73276/87

COMMONWEALTH of AUSTRALIA

PATENTS ACT 1952

597369

APPLICATION FOR A STANDARD PATENT

I/
We SUMITOMO ELECTRIC INDUSTRIES, LTD., of
No. 15, Kitahama 5-chome,
Higashi-ku, Osaka-shi,
Osaka-fu, Japan.

ACCEPTED AND AMENDED 7-3-90

hereby apply for the grant of a Standard Patent for an invention entitled:

"A MONITORING DEVICE FOR OVERHEAD POWER TRANSMISSION SYSTEM"

which is described in the accompanying ~~provisional~~ complete specification.

Details of basic application(s):—

Number	Convention Country	Date
78498/1986	Japan	23rd May, 1986

LODGED AT SUB-OFFICE
21 MAY 1987
Melbourne

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 21st day of May, 1987

K. A. Rimington

To: THE COMMISSIONER OF PATENTS

(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

Davies & Collison, Melbourne and Canberra.

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention.

In support of the Application made for a patent for an invention entitled : "A monitoring device for overhead power transmission system"

Insert full name(s) and address(es) of declarant(s) being the applicant(s) or person(s) authorized to sign on behalf of an applicant company.

I, ~~We~~ Tsuneo Nakahara

of SUMITOMO ELECTRIC INDUSTRIES, LTD.
of No. 15, Kitahama 5-chome, Higashi-ku, Osaka-shi,
Osaka-fu, Japan

do solemnly and sincerely declare as follows :-

Cross out whichever of paragraphs 1(a) or 1(b) does not apply

1(a) relates to application made by individual(s)
1(b) relates to application made by company; insert name of applicant company.

1. (a) ~~I am / We are~~ the applicant for the patent

or (b) I am authorized by SUMITOMO ELECTRIC INDUSTRIES, LTD.

the applicant..... for the patent to make this declaration on ~~its / their~~ behalf.

Cross out whichever of paragraphs 2(a) or 2(b) does not apply

2(a) relates to application made by inventor(s)
2(b) relates to application made by company(s) or person(s) who are not inventor(s); insert full name(s) and address(es) of inventors.

2. (a) ~~I am / We are~~ the actual inventor of the invention

or (b) Tsuneo Nakano, of
c/o Osaka Works of Sumitomo Electric Industries, Ltd.
1-3, Shimaya 1-chome, Konohana-ku, Osaka-shi, Osaka-fu
Japan
Seika Nakamura and Kiyomi Shimohashi, both of
c/o Nihon Katan, Ltd.
13-1, Isojima Minami-cho, Hirakata, Osaka, Japan

~~is / are~~ the actual inventor...s..... of the invention and the facts upon which the applicant..... ~~is / are~~ entitled to make the application are as follows :-

State manner in which applicant(s) derive title from inventor(s)

The applicant is the assignee of the said
actual inventors in respect of the invention.

Cross out paragraphs 3 and 4 for non-convention applications. For convention applications, insert basic country(s) followed by date(s) and basic applicant(s).

3. The basic application..... as defined by Section 141 of the Act ~~was / were~~ made

in Japan on the 23rd May, 1986

by Sumitomo Electric Industries, Ltd.

in ..... on the .....

by.....

in ..... on the .....

by.....

in ..... on the .....

by.....

in ..... on the .....

by.....

4. The basic application..... referred to in paragraph 3 of this Declaration ~~was / were~~ the first application..... made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature.

Declared at Osaka this 23rd day of April, 1987

SUMITOMO ELECTRIC INDUSTRIES, LTD.

Signature of declarant(s) (no attestation required)

.....

Tsuneo Nakahara, Representative Director

Note: Initial all alterations.

DAVIES & COLLISON, MELBOURNE and CANBERRA.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-73276/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 597369

(54) Title
MONITORING DEVICE FOR OVERHEAD POWER TRANSMISSION SYSTEM

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(71) Applicant(s)
SUMITOMO ELECTRIC INDUSTRIES, LTD.

