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(54) **ELECTRIC RADIATING TUBE, GENERATOR AND DIFFUSER OF HEAT, OF INSULATING AND OF HIGHLY CONDUCTING SPIRALLED BANDS**

ELEKTRISCHES STRAHLUNGSROHR,WÄRMEGENERATOR UND DIFFUSOR AUS ISOLIERENDEN UND HOCHKONDUKTIVEN SPIRALFÖRMIG GEWICKELTEN BÄNDERN

TUBE ELECTRONIQUE RAYONNANT, GENERATEUR ET DIFFUSEUR DE CHALEUR, A BANDES SPIRALEES ISOLANTES ET TRES CONDUCTRICES

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## Description

**[0001]** The invention concerns means for transforming electric current into heat and for diffusing it.

**[0002]** It is well known that this apparatus uses resistances made of materials of high resistivity which, when electric current passes through them, produce very high temperatures, the great concentration of heat so created causing considerable drawbacks.

**[0003]** Diffusers have therefore to be used with these resistances to adapt their temperatures to the requirements of the various appliances, possibly involving high thermal heads .

**[0004]** The high temperatures in the resistances require both special supports made of heavy but fragile materials such as ceramic and the like, as well as complex structures for heat insulation.

**[0005]** Efficiency, especially when compared with heat produced by fuels, is very low.

**[0006]** For an electric heat generator, patent FR A 1 448 060 discloses an electrically insulating tube, very thick and consequently heavy, around which a band of closely meshed resistive metal is wound. Over this band, an electrically insulating band can be laid.

**[0007]** It is thus clear that the problems raised by these drawbacks remain unsolved.

**[0008]** Apparatus and processes for generating heat by electric current, have been subject of previous patents by the same inventor, use as generators high conductors of electricity, extremely thin but of considerable, surface area, such as to permit diffusion of the heat immediately on production, of a low thermal leap compared with the environment, and therefore of high efficiency, inexpensive to run and to manufacture.

**[0009]** The above invention discloses tubular heating elements whose composition and structure can offer exceptional advantages from the aspects of production, weight, efficiency and bulk as will be explained below.

**[0010]** Subject of the invention is an electric radiating tube, generator and diffuser of heat, and a process for obtaining said tube by means of entirely or partially superimposed spirally-wound bands.

**[0011]** One or more of said bands is of highly electrically conductive material with an extremely high ratio between surface area and thickness, of a constant cross section. Between said bands of highly conductive material, bands of electrically insulating material are inserted.

**[0012]** At the ends of said tube are means of contact and connection for electric feed.

**[0013]** Said means are joined to the electrically conducting bands.

**[0014]** The spiralled bands can all be wound in the same direction or else one or some in one direction and one or some in the opposite direction.

**[0015]** Width can be the same for all bands or different for some of them.

**[0016]** In one type of execution the two sets of two or more electrically conducting bands are electrically connected at one end of the tube, while said two sets are respectivelly connected, at the other end of said tube, to two contacts for electric feed.

**[0017]** In one type of execution the tube is formed of an electrically conducting band and of a band of insulating material.

**[0018]** The electrically conducting bands are preferably of copper or aluminium. Structure of the tube is advantageously modular or continuous and, as the case may be, have a round or differently shaped cross section; it may be straight and of unlimited length, in sections, circular or annular.

**[0019]** Said electric tube may advantageously be inserted in electric apparatus fitted to a ceiling, a wall or it may be portable and used to carry and electrically feed discharge lamps or glow lamps, to replace said lamps or be associated to them.

**[0020]** The contacts and electrical connections on commercially available apparatuses used to carry and electrically feed such lamps can be replaced by simplified specific electric contacts and connections for closing electric circuits with the means of electric contact placed at the ends of said tube.

**[0021]** In one execution said electric tube presents a diameter of 2-3 cm, a temperature of 100-200°C, a voltage of 12-220V.

**[0022]** One or more units of said electric tube can advantageously be inserted in specially prepared electric equipment which may be portable, floor or table based or fixed to a wall or ceiling.

**[0023]** In one type of execution the portable equipment has a flat base to stand on the floor or on a table, to which base one of more of said tubes can be applied at right angles.

**[0024]** In another type of execution the portable equipment has two opposing flat plates between which the electric tubes are fixed at right angles.

**[0025]** A number of such tubes can be joined axially, structurally and electrically separate, or else a tube can be made in any length to form lines of electric heating.

**[0026]** Such lines of electric heating can be suspended, on wires or on other means, to roofs or in any case at certain heights from the ground. This may be very advantageous inside a greenhouse for example.

**[0027]** The tubes forming lines of electric heating are advantageously placed axially inside parabolic reflectors.

**[0028]** The invention offers evident advantages

**[0029]** By means of an extremely light tube produced by a simple rapid and low cost process, using matrials equally simple and inexpensive, electric generators can be obtained that radiate heat, at the same time diffusing it, and that permit a very wide range of applications bearing in mind the low temperature of said generators, their negligible weight and great adaptability to the most varied forms.

**[0030]** Composition of portable, floor or ceiling based

heating equipment becomes possible, practically for any use whether in small rooms or in spaces of any size.

**[0031]** Being so light in weight it is a simple matter to fit them to a ceiling.

**[0032]** The exceptionally pleasing appearance of the tubes, made so by the materials used to construct them, facilitates the formation of generators suitable for any and every application.

**[0033]** The forms, sizes and electric feed values of the types of apparatus in which the electric generators of heat, subject of the present invention, can be placed, also correspond to the supporting means for the well-known discharge or glow lamps.

**[0034]** Generation of heat, especially by radiation, can therefore also be obtained by merely replacing said lamps in commercially available equipment with the electric generators described above, subject of the present invention.

**[0035]** The contacts at the ends of said electric generators of heat can be formed so as to fit correctly onto the connections already present on existing pieces of equipment, or be replaced by simplified connections specifically for the electric contacts present at the ends of said electric generators of heat.

**[0036]** The level of efficiency is very high partly because heat is diffused practically speaking at the time when it is produced and also because of the low thermal leap between heat generators and the environment.

**[0037]** Even if the heat generators reach a temperature of about 200°C, there is a great saving in running costs and in those of constructing the apparatuses in view of the absence of expensive and fragile insulating materials that deteriorate rapidly and also because of the possibility of using contacts and connections of a very simple kind.

**[0038]** By using multiple lighting equipment for various lamps or heat generators, both when using ready made equipment or that purposely constructed, it becomes possible to insert inside them one or more lighting elements associated to one or more heating elements thus obtaining, according to climatic needs, means for simultaneously lighting and heating the environment.

