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(54) **Load materials for use in microwave lenses.**

(57) The load material comprise carbonyl iron powder and a mix of resin/hardener mix. The resin has a low glass transition temperature which together with the ratio of carbonyl iron powder to resin/hardener mix gives a load material that is flexible over the temperature range + 85° C to - 30° C. The carbonyl iron powder may be in the grades E, TH or SF. The resin may be resin CY1300 and the hardener may be hardener HY1308.

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The present invention relates to materials, commonly known as load materials which are for use in the manufacture of microwave lenses.

Hitherto, load materials used in microwave systems are hard and have a low glass transition temperature which normally causes their insulation properties to drop in high temperature environments. This drop in insulation makes the materials more conductive and often causes disruption in the microwave system.

The hardness of the materials made them particularly vulnerable to fracture, particularly when the materials were moulded to shapes having "knife-edges".

It is an object of the present invention to provide a flexible insulative material for use in microwave systems which operate over a wide temperature range.

A further object of the invention is to provide a flexible insulative material which may be moulded to shapes have "knife-edges".

According to the present invention there are provided load materials for use in microwave lenses, characterised in that the load materials comprise carbonyl iron powder, and a mix of resin and hardener in the ratio of 3:1 carbonyl iron powder to resin/hardener mix, said resin having a low glass transition temperature, which together with the ratio of carbonyl iron powder to resin/hardener gives a load material that is flexible over a predetermined temperature range.

It will be appreciated that various grades of material may be used, and that the choice of materials and their quantities provide the desired flexibility in the temperature range of +85° C to -30° C.

The load materials may be moulded into shapes having "knife-edges".

An embodiment of the present invention and a method of manufacturing the load materials will now be described.

The flexible insulative material comprises carbonyl iron powder manufactured to the grades of E, TH or SF. This powder is mixed together with an epoxy resin which consists of a resin which may be resin CY1300 and a hardener which may be a hardener HY1308. These materials are well known in the art and are obtainable from known suppliers. The resin has a low glass transition temperature T_g (°C). This is the temperature at which on heating, the polymer chains are caused to vibrate in a co-ordinated manner (ie become plastic) and the polymer chains become rigid and glassy. The mix is made in a ratio of 3:1 of carbonyl iron powder to resin/hardener. The combination of the mix ratio and the resin having a low T_g temperature gives a very flexible material.

A method of manufacturing the mix will now be described. A suitable mould is used which corresponds to the size and shape of microwave lens required. The mould is cleaned with industrial alcohol and sprayed with a release agent over the relevant parts of the mould. The mould is assembled ensuring that respective parts mate correctly.

The carbonyl iron powder is pre-dried in an oven at 45 to 55° C. In the example that follows, the weights are determined by the size of the microwave lens required and will vary accordingly, however, the mix ratio is in the order of 3:1. In the present example, 300 gm of carbonyl iron powder are used together with 50 gm of resin CY1300 and 50 gm of hardener HY1308. The resin and the hardener are mixed together and the carbonyl iron powder is added and mixing continues until a smooth consistent paste is obtained. The mixture is then de-aerated in a vacuum encapsulation plant down to a vacuum of 5 Torr, and is subjected to a dwell period of 5 minutes before the vacuum is released. The mixture is then poured into the mould until the mould is full, and the mould is placed in encapsulation unit, and operated down to a vacuum of 5 Torr and allowed to dwell for 5 minutes before the vacuum is released. The load mix is then allowed to stand for a period of 24 hours at room temperature. The mould is then demounted from the encapsulation unit and the load is carefully extracted.

The load may then be affixed to a backing strip for transport.

The material is aptly suitable for moulding into shapes having "knife-edges" and because of its flexibility does not have a tendency to fracture.

The flexible material produced by the above method is aptly suitable for use in microwave components which are placed in a temperature environment ranging from +85° C to -30° C.

It will be readily appreciated by those skilled in the art that the use of other types of ingredients for the mix may be used which give the same flexibility.

Claims

1. Load materials for use in microwave lenses, characterised in that the materials comprise carbonyl iron powder, and a mix of resin and hardener in a ratio of 3:1 carbonyl iron powder to resin/hardener mix, said resin having a low glass transition temperature, which together with the ratio of carbonyl iron powder to resin/hardener gives a load material that is flexible over a predetermined temperature range.
2. Load materials as claimed in claim 1, which remain flexible in the temperature range of +

85° to - 30° C.

3. Load materials as claimed in claim 1 or claim 2, wherein the carbonyl iron powder may be in the grades E, TH or SF.

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4. Load materials as claimed in any preceding claim, wherein the resin is resin CY1300 and the hardener is hardener HY1308.

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5. Load materials as claimed in any preceding claim, wherein the material may be moulded into shapes including "knife-edges".

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EUROPEAN SEARCH REPORT

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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)
A	IEEE TRANSACTIONS ON MAGNETICS vol. 10, no. 1, March 1974, NEW YORK US pages 96 - 97 W. L. WADE JR. ET AL. 'Method of forming ferrite impregnated resins for microwave measurements' * page 96, right column, line 17 - line 18 * * page 97, right column, line 1 - line 19 *	1	H01Q15/08
A	--- JOURNAL OF APPLIED PHYSICS vol. 45, no. 8, August 1974, NEW YORK US pages 3587 - 3592 R.S. MUELLER 'Ferrite prisms and lenses' * page 3591, left column, line 5 - page 3592, left column, line 5; figure 7 *	1	
A	--- US-A-3 843 593 (SHELL ET AL.) * column 1, line 27 - line 29 * * column 9, line 62 - column 10, line 6 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	--- GB-A-1 278 791 (ARMSTRONG CORK COMP.) * page 1, line 11 - line 32 * * page 3, line 13 - line 20 * -----	1	H01Q
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 OCTOBER 1993	Examiner DEN OTTER A.M.
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			