COMMISSIONER'S DECISION

OBVIOUSNESS: Electric Fuse

A glass coating on a resistance wire reacts under overload to cause a rapid opening of the circuit. The claims were rejected under 45(4) as this is shown in a prior patent.

Rejection: Affirmed.

This decision deals with a request for review by the Commissioner of Patents of a refusal of claims C1 to C18 inclusive of patent application 155,163. The refusal was made by an Office letter dated October 28, 1975 issued as a result of re-examination of the claims under Section 45(4) during conflict proceedings.

The application was filed November 4, 1971 by Matthey & Mallory Limited and is entitled "Fusing Resistor." Mr. G. Seaby represented the applicant at a Hearing conducted by the Patent Appeal Board on March 3, 1976.

This application relates to an electrical safety resistor (i.e. a fuse) having improved means for interrupting an electrical current flowing through the fuse in the event of overloads. The conductive portion of the fuse is coated with a glass which melts at a lower temperature than the conductor itself, and reacts with the conductor to destroy it, and thus break the circuit. Temporary overloads will not melt the glass, but if they continue the fuse interrupts the circuit at lower temperatures than would fuse the conductor itself, and the risk of fire from hot fuses is reduced.

In the Office letter, claims C1 to C18 inclusive were rejected for failing to patentably distinguish over the following prior art:

German Auslegeschrift 1,196,765, July 15, 1965, Kugelstadt

The Office letter said:

> The applied publication teaches the use of a safety resistor which is self destructing at electrical overloads by means of a glass layer which adheres to the resistor at least in part. The glass layer becomes ionic above its melting point and destroys the resistor through electrolysis.
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> The Figure shows a coiled resistor inside a tubular base which is sealed with resin around the electrodes.
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> Claims C1 to C18 are rejected for being anticipated by the applied publication.
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> The applicant must reply to this letter to either cancel the rejected claims C1 to C18 or show how their subject matter is patentably different from the subject matter of the reference.
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> If an argument is presented that the subject matter of a rejected conflicting claim is patentable, and the claim continues to be a conflicting claim, the patentability of such claim will be reviewed by the Patent Appeal Board before a final decision is made by the Commissioner. In view of this, the applicant should submit a full statement of the reasons why the cited prior art is not pertinent and if an oral hearing is desired before the Patent Appeal Board such must be requested within the time limit of 3 months set for response to this letter.
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> ...
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> It appears that there is no patentable subject matter in the present application over the German publication. However, this will be dealt with at a later time.

In his response dated January 23, 1976 the applicant stated (in part):

> The cited German reference does not teach the use of a protective covering for the resistor, as claimed in conflicting claims C1 to C7 and C10 to C18. In fact, there is no need for such a protective covering, since the resistance film in the device of the cited reference is on the inside of a tube. Strictly speaking, the reference does teach the use of grooves formed in the resistance material, as claimed in each of conflicting claims C6, C7 and C12 to C17. The resistance material of the cited reference is applied as a strip in the form of a helix. The cited reference does not teach the use of glass applied annularly around the resistor.
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> More importantly, the reference does not teach the use of a metal oxide as the resistance film. The reference teaches the use of noble metals, giving by way of example a gold-platinum metal layer. A metal and a metal oxide are not equivalent, the metal oxide being an alloy with entirely different characteristics from the metal. For example, with regard to their electrical characteristics, the electrical conductivity of a metal decreases as its temperature increases, while the conductivity of an oxide increases as its temperature increases. It will be noted that the use of a metal oxide as the resistance material is claimed in each of conflicting claims C2 to C4, C8 and C11.

> The advantage of using a metal oxide as the resistance material, and in particular of tin oxide is set out in the paragraph starting on page 3 of the disclosure.

The German patent describes an electrical safety resistor comprising a tubular insulating base enclosing a spiralled coiled metal layer on the inner surface of the base. Connecting wire leads extend through resin-sealed ends of the resistor, and these are soldered to the coiled metal layer. A powdered glass covers several coils of the metal so that when an overload occurs the glass fuses to react with the metal layer to open the circuit. The applicant conductor is wrapped around the outside of the non-conductive base, but we are satisfied such structural alterations are of no material significance.

This application relates to resistors having a layer of material disposed over a portion of the resistive film of the resistor. This material has a melting point lower than the melting point of the resistive film and when melted it reacts with the film to open the circuit. Claim C1 reads:

> A resistor comprising: a non-conductive substrate, a resistive film on said substrate, a layer of material disposed on at least a portion of said resistive film having a melting point below the melting point of said resistive film which when melted chemically reacts with said film to render said portion thereof non-conductive, metallic caps disposed at opposed ends of said substrate and overlying said film, electrical leads coupled to said end caps, and an insulative cover substantially surrounding said film and said caps.