**[0039]** Briefly therefore, the tubes here invented permit the use of electricity for heating at an extremely low cost both because of the materials used and because of their negligible weight, as well as because of the high level of efficiency obtained.

**[0040]** Characteristics and purposes of the invention will be made still clearer by the following examples of its execution illustrated by diagrammatcally drawn figures.

Fig.1 Perspective view of the process of making a four-band tube.

Fig.2 Tubular electric body formed by the tube in Fig. 1, perspective view.

Fig.3 Tubular electric body, obtained from a tube similar to that in Fig. 1 but of two bands, perspective view.

Fig.4 Electric stove consisting of three vertical tubular bodies of different heights, perspective view.

Fig.5 Electric apparatus, available on the market, for a discharge lamp, that uses the electric tubular body described above, in perspective.

Fig.6 Ready made electric apparatus for discharge lamps, that uses the electric tubular body described above, with simplified contacts, in perspective.

Fig.7 Electric heating line formed of the tubular bodies already described seen in perspective.

Fig.8 Greenhouse with the heating lines seen in Fig. 7, perspective view.

**[0041]** In Fig. 1 there is a tube 10 being formed on a round core 11 using four bands 20, 21,22,23 that unwind each from its own reel 25.

**[0042]** The bands lie superimposed one over another by about half their width, as seen in the figure.

**[0043]** Bands 20 and 22 are of electrically insulating plastic material while bands 21 and 23 are of aluminium.

**[0044]** At the end of a well-known process, which is not described here for the sake of simplicity, after application of pressure and heat the four bands are substantially welded together to form a rigid tube which practically speaking will not get out of shape in spite of its minimum thickness.

**[0045]** All the bands 20-23 are in fact very thin, especially those of aluminium whose thickness is measured in microns.

**[0046]** As will be seen in the figures the tube possesses structural continuity along its entire length and also continuous electric conduction if the ends of the aluminium bands are closed in an electric circuit.

**[0047]** Closure of the electric circuit between the aluminium bands can produce electric heating, temperature and power of which can be adjusted at will by choosing suitable parameters both dimensional and in relation to the electric current supplied, especially voltage and amperage.

**[0048]** The ratio between width and length of the metal bands and their thickness is similarly decisive for generation of heat, and at the same time its radiation and diffusion, in the environment with practically no need for special reflecting devices or means of support for high temperatures.

**[0049]** A feature of the tube described is in fact that of diffusing heat throughout the environment practically when produced, needing no special devices.

**[0050]** Fig. 2 shows an electric radiating tube 30, formed of a length of the tube 10 in Fig. 1, at whose ends two electrically insulating plastic end pieces or heads 31, 40 have been applied.

**[0051]** The head 31 is applied to the tube, into one of whose ends it is fitted, having at its centre a stable connection with a U-shaped copper spring 32 whose arms

33, 34 form terminals 35, 36 and whose external shape substantially matches with the inner wall of the radiating tube 30.

**[0052]** Length of the arms 33, 34 is such that, in view of the inclination of the spiral formed by the bands 20, 21, 22 and 23, contact is made between the terminal 35 and the aluminium band 21 and between terminal 36 and the band 23 also of aluminium.

**[0053]** The head piece 40, fitted into the other end of the tube 30, has elastic L-shaped contacts 41, 42 respectively fixed to the head 40 by pins 43, 44. These elastic contacts 41, 42 are substantially identical with arms 33, 34 of the U-shaped spring 32 and the external shape of terminals 45, 46 substantially matches with the internal wall of the tubular body 30.

**[0054]** Similarly, inclination of the bands 20-23 and the length of said elastic contacts 41, 42, is such that contact is made between terminal 46 and the band 23 and between terminal 45 and the band 21.

**[0055]** A continuous electric circuit is thus formed from pin 43 to pin 44 on the head 30, through aluminium bands 21 and 23 and the U-shaped spring on head 31.

**[0056]** Therefore, on inserting the pair of pins 43, 44 in an electric socket, the tubular body 30 is turned on producing generation of heat by radiation and its diffusion.

**[0057]** Fig. 3 shows an electric radiating tube 50 substantially similar to the tube 30 described above, except that it is made from only two bands.

**[0058]** The band 51 is of insulating material and the band 52 of metal, especially aluminium.

**[0059]** The effect of the process already described is that said bands are practically welded together to form a substantially homogeneous structure.

**[0060]** There are practically identical heads 54, 55 at the two ends fitted in and rendered stable by central pins 56, 57 with springs 58 and 59 respectively inside them.

**[0061]** Said springs have a terminal piece 60 externally shaped to match with the internal cylindrical wall of the tubular body 50.

**[0062]** Inclination of the band 52 and length of said springs 58 and 59 are such that electrical continuity is created between pin 56 and pin 57.

**[0063]** Therefore, by inserting the radiating tube 50 in an apparatus which has two opposing sockets, suitable for supporting and housing pins 56, 57 with electric contact, an electric circuit can be closed with said tubular body so that heat is generated and diffused as in the case of radiating tube 30.

**[0064]** Radiating tubes 30 and 50 therefore permit formation of electric generators, of any shape and size and for any application, capable of radiating heat.

**[0065]** Merely to illustrate this point, some types of application are given in Figures 4 to 8.

**[0066]** Fig, 4 shows a stove 70 standing on an insulating base 71 fixed to a shaped spacer 72 provided with three electric sockets, not indicated in the figure for simplicity, which sockets can receive pairs of plugs 75 from the radiating tubes 80, 81, 82 of different lengths but of the same diameter, made using four bands 20-23, substantially identical with the tubular body 30 in Figure 2.

**[0067]** The only differences consist in the lengths, in the presence of semispherical heads 85 and in the parabolical walls 86 behind each tubular body placed to facilitate radiation of heat.

**[0068]** The stove can be connected up to main electricity by the plug 97 and switch 98.

**[0069]** Fig. 5 illustrates a ready-made apparatus 100 to be ceiling mounted, built for an ordinary discharge lamp fed through the sockets 101 at each end. Radiant tubes like the one 105 designed, substantially the same as the radiating tubes 50 in Figure 3, except that there are pairs of plugs 106 instead of the single plug 56, 57 at each end, can be fitted into said sockets without any alteration.

**[0070]** The bands, 108 of aluminium and 109 insulating, can be seen forming the tubular body 105.

**[0071]** The aluminium band is electrically connected to the end head 107.

**[0072]** By fitting said radiating tube 105 into the apparatus 100, heating is obtained instead of lighting.

**[0073]** The apparatus 110 in Figure 6 is practically the same as the one 100 already described, the only difference being that the electric sockets 111 at the ends are simplfied having only the elastic springs 112.

