers of metal, reinforced concrete or wood provided with a rath-

er massive structure.

[0036] The carrying beams of laminar wood harmonize perfectly with the landscape of a forest both in shape and natural colour and blend with the tree trunks so that they do not disturb the visitors of the natural park. The present invention has been described and illustrated according to preferred embodiments thereof, however, it should be understood that those skilled in the art can make equivalent modifications and/or replacements without departing from the scope of the present industrial invention.

Claims

1. A sighting tower (1) of the type comprising a raised observation platform supported by a carrying structure, characterized in that said carrying structure consists of three essentially rectilinear beams or pillars of preimpregnated laminar wood projecting from the ground and supporting at least one observation platform (4), said beams being provided with suitable guy ropes and resting on fully buried small-size concrete foundation plinths (13) through anchor means consisting of a plate and a counterplate.

2. The sighting tower (1) of claim 1, characterized in that said beams (2, 3) run along the corners of an isosceles or equilateral triangular pyramid, two beams (2) being equal to each other and the third beam (3) being opposite to the former.

3. The sighting tower (1) of the preceding claims, characterized in that sighting platform (4) is accessible through a ladder (5) running along central beam (3).

4. The sighting tower (1) of the preceding claims, characterized in that the height of the sighting tower may be changed by varying the position of central beam (3) hinged to the other two side beams (2) by a hinge pin (14), i.e. shifting the lower end of said central beam (3) forward and/or backward and securing it to further, properly arranged anchor means (13).

5. The sighting tower (1) of the preceding claims, characterized in that two or three further triplets of plinths or anchor means (13) may be provided on the ground so that the height of tower can be changed in a second time for adapting it to the environment changes such as the height of the wood trees.

6. The sighting tower (1) of the preceding claims, characterized in that there are provided horizontal bracings consisting of three horizontal beams in the form of a triangle connecting the three main beams (2, 3) to one another.

7. The sighting tower (1) of the preceding claims, characterized in that, in constructions higher than ten metres, ladder (5) is provided with rest platforms (6) every about five metres, and the user is prevented from falling down by a shoulder protection cage over the whole height of the ladder as well as handrails and banisters (7) at each half space and platform (4).

8. The sighting tower (1) of the preceding claims, characterized in that sighting platform (4) made of laminar wood for scaffolds can be reached through a trapdoor at the end of ladder (5).

9. The sighting tower (1) of the preceding claims, characterized in that a cab (8) for the operators is provided on sighting platform (4) and comprises:

   - a carrying structure of laminar wood;
   - laminated panels formed of outside layers of wood and inside layers of insulating material;
   - transparent panels (9) of polycarbonate that guarantees optimum technical performances particularly as far as light weight and anti-breaking property is concerned.

10. The sighting tower (1) of the preceding claims, characterized in that platform (4) and cab (8) are protected from the sun by a light cover (10) made of a material having a differentiated permeability such as a non-woven fabric of the type used in agriculture for the nets, microperforated PVC, or a membrane of treated fire-retarding polyester fabric coated with PVC so that shadow is provided and sail-effect is avoided, and at the same time humidity and the consequent mould is reduced.

11. The sighting tower (1) of the preceding claims, characterized in that a yard (3A) is provided at the top of the tower, at the highest point of which an antenna and/or a lightning rod (11) is installed.

12. The sighting tower (1) of the preceding claims, characterized in that the power supply is provided by a solar energy system capable of make the construction self-contained, such a system having a number of solar panels (12) placed on banisters (7) of platform (4) and/or on the three beams (2 and 3).

13. The sighting tower (1) of the preceding claims, characterized in that the carrying structure is treated by an impregnating agent to block the wood decomposition process so as to guarantee a life of the tower not shorter than 30 years without any maintenance intervention, an ordinary maintenance program being further provided and consisting of a wood treatment with suitable protection paints every 5 years so that the life of the tower is theoretically unlimited.

14. The sighting tower (1) of the preceding claims, characterized in that the sighting tower has a differentiated fire resistance, a sheathing of the carrying beams with wood panels having a thickness of 7,5 cm which increase the fire resistance to 180 minutes being provided at the base, where the possibility of a direct contact with fire is higher, the remaining part of the tower having a fire resistance of 120 minutes.

