

①⑫ **EUROPEAN PATENT APPLICATION**

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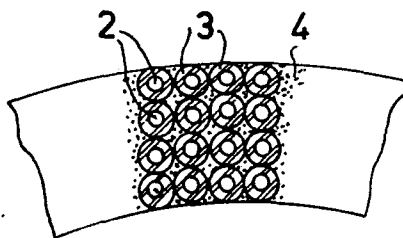
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⑤④ **Fixation of coils by means of poly-p-xylylene or a derivative thereof, and such coils.**

⑤⑦ The winding wires of coils, in particular deflection coils, are fixed by means of poly-p-xylylene. As a result of this thermally stable coils are obtained.



"Fixing coils by means of parylene, fixed coils."

TITLE MODIFIED
see front page

The invention relates to a coil the winding wires of which have been fixed by means of an adhesive and to a method of fixing coils by means of an adhesive.

Coils are used, for example, in motors or as
5 deflection coils in cathode-ray tubes and in camera tubes for television cameras and the like. Such coils are constructed from a winding wire which is wound according to a given pattern. The pattern determines the electromagnetic properties of the coil.

10 United States Patent Specification 2,395,736 discloses a method of fixing the winding wires of coils in which method the coils are impregnated with a resin. This method has for its result that the outside dimensions of the coils vary for each individual coil. Upon assembling
15 the coils this may present problems.

According to Netherlands Patent Application 7,412,209 the winding wire for coils is a wire which has a first electrically insulating envelope about which a second envelope has been provided. This second envelope usually
20 consists of a thermoplastic synthetic resin. Said second envelope serves to bond the winding wires together as soon as they have been wound to a given pattern and to thus fix the winding wires. Most thermoplastic resins soften already at a comparatively temperature. This has
25 for its result that the winding wires of the coil are no longer sufficiently fixed when the temperature rises and deform as a result of internal stresses built up during winding.

In order to solve this problem, Netherlands Patent
30 Application 7 412 209 suggests the use of special synthetic resins for the second envelope.

The invention provides a different solution to this problem. The coils according to the invention are

characterized in that the winding wires are fixed with more than one adhesive, at least one of the adhesives being a poly-p-xylylene or a derivative thereof.

A method according to the invention of fixing
5 coils is characterized in that the coils are first fixed with one or more adhesives according to a known method and a layer of poly-p-xylylene or a derivative thereof is then provided on the coils.

The coils according to the invention maintain
10 their shape when, for example, they are exposed to an alternating temperature test from -25° to $+75^{\circ}\text{C}$ or when they are brought to $+75^{\circ}\text{C}$ or -25°C .

The Figure shows a suitable embodiment of a coil according to the invention.

15 The coils according to the invention have a poly-p-xylylene layer in a thickness of usually less than 10 micrometres, preferably from 1-5 micrometres.

Poly-p-xylylene or a derivative thereof is to be understood to include herein all compounds of this type as
20 described in United States Patent Specifications 3,246,627, 3,288,728 and 3,342,754. These Patent Specifications, as well as United States Patent Specification 4,173,664, describe how poly-p-xylylene can be provided. These four United States Patent Specifications are deemed to be incor-
25 porated in this Application by reference.

Up till now poly-p-xylylene has mainly been used due to its favourable electrically insulating properties. In the coils according to the invention these insulating properties are not used; as a matter of fact the winding
30 wire from which the coils according to the invention have been manufactured is a known winding wire which already has an insulating envelope.

In the coils according to the invention the properties of poly-p-xylylene as an adhesive are used. It
35 has been found that poly-p-xylylene keeps good adhesive properties in the case of temperature changes between -25°C and $+75^{\circ}\text{C}$. Adhesion is to be understood to mean in this connection that the poly-p-xylylene serves as an embedding

mass in which the winding wires are embedded so as to be substantially immovable. Poly-p-xylylene is provided in the vapour phase in a monomeric state (in a radical form). It then condenses and polymerises. It is supposed that the monomeric form penetrates between the winding wires of the coil and deposits not only on the outer surface of the coil but also between the winding wires of the coil.

In connection with the favourable penetration properties of the monomeric precursor of p-xylylene itself, poly-p-xylylene is to be preferred.

An embodiment of the invention has been shown in the drawings, in which

fig. 1 represents a complete coil

fig. 2 shows a cross section of the coil according to fig. 1 along lines A-A and

fig. 3 shows enlarged part B of fig. 2.

In fig. 1 has been shown a complete coil according to the invention comprising fixed winding wires 1.

Fig. 2 shows the coil according to the invention in cross section A-A of fig. 1. Fig. 3 shows in enlargement part B of fig. 2. By way of example only four arrays of fixed winding wires have been shown. In fig. 3 one can see the separate winding wires consisting of a metal core (2) and an insulating envelope (3). Insulating envelope (3) comprises a first insulating envelope of polyurethane and a second thermoplastic envelope of polyvinylbutyral. Envelopes (3) touch one another and provide some fixing of the winding coils. In between the fixing coils one sees a mass of polyvinylbutyral giving a further adhesion between the winding wires.

The invention will now be described with reference to an example which describes the manufacture of a given type of coil. A winding wire is used which is coated with a thermoplastic material, namely with polyvinyl butyral.

This material loses its adhesive force partly at temperature fluctuations between -25°C and $+75^{\circ}\text{C}$. When poly-p-xylylene or a derivative thereof is provided on the coil, the coil does not appreciably deform in the case of such

temperature fluctuations.

However, the invention is by no means restricted to coils having winding wires which are coated with polyvinyl butyral. The invention provides the provision of poly-p-xylylene in all those cases in which the thermo-
5 plastic material or other material used for fixing the winding wire does not adhere sufficiently at elevated or reduced temperatures to prevent deformation of the coil.