**[0074]** Said springs 112 can make contact with the end sockets 122 on the radiating tube 120, substantially identical with the radiating tube 30 already described, except that the heads 121 are connected internally to both the metal bands.

**[0075]** By fitting the radiating tube 120 between the end sockets 111 on the apparatus 110 so that the springs 112 penetrate into the sockets 122 in the heads 121, electrical connection is obtained and therefore generation of heat.

**[0076]** Fig.7 shows a heating line 130 comprising a radiating tube 131 with heads 132, said line being formed of four bands, very similar to the tubular body 30 described earlier, but of considerable length supported at the two ends by sockets, like 133, applied to a parabolic channel 140 that is easily hung from the ceiling by the rods 141.

**[0077]** The electric cable 145 is one of those supplying electricity.

**[0078]** As the parts of said line are of negligible weight, both as regards the parabolic channel and the tubular body 131, this is an extremely rational application, easy to mount and of minimum bulk, suitable where exceptional lengths are required, avoiding all problems of a structural or functional nature.

**[0079]** Fig. 8 shows how a set of heating lines 130, as described, can be used in a greenhouse 150, mounted to the ceiling 151 by rods like 152 and 153. In view of the structural and operational features of a greenhouse, this is an application of great interest as the heating lines can be extended without limits with no problems of sus-

pension as the weight is so light, nor of varied degrees of heating, given the great versatility offered not only by electric heating but also by the tubular electric bodies subject of the invention and which are used to form said heating lines.

## Claims

1. Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat
characterized in that it is formed of spirally wound bands (20-23, 51, 52, 108, 109) entirely or partially superimposed, one or more of said bands (21, 23, 52, 108) being of material possessing high electrical conducting properties, with a very high ratio between area and thickness, of a constant transversal section, one or more of said bands (20, 22, 51, 109) being of electrically insultating material and interposed between the bands (21, 23, 52, 108) of highly electrically conducting material, said tube (30, 50, 80-81, 105, 120, 131) having at its ends means of connection and contact (32, 43, 44) for electric feed connected to one or more of the bands (21, 23, 52, 108) possessing high electrical conducting properties.

2. Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1, characterized in that the spiralled bands (20-33, 51, 52) are wound in the same direction.

3. Electric heat radiating tube for generating and diffusing heat as in claim 1,
characterized in that one or some of the spiralled bands are wound in one direction and one or some in the opposite direction.

4. Electric heat radiating. tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1,
characterized in that the bands (20-23) are of equal or varied widths.

5. Electric heat radiating tube (50, 105) for generating and diffusing heat as in claim 1,
characterized in that it is formed of an electrically conducting band (52, 108) and of a band (51, 109) of insulating material.

6. Electric heat radiating tube (30, 80-82) for generating and diffusing heat as in claim 1,
characterized in that two sets of two or more electrically conducting bands (21, 23) are together electrically connected at one end of the tube (30, 80-82) while at the other end of said tube, said two sets are respectively connected to two contacts (41, 42, 75) for electric feed.

7. Electrict heat radiating tube (30, 50, 80-82, 105, 120,131) for generating and diffusing heat as in claim 1,
characterized in that the electrically conducting bands (21, 23, 52, 108) are of copper

8. Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1, characterized in that the electrically conducting bands (21, 23, 52, 108) are of alumium.

9. Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1, characterized in that its cross section is round.

10. Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1, characterized in that its form takes a straight line.

11. Electric heat radiating tube for generating and diffusing heat as in claim 1, characterizd in that it is divided up into sections.

12. Electric heat radiating tube for generating and diffusing heat as in claim 1,
characterized in that its form is circular.

13. Electric heat radiating tube for generating and diffusing heat as in claim 1,
characterized in that its form is annular.

14. Electric heat radiating tube (105) for generating and diffusing heat as in claim 1,
characterized in that it is inserted in electrical apparatuses (100) available on the market to be ceiling or wall mounted or else portable for carrying and supplying electric feed to what are known as discharge lamps to replace them or be used in association with them.

15. Electric heat radiating tube (120) for generating and diffusing heat as in claim 15,
characterized in that the contacts (101), electrical connections and the ready-made equipment (110) used to support and electrically feed what are known as discharge lamps, are replaced by simplified and specific contacts (112) for closing the electric circuit with the means of electric contact (121, 122) at the ends of said radiating tube (120).

16. Electric heat radiating tube for generating and diffusing heat as in claim 1, one type of which is characterized by a diameter of 2-3 cm, a temperature of 100-200°C, a power of 100-150W, a voltage of 12-200.

17. Electric heat radiating tube for generating and diffusing heat as in claim 1,

characterized in that one or more of its units (80-82, 105, 120, 131) are inserted in specially prepared pieces of electrical equipment, portable (70), on floors on tables, wall or ceiling mounted (100, 110, 130).

**18.** Electric heat radiating tube (80-82) for generating and diffusing heat, as in claim 17,
characterized in that the portable types of apparatus (70) have a flat base (71) for standing them on a floor or table, to which base one or more of said radiating tubes (81-82) are applied orthogonally.

**19.** Electric heat radiating tube for generating and diffusing heat as in claim 1,
characterized in that the portable types of apparatus have two opposing flat plates between which the electric tubes are fixed orthogonally.

**20.** Electric heat radiating tube (30, 50, 80-82, 105, 120, 131) for generating and diffusing heat as in claim 1, characterized in that they have a modular structure.

**21.** Electric heat radiating tube (131) for generating and diffusing heat as in claim 20,
charcterized in that a number of said tubes are joined axially, separated structurally and electrically, forming lines (130) of electric heating.

**22.** Electric heat radiating tube (131) for generating and diffusing heat as in claim 21,
characterized in that the lines (130) of electric heating are suspended by rods (141, 152, 153) or other means to greenhouse roofs (151) or at any rate at a certain height above the ground inside greenhouses (150).

**23.** Electric heat radiating tube (131) for generating and diffusing heat as in claim 22,
characterized in that it is placed axially inside downward-facing parabolic reflectors (140).

**24.** Process for the manufacture of an electric heat radiating tube (30, 50 , 80-82, 105, 120, 131) according to claim 1, comprising:

winding, entirely or partially superimposed, bands (20-23, 51, 52, 108, 109) around a round core (11);
one or more of said bands (21, 23, 52, 108) being made of highly electrically conducting material with a very high ratio between area and thickness and having a constant transversal cross-section, one or more of said bands being of electrically insulating material, whereby said bands of electrically insulating material are interposed between said bands of highly electrically conducting material so that electrical connection among said bands of highly electrically conducting material is avoided;
applying pressure and heat whereby all of said bands are substantially welded together to form a rigid tube;
providing for electric current supply, at the ends of the tube, means of connection and contacts (32, 43, 44) connected to said bands of highly electrically conducting material.

