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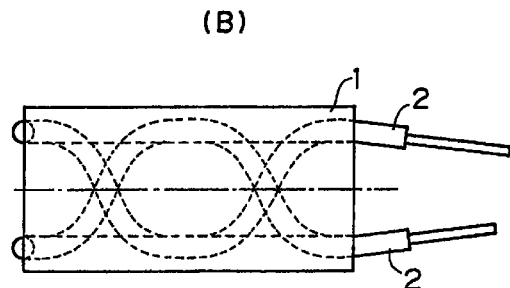
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(54) **ELECTROLUMINESCENT FIBER HOSE**

(57) Disclosed is an electroluminescence fiber (referred to as "ELF" hereinafter) hose comprising a transparent or translucent tubular hose member 1 having flexibility and elasticity, and one or more ELFs linearly or spirally disposed on inner surface of the hose member or inside the hose member. The ELF hose has improved properties as for all of strength, attachability, water resistance, quantity of light and ornamentalness, compared with a case where ELF is used alone, and hence realizes expanded applications of ELF.

Fig 1



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Description

Technical field

[0001] The present invention relates to an electroluminescence fiber hose that comprises a built-in electroluminescence fiber (referred to as "ELF" hereinafter).

Background art

[0002] Fig. 5 is an explanatory view representing ELF alone (Japanese Patent Application No. 6-236797).

[0003] This ELF 2 comprises a linear core electrode 21, a luminescence layer 22 disposed around the core electrode 21, a transparent electrode layer 23 disposed around the luminescence layer 22, additional electrodes 24 spirally disposed around the transparent electrode layer 23, an inner and outer coverings 25 and 26 covering the aforementioned members and the like. The core electrode 21 and the additional electrodes 24 are connected to an actuation circuit 27 for an inverter or the like, and further connected to an AC power source 28 of 100 V (50/60 Hz), or a DC power source 29 of 3-12 V.

[0004] This ELF 2 emits light from the tubular luminescence layer 22 provided between the core electrode 21 and the transparent electrode 23 when an alternating voltage is applied between the electrodes, and it has been used as illuminations and the like.

[0005] ELF of the aforementioned type has drawbacks to be solved such as those mentioned below, when it is used by itself.

(1) Strength

[0006] Because ELF 2 is thin and light, it can be easily handled, but it is poor in tensile strength. Therefore, it may be destroyed, fractured, or suffer from breaking by external force.

[0007] Moreover, because it is thin and light, it may be difficult to be fixed contrary to expectations. If ELF is simply made thicker, it requires higher voltage, and it leads to higher cost for the manufacture and the use thereof.

(2) Attachability

[0008] Since it is spirally bound by the additional electrodes 24, it is likely to be bent and have kinks, and it is poor in resilience and elasticity. Thus, it is difficult to be linearly fixed.

[0009] Moreover, because it is thin, it is difficult to be attached to a flat surface. Because it can have only line contact with such a surface, only insufficient adhesion or even no adhesion may be obtained even if a double-sided adhesive tape is used, for example.

(3) Water resistance

[0010] ELF 2 uses PVC (a soft vinyl resin) or the like for the coverings 25 and 26 in order to obtain good light transmission. However, because such a resin exhibits water absorption, it is poor in water resistance. Therefore, it cannot be used in outdoor, since the luminescence layer 22 may be degraded with moisture.

10 (4) Quantity of light

[0011] Since ELF 2 emits light linearly, its light emission is thin, and quantity of light is small. Therefore, it is difficult to be recognized from a distant place. Several ELFs may be bundled in order to improve luminance. However, light emission from the backside (shady side of the bundle) is considered wasteful, and in addition, overlapped light emission may not be uniform or regular. When they were arranged in a row, the luminance may vary depending on the viewing angle.

(5) Ornamentality

[0012] There are ELFs 2 emitting light in blue green, red, orange, yellow, brown, bronze, white and the like. However, each ELF can exhibit only a single color, and it is impossible to obtain multiple colors with a single ELF. In addition, since ELF has a thin linear shape, it affords a monotonous emission line when it is fixed. If mixed color or complex emission line is desired, laborious fixation work would be required.

