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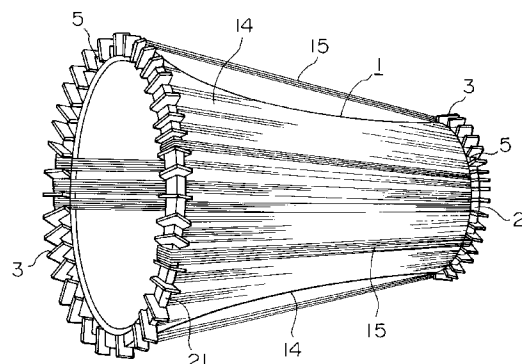
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(54) **Deflection yoke.**

(57) A deflection yoke equipped with a horizontal deflection coil and a vertical deflection coil which includes a frame body having at least on both the terminal ends thereof with respect to its axial direction a plurality of coil-winding grooves formed adjacent to one another and parallel to the axial direction, wherein at least one of the horizontal coil and the vertical coil is formed by winding a conductive row member onto the frame body along the coil-winding grooves in a toroidal manner.

FIG. 6



BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a deflection yoke mounted on television receivers or display units.

2. Description of the Prior Art

A typical deflection yoke fitted to a cathode ray tube used for television receivers and display units includes a funnel-shaped bobbin which has horizontal deflection coil elements attached on its top and bottom sides of the inner face. There are also attached vertical deflection coil elements on the outside of the funnel-shaped bobbin.

Fig.1 shows an example of a bobbin for a saddle type deflection coil for use in a typical deflection yoke. The bobbin 2 is provided with a plurality of coil-winding grooves 5, on which, for example, a coiling wire 11 as shown in Fig.2, is wound in layers to thereby form a deflection coil. Coiling wire 11 uses one of conductive wires (including litz wires) with an insulating layer 4 provided thereon.

In winding coiling wire 11 into the aforementioned coil-winding grooves 5, the coiling wire 11 is wound in layers by a flyer type automatic winding machine, one by one, or by every some wires, with being unbound or separated in a form of single wires, whereby a deflection coil will be produced.

Such prior art deflection coil, however, suffers from difficulties: owing to variation of the stretching force acted on coiling wire 11 as it is wound and other reasons, the coiling wire 11 is displaced and biased as shown in Fig.2, and in other cases, the order of winding of coiling wire 11 is altered and hence such winding as previously designated by a design instruction cannot be practiced. Further, the biased states of coiling wire 11 of deflection coil that is mass-produced differ from one another for each article, therefore, it would be impossible to regulate a deflection field with high precision. Additionally, the products made by mass-production are necessarily attended with dispersion, resulting in lowering of the yield. Hence the prior art winding method is disadvantageous in view of the cost. It is true that the just-mentioned prior art method would reduce displacement and biased winding of coiling wire 11 as the width of the coil-winding groove is narrowed so as to satisfy an original design, but this method is followed by another problem of coil performance being deteriorated because of a ratio L/R between inductance L and resistance R being reduced.

In order to eliminate such problems, the present applicant has previously proposed a deflection coil which is formed using a conductive wire row member (which will be referred to as "wire ribbon" hereinafter) as shown in Figs.3A to 3D, in place of winding sepa-

rate single wires one by one as used to be practiced.

Examples of wire ribbon 15 include one that is composed as shown in Fig.3A by arranging in parallel a plurality of conductive wires 8 of copper, aluminum or the like with an insulating layer 4 coated thereon and adhering them using an adhesive 6; one that is composed as shown in Fig.3B by arranging in parallel a plurality of conductive wires 8 with an insulating layer 4 coated thereon and adhering together the wires on one side of an insulator sheet 7 of resin, etc. with an adhesive 6; one that is composed as shown in Fig.3C by arranging and adhering together in parallel a plurality of conductive wires 8 formed with an insulating layer 4 and an adhesive layer 9; and one that is composed as shown in Fig.3D by arranging a plurality of conductive wires 8 which are each coated with an insulating layer 4 and covered by a thermoplastic adhesive layer 20 and adhering them together in a row.