**Patentansprüche**

**1.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme
dadurch gekennzeichnet, dass es mittels Schraubenbänder (20-23, 51, 52, 108, 109), gänzlich oder teilweise überlagert, gebildet ist, wobei eines oder mehrere dieser Bänder (21, 23, 52, 108) aus hoch elektrizitätsleitendem Material besteht, mit einem sehr hohen Verhältnis zwischen der Erstreckung und der Dicke, mit konstantem Querschnitt, und wobei eines oder mehrere dieser Bänder (20,22,51,109) aus elektrischem Isolierungsmaterial sind und eingesetzt werden zwischen den Bändern (21,23,52,108) aus Material das hoch elektrizitätsleitend ist, wobei dieses Rohr (30, 50, 80-81, 105, 120, 131) an seinen Enden, mit Anschluss-und Kontaktmittel (32, 43, 44) für die Elektro-Speisung versehen ist, die an eines oder mehrere der Bänder (21,23,52,108), die hoch elektrizitätsleitend sind, verbunden sind.

**2.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1),
dadurch gekennzeichnet, dass die Schrauben des Bandes (20-33, 51, 52) in dieselbe Richtung gewikkelt sind.

**3.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1),
dadurch gekennzeichnet, dass von den Schrauben des Bandes eine oder einige in eine Richtung, eine oder einige in die entgegengesetzte Richtung gewickelt sind.

**4.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1),
dadurch gekennzeichnet, dass die Breiten der Bänder (20-23) gleich oder unterschiedlich sind.

**5.** Elektrisches Strahlrohr (50-105) Generator und Diffusor von Wärme wie unter Anspruch 1),
dadurch gekennzeichnet, dass es von einem elektrizitätsleitendem Band (52, 108) und von einem Band (51, 109) aus Isolierungsmaterial gebildet ist.

**6.** Elektrisches Strahlrohr (30, 80-82) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass zwei Gruppen von zwei oder mehreren elektrizitätsleitenden Bändern (21, 23) elektrisch miteinander an ein Ende des Rohres (30, 88-82) verbunden sind, während an das zweite Ende des genannten Rohres diese beiden Gruppen jeweils an zwei Kontakte (41, 42, 75) für die elektrische Speisung verbunden sind.

**7.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass die elektrizitätsleitenden Bänder (21, 23, 52, 108) aus Kupfer sind.

**8.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass die elektrizitätsleitenden Bänder (21, 23, 52, 108) aus Aluminium sind.

**9.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es einen runden Schnitt aufweist.

**10.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es eine gerade Entwicklung aufweist.

**11.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es eine gebrochene Entwicklung aufweist.

**12.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es eine kreisförmige Entwicklung aufweist.

**13.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es eine ringförmige Entwicklung aufweist.

**14.** Elektrisches Strahlrohr (105) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es in die elektrischen Deckengeräte (100), Wandgeräte oder tragbaren Handelsgeräte eingefügt wird, die für den Halter und die elektrische Speisung der sogenannten Entladungslampen als Austausch oder in Verbindung mit jenen Lampen verwendet werden.

**15.** Elektrisches Strahlrohr (120) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass die Kontakte (101) und die elektrischen Verbindungen und die Handels-Geräte (110), die als Träger und für die elektrische Speisung der sogenannten Entladungslampen verwendet werden, von den Kontakten (112) und von den elektrischen vereinfachten Verbindungen spezifisch für den Verschluss des elektrischen Kreises mit den Kontaktmitteln (121, 122) an den Enden dieses Strahlrohres (120) ersetzt werden.

**16.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), durch eine Ausführungstype mit Durchmesser 2-3 cm, Temperatur 100-200°, Leistung 100-150 W, Spannung 12-220 V gekennzeichnet.

**17.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es in eine oder meherere Einheiten (80-82, 105, 120, 131) in dazu vorbereitete tragbare elektrische Geräte (70) oder zur Aufstellung auf Fußböden oder auf Tische, Wände, oder Decken (100, 110, 130) eingesetzt wird.

**18.** Elektrisches Strahlrohr (80-82) Generator und Diffusor von Wärme wie unter Anspruch 17), dadurch gekennzeichnet, dass die tragbaren Geräte (70) eine ebene Basis (71) aufweisen, die dafür geeignet ist, mit dem Fußboden oder mit der Fläche der Tische zusammenzupassen wobei an dieser Basis eines oder mehrere solcher Strahlröhre (81-82) rechtwinklig angebracht sind.

**19.** Elektrisches Strahlrohr Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass die tragbaren Geräte zwei entgegengesetzte flache Platten aufweisen, zwischen denen die elektrischen Röhre rechtwinklig befestigt sind.

**20.** Elektrisches Strahlrohr (30, 50, 80-82, 105, 120, 131) Generator und Diffusor von Wärme wie unter Anspruch 1), dadurch gekennzeichnet, dass es eine modulare Struktur aufweist.

**21.** Elektrisches Strahlrohr (131) Generator und Diffusor von Wärme wie unter Anspruch 20), dadurch gekennzeichnet, dass eine Mehrheit an solchen Röhren axial mit Lösungen struktureller und elektrischer Kontinuität verbunden wird, wodurch elektrische Heizungslinien (130) bereitgestellt werden.

**22.** Elektrisches Strahlrohr (131) Generator und Diffu-

sor von Wärme wie unter Anspruch 21),
dadurch gekennzeichnet, dass die Elektroheizungslinien (130) durch Schnuren (141, 152, 153) oder andere Mittel an den Dächern (151) oder jedenfalls an bestimmten Höhen vom Boden innerhalb von Gewächshäusern aufgehängt werden.

**23.** Elektrisches Strahlrohr (131) Generator und Diffusor von Wärme wie unter Anspruch 22),
dadurch gekennzeichnet, dass es axial innerhalb von parabolischen Reflektoren (140), die nach unten gerichtet sind, voreingestellt ist.