(72) Inventor(s)
TSUNEO NAKANO; SEIKA NAKAMURA; KIYOMI SHIMOHASHI

(74) Attorney or Agent
DAVIES & COLLISON, MELBOURNE

(56) Prior Art Documents
GB 1358994
US 3185424

(57) Claim

1. A monitoring device for an overhead electrical power system, said system comprising a main overhead power transmission line or ground wire suspended along a plurality of support towers, and anchoring means secured to said overhead line or wire for anchoring the line or wire at each of said towers, the monitoring device comprising sensing means for sensing an electrical or physical condition of the line or wire, wherein said sensing means is adapted to be secured to said anchoring means such that said line or wire passes through or adjacent to said sensing means at said anchoring means such that relative motion between said line or wire and said sensing means is substantially or entirely eliminated.

8. An anchoring device assembly for use in a main overhead electrical power system, for anchoring a main overhead

.../2

power transmission line or ground wire, which comprises an anchoring member having a clamp body for clamping said main overhead line or ground wire at an intermediate area of the anchoring member; a first end portion for coupling said anchoring member with an arm of a support tower of the system, and a second end portion for coupling said anchoring member to said line or ground wire, said assembly further comprising a sensing member for sensing an electrical or physical condition of the line or ground wire, said sensing member being secured to said second end portion of the anchoring member, and said sensing member being disposed, in use, around or adjacent to said main overhead line or ground wire so as to minimise or eliminate relative movement between said line or wire and said sensing member.

COMMONWEALTH OF AUSTRALIA

PATENT ACT 1952

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COMPLETE SPECIFICATION

(Original)

FOR OFFICE USE

Class Int. Class

Application Number: 75276/87
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

Name of Applicant: SUMITOMO ELECTRIC INDUSTRIES, LTD.

Address of Applicant: No. 15 Kitahama 5-chome, Higashi-ku, Osaka-shi, Osaka-fu, Japan.

Address for Service: DAVIES & COLLISON, Patent Attorneys, 1 Little Collins Street, Melbourne, 3000.

Complete Specification for the invention entitled:

"A MONITORING DEVICE FOR OVERHEAD POWER TRANSMISSION SYSTEM"

The following statement is a full description of this invention, including the best method of performing it known to us :-

TITLE OF THE INVENTION

A MONITORING DEVICE FOR OVERHEAD POWER TRANSMISSION SYSTEM

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a monitoring device for an overhead electric power transmission system or a power distribution system. It finds particular application in monitoring the condition of a power transmission system or power distribution system, such as in respect of an abnormal current flowing in overhead power transmission lines and/or an overhead ground wire when an accident or a lightning strike occurs, or there is wire vibration or abnormal wire temperature, or the like.

BACKGROUND OF THE INVENTION

In a conventional monitoring device of the type mentioned above, a current detecting unit such as a current transformer is directly mounted to an overhead ground line which is suspended by means of anchor and clamp members coupled to arms of steel towers of an overhead power transmission system. In such a case, the current transformer is mounted on the overhead ground wire by passing the overhead ground wire through a center hole of the current transformer, and the current transformer is fastened to the overhead ground wire only by the friction between the overhead ground wire and the current transformer.

In the conventional arrangement as mentioned above, the clamping force of the current transformer to the overhead ground wire is gradually weakened due for instance to the vibration of the ground wire, whereby the current transformer may be moved along the ground wire, resulting in damage of the ground wire. Therefore, in the conventional arrangement, it is difficult to guarantee the ability of detection of the conventional monitoring device for a long time and reliability of the monitoring device is relatively

low.

SUMMARY OF THE INVENTION

An essential object of the present invention is to provide a monitoring device which can detect a condition of the overhead power transmission system or power distribution system for a long time without secular change.