The conductive wires 8 forming the aforementioned wire ribbon 15 are arranged in parallel with one another in an orderly manner in a row, and therefore, neither will each conductive wire 8 be displaced in wire ribbon 15, nor will the order of the wires be altered. Therefore, if such a wire ribbon 15 is used, or wound in layers into coil winding grooves, it can be expected that deflection coils will be produced which clear the problems mentioned above such as a significant displacement of conductive wires 8.

The production of such a deflection coil as described above is achieved by inserting wire ribbon 15 into a coil-winding groove 5 of bobbin 2 having a flange 3 as shown in Fig.4 so that the wire ribbon is wound in layers along the bottom face 10 of the coil-winding groove 5. The deflection coil formed with the wire ribbon 15 can be improved in its characteristics to a great extent as compared with those in the prior art. Further, this type of bobbin 2 is provided with coil-winding grooves 5 in its crossover portions respectively on the head and tail sides thereof, as shown in Fig.5.

Meanwhile, when the aforementioned winding machine of flyer type is used for winding wire ribbon 15 on saddle-shaped bobbin 2, some problems occurs. That is, with this machine, the wire ribbon 15 is easy to be twisted as is wound around the crossover portions on the head and tail sides, and the wire ribbon sometimes comes off coil-winding groove 5. In order to solve these problems, the applicant of the present invention has proposed a coil-winding machine dedicated for the limited purpose. Referring to Fig.5, description will be made on the operation of winding wire ribbon 15 around bobbin 2 using this dedicated coil-winding machine. Initially, as bobbin 2 moves in a direction of Z-axis shown by the arrow, at the same time a nozzle 30 for delivering wire ribbon 15 moves in a direction of X-axis with facing the inner surface of bobbin 2 and keeping a predetermined distance

therefrom. The combination of these movements places wire ribbon 15 onto a groove disposed on a right side inner wall face 45 of bobbin 2. Subsequently, when reaching a position facing the crossover portion on the head side, nozzle 30 turns around and moves to coil-winding groove 5 of the crossover portion. In winding wire ribbon 15 into coil-winding groove 5 of the crossover portion on the head side, wire ribbon 15 will be regulated so as not to be twisted or displaced from coil-winding groove 5. This regulation takes a long time. After the completion of winding the wire ribbon along the crossover portion on the head side, the wire ribbon 15 will be placed into the groove on the left side inner wall face 46. Then, the wire ribbon will be wound into the crossover portion on the tail side with a long period of time as the same manner in the crossover portion on the head side. A series of these steps will be repeated to wind the ribbon in layers to form a deflection coil.

Thus, the winding process in the fabrication of a deflection coil by winding wire ribbon 15 on saddle shaped bobbin 2 is complicated. Particularly, when the wire ribbon is placed into the crossover portions on the head and tail sides, the control of the winding process is complicated and takes much time. Hence, this fabrication method suffers from a low efficiency and a low yield of deflection coils.

Further, the dedicated winding machine is indispensably costly because the machine includes extremely complicated control. The price directly reflects on the fabrication cost of the deflection coil, resulting in an increased cost.

Alternatively, in order to reduce the time for winding, a multiple winding machine is adopted in which some or several winding machine units are simultaneously driven for winding. But, in this case, the total cost of the plural winding machine units used in parallel should directly be added to the fabrication cost of the deflection coils, so that this also makes the fabrication cost up greatly.

SUMMARY OF THE INVENTION

The present invention has been achieved to solve the problems in the prior art described above, and it is therefore an object of the present invention to provide a deflection yoke wherein the time taken for winding the wire ribbon can be reduced to a great extent without using costly winding machine.

Therefore, in one aspect the invention provides a deflection yoke comprising a hollow frame having a longitudinal axis and at least one deflection coil wound longitudinally around the inner and outer surfaces of the frame, the coil being of toroidal section about the longitudinal axis of the frame. By "toroidal" we mean that, when viewed in a section plane containing the axis of the frame, the coil is shaped as a ring or loop.