**24.** Verfahren für die Erschaffung von elektrischen Generatoren von Wärme und deren Streuung durch ein Strahlrohr (30, 50, 80-82, 105, 120, 131), das nach den Merkmalen aus den Ansprüchen 1-23 mit den Schraubenbändern (20-23, 51, 52, 108, 109), die gänzlich oder teilweise übereinandergelagert sind, erlangt wird, wobei eines oder mehrere solcher Bänder (21, 23, 52, 108) aus hoch elektrizitätsleitendem Material bestehen und mit sehr hohem Verhältnis zwischen der Erstreckung und der Dicke mit konstantem Querschnitt gestaltet sind und wobei eines oder mehrere solcher Bänder (20, 22, 51, 109) aus elektrischem Isolierungsmaterial sind und zwischen den Bändern (21, 23, 57, 108) aus hoch elektrizitätsleitendem Material eingesetzt sind und wobei ein solches Rohr (30, 50, 80-82, 105, 120, 131) an seinen Enden mit Anschluss-und Kontaktmitteln (32, 43, 44) zur Elektro-Speisung versehen ist, die an einem oder an mehreren der hoch elektrizitätsleitenden Bänder (21, 23,52, 108) angeschlossen sind.

**Revendications**

**1.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur
caractérisé par le fait qu'il est formé de bandes (20-23, 51, 52, 108, 109) en spirale, superposées totalement ou en partie, une ou plusieurs de ces bandes (21, 23, 52, 108) étant en matériel hautement conducteur d'électricité, avec un rapport très élevé entre l'extension et l'épaisseur, à section transversale constante, une ou plusieurs de ces bandes (20, 22, 51, 109) faites d'un matériel isolant étant interposées entre les bandes (21, 23, 52, 108) en matériel hautement conducteur, ledit tube (30, 50, 80-81, 105, 120, 131) étant équipé, à ses extrémités, de moyens de fixation et de contact (32, 43, 44) pour l'alimentation électrique, reliés à une ou plusieurs des bandes (21, 23, 52, 108) hautement conductrices.

**2.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que les spirales des bandes (20-33, 51, 52) sont tournées dans le même sens.

**3.** Tube électrique radiant générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que les bandes en spirale sont enroulées une ou plusieurs dans un sens, une ou plusieurs dans le sens opposé.

**4.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que les bandes (20-23) sont de même largeur ou de largeurs différentes.

**5.** Tube électrique radiant (50-105) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait qu'il est formé d'une bande (52, 108) conductrice d'électricité et d'une bande (51-109) en matériel isolant.

**6.** Tube électrique radiant (30, 80-82) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que deux groupes de deux ou plusieurs bandes (21, 23) conductrices d'électricité sont reliées électriquement entre elles à une extrémité du tube (30, 88-82) alors qu'à l'autre extrémité dudit tube, ces deux groupes sont reliés respectivement à deux contacts (41, 42, 75) pour l'alimentation électrique.

**7.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que les bandes (21, 23, 52, 108) conductrices d'électricité sont en cuivre.

**8.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131), générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait que les bandes (21, 23, 52, 108) conductrices d'électricité sont en aluminium.

**9.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait qu'il présente une section ronde.

**10.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait qu'il présente un développement droit.

**11.** Tube électrique radiant générateur et diffuseur de chaleur, conformément à la revendication 1), caractérisé par le fait qu'il présente un développement brisé.

**12.** Tube électrique radiant générateur et diffuseur de chaleur conformément à la revendication 1), caractérisé par le fait qu'il présente un développement circulaire.

**13.** Tube électrique radiant générateur et diffuseur de chaleur conformément à la revendication 1), caractérisé par le fait qu'il présente un développement annulaire.

**14.** Tube électrique radiant (105) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait qu'il est introduit dans les appareils (100) électriques fixés au plafond, fixés au mur ou portatifs vendus dans le commerce et utilisés pour le support ou l'alimentation électrique des lampes dites à décharge, soit pour les remplacer, soit pour s'y ajouter.

**15.** Tube électrique radiant (120) générateur et diffuseur de chaleur conformément à la revendication 14)
caractérisé par le fait que les contacts (101) et les connexions électriques et les appareils (110) vendus dans le commerce utilisés pour le support et l'alimentation électrique des lampes dites à décharge sont remplacés par des contacts (112) et des connexions électriques simplifiés pour la fermeture du circuit électrique avec les moyens de contact (121, 122) électrique aux extrémités dudit tube radiant (120).

**16.** Tube radiant électrique générateur et diffuseur de chaleur conformément à la revendication 1), caractérisé par un type de réalisation de 2-3 cm de diamètre, température 100-200°, puissance 100-150 W, tension 12-220 V.

**17.** Tube électrique radiant générateur et diffuseur de chaleur conformément à la revendication 1), caractérisé par le fait qu'il est introduit dans une ou plusieurs unités (80-82, 105, 120, 131), dans des appareils électriques portatifs (70) ou à poser sur le sol, sur une table, sur un mur, ou au plafond (100, 110, 130) disposés à cet effet.

**18.** Tube électrique radiant (80-82), générateur et diffuseur de chaleur conformément à la revendication 17),
caractérisé par le fait que les appareils portatifs (70) présentent une base (71) plane apte à être posée par terre ou sur une table, à laquelle base sont appliqués perpendiculairement un ou plusieurs tubes radiants (81-82).

**19.** Tube électrique radiant générateur et diffuseur de chaleur conformément à la revendication 1), caractérisé par le fait que les appareils portatifs présentent deux plaques opposées, planes, entre lesquelles sont fixés perpendiculairement les tubes électriques.

**20.** Tube électrique radiant (30, 50, 80-82, 105, 120, 131) générateur et diffuseur de chaleur conformément à la revendication 1),
caractérisé par le fait qu'il présente une structure modulaire,

