Jan. 28, 1958 R. G. BLACK 2,821,082

METHOD OF AND DEVICE FOR DETERMINING THE RELATIVE RESISTANCE OF VARIOUS CASTING RESINS TO CRACKING

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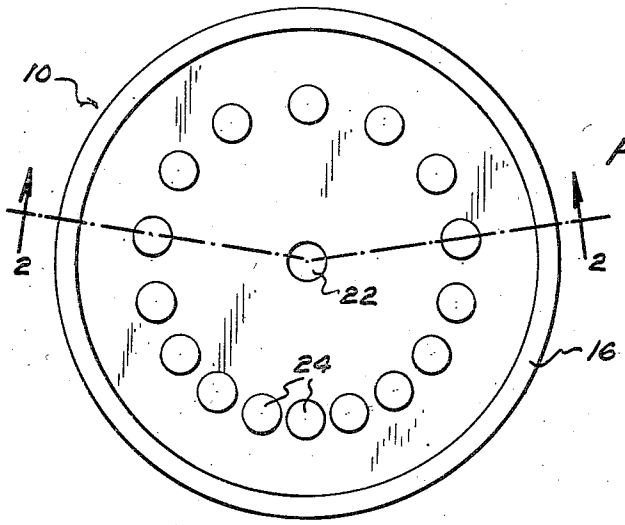