15. The sighting tower (1) of the claim 14, characterized in that in order to prevent the base of the tower from undergoing vandalic acts by cutting tools such as saws, crosscut saws, hatchets, etc., the sheathing of the base for increasing the fire resistance is additionally covered by an outside layer made of steel sheet for preventing the material from being cut, a further protection from vandalic acts and intrusions of unauthorised persons consisting of removing the steps of the ladder to the sighting platform.

16. The sighting tower (1) of the preceding claims, characterized in that in the unfortunate case of fire, the total destruction of the tower does not leave at all traces of its former presence as the tower is made of materials that are completely consumed after having exceeded the predetermined endurance time so that it is no longer needed to provide heavy vehicles at the site of installation to remove the relict construction.

17. The sighting tower (1) of the preceding claims, characterized in that a shelter (18) is provided at the base of the tower for lodging the operator so that a further stiffening of the construction because of the ballast effect of such shelter is obtained.

18. A method of installation and assembling the sighting tower (1) according to one or more of the preceding claims, characterized in that after having selected the site of installation and the height of the tower determined as a function of the specific morphological characteristic of such site of installation, the following step are provided:

1. providing suitably spaced apart anchor means or plinths (13) in situ for the two side beams (2) and central beam (3) opposite to the former;
2. after the setting of plinths (13), connecting the two side beams (2) of the carrying structure to plinths (13) by means of hinges at the base of said beams;
3. arranging the third central beam (3) on the ground in a position opposite to the two beams and connecting the former to the latter by means of a hinge pin (14);
4. lifting the tower by jack (15) placed under hinge pin (14) connecting the three beams (2, 3);
5. assembling the steps, the shoulder protection cage, a pulley for lifting the finishing materials and those for assembling the rest platforms (6), upper platform (4), operator's cab (8), and any material for finishing the construction;
6. further lifting the base of third beam (3) by a manual and/or mechanical winch (16) to bring it near its anchor plinth until the same is anchored thereto with the aid of a guide wheel (17) placed at the lower end of beam (3) ;
7. tightening the coupling joints of tower and installing all of accessories for its stability such as vertical guy ropes of steel (19) and any horizontal bracings of laminar wood as well as the functional accessories such as rest platform (6), working platform (4), operator's cab (8), cover (10), etc.

19. The method of claim 18, characterized in that upper sighting platform (4) and any intermediate platforms (6) are assembled only after the carrying structure has been lifted to the working position and suitably fastened, all of the necessary anchor means for assembling the plurality of components as well as the pulley for lifting the accessories of the various platforms at the desired height being connected to main beams (2 and 3) before lifting the tower so as to guarantee a safe operation and to avoid additional equipments.