Example.

10 Ten coils as shown in the Figure were manufactured by means of conventional winding wire. The winding wire consisted of a copper wire having a first insulating envelope of polyurethane and a second thermoplastic envelope of polyvinyl butyral. The thickness of the wire (including
15 the two envelopes) was approximately 0.25 mm. Five wires were simultaneously wound in one plane according to a rectangular pattern. The resulting rectangle was then bent in a jig with a radius of curvature of approximately 17 mm. Simultaneously a current was passed through the winding
20 wire so as to raise the temperature of the coil to approximately 70°C. The thermoplastic envelope softened. The coils were cooled in the jig. In this manner, known coils as shown in the Figure were obtained.

Five out of the ten coils (Nos. 1-5) were further
25 treated in order to obtain coils according to the invention. These five coils were introduced into a device the principle of which is described in the above-mentioned United States Patent Specification 3,246,627. In this device a layer of poly-p-xylylene was provided on the five
30 coils in a layer thickness of 2.5 micrometres. All ten coils were then subjected to an alternating temperature test consisting of five cycles of each 1 hour at 75°C plus 1 hour at -25°C. Prior to and after the test the length of the coils was measured at room temperature. The results
35 obtains are recorded in the table below.

Coils No.	Length in mm		Difference in length in mm	
	prior to the test	after the test		
5	1	64.85	65.15	0.3
	2	64.8	65.15	0.35
	3	64.9	65.1	0.2
	4	64.95	65.25	0.3
	5	64.9	65.1	0.2
10	Average Nos.			
	1 to 5			0.27
	6	64.95	65.8	0.85
	7	64.9	65.6	0.7
15	8	64.85	65.5	0.65
	9	65	65.7	0.7
	10	64.9	65.75	0.85
	Average Nos.			
	6 to 10			0.75

20 It may be seen from the table that the coils
6 to 10 which are not coated with poly-p-xylylene showed
an average change in their length of 0.75 mm while the
coils 1 to 5, which have been provided with a second ad-
hesive (poly-p-xylylene) according to the invention showed
25 the same type of change of only 0.27 mm. This means that
the shape of the coils according to the invention is more
stable in the case of temperature fluctuations as they
occur in practical use. Consequently the electromagnetic
field of the coils according to the invention in the case
30 of temperature fluctuations is more constant in nature than
in the known coils.

A similar effect occurs when the coils are not
subjected to temperature fluctuations but are heated once
to, for example, +75°C.

1. A coil the winding wires of which have been fixed by means of an adhesive, characterized in that the winding wires are fixed with more than one adhesive, at least one of the adhesives being a poly-p-xylylene or
5 a derivative thereof.
2. A coil as claimed in Claim 1, characterized in that the coil is fixed by means of poly-p-xylylene and at least one other adhesive.
3. A method of fixing coils by means of an ad-
10 hesive, characterized in that the coils are first fixed with one or more adhesives in known manner and a layer of poly-p-xylylene or a derivative thereof is then provided on the coils.
4. A method as claimed in Claim 3, characterized
15 in that poly-p-xylylene is used.

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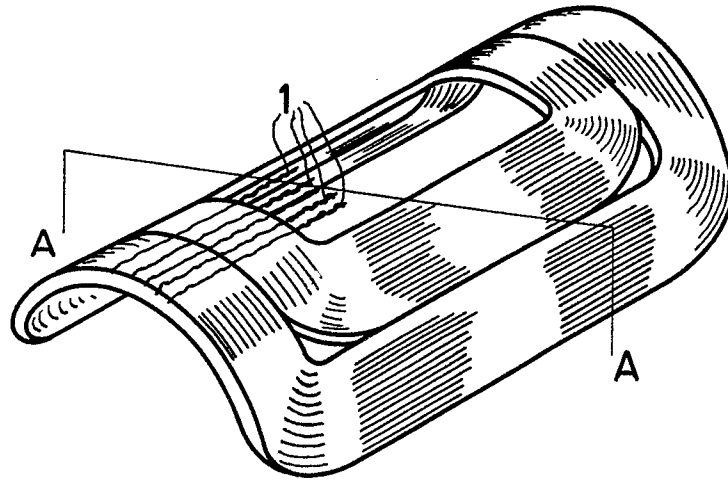


FIG. 1

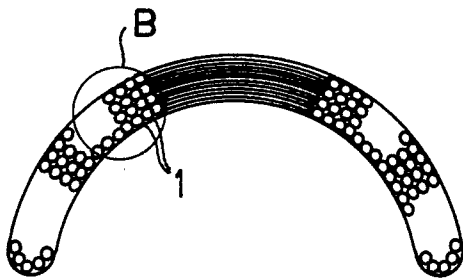


FIG. 2

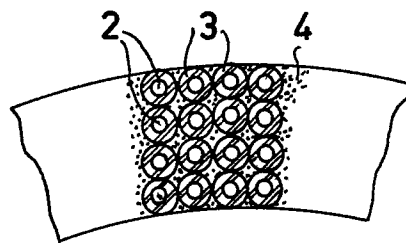


FIG. 3



European Patent
Office

EUROPEAN SEARCH REPORT

0080217
Application number

EP 82 20 1177

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. ³)
D, A	FR-A-2 244 237 (SCHWEIZERISCHE ISOLA-WERKE) ---		H 01 B 3/30 C 08 G 61/02
A	GB-A-1 281 326 (PHELPS DODGE MAGNET WIRE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 01 B 3/30 C 08 G 61/02
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06-01-1983	Examiner STIENON P.M.E.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	