FIG. 1

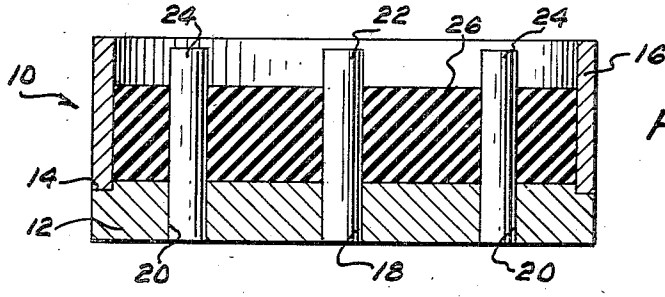



FIG. 2

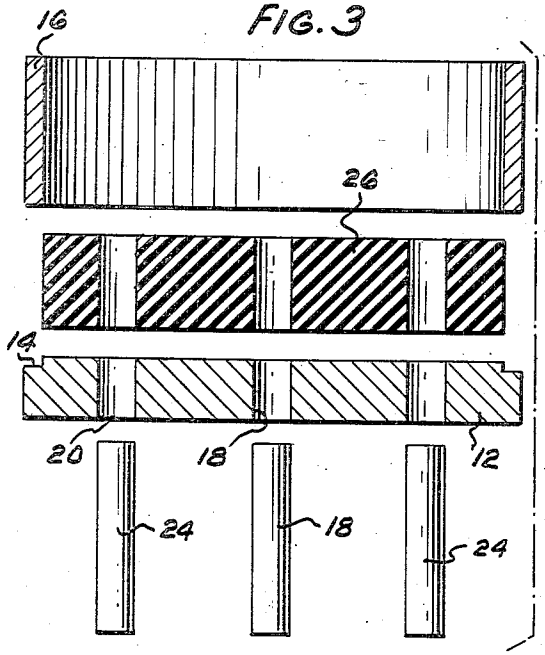



FIG. 3

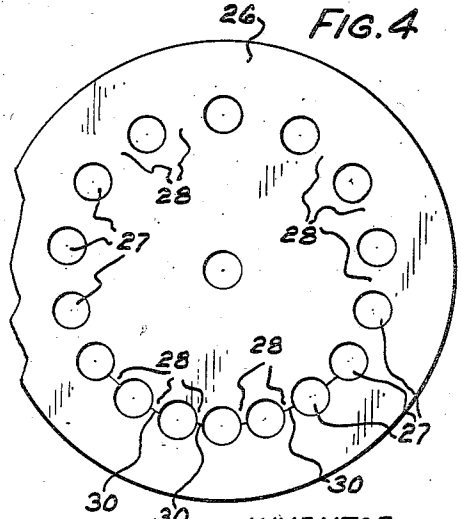



FIG. 4

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FIG. 5

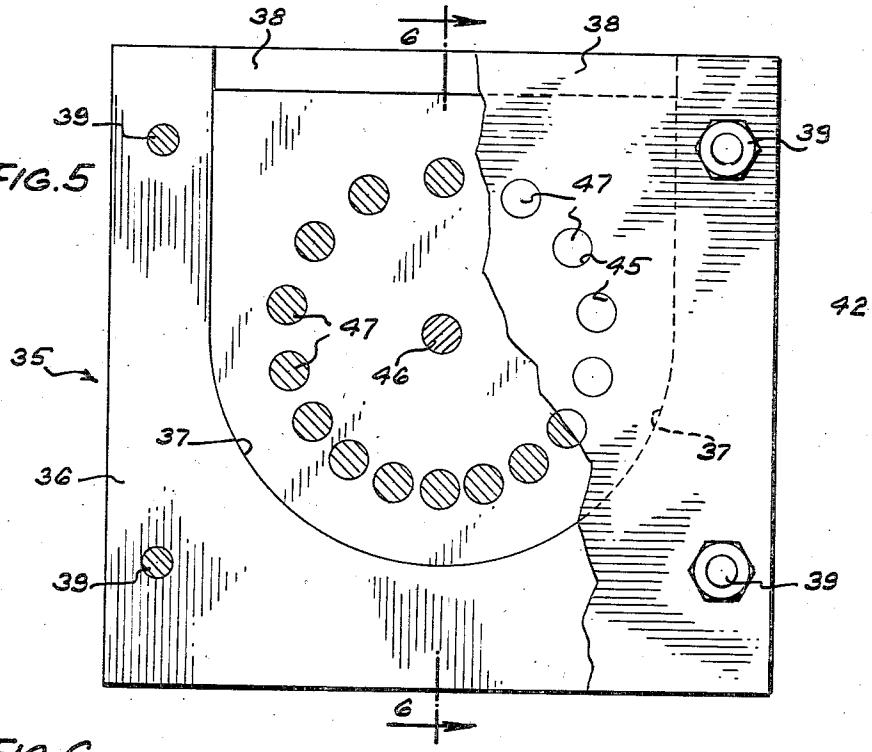



FIG. 6

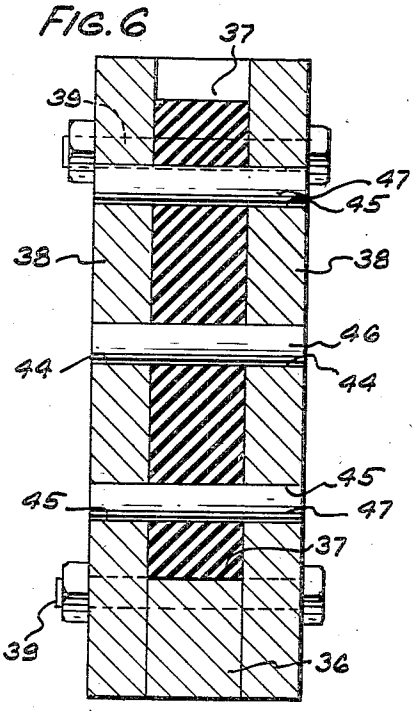
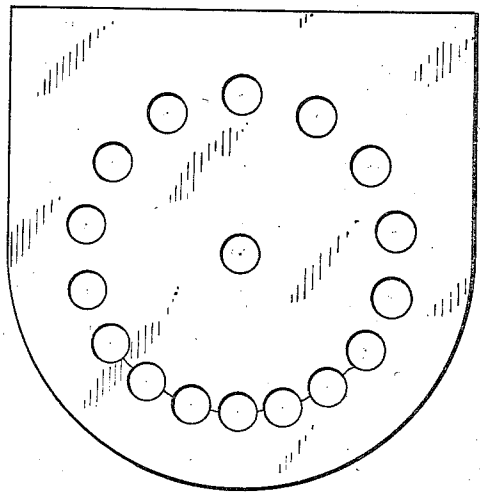



FIG. 7



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# METHOD OF AND DEVICE FOR DETERMINING THE RELATIVE RESISTANCE OF VARIOUS CASTING RESINS TO CRACKING

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16 Claims. (Cl. 73—150)

This invention relates to the art of casting resins and more particularly to a method of and device for determining the relative resistance of casting resins to cracking when cast about the rigid object.

During the past few years, there has been a widespread increase in the use of casting resins for encasing electrical circuits, networks, and assemblies. As the cast resin cures about an assembly, stresses are set up in the resin and in some of the many types of casting resins used in this manner cracks occur in the product. There is an obvious need for some method and device for testing the various mixtures of casting resins to indicate their relative resistance to cracking when cured about rigid objects to predetermine which of the resins are satisfactory for use in production.