According to a first aspect of the present invention, there is provided a monitoring device for an overhead electrical power system, said system comprising a main overhead power transmission line or ground wire suspended along a plurality of support towers, and anchoring means secured to said overhead line or wire for anchoring the line or wire at each of said towers, the monitoring device comprising sensing means for sensing an electrical or physical condition of the line or wire, wherein said sensing means is adapted to be secured to said anchoring means such that said line or wire passes through or adjacent to said sensing means at said anchoring means such that relative motion between said line or wire and said sensing means is substantially or entirely eliminated.

The sensing means may be a current transformer for detecting abnormal current occurring in said power transmission or distribution line or flowing in said overhead ground wire for instance in case of an accident in the power transmission system, or lightning strike.

The sensing means may be a sensor for detecting a condition such as vibration of the power transmission or distribution line or overhead ground wire, for instance due to wind.

Moreover, the sensing means may be a sensor for detecting a layer of snow deposited on the overhead power transmission or distribution line or overhead ground wire.

The current transformer may be secured to the bottom portion of the anchoring means.

The overhead ground wire may be a composite optical fiber overhead ground wire.

According to a second aspect of the present invention,

there is provided an anchoring device assembly for use in a main overhead electrical power system, for anchoring a main overhead power transmission line or ground wire, which comprises an anchoring member having a clamp body for clamping said main overhead line or ground wire at an intermediate area of the anchoring member; a first end portion for coupling said anchoring member with an arm of a support tower of the system, and a second end portion for coupling said anchoring member to said line or ground wire, said assembly further comprisi , a sensing member for sensing an electrical or physical condition of the line or ground wire, said sensing member being secured to said second end portion of the anchoring member, and said sensing member being disposed, in use, around or adjacent to said main overhead line or ground wire so as to minimise or eliminate relative movement between said line or wire and said sensing member.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings.

BRIEF EXPLANATION OF THE DRAWINGS

Fig. 1 is a side elevation of an embodiment of a monitoring device according to the present invention,

Fig. 2 is a top plan view of the monitoring device shown in Fig. 1,

Fig. 3 is a side elevation of another embodiment of a monitoring device according to the present invention, and

Fig. 4 is a side elevation of a further embodiment of a monitoring device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 and 2, there is shown an anchor and clamp member 1 coupled with end portion 2a of an arm 2 protruded horizontally from a steel tower (not shown) of an overhead power transmission system through connecting members 3, 4 and 5 so as to clamp and anchor an optical fiber composite overhead ground wire 6 (referred to as OPGW

hereinafter). There is shown another anchor and

clamp member 1' coupled with end portion 2a' of an arm 2' protruded horizontally from another steel tower (not shown) of the overhead power transmission system through connecting members 3', 4' and 5' so as to clamp and anchor another OPGW 6'. The respective OPGWs 6 and 6' are suspended across at least two adjacent steel towers in such a manner as mentioned above. Reference numerals 7 and 8 denote respectively jumper lines of the OPGWs 6 and 6' extending from the anchor and clamp members 1 and 1' toward joint boxes situated on the steel towers. Reference numeral 9 denotes a clamp member secured to the top portion of the arm 2 for clamping the respective jumper lines 7 and 8. Reference numerals 10 and 11 denote additional clamp members for clamping the respective jumper lines 7 and 8 at both sides of the clamp member 9.

In the embodiment shown, a sensor 13 is secured at the bottom portion of the conductor introducing end portion 12 of the anchor and clamp member 1 and the sensor 13 is so arranged as to pass the OPGW 6 or situated adjacent to the OPGW 6 at the position of the introductory part of the OPGW 6 to the anchor and clamp member 1 so that the sensor 13 can detect abnormal current flowing through the overhead ground wire. The sensor 13 is connected by means of lead wire 14 with a transmission terminal device through a joint box for connecting the optical fiber of the OPGW.

Although, in the embodiment shown, only the anchor

and clamp member 1 is provided with the sensor 13, the anchor and clamp member 1' may also be provided with another sensor. It is essential in the present embodiment that at least one of the anchor and clamp members of the two anchor and clamp members 1 and 1' of a steel tower is provided with the sensor 13 which is secured to the anchor and clamp member.