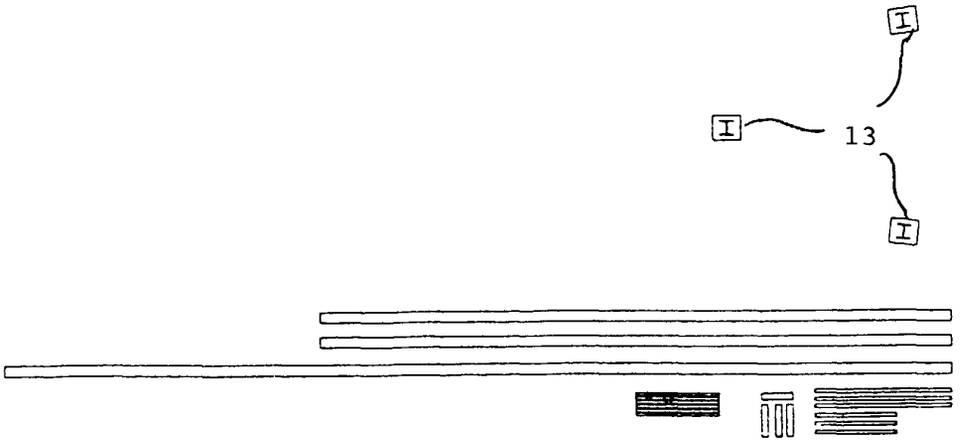

FIG. 1

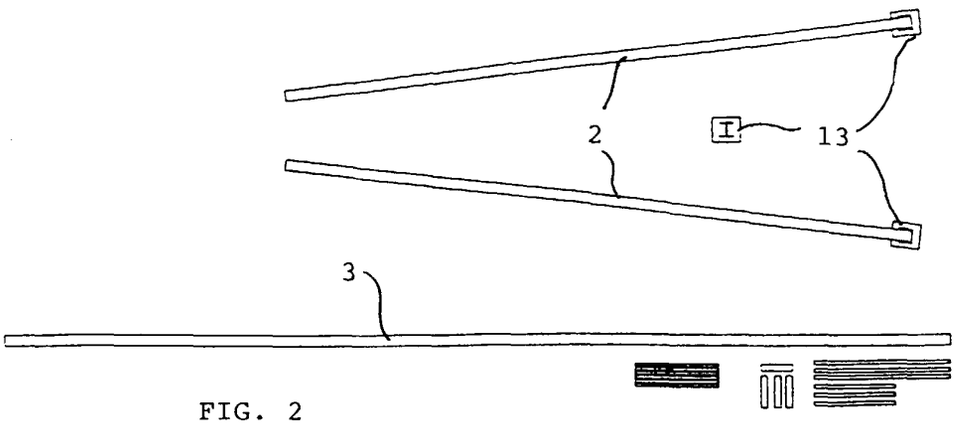

FIG. 2

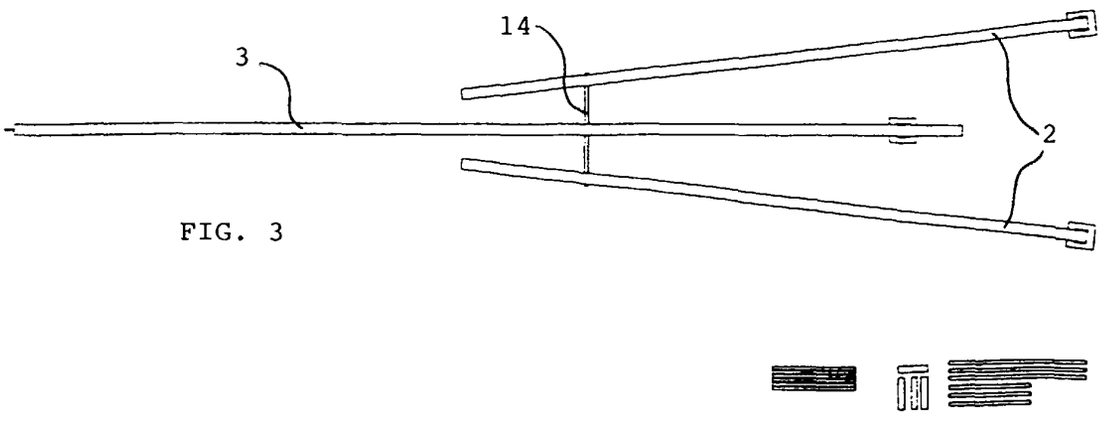

FIG. 3

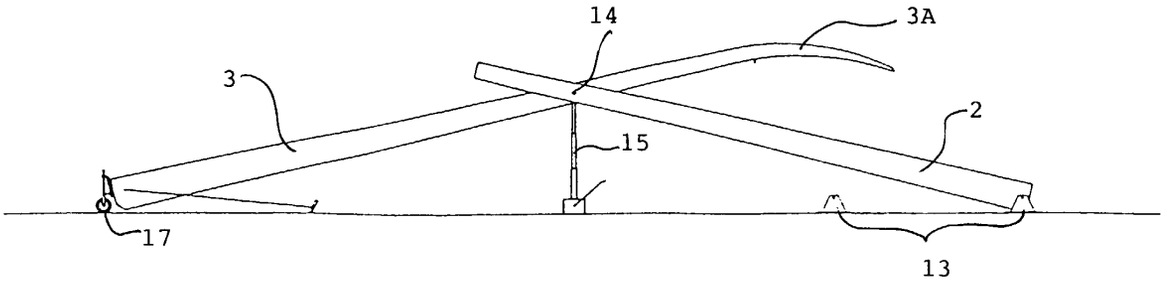

FIG. 4

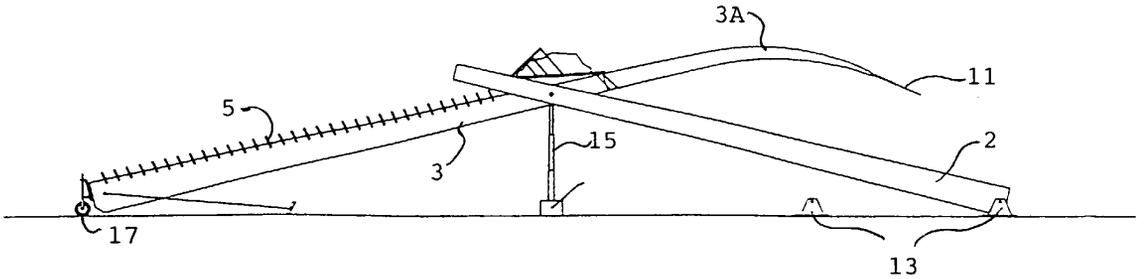