Objects of the present invention are to provide a method of and a device for determining the relative resistance of various casting resins to cracking when cast about rigid objects.

The invention contemplates the provision of an open-ended mold having a plurality of dowel pins disposed in a circle about a central anchor pin and in a predetermined progressively increasing spaced relation one to another, and the casting and curing of uniform samples of various casting resins in the mold. The samples of the resins thus cast will have a plurality of wall portions of predetermined progressively increasing thicknesses arranged in a circle between the dowel pin apertures and during the curing of the samples in the molds some of the wall portions thereof may crack due to the stresses set up therein, the number of walls which crack will vary in the cast samples of the different casting resins, whereby a numerical value may be given to the different resins according to the number of cracked walls in the sample and the number of the samples compared to give an indication, inversely, of the order of their relative resistance to cracking.

Other objects and advantages of the invention will be more clearly understood by reference to the following detailed description thereof and the accompanying drawings illustrating two embodiments of mold structures, in which:

Fig. 1 is a plan view of a circular type of mold with which the invention may be practiced;

Fig. 2 is a vertical sectional view of the mold taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view of the elements of the mold and a cast sample of a casting resin shown in separated relation one to another;

Fig. 4 is a face view of sample of cast resin formed in the mold;

Fig. 5 is a vertical sectional view of an alternate construction of the mold;

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5; and

Fig. 7 is a face view of the sample cast in the mold shown in Figs. 5 and 6.



Referring to the drawings, Figs. 1, 2, and 3 disclose a preferred embodiment of mold or fixture 10 with which the invention may be practiced.

The mold 10 comprises a circular disc 12 forming the base of the mold and having a rabbetted upper peripheral edge 14 for positioning a hollow cylinder 16 thereon which forms the side walls of the mold. The disc 12 is provided with a plurality of apertures 18 and 20 for supporting a plurality of removable dowel pins 22 and 24. The aperture 18 and dowel 22 are centrally located on the disc 12 and the apertures 20 and pins 24 are arranged in a circle in spaced and concentric relation with the pin 22 and the cylinder 16 and the pins 24 are separated from one another to provide spaces of progressively increasing distances therebetween. The lowermost pin 24, as viewed in Fig. 1, is spaced from the two adjacent pins 20 a distance to provide a space of 1/32" and the spacing between successive pairs of pins on opposite sides of the lowermost pin increases progressively by increments of 1/32", and ranges from 1/32" to 8/32".

A predetermined amount of one of the casting resins to be tested is poured into the mold to form a sample 26 of a predetermined thickness. The sample 26 is cured in the mold by heating to a predetermined temperature or in other ways according to the method to be used in the production of parts in which the casting resin being tested is to be used. The sample is then allowed to cool to room temperature after which the dowel pins 24, the ring 16, and the base 12 are carefully removed from the sample 26. Uniform samples 26 of each of the different types of casting resins are cast and cured under the same conditions. The samples 26 thus formed have a circular row of apertures 27 forming therebetween a plurality of wall portions 28 of progressively increasing thickness.

During the curing of the samples in the mold, as pointed out above, stresses are set up therein, which, in some of the samples, form cracks 30 in the wall portions 28. The cracks will normally occur first in the thinnest wall portion of the sample and successively in the wall portions of progressively increasing thickness. If the cracks do not occur successively in adjacent wall portions of the sample, it is an indication of lack of uniformity of the casting material. The number of cracked wall portions 28 in the samples 26 of different casting resins will vary; some may have no cracks, some one, others two, etc. Numerals may be assigned to the samples according to the number of cracked wall portions in each, which numerals will thus inversely indicate the order of relative resistance to cracking of the different kinds of resins cast and cured about rigid elements.

The invention may be practiced with a mold in which the pins are not removable and in which only the cylindrical wall member 16 may be removable to aid in the removal of the samples. When molds of this kind are used the samples 26 are cast, cured, and cooled in the mold and then inspected while in the mold to determine the number of cracked walls in the individual samples.