[0013] The object of the present invention is to provide an ELF hose which has improved properties as for all of strength, attachability, water resistance, quantity of light and ornamentality, compared with a case where ELF is used alone, and hence realizes expanded applications of ELF.

Description of the Invention

[0014] In order to achieve the aforementioned object, the present invention provides, as the first embodiment, an electroluminescence fiber hose comprising a transparent or translucent tubular hose member having flexibility and elasticity, and one or more electroluminescence fibers linearly or spirally disposed on inner surface of the hose member or inside the hose member.

[0015] The second embodiment of the invention corresponds to the electroluminescence fiber hose of the first embodiment, wherein the one or more electroluminescence fibers are spirally disposed side by side with one or more hollow tubes or solid cords having flexibility and elasticity.

[0016] The third embodiment of the invention corresponds to the electroluminescence fiber hose of the first or second embodiment, wherein the one or more electroluminescence fibers are contained in one or more

hollow tubes having elasticity.

[0017] The fourth embodiment of the invention corresponds to the electroluminescence fiber hose of the first embodiment, wherein the hose member comprises an inner hose member and a cover layer covering the one or more electroluminescence fibers wound around the inner hose member.

Brief Explanation of the Drawings

[0018]

Fig. 1 represents an ELF hose according to the first embodiment of the present invention.

Fig. 2 represents an ELF hose according to the second embodiment of the present invention.

Fig. 3 is a cross-sectional view of an ELF hose according to the third embodiment of the present invention.

Fig. 4 includes a transverse-sectional view of an ELF hose according to the fourth embodiment of the present invention.

Fig. 5 is an explanatory view representing ELF alone (Japanese Patent Application No. 6-236797).

Best Mode for Carrying out the Invention

[0019] The present invention will be explained in more detail by exemplifying the embodiments of the present invention with reference to the drawings and the like.

(First Embodiment)

[0020] Fig. 1 represents an ELF hose according to the first embodiment of the present invention.

[0021] The ELF hose of this embodiment comprises a hose member 1, ELFs 2 and the like.

[0022] The hose member 1 is a tubular member made of a transparent or translucent resin having flexibility and elasticity, such as polyurethane and polyvinyl chloride. Polyurethane is more excellent in transparency and strength as compared with vinyl chloride, and they can be properly used depending on applications. The outer surface of this hose member 1 may further be coated with a transparent resin.

[0023] In the ELF hose of this embodiment, each ELF 2 is supported by the hose member 1, and therefore improved tensile strength can be obtained. By using a larger diameter of the hose member 1, the apparent diameter of ELF 2 can be made larger.

[0024] Because the hose member 1 has proper weight per unit length, it is advantageous for its attachment, handling and the like. Because the hose member 1 has flexibility and property of restoring its original shape, it can be made more durable against deformation by applying internal pressure. Moreover, because it can be deformed, it can fit a surface to which the hose

is attached, and easily adhered to the surface. Therefore, it can be easily used as a substitute for ornaments that have conventionally utilized LED, electric bulbs and the like.

[0025] Each ELF 2 is covered with the hose member 1, and therefore water resistance and weather resistance of ELF 2 can be improved by using a waterproofed type special connector to maintain the inside airtight. In this case, electrodes of ELF 2 and the like are not exposed to the outside, and therefore the hose can also be used in an explosion prevention area having, for example, volatile gas atmosphere or the like.

[0026] Since the hose member 1 is hollow, it can contain an inserted resin stick, wire rope, rope made of synthetic fibers such as Kevlar (trade name) and the like as a core member, and it can be placed vertically, passed between members or places, or hung from a member or place.

[0027] The hose member 1 has one or multiple ELFs 2 spirally disposed on its internal surface or in its inside. Each ELF 2 itself is one similar to that of Fig. 5.

[0028] Since ELF 2 is disposed spirally, the hose does not exhibit directivity, i.e., it exhibits the same illumination effect irrespective of the viewing direction. Furthermore, since ELF 2 present on the side opposite to a viewer can also be seen, continuous wavy illumination or illumination composed of multiple crossing wavy lines can be obtained.