At the hearing, the applicant and the Board agreed to confine the issue to one of "obviousness," rather than "anticipation." Obviousness had been raised on pages 1 and 2 of the Office letter where we find such statements as "there is no patentable subject matter in the present application over the German publication" and "or show how their subject matter is patentably different from the subject matter of the references." It was clear to the Board that a rejection for anticipation could not be sustained. There are minor structural differences between the two fuses which preclude such a rejection, but not necessarily one for obviousness.

The applicant contends that in the reference the melting temperature of the glass is higher than the melting temperature of the film, whereas in claims C1 to C18 the melting temperature of the glass is below that of the resistive film.

In describing the prior art, the German publication states (as translated)

"Previously resistors were made with carbon, metal strips or wires and constructed to act as safety devices which, in addition to their function as resistors, self-destruct when there is an electric overload, so that the circuit into which the resistor is inserted can no longer pass current, and the remaining components of the circuit are protected against destruction." According to the publication such resistors are not satisfactory because "there are cases wherein the overload is not sufficient to destroy the resistor rapidly; it can merely destroy it slowly, eg., with a gradual disintegration of the resistor layer. The increase in the resistance value introduced (among other things) by the disintegration of the layer reaches (in this connection) frequently orders of magnitude that exceed by far the maximal permissible deviation from the rated [required, desired] value of resistance."

The German applicant continues to indicate how he overcomes such difficulties, and we quote:

> The invention solves the problem in such a manner that the metal layer arranged on the base of a resistor is covered at least in part with adhering glass whose temperature of fusion corresponds to a predetermined temperature of the layer that appear at an inadmissible overload of the resistor and which glass exhibits ionic conductivity only above the temperature of fusion.
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> and:
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> In relation to known safety resistors constructed as layer resistors, the safety resistors of this invention also offer considerable advantages in manufacture. For example, any completed metal-layer resistor can be transformed into a safety resistor by coating it with a suitable glass, without the necessity of providing narrowed portions in the resistor layer, such as is otherwise customary in safety resistors. In accordance with the degree of mechanical stresses to which safety resistors are subjected in use, ranging from shaking to positions at rest, the glass can be bonded in powder form to the metal layer with a silicon resin as binder, deposited on it by means of silicone oil, powdered on the metal layer, or even fused onto the layer.

It is clear that the German publication does use a glass whose melting temperature is below the melting temperature of the resistive film. If that were not so, there would be no purpose in using the glass additive, since otherwise the metal would fuse first to open the circuit, as was common in the prior art. We quote again from the German reference:

> The object of the invention is to produce safety resistors that are not only destroyed automatically at a very high overload but are self-destructing even at overloads that normally lead only to an overstepping of the maximal permissible deviation from the rated value of resistance and not to the destruction of the resistor. (underlining added)

In this invention, when an overload occurs the glass coating on the resistance film is fused by the heat evolved from the resistive film. This makes the fused glass conductive, thereby rapidly changing the resistance value of the resistive film and causing swift failure of the resistor. The applicant uses the same means to accomplish the same result as shown in the German publication.

The applicant has stressed that a metal oxide resistance film is not shown in the reference. However the use of tin oxide resistor films in this art is well known. See, for example, the admission on page 1, line 2 of the applicant's own disclosure. Since the conductivity of a metal oxide increases with current overloads, it would generate more heat before it fuses than a metal resistor under similar circumstances. There is no suggestion in the disclosure that a resistance film of metal oxide would provide a superior fusing resistor than a metal resistor, and in our view does not represent a patentable advance in the art. Whether the resistor is a metal or metal oxide is immaterial to the invention we are considering, which is the use of glass or other materials to decompose the resistor. The applicant was obviously of the same mind, since the main claim contains no limitation to oxides.

We are satisfied that claims C1 to C18 inclusive fail to show any patentable advance in the art and we recommend that the decision to refuse these claims be affirmed.

G. Asher
Chairman
Patent Appeal Board

I concur with the findings of the Patent Appeal Board. Claims C1 to C18 inclusive are refused. The applicant has six months within which to remove the claims, or to appeal this decision under the provisions of Section 44 of the Patent Act.

J.H.A. Gariépy
Commissioner of Patents

Dated at Hull, Quebec
this 22nd.day of April, 1976

Agent for Applicant

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