The anchor and clamp member 1 has a clamp body for clamping said OPGW 6 at the intermediate area of the anchor and clamp member 1 and a first coupling end portion 23 formed on its one longitudinal end for coupling said anchor clamp member 1 with the arm 2 of the steel tower (not shown) and a second coupling end portion 24 (or conductor introductory portion 12) formed on another end portion opposite to said first coupling end portion 23. The sensor 13 is secured adjacent to the second coupling end portion 24 and away from the first coupling end portion 23.

The sensor 13 may be a current transformer in an annular shape having a center hole (not shown) to pass through the OPGW 6 and the current transformer 13 is secured to the second end portion 24 of the anchor and clamp member 1 through the securing bracket 20 projected from the current transformer 13 by means of a screw 21.

By the arrangement mentioned above, since the sensor or the current transformer 13 is secured to the anchor and clamp member 1 which clamps the OPGW 6, the

sensor 13 is prevented from being displaced even if there is vibration of the OPGW 6, whereby the ability of the sensor of detecting the specific condition such as abnormal current flowing in the OPGW is not influenced by the vibration of the OPGW and secular change. Moreover, since the sensor can be assembled to the anchor and clamp member as one body, there occurs neither displacement of the sensor nor the problem of loosening of the fastening portion of the sensor to the ground wire regardless of the vibration of the OPGW. Accordingly, damage of the OPGW due to movement of the current transformer can be prevented. Also, it is assured to keep the stabilized detecting ability of the sensor for a long time, whereby it is possible to make the monitoring device of the overhead power transmission system with a high reliability.

The operation of the monitoring device will be explained hereinafter.

When an abnormal current flows in the OPGW 6 due to an accident in the power transmission lines or lightening stroke, the abnormal current is detected by the sensor 13 and the detecting signal is transferred to the transmission terminal device (not shown) and is compared with another detecting signal fed from a different sensor situated on a different steel tower. Accordingly, it can be detected that on what steel tower or span the accident occurs, whereby it is possible to take a necessary step in case there occurs

necessity of detection of cut off of the power or detection of the accident.

Fig. 3 shows another embodiment of the present invention in which a current transformer 30 as the sensing member is mounted onto the power transmission line 31 clamped by a clamp member 32. The clamp member 32 is suspended by a suspension insulator 33 which is also suspended on a steel tower of the power transmission system. The current transformer 30 is secured to the clamp member 32 through a securing member 34 fastened to the bottom of the clamp member 32 by means of screws 35. The embodiment shown in Fig. 3 is used for the steel towers of the intermediate portion of the power transmission system.

Fig. 4 shows a further embodiment of the monitoring device according to the present invention which may be employed at the steel tower of an end terminal of the power transmission system for anchoring the power transmission line 31. In the embodiment shown in Fig. 4, the current transformer 30 as the sensing member is secured to the clamp member 32 through the securing member 34. The information of the abnormal current of the transmission line obtained by the current transformer 30 is transmitted from an antenna 36 mounted on the current transformer 30 to a terresterial station (not shown) in a wireless communication. In Figs. 3 and 4, reference numeral 56 denotes arcing horns.

It is noted that the present invention may be

employed not only to the power transmission system which transmits the ~~elect~~ electric power of relatively high voltage a long distance but also to the power distribution system which distributes the electric power of relatively low voltage relatively short distance.