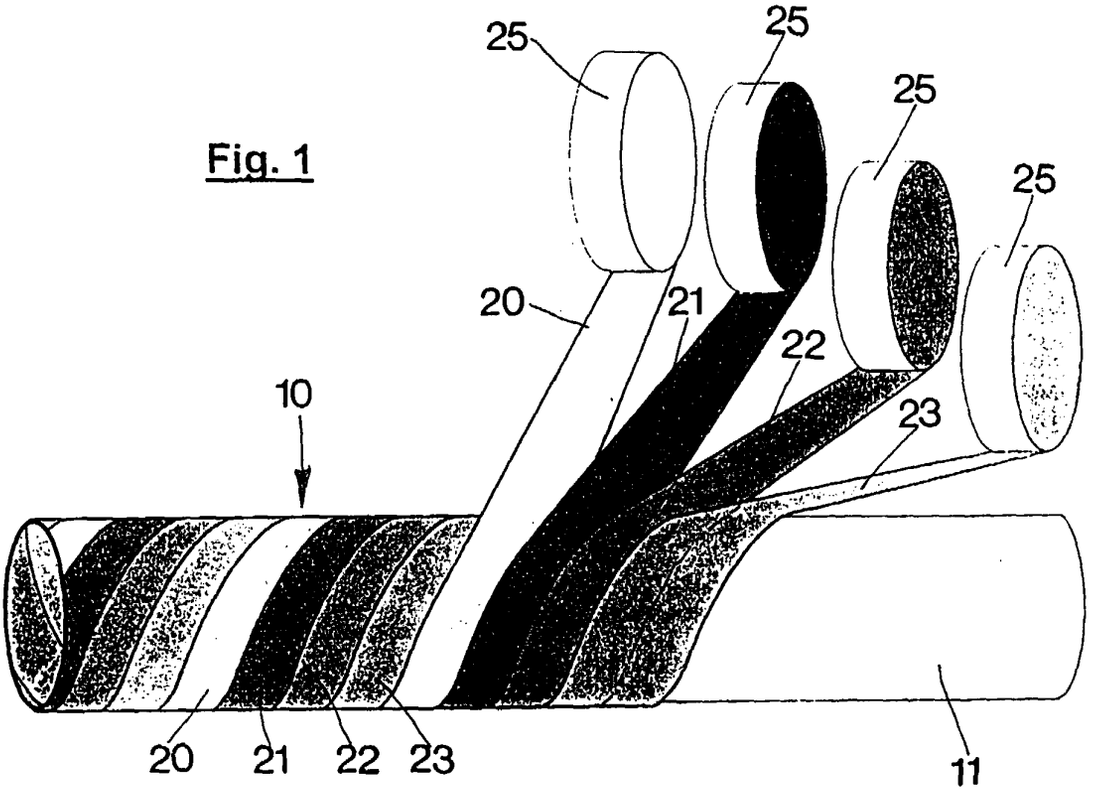
**21.** Tube électrique radiant (131) générateur et diffuseur de chaleur conformément à la revendication 20),
caractérisé par le fait que plusieurs de ces tubes sont reliés axialement avec des solutions de continuité structurelle et électrique donnant lieu à des lignes (130) de chauffage électrique.

**22.** Tube électrique radiant (131) générateur de chaleur conformément à la revendication 21),
caractérisé par le fait que les lignes (130) de chauffage électrique sont suspendues par des cordelettes (141, 152, 153) ou d'autres moyens aux toits (151) ou de toutes façons à une certaine hauteur au-dessus du sol à l'intérieur de serres (150).

**23.** Tube électrique radiant (131) générateur et diffuseur de chaleur conformément à la revendication 22),
caractérisé par le fait qu'il est prédisposé axialement à l'intérieur de réflexteurs paraboliques (140) tournés vers le bas.

**24.** Procédé pour la création de générateurs et diffuseurs électriques de chaleur au moyen d'un tube radiant (30, 50, 80-82, 105, 120, 131) obtenu selon les caractéristiques des revendications 1-23 avec des bandes (20-23, 51, 52, 108, 10)) en spirale, superposées totalement ou en partie, une ou plusieurs de ces bandes (21, 23, 52, 108) étant en matériel hautement conducteur d'électricité, avec un rapport très élevé entre l'extension et l'épaisseur, à section transversale constante, une ou plusieurs de ces bandes (20, 22, 51, 109) étant en matériel isolant et interposées entre les bandes (21, 23, 57, 108) en matériel hautement conducteur d'électricité, ce tube (30, 50, 80-82, 105, 120, 131) étant équipé à ses extrémités de moyens de fixation et de contact (32, 43, 44) pour l'alimentation électrique, reliés à une ou plusieurs des bandes (21, 23, 52, 108) hautement conductrices d'électricité.

Fig. 1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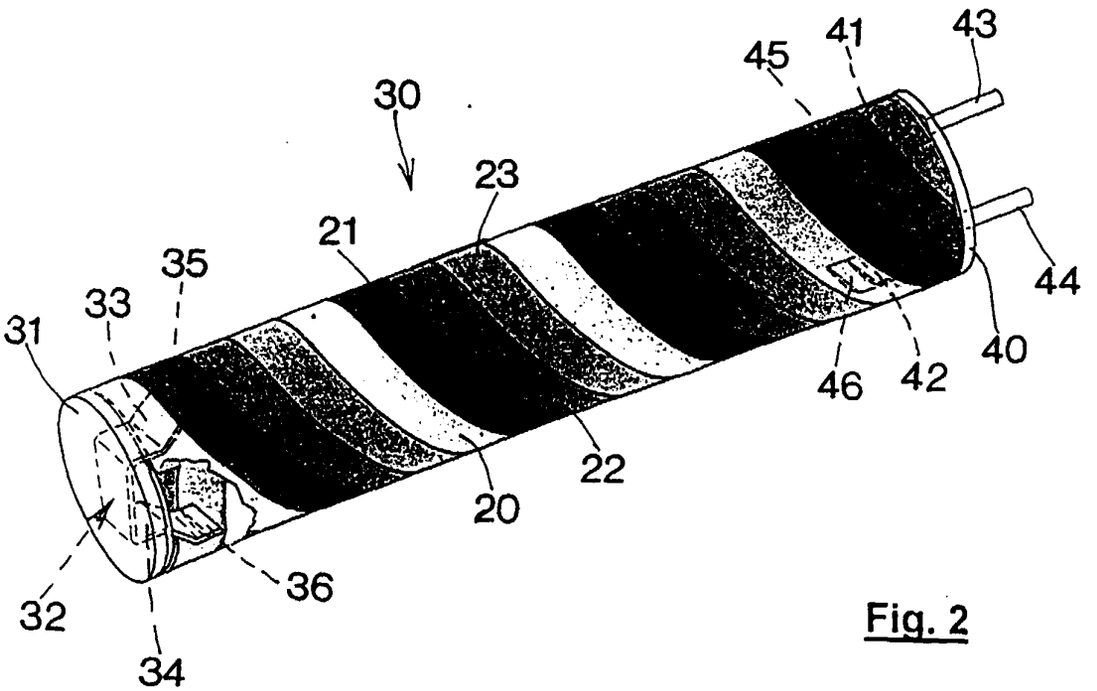
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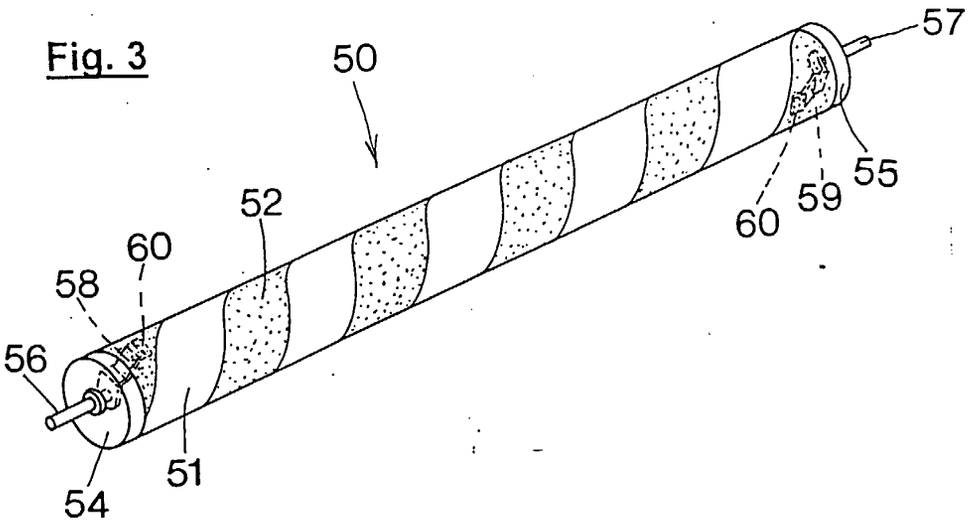
Fig. 2