In a modified construction shown in Figs. 5 and 6, the mold 35 comprises a U-shaped central body member 36 having a central recess 37 with the lower portion thereof of semi-cylindrical shape. A pair of plates 38—38 forming side walls of the mold are secured to the member 36 by a plurality of bolts 39 and the plates 38 are provided with a plurality of aligned apertures 44 and 45 for supporting a plurality of removable dowel pins 46 and 47. The apertures 45 and the dowel pins 47 are arranged in a circle about the centrally located pin 46 and apertures 44 and in spaced relation to the walls of the recess 37 and are also disposed in a predetermined progressively increasing spaced relation to each other so that the space between the lowermost pin 47, as viewed in Fig. 5, and the

next adjacent pin to the right thereof, is a minimum spacing of 1/32" and the spacing between successive adjacent pins to the right thereof increases in increments of 1/32", and the spacing between the lowermost pin and the adjacent pin to the left thereof is 3/64" and succeeding spaces between adjacent pins to the left thereof increase in increments of 1/32". Thus, the spacing between the pins 47 ranges from 1/32" to 1/4" and increases in increments of 1/64".

Samples of the various kinds of casting resins are made individually by pouring a predetermined amount of the casting resin into the mold cavity to fill the cavity to a level above the uppermost pin 47 of the mold, as indicated in Figs. 5 and 6. The mold, with the resin therein, may then be placed in an oven for a predetermined length of time to cure the resin, after which the mold is cooled to room temperature. The pins 47 and 46 are then carefully removed from the mold and the sample, which contracts upon curing, may readily be removed from the mold. The design of mold as shown in Figs. 5 and 6 has the advantage over the design of mold shown in Figs. 1 and 2 in that it provides samples of uniform thickness and shape, even though the amount of resins placed in the mold may vary slightly, and it also excludes the atmosphere from the sample during the curing of the resin, except from the upper surface thereof.

If desired, the samples may be cooled to any desired temperature below the room temperature before removal from the mold, which will impose additional stress on the sample and usually cause a greater degree of cracking than when the sample is cooled only to room temperature.

Where the term resin is used in the specification it will be understood that the term is used to cover resins and resin compositions containing fillers, extenders, and/or reinforcing materials.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A method of determining the relative resistance to cracking of various resins cast about rigid elements which comprises the steps of casting a plurality of uniformly shaped samples of different kinds of casting resins in a mold cavity and around a plurality of fixed elements therein spaced from each other in progressively increasing distances to form a plurality of apertures in the samples and a plurality of wall portions of progressively increasing thicknesses therein, curing the samples in the mold, cooling the samples while in the mold to a predetermined temperature, removing the samples from the mold, and inspecting the samples to determine the number of cracked walls in each sample.

2. A method of determining the relative resistance to cracking of various kinds of casting resins cast about rigid elements which comprises casting a plurality of uniformly shaped samples of different kinds of casting resins in a mold cavity having a plurality of parallel elements therein arranged in a circle and spaced from each other in predetermined progressively increasing distances to form a plurality of apertures in the samples and a plurality of wall portions of progressively increasing thicknesses, heating the samples to cure them, cooling the samples, removing the samples from the mold, and inspecting the samples to determine the number of cracked wall portions therein.

3. A method of determining the relative resistance to cracking of various kinds of casting resins cast about rigid elements which comprises the steps of casting a plurality of uniformly shaped samples of different kinds of casting resins around a plurality of relatively fixed parallel elements arranged with one in the center and the others in a circle concentric therewith and spaced from each other in predetermined progressively increasing distances to form a plurality of apertures in the sample and a plurality of wall portions of progressively increasing thicknesses, curing the samples, and inspecting the samples to determine the number of wall portions having cracks therein.

4. A method of determining the relative resistance to cracking of various resins cast about rigid elements which comprises the steps of forming a mold with a plurality of rigid elements in the chamber thereof spaced apart in predetermined progressively increasing distances, pouring a predetermined quantity of one of the various casting resins into the mold chamber and about the elements to form a sample of said one casting resin having a plurality of apertures therein and a plurality of walls of progressively increasing thickness, curing the sample while in the mold, removing the sample from the mold, inspecting the sample to determine the number of cracked walls therein, and repeating the steps except the first one with the other casting resins to form uniform samples of each of the various casting resins to be compared.

5. A method of determining the relative resistance to cracking of various resins cast about rigid elements which comprises the steps of forming a mold with a plurality of rigid elements in the chamber thereof spaced apart in predetermined progressively increasing distances, pouring a predetermined quantity of one of the various casting resins into the mold chamber and about the elements to form a sample of said one casting resin having a plurality of apertures therein and a plurality of walls of progressively increasing thickness, curing the sample while in the mold, inspecting the sample while in the mold to determine the number of cracked walls therein, assigning a number to said sample in accordance with the number of cracked walls therein, removing the sample from the mold, and repeating the steps except the first one with the other casting resins to form uniform samples of each of the various casting resins to be compared.