FIG. 5

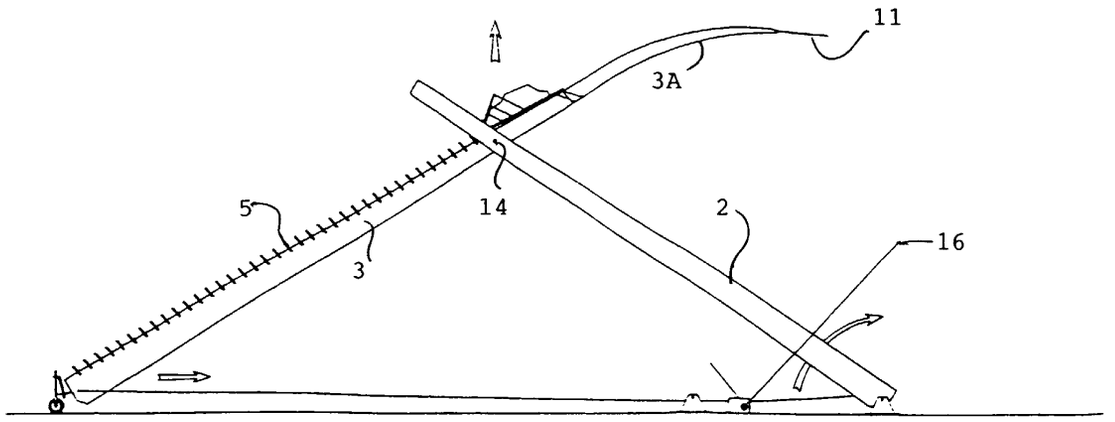

FIG. 6

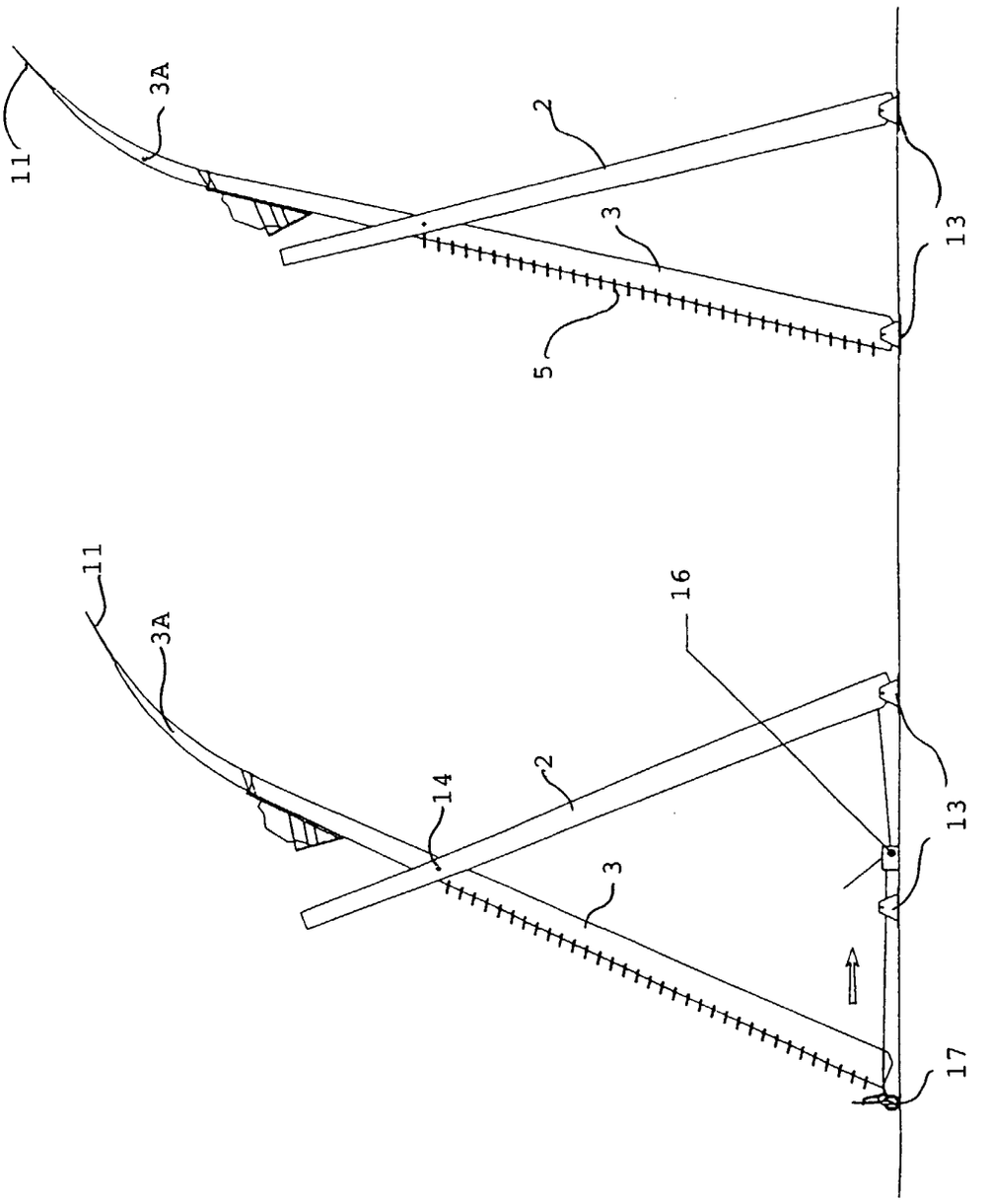

FIG. 8

FIG. 7

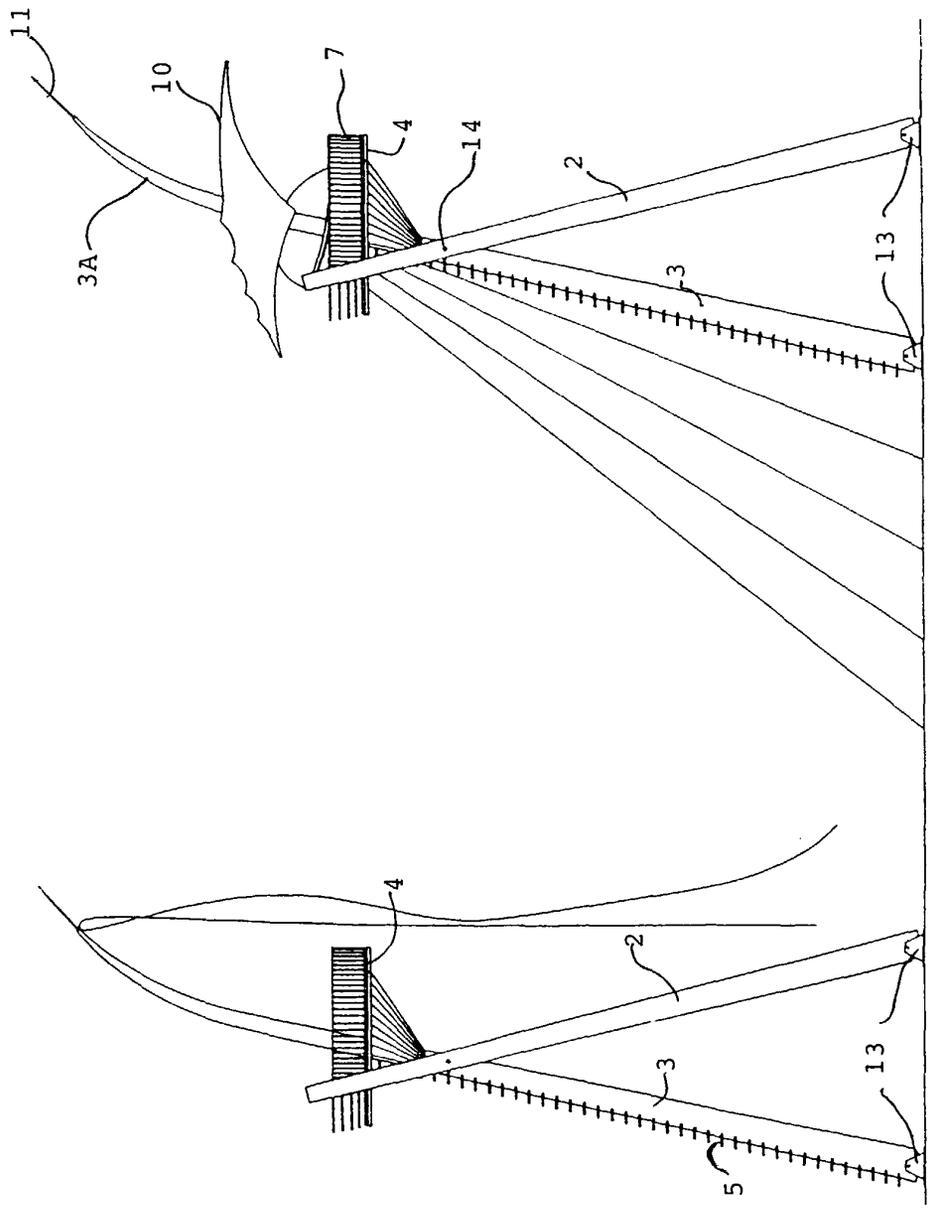

FIG. 10

FIG. 9

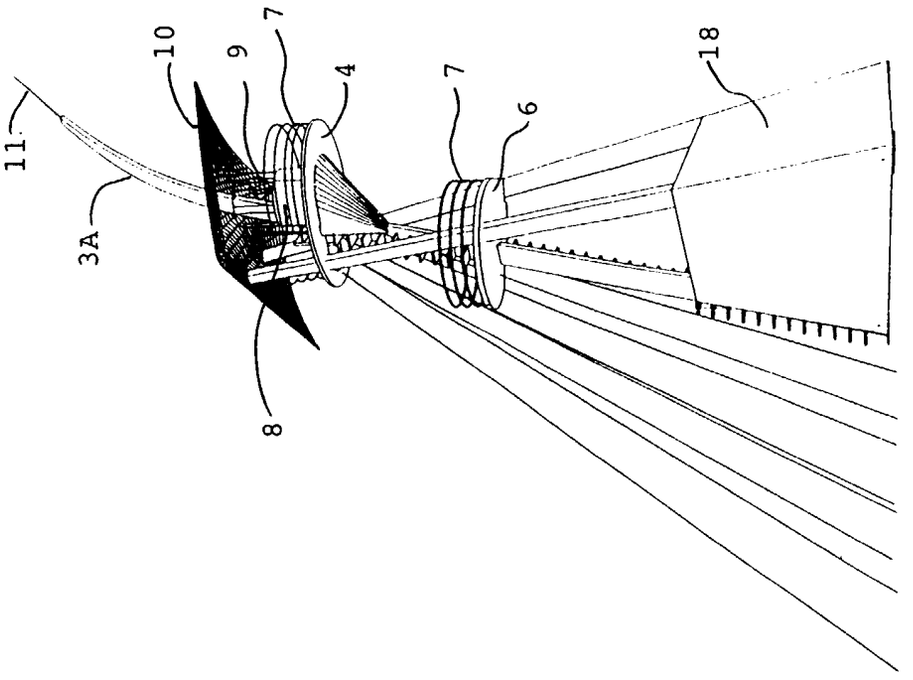