Fig. 3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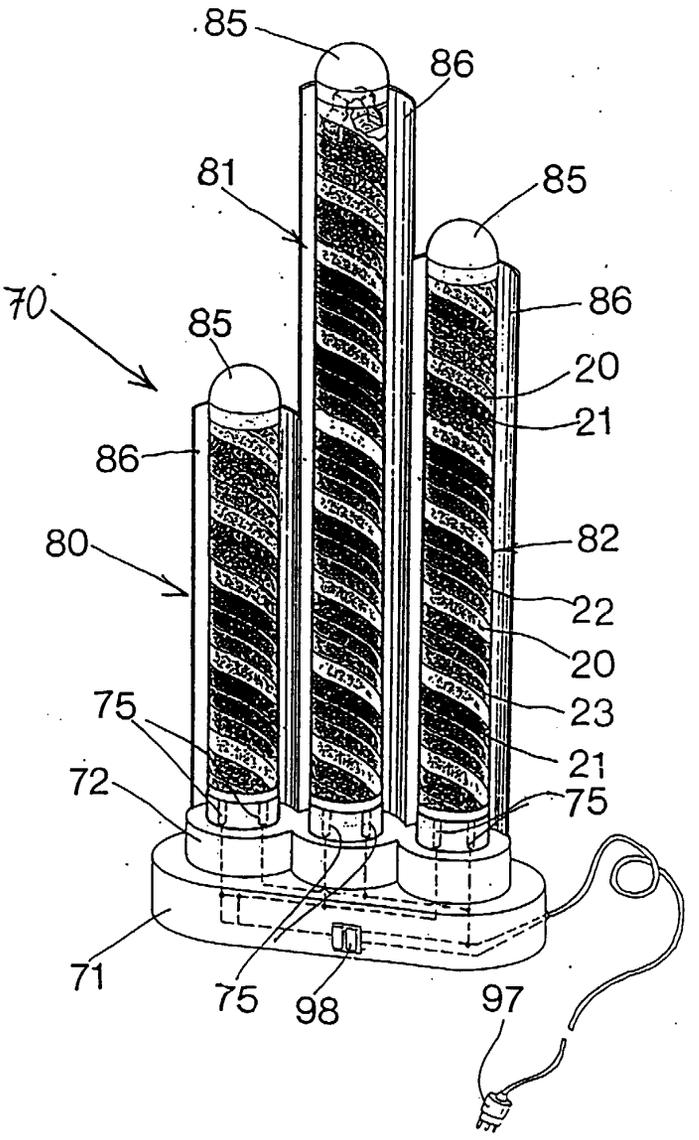
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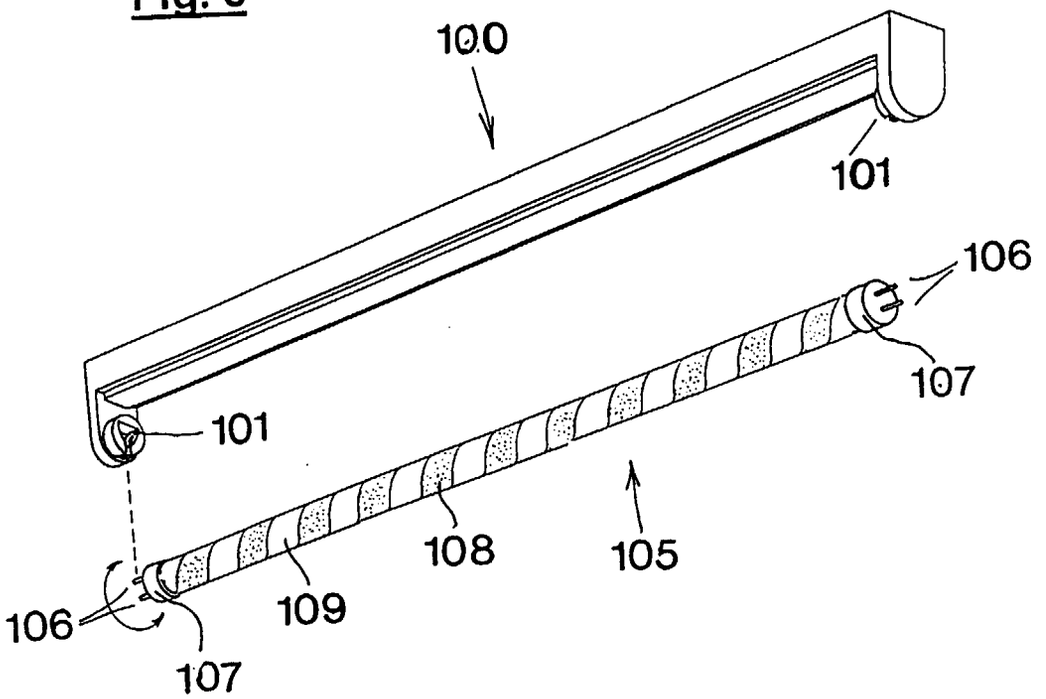
Fig. 5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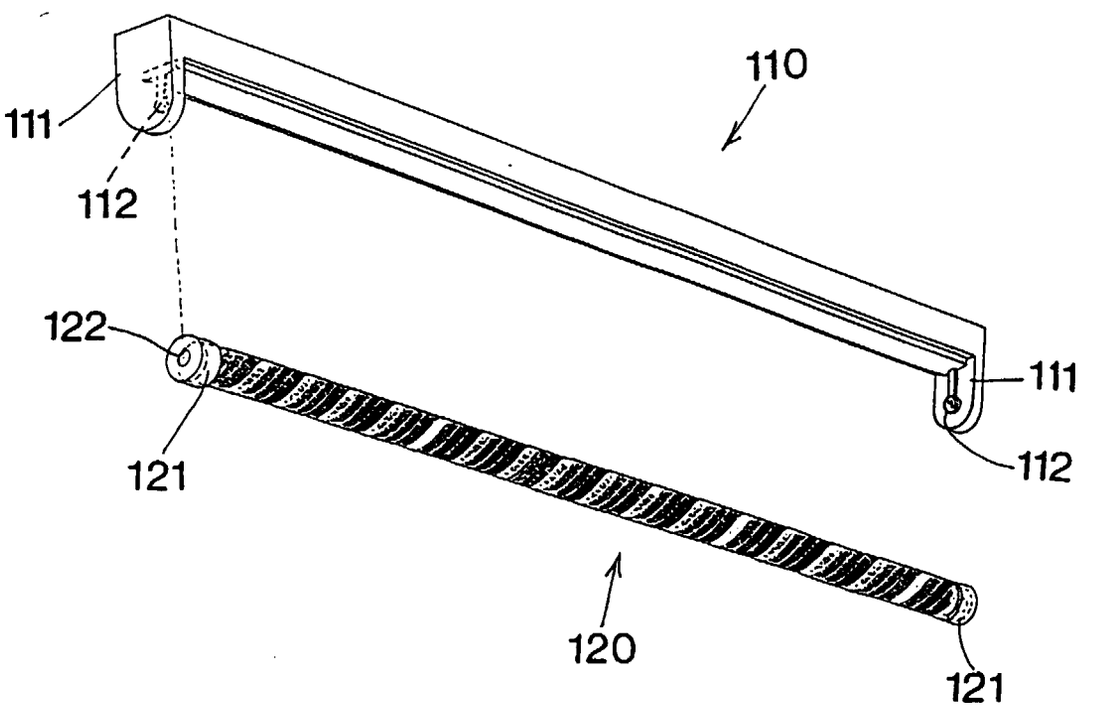
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Fig. 6