According to another main aspect of the present invention, the above object can be achieved by providing a deflection yoke equipped with a horizontal deflection coil and a vertical deflection coil, comprising: a frame body having at least on both the terminal ends thereof with respect to its axial direction a plurality of coil-winding grooves formed adjacent to one another and parallel to the axial direction, wherein at least one of the horizontal coil and the vertical coil is formed by winding a conductive row member onto the frame body along the coil-winding grooves in a toroidal manner.

Preferably, in a deflection yoke as set forth above, the frame body comprises a funnel-shaped core and rings fitted to both terminal ends of the core and each of the rings has a plurality of coil-winding grooves partitioned by flanges arranged radially and equi-spaced from one another.

The deflection coil may be constructed such that a core as a frame body is fitted at its both end sides with rings having a plurality of coil-winding grooves formed radially and a wire ribbon is wound on the frame along the coil-winding grooves in a toroidal manner. Therefore, there is no longer needed any changeover portion which would be provided for a saddle type deflection coil and which would require a complicated control. As a result, it is possible to save a long period of time that should be taken for the winding in the crossover portion. Consequently, the deflection coil can be fabricated by winding the wire ribbon at a markedly increased speed, thus it is possible to improve the work efficiency to a great extent.

Since no crossover portion exists, the control becomes so simple that the winding of the wire ribbon can be effected by a simple-structured, and therefore, low cost winding machine. This also makes it possible to fabricate a deflection coil at low cost, and the operation of the winding machine itself becomes simplified.

Further, the absence of the crossover portion can shorten the wire ribbon of the deflection coil to be used by the length required for the crossover portions.

Moreover, since wire ribbon is used to make a deflection coil, no winding wire is displaced or positioned away from where it should be, or no deterioration of the order of winding wires occurs, like the prior art examples would suffer. Since the wire ribbon is wound up in a toroidal manner, no wire ribbon would be wound twisted, thus making it possible to improve the convergence and the focusing characteristics.

The above and many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the following detailed description and accompanying drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative exam-

ple.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a schematic perspective view showing an example of a prior art bobbin to which deflection coil is formed;

Fig.2 is an illustration showing a state of coil-windings in a conventional deflection coil;

Figs.3A to 3D are illustrative views showing a different types of conventional wire ribbons;

Fig.4 is an illustration showing an example of a prior art deflection coil formed by winding in layers a wire ribbon into a coil-winding groove;

Fig.5 is an illustration for explaining an operation of winding a wire ribbon in a conventional manner;

Fig.6 is a perspective view for illustrating a state in which a wire ribbon is wound on a core of a deflection yoke in accordance with an embodiment of the present invention; and

Fig.7 is a perspective view for illustrating a state in which a wire ribbon is wound on a bobbin having another configuration for a deflection yoke in accordance with the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention will hereinafter described in detail with regard to embodiments shown in Figs.6 and 7 of the accompanying drawings. In Figs.6 and 7, the parts having identical name with that in the prior art example will be designated by the same reference numerals, and the repeated description of such parts will be omitted.

Fig.6 is a perspective illustration showing a state in which a wire ribbon is wound onto a frame body of a deflection yoke in accordance with the embodiment.

The main feature of this embodiment lies in that a frame body 1 is constructed of an integrated funnel-shaped core 14 and rings each of which has a plurality of coil-winding grooves partitioned by flanges 3 arranged radially and equi-spaced from one another and which are fitted to both end sides of the core, and wire ribbon 15 is wound in a toroidal manner along coil-winding grooves 5 of frame body 1 to thereby fabricate a deflection coil in a short time.

Now, the operation of the fabrication of the deflection coil of the embodiment will be described. First of all, a frame body 1, shown in Fig.6, which is composed of a core 14 fitted at both end sides thereof with rings 21 having coil-winding grooves 5, is mounted on, for example, a frame body holding portion of an unillustrated winding machine. In this arrangement, wire ribbon 15 is delivered from a nozzle (not shown) for wire ribbon 15 of the winding machine, and the de-

livered wire ribbon is wound up to be fit into coil-winding grooves 5 in a toroidal form, thus fabricating a deflection coil in a markedly short period of time. In this case, either frame 1 may be rotated or the nozzle may be moved to wind up wire ribbon 15.