Moreover, although the current transformer is used as the sensing member in the various embodiments mentioned above, there may be used other types of sensing member for detecting various kinds of condition such as vibration detector to detect the vibration of the overhead power transmission or distribution phase lines or the overhead ground wire or a snow detector which detects the diameter of the snow deposited on the overhead power transmission or distribution lines or the overhead ground wire or a temperature detector for detecting the temperature of the overhead power transmission or distribution lines or overhead ground wire. In this case the sensing member may be disposed adjacent to the overhead power transmission or distribution lines or the overhead ground wire.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A monitoring device for an overhead electrical power system, said system comprising a main overhead power transmission line or ground wire suspended along a plurality of support towers, and anchoring means secured to said overhead line or wire for anchoring the line or wire at each of said towers, the monitoring device comprising sensing means for sensing an electrical or physical condition of the line or wire, wherein said sensing means is adapted to be secured to said anchoring means such that said line or wire passes through or adjacent to said sensing means at said anchoring means such that relative motion between said line or wire and said sensing means is substantially or entirely eliminated.

2. The monitoring device according to claim 1, wherein said sensing means is a current transformer for detecting an abnormal current flowing in said overhead line or wire.

3. The monitoring device according to either one of the preceding claims, wherein the anchoring means has a first coupling end portion and a second coupling end portion; and said sensing means is secured at the second coupling end portion.

4. The monitoring device according to any one of the preceding claims, wherein said overhead line or wire comprises a composite optical fiber overhead ground wire.

5. The monitoring device according to any one of claims 3 or 4 wherein said sensing means is a detect detecting vibration of said overhead line or wire.

6. The monitoring device according to any one of claims 1, 3 or 4 wherein said sensing means is a detector for detecting temperature of said overhead line or wire.

7. The monitoring device according to any one of claims 1, 3 or 4 wherein said sensing means is a detector for detecting a layer of snow deposited on said overhead line or wire.

8. An anchoring device assembly for use in a main overhead electrical power system, for anchoring a main overhead power transmission line or ground wire, which comprises an anchoring member having a clamp body for clamping said main overhead line or ground wire at an intermediate area of the anchoring member; a first end portion for coupling said anchoring member with an arm of a support tower of the system, and a second end portion for coupling said anchoring member to said line or ground wire, said assembly further comprising a sensing member for sensing an electrical or physical condition of the line or ground wire, said sensing member being secured to said second end portion of the anchoring member, and said sensing member being disposed, in use, around or adjacent to said main overhead line or ground wire so as to minimise or eliminate relative movement between said line or wire and said sensing member.

9. The assembly according to claim 8, wherein said sensing member is a current transformer of an annular shape with a center hole to accommodate the overhead line or ground wire and a securing bracket for securing said current transformer on the anchoring member.

10. The assembly according to claim 9, wherein said current transformer is secured adjacent to the second coupling end portion of said anchoring member through said bracket.

11. A monitoring device for an overhead electrical power system substantially as hereinbefore described with reference to the drawings.