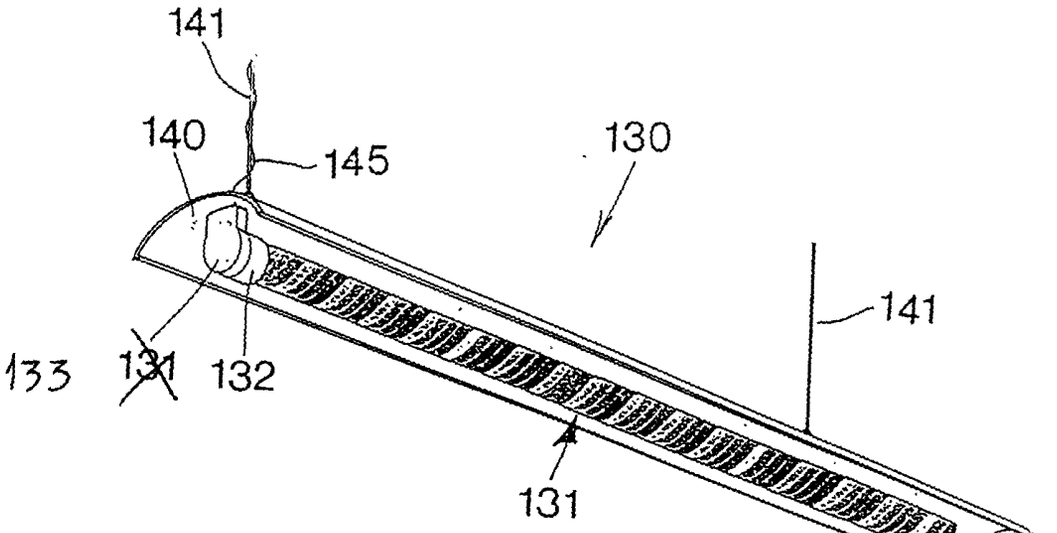
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Fig. 7

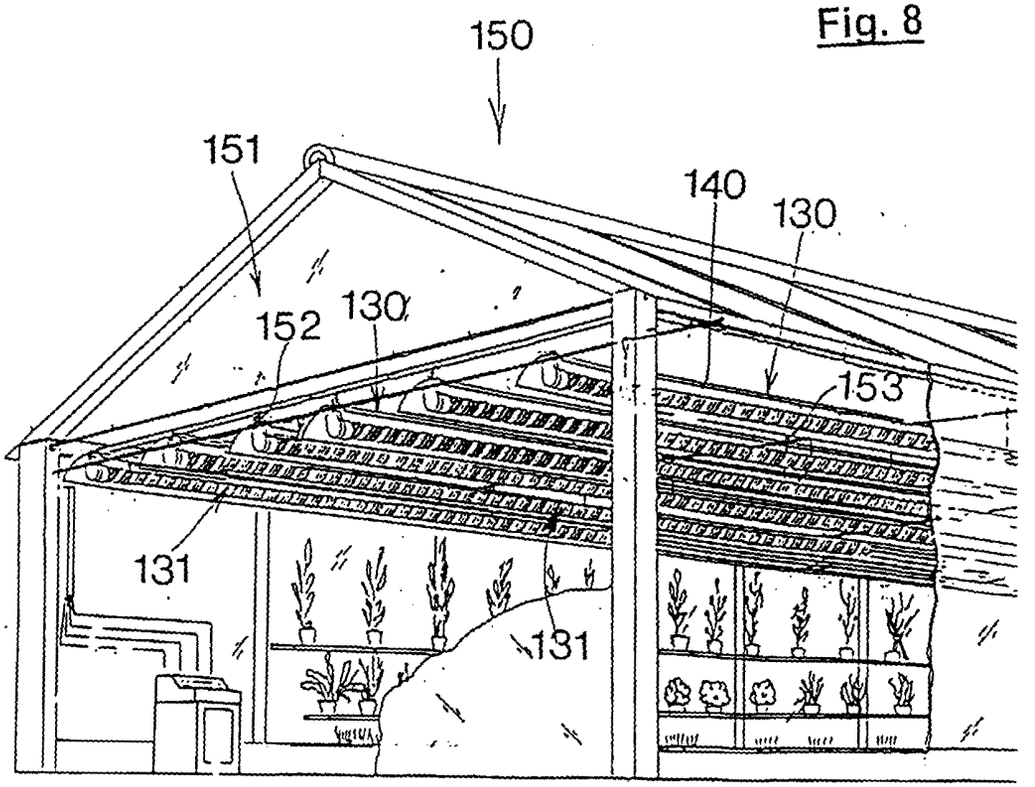
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Fig. 8