The present invention should not be limited to the above embodiment, various changes and modifications can be made. For example, although rings 21 having coil-winding grooves 5 are attached to core 14 in the above embodiment, core 14 itself may be formed at its both ends with coil-winding grooves 5. Alternatively, although core 14 is constructed by an integrated cylindrical body in the above embodiment, it is also possible to make a deflection coil by forming half cores 14 and combining a pair of the half cores after winding wire ribbon 15 onto each of the half cores. In this case, each half core should be formed with coil-winding grooves 5.

Further, though coil-winding grooves 5 are formed on the both ends of core 14 in the above embodiment, it is possible to form coil-winding grooves 5 having flanges 3 on the inner side of core 14 as well as the both ends of the core. Moreover, although rings 21 having coil-winding grooves 5 are fitted to both ends of core 14, it is also possible that rings 21 are formed as having coil winding grooves 5 extended to the inner surface of core 14, and the thus formed rings are fitted to core 14 to form coil-winding grooves 5 on the inner surface of core 14 and on the both ends of the core 14.

Although rings 21 each having a plurality of coil-winding grooves 5 formed therein are fitted to the both ends of core 14, a deflection coil may also be made in the following alternative manner. That is, as shown in Fig. 7, a plurality of coil-winding grooves 5 with flanges 3 are formed such that the flanges is extended on an inner side of a half bobbin 2, and wire ribbon 15 is wound along these coil-winding grooves 5 in a toroidal manner. A pair of the thus formed coils are combined to form a deflection coil. Further, a concentric core (not shown) may be inserted into and fixed in a space 12 defined between the external peripheral wall surface of the coil formed in the toroidal shape and the coil. It is also possible to form coil-winding grooves 5 on an integrated bobbin 2 in place of the half bobbins. Moreover, although coil-winding grooves 5 are provided on the both head and tail sides and the inner surface of bobbin 2 in Fig.7, coil-winding grooves 5 may be formed only on the head and tail sides of bobbin 2.

Claims

1. A deflection yoke equipped with a horizontal deflection coil and a vertical deflection coil, comprising:
a frame body having at least on both the

terminal ends thereof with respect to its axial direction a plurality of coil-winding grooves formed adjacent to one another and parallel to the axial direction, wherein at least one of said horizontal coil and said vertical coil is formed by winding a conductive row member onto said frame body along said coil-winding grooves in a toroidal manner.

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2. A deflection yoke according to claim 1, wherein said frame body comprises a funnel-shaped core and rings fitted to both terminal ends of said core, each of said rings having a plurality of coil-winding grooves partitioned by flanges arranged radially and equi-spaced from one another.

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3. A deflection yoke comprising a hollow frame having a longitudinal axis and at least one deflection coil wound longitudinally around the inner and outer surfaces of the frame, the coil being of toroidal section about the longitudinal axis of the frame.