FIG. 11

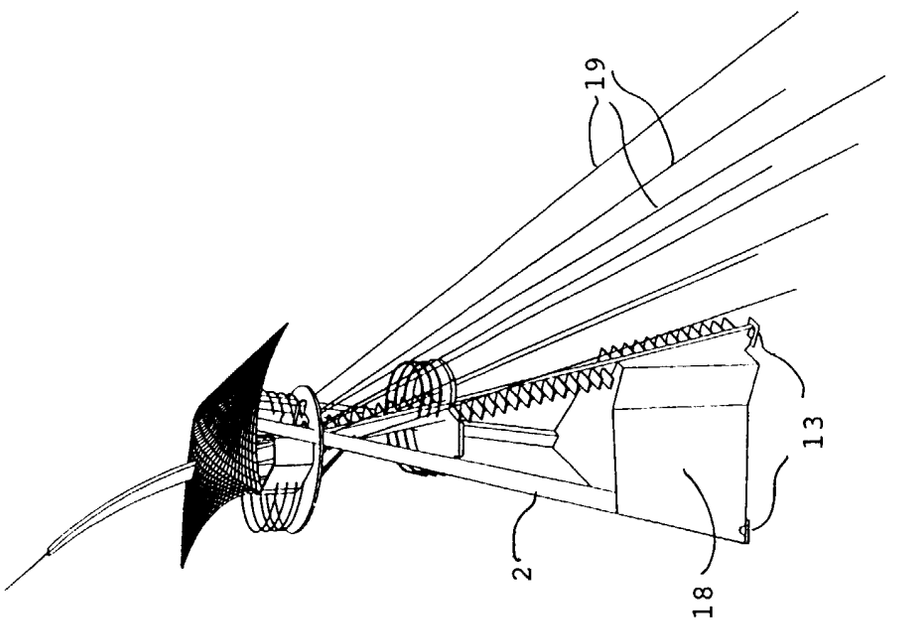

FIG. 12

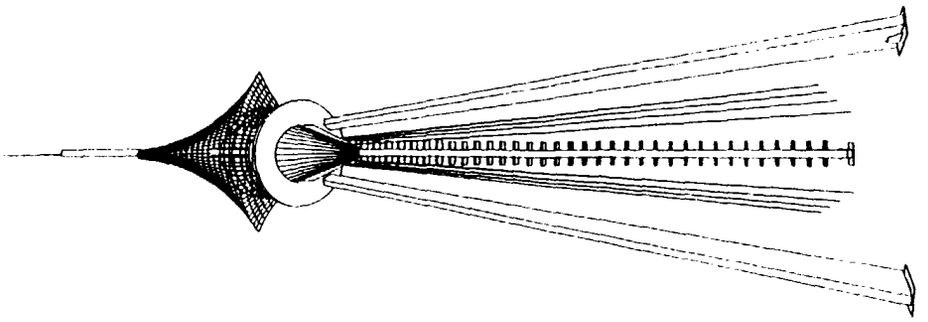

FIG. 14

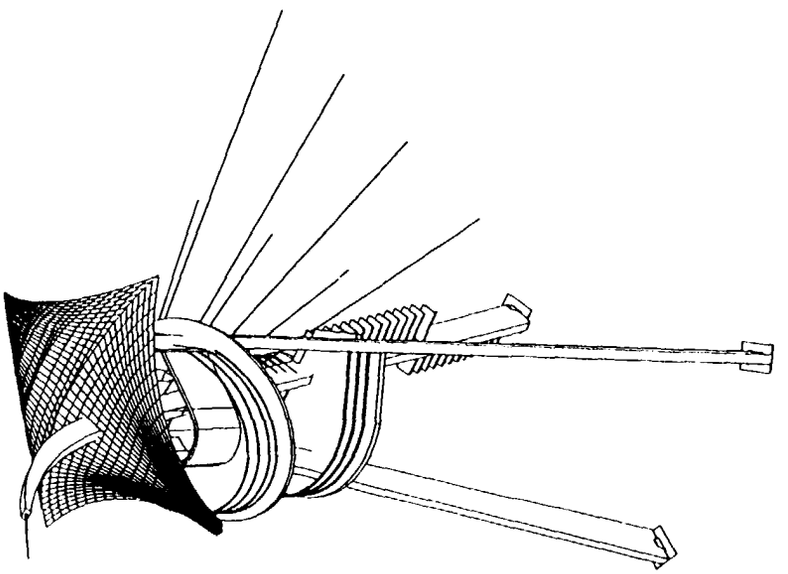

FIG. 13

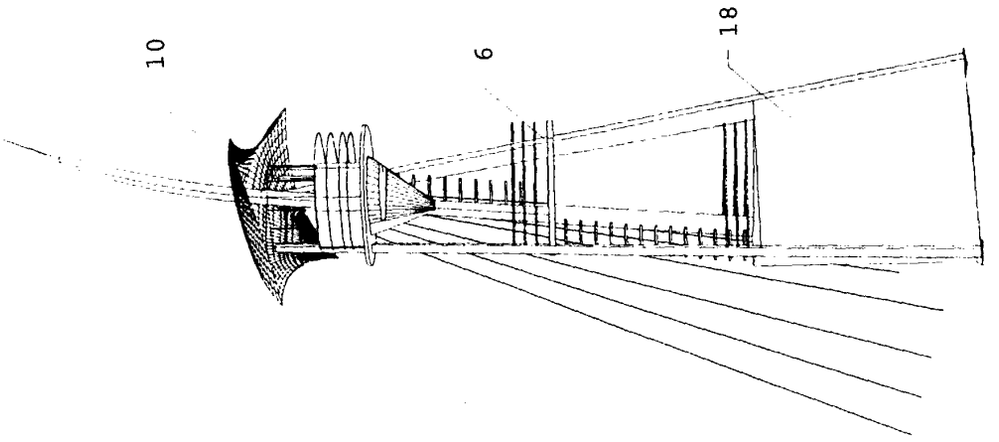

FIG. 15