6. A device for casting uniform samples of casting resins comprising a mold having a plurality of sections forming an open top mold cavity, a plurality of elongated elements, means on one of said sections for removably supporting said elements with the elements extending into and across the mold cavity in parallel relation to each other and spaced from one another in predetermined progressively increasing distances and for movement of the elements from the mold while the article is therein.

7. A device for casting samples of casting resins comprising a base having a plurality of pins extending therefrom in parallel relation to each other and spaced apart predetermined progressively increasing distances, and a member removably supported on said base and encircling said pins in spaced relation thereto and cooperating with said base to form a mold chamber.

8. A device for casting samples of casting resins comprising a mold having an open top mold cavity and having a pair of parallel walls provided with a plurality of aligned parallel apertures spaced apart from one another in progressively increasing distances, and a plurality of elements removably supported in the apertures in said sectional mold and extending through said mold cavity in parallel and spaced relation to each other and with the spacing between adjacent elements being of predetermined progressively increasing distances.

9. A device for casting samples of casting resins comprising a base having an annular seat and a plurality of apertures arranged in a circle concentric with said seat and spaced from each other in progressively increasing distances, a plurality of pins removably supported in the apertures in said base in parallel and progressively increasing spaced relation to each other, a ring removably supported on said seat in spaced relation to said pins and coperating with said base and said pins to form an open ended mold cavity with said pins therein.

10. A device for casting samples of casting resins com-

prising a mold having a plurality of walls forming an open top mold cavity, one of said walls having a central aperture and a plurality of parallel apertures arranged in a circle concentric with said central aperture and spaced apart from one another in progressivly increasing distances, and a plurality of elements removably supported in the apertures in said wall in parallel and spaced relation to each other and some of the walls of the mold and with the spacing between adjacent elements being of predetermined progressivly increasing distances.

11. A device for casting samples of casting resins comprising a base having a central aperture and a plurality of parallel apertures arranged in a circle concentric with said central aperture and spaced from each other in progressively increasing distances, a plurality of pins removably supported in the apertures in said base and extending upwardly therefrom in spaced relation to each other, an annular wall on said base in spaced relation to said pins and cooperating with said base and said pins to form an open ended mold cavity with said pins therein for molding and curing uniform samples of casting resins in the mold and around said pins.

12. A device for casting samples of casting resins comprising a mold forming an open topped mold cavity and having a pair of parallel side walls, and a plurality of elongated rod-like elements, said walls having a plurality of aligned apertures for removably supporting the elements therein in parallel relation across the mold cavity and spaced from one another in predetermined progressively increasing distances.

13. A device for casting samples of casting resins comprising a mold forming an open topped mold cavity and having a pair of parallel side walls, a plurality of elongated rod-like elements, and means removably supporting said elements in parallel relation to each other transversely of said side walls and across the mold cavity and spaced from one another in predetermined progressively increasing distances.

14. A method of determining the relative resistance to cracking of various resins which comprises the steps of casting a plurality of uniformly shaped samples of various kinds of casting resins around a plurality of relatively fixed core elements spaced from each other



in progressively increasing distances to form a plurality of apertures and a plurality of wall portions of progressively increasing thicknesses in the samples, curing the samples with the core elements therein, and inspecting the samples to determine the number of cracked walls in each sample.

15. In a device for determining the resistance of cast resins to cracking, a plurality of sections forming an open mold, one of said sections having apertures spaced from each other in predetermined progressively increasing distances, and a plurality of pins removably supported by said one section in said apertures and extending into and across the cavity of the mold whereby uniform quantities of resin to be tested may be poured into the mold around the pins with the pins projecting therethrough so that they may be removed from the cast resin after it has been cured.

16. A device for casting uniform samples of casting resins comprising a sectional mold having a recessed middle section with a cylindrical surface and a pair of end sections with flat faces engageable with opposite sides of said middle section in parallel relation to each other to form an open mold cavity, said end sections each having a plurality of apertures arranged in an arc and in predetermined progressively increasing spaced relation to each other, means for releasably holding said sections in a predetermined assembled relation with the apertures in the side sections aligned with each other and disposed in concentric relation to the cylindrical surface of the middle section and in inwardly spaced relation thereto, and a plurality of core elements removably supported in the apertures in said side sections and extending through the mold cavity in parallel and progressively increasing spaced relation to each other.

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