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FIG. 1
PRIOR ART

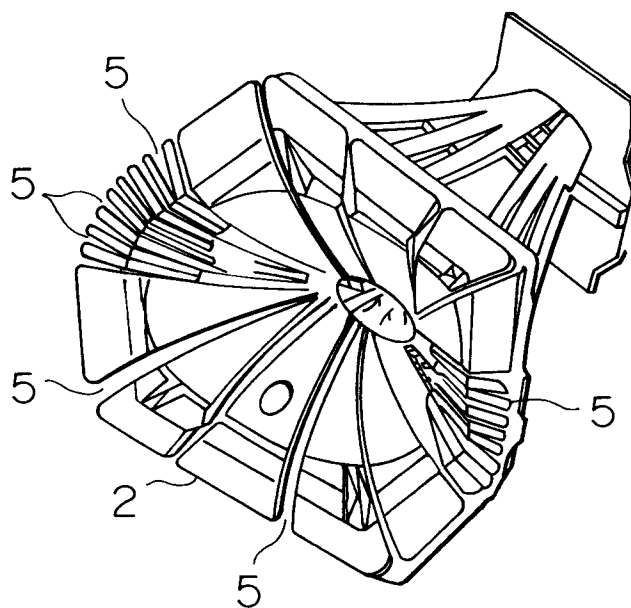


FIG. 2
PRIOR ART

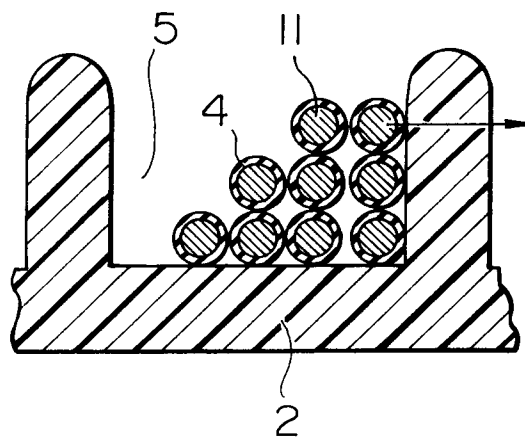


FIG. 3A
PRIOR ART

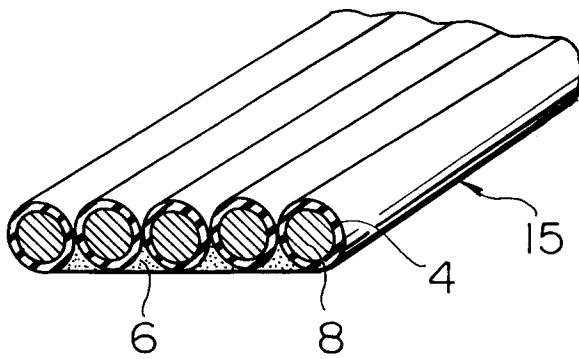


FIG. 3B
PRIOR ART

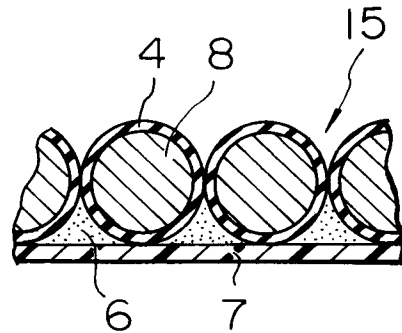


FIG. 3C
PRIOR ART

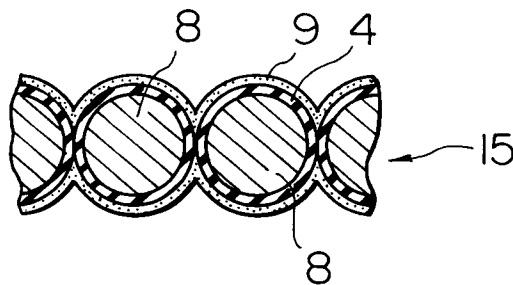


FIG. 3D
PRIOR ART

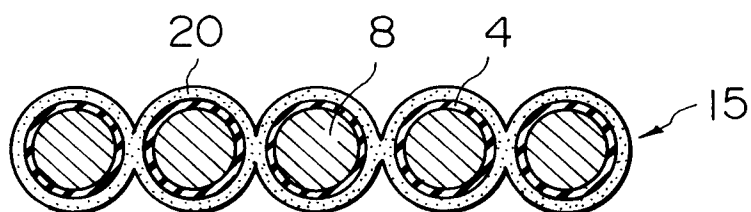


FIG. 4