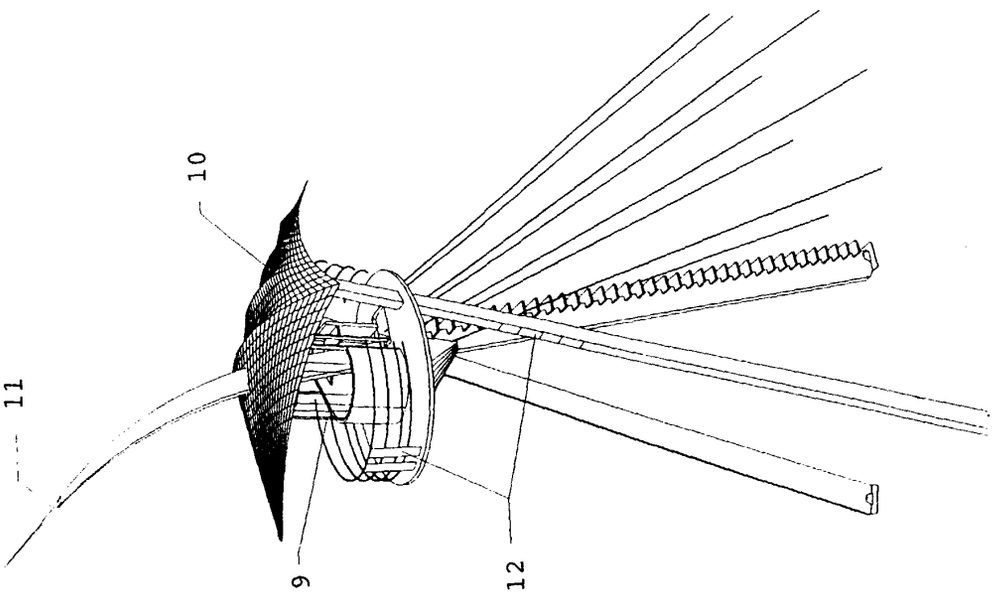

FIG. 16

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0096

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 659 959 A (ACCIAI CENTRO SPA) 28 June 1995 * column 2, line 15 - line 22; figures 1,7,10 *	1	E04H12/00
A	US 1 976 345 A (HRUBY) 9 October 1934		
A	US 5 009 283 A (PREJEAN LEONARD W) 23 April 1991		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E04H
E04B
E06C
A01M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 July 1999	Porwoll, H

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 83 0096

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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