12. An anchoring device assembly substantially as hereinbefore described with reference to the drawings.

DATED this 23rd day of February, 1990

SUMITOMO ELECTRIC INDUSTRIES, LTD.
By its Patent Attorneys
DAVIES & COLLISON

Fig. 1

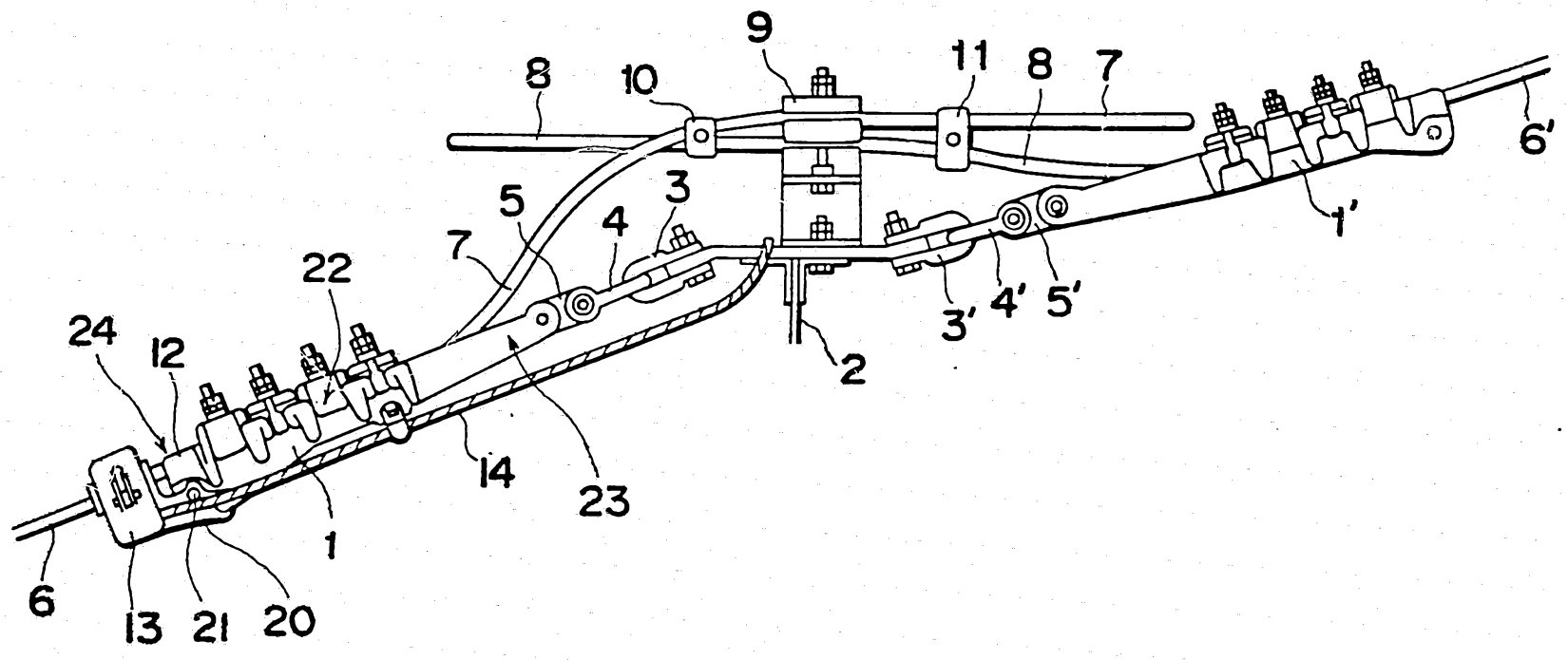
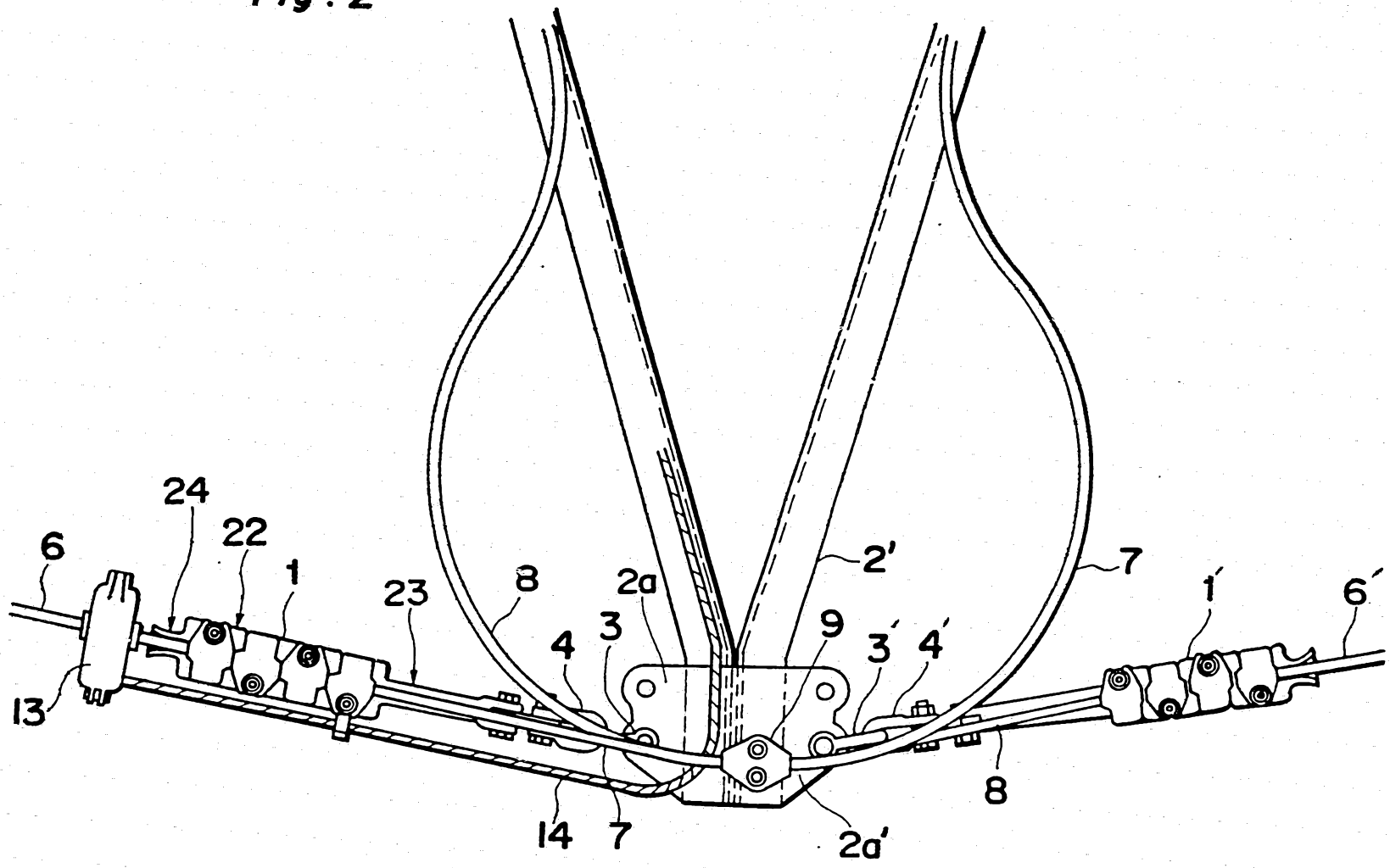
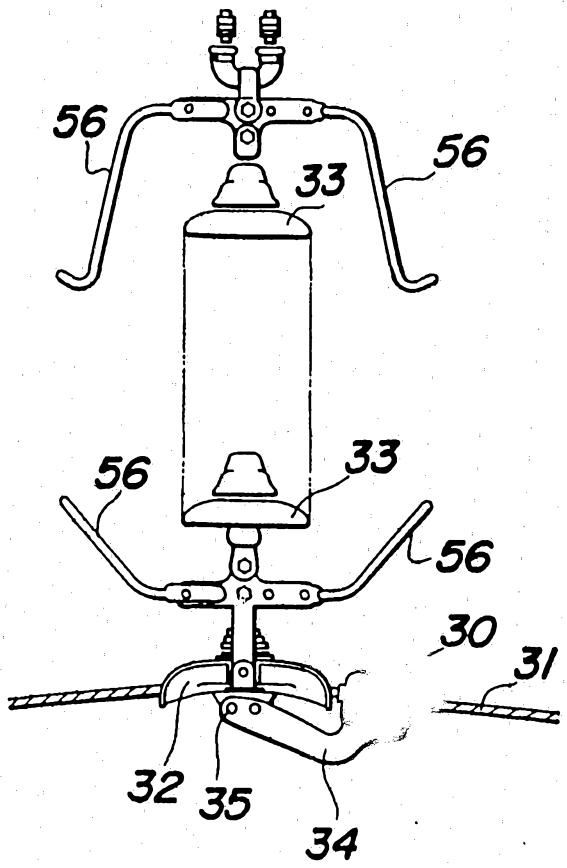


Fig. 2



Fig, 3



Fig, 4