[0029] Because ELF 2 is disposed spirally, the hose can afford regular and three-dimensional illumination. By changing the winding scheme of the spiral, for example, by winding denser with a smaller lead angle, increased density of light can be obtained.

[0030] Further, by using two or more ELFs 2, a crossing pattern can be obtained, and two or more colors can be used. In such a case, by alternately turning on and off the multiple ELFs 2, more attractive illumination effect can be obtained.

(Second Embodiment)

[0031] Fig. 2 represents an ELF hose according to the second embodiment of the present invention.

[0032] In the following explanations for each embodiment, those members functioning in the same manner as those of the first embodiment are indicated with the same numberings, and repetitive explanations will be duly omitted.

[0033] In the second embodiment, two or more hollow tubes or solid cords 3 are sandwiched between ELFs 2, and spirally disposed (embedded) on the inner surface of the hose member 1 in a manner similar to that of ELFs 2. Their detailed structure as well as production method therefor will be explained hereafter.

[0034] The ELF hose of the second embodiment can be produced by, as shown in Fig. 2(A), winding a strip-like member composed of ELF 2A and four tubes 3A composed of resin cords and the like, which are dis-

posed side by side with the ELF 2A so that two of them should be disposed each side of the ELF 2A, and a similar strip-like member composed of ELF 2B and four tubes 3B, which are disposed side by side with the ELF 2B, as a double-line spiral around a jig, (mandrel) M (winding step), and covering them with the hose member 1 composed of a covering resin (covering step).

[0035] In the winding step, by winding the strip-like members so as not to form any gap, the hose member 1 can be prevented from flowing into a space between ELF 2 and the and the mandrel M due to slip of the strip-like members during the covering step, and a uniform hose member 1 can be formed.

[0036] Because the tubes 3 are provided in the ELF hose of the second embodiment, light transmitting the hose is refracted and irregularly reflected to afford beautiful illumination. When the tubes 3 are hollow, this effect is further enhanced.

[0037] The tubes 3 also serve to maintain a pitch of the spiral during the production, and afford good appearance. Furthermore, since they have good elasticity, the hose is not broken in use even if the hose is slammed by feet, and in spite of such strength, it can be made with a relatively small weight. Moreover, the property of restoring the original shape of the hose is enhance by the tubes 3, and thus the hose becomes unlikely to suffer from kinks (angles) even if it is bent with a relatively small radius.

(Third Embodiment)

[0038] Fig. 3 is a cross-sectional view of an ELF hose according to the third embodiment of the present invention.

[0039] In the third embodiment, each ELF 2 is inserted into a hollow tube 4 made of transparent or translucent resin, and spirally wound in the same manner as in the second embodiment.

[0040] According to the third embodiment, water resistance, as well as reflection and refraction effects can be enhanced by accommodating ELF 2 in the hollow tube 4. As for the hollow tube 4-2, one colored in the same color as the luminescence color of ELF 2 is effective.

(Fourth Embodiment)

[0041] Fig. 4 consists of sectional views representing the fourth embodiment of the ELF hose of the present invention.

[0042] In the ELF hose of this embodiment, each ELF 2 is spirally wound around a transparent or translucent inner hose member 5, and the outer surface thereof is covered with a cover layer 6 made of a transparent or translucent resin.

[0043] According to the fourth embodiment, the production of the hose becomes very easy, and even if ELF 2 itself is coated with polyvinyl chloride, water resist-

ance and protection effect for ELF 2 can be improved by using resins excellent in strength and water resistance (e.g., polyurethane) for the inner hose member 5 and the cover layer 6 so that the inner hose member 5 and the cover layer 6 should be fused together.

[0044] As shown in Fig. 4(B), a gap having a cross section of extruding shape S may be formed between ELF 2 and the cover layer 6. This gap can preferably serves to prevent outer force from directly acting on ELF 2, and afford beautiful illumination because of irregular reflection by an air layer in the gap S.

(Other Modifications)

[0045] The present invention is not limited to the embodiments explained above, and various modifications and alterations may be made within the scope of the present invention.

[0046] For example, by incorporating metal pieces into the hose member 1, more beautiful ornaments can be obtained by the irregular reflection effect of the metal pieces.