PRIOR ART

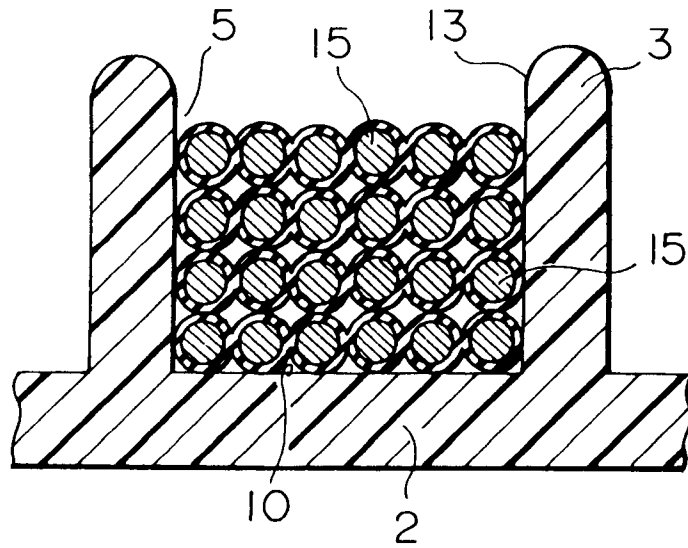


FIG. 5
PRIOR ART

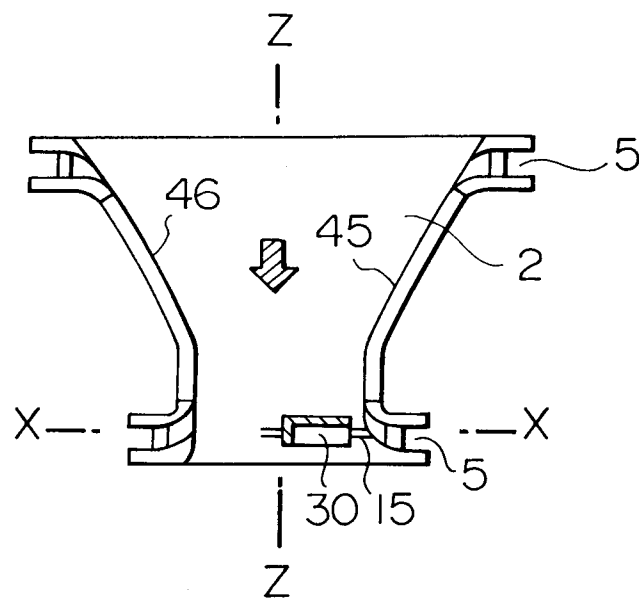


FIG. 6

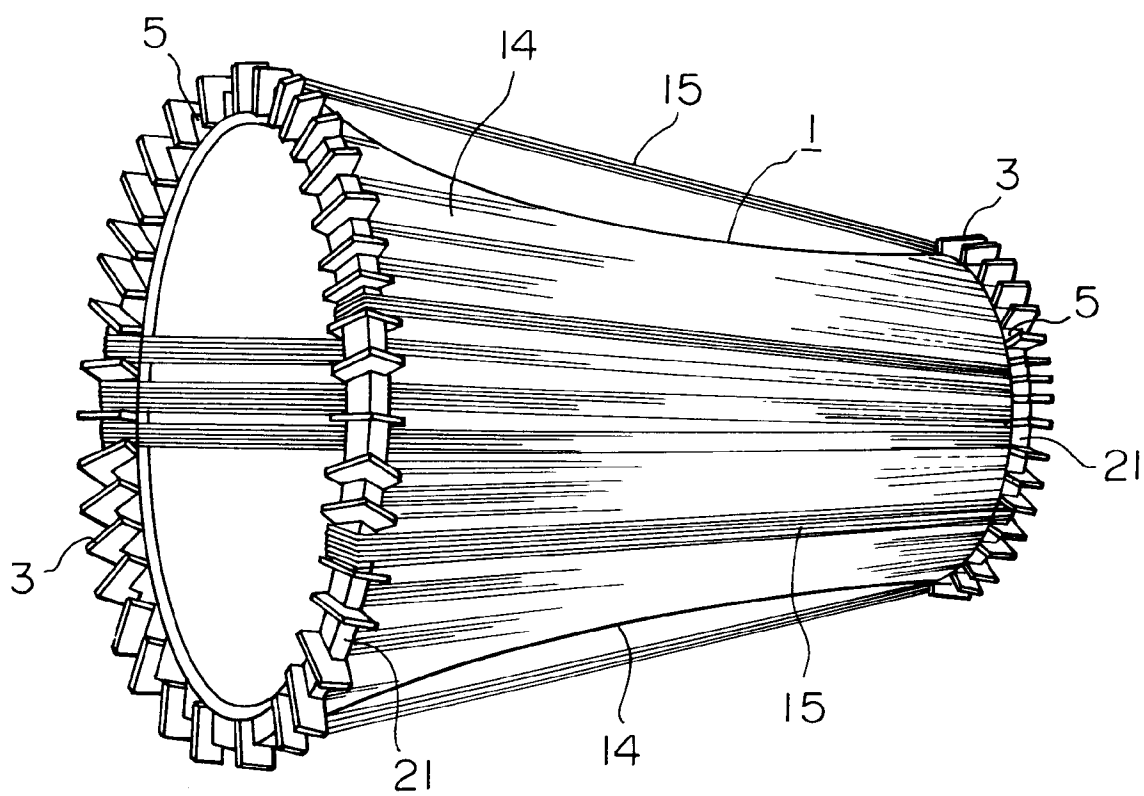
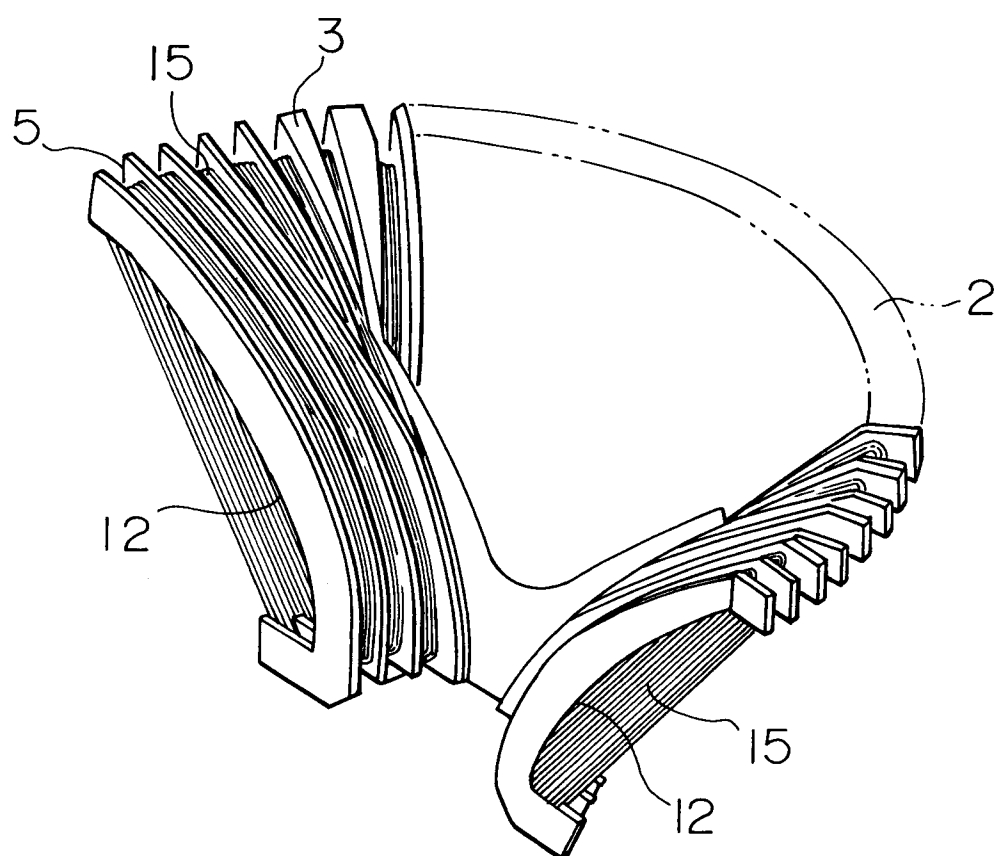


FIG. 7





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 30 5965

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.5)
X	GB-A-1 370 829 (MATSUSHITA) * page 2, right column, line 84 - page 3, right column, line 88 * * figures 1-10 *	1-3	H01J29/76 H01J9/236
A	DE-A-2 010 699 (RCA) * claim 1 * * figures 1,2 *	1-3	
A	US-A-4 243 965 (N.YOSHIKAWA) * figure 5 * * column 3, line 30 - column 4, line 7 *	1-3	
A	US-A-3 711 802 (C.E. TORSCH) * the whole document *	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H01J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 OCTOBER 1993	Examiner DAMAN M.A.
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