[0047] When the hose is used as an overhead warning indication hose at low ceiling, stairway etc., it secures safety even if someone hits his head or the like on it, and ELF itself is unlikely to be broken, because of its cushioning effect. The hose may also be used as a warning rope in black and yellow colors (tiger rope).

[0048] Furthermore, the hose can be used instead of conventional warning tubes for night use comprising LED or electric bulbs, and eliminate the drawback of the conventional tubes, i.e., breakage of electric bulbs and LED. Therefore, conditions for use concerning installation places, handling and the like may be greatly relaxed, and hence its application may be expanded. That is, it can be used as illumination on street, deck and gangway ladder of ships and the like, where it may be slammed by feet.

[0049] When ELF is disposed with an extremely large lead angle (90°), ELF will be disposed substantially linearly. Such a configuration also falls within the scope of the present invention. In this case, the production apparatus can advantageously be made simpler.

[0050] As explained above in detail, the ELF hose of the present invention realizes improvements over the use of ELF alone, that is, (1) larger diameter, (2) higher strength, (3) higher water resistance and weather resistance, (4) ease of attachment to a flat surface, (5) bending resistance, (6) ease of increasing quantity of light, (7) improved illumination effect obtained by using two or more colors, and alternately tuning on and off ELF for each color. Therefore, the present invention expand applications of ELF.

55 Fig. 5

[0051]

21	CORE ELECTRODE	
22	LUMINESCENCE LAYER	
23	TRANSPARENT ELECTRODE	
24, 24A, 24B	ADDITIONAL ELECTRODE	
25	INNER COVERING	5
26	OUTER COVERING	
27	ACTUATION CIRCUIT	

Claims

- 10
1. An electroluminescence fiber hose comprising a transparent or translucent tubular hose member having flexibility and elasticity, and one or more electroluminescence fibers linearly or spirally disposed on inner surface of the hose member or inside the hose member. 15
 2. The electroluminescence fiber hose according to claim 1, wherein the one or more electroluminescence fibers are spirally disposed side by side with one or more hollow tubes or solid cords having flexibility and elasticity. 20
 3. The electroluminescence fiber hose according to claim 1 or 2, wherein the one or more electroluminescence fibers are contained in one or more hollow tubes having elasticity. 25
 4. The electroluminescence fiber according to claim 1, wherein the hose member comprises an inner hose member and a cover layer covering the one or more electroluminescence fibers wound around the inner hose member. 30

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Fig 1

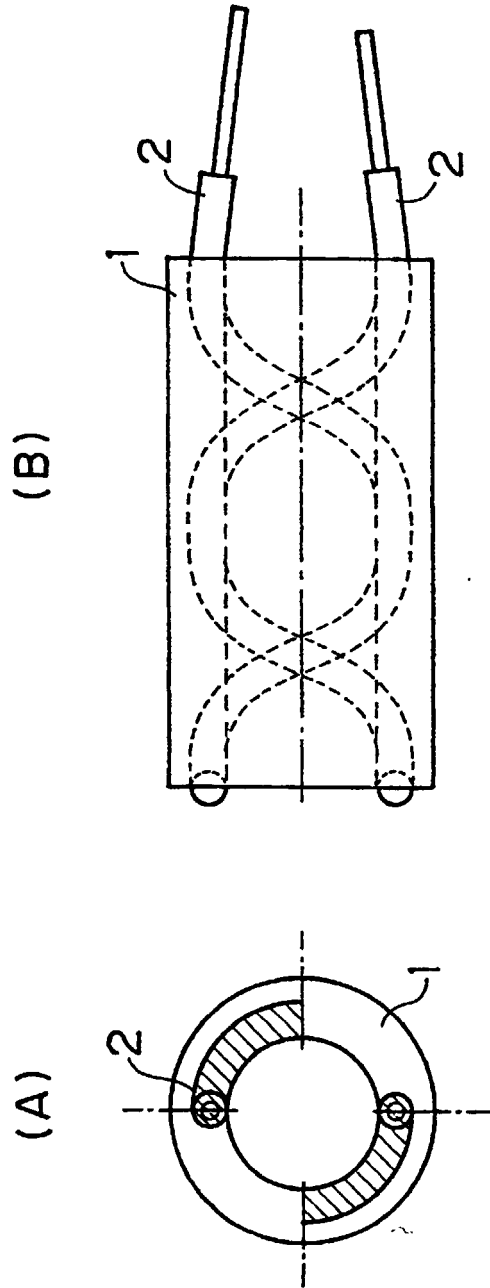


Fig 2

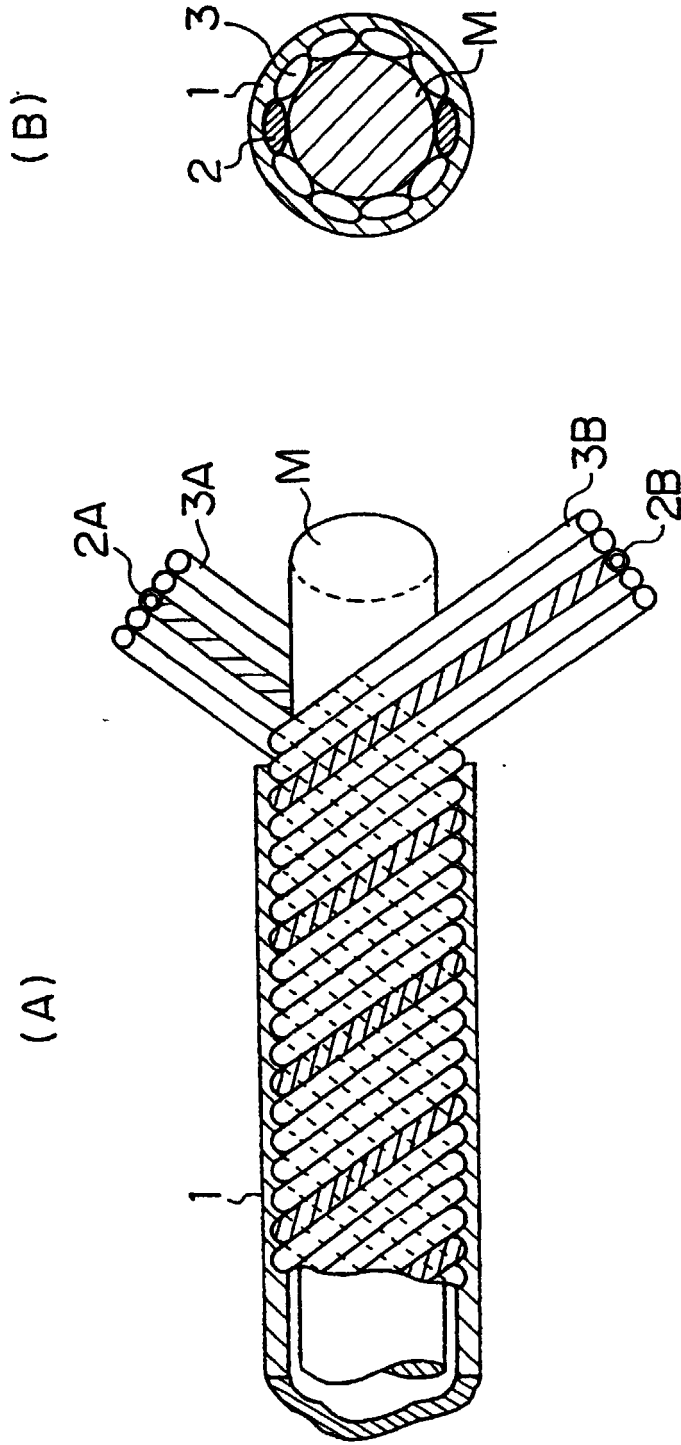


Fig 3

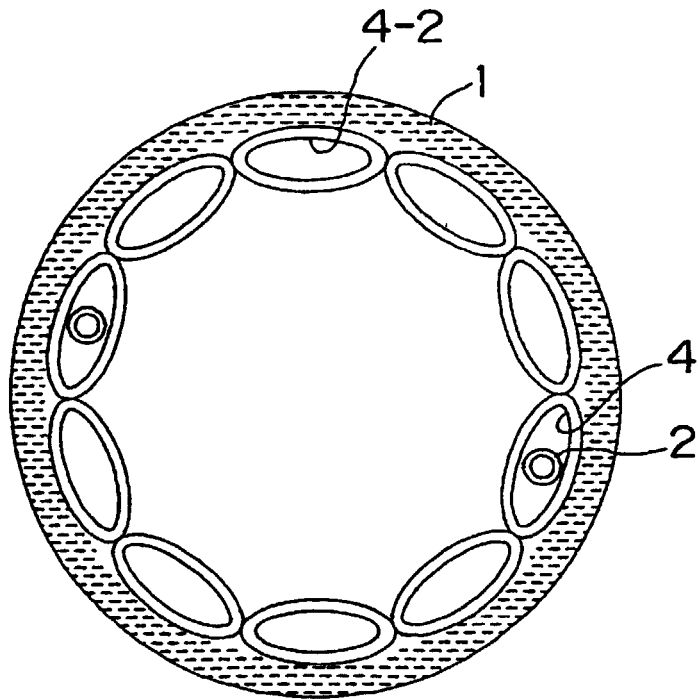


Fig 4

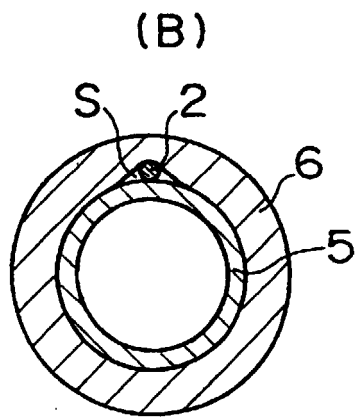
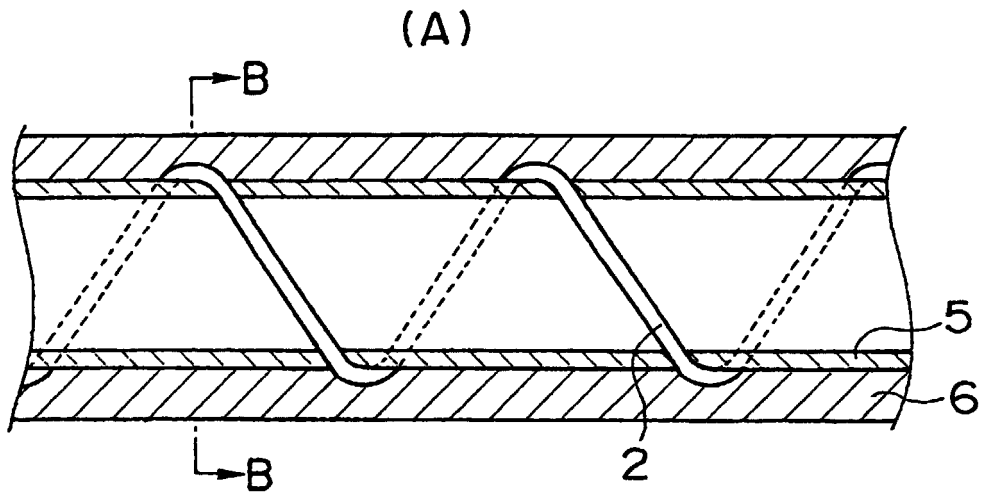
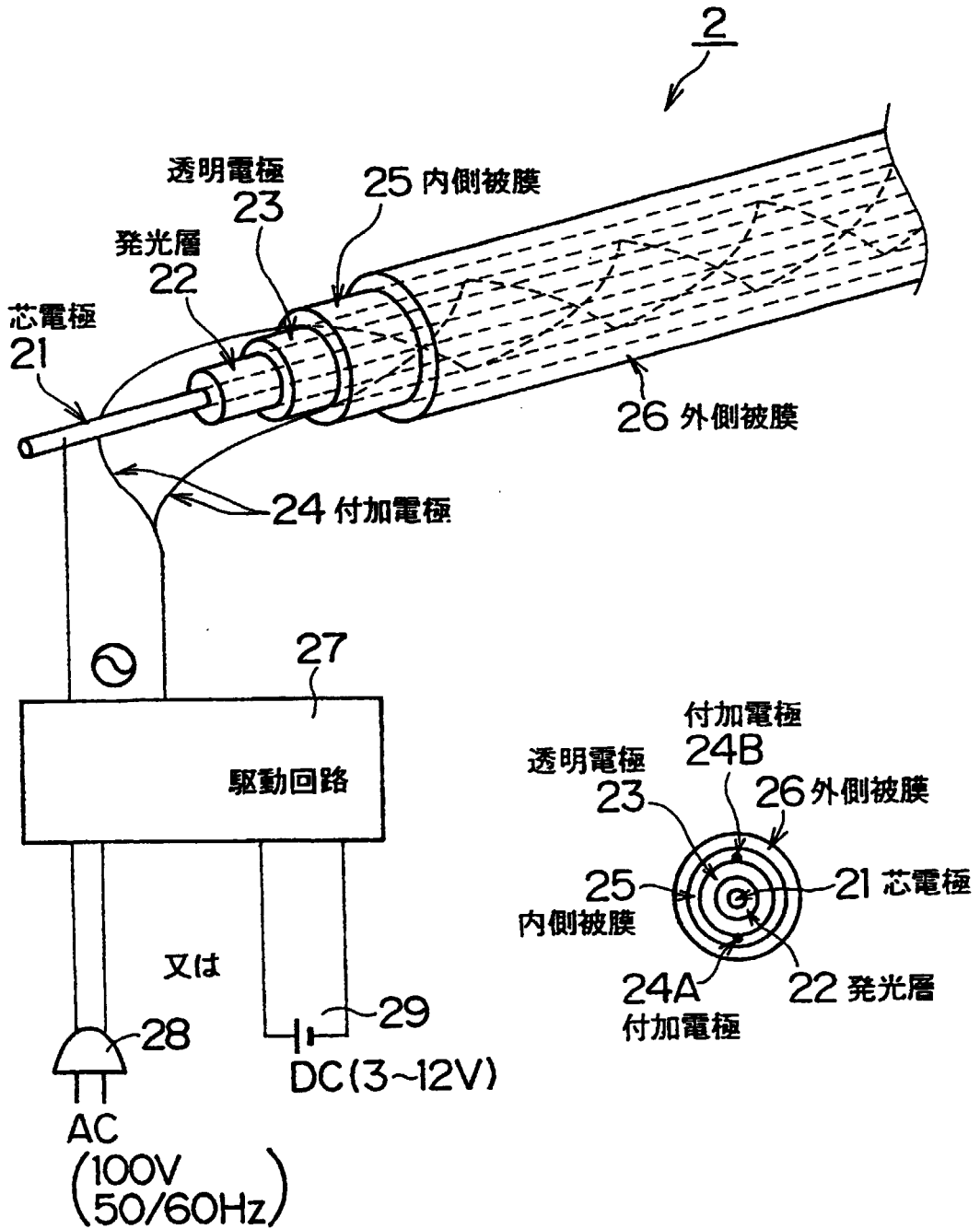


Fig 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP98/04279

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁶ H05B33/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl. ⁶ H05B33/00-33/28		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1940-1996 Toroku Jitsuyo Shinan Koho 1994-1998 Kokai Jitsuyo Shinan Koho 1971-1998 Jitsuyo Shinan Toroku Koho 1996-1998		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 61-32990, A (Alpus Electric Co., Ltd.), 15 February, 1986 (15. 02. 86), Full text ; Figs. 1 to 5 (Family: none)	1-4
P, A	JP, 3043257, U (K.K. Wako Eito), 18 November, 1997 (18. 11. 97), Full text ; Figs. 1 to 8 (Family: none)	1-4
P, A	JP, 9-328726, A (Yamaha Motor Co., Ltd.), 22 December, 1997 (22. 12. 97), Full text ; Figs. 1 to 6 (Family: none)	1-4
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 76786/1987 (Laid-open No. 184501/1988) (K.K. Yamanaka Daibutsudo, Norimichi Funato), 28 November, 1988 (28. 11. 88), Full text ; Figs. 1 to 6 (Family: none)	1-4
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		"U" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
Date of the actual completion of the international search 9 November, 1998 (09. 11. 98)		Date of mailing of the international search report 24 November, 1998 (24. 11. 98)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
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