(19) Oifig Maoine Intleachtúla na hÉireann
Intellectual Property Office of Ireland

(11) **IE 87164** (13) **B1**

(43) Date of Publication of Grant:
30.09.2020 Journal No. 2421

(12) # IRISH PATENT SPECIFICATION

(54) Title of Invention: **Fire protective sleeve**

(51) Int. Cl. (2020.01)
A62C 2/00
H02G 3/00

(21) Application Number: **20150434**

(22) Date of Filing: **17.12.2015**

(43) Date of publication of application:
14.12.2016 Journal No. 2322

(30) Priority data: **GB 19.12.2014 1422721.9**

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Fire Protective Sleeve

Field of the Invention

This invention relates to fire protective sleeves.

Background of the Invention

Fire protective sleeves are used in buildings to protect cables, pipes and trunking passing through fire-rated ceilings, floors, walls, including block, brick, concrete and hollow plasterboard floors and walls. The sleeves can be flexible, allowing expansion and contraction of water pipes, for example, and give protection from corrosion caused by close contact with cement, plaster and other potentially corrosive building materials.

A layer of intumescent material is present in the sleeve, which expands in the presence of heat caused by a fire, with the aim of reducing the airflow space within the sleeve to prevent the spread of fire through the building and/or to maintain the integrity of the ceiling, floor or wall of the building, at least for a particular time period.

However, this expansion often does not block the airflow completely (or substantially) and so there remains the possibility of fire spreading and/or failure of structural integrity in a short time period.

It is an aim to provide an improved fire protection sleeve.

Summary of the Invention

In a first aspect, the invention provides a fire protective sleeve for surrounding cables, pipes and trunking passing through a ceiling, floor or wall of a building, the sleeve comprising a multi-layered tube which includes a tubular layer of intumescent material to the inner and outer surfaces of which are adhered layers of metallic foil, a tubular layer of reinforcement material comprising woven glass fibre cloth adhered to the outermost layer of metallic foil, and a further tubular layer of metallic foil material about the outer surface of the layer of reinforcement material to resist outwards expansion of the sleeve.

Such a sleeve is found to expand inwardly only (or substantially so) by virtue of the reinforcing material on the outer surface; this tends to substantially block or hinder airflow through the sleeve, and can even crush into melting plastic pipes, trunking and ducts, improving

performance. The metallic material, which can be a foil-type material, helps transfer heat to the intumescent material to promote said expansion.

The intumescent material may be graphite or graphite based.

The sleeve may be substantially rectangular or circular in cross section.

In a second aspect, the invention provides a method of forming a protective sleeve for surrounding cables, pipes and trunking passing through a ceiling, floor or wall of a building, the method comprising the steps of adhering a layer of metallic foil to the inner and outer surfaces of a tubular layer of intumescent material, adhering a layer of reinforcement material comprising woven glass cloth to the outer surface of the layer of metallic material on the outer surface of the tubular layer of intumescent material, and adhering a layer of metallic foil material to the outer surface of the layer of reinforcement material to resist outwards expansion of the sleeve.

Brief Description of the Drawings

The invention will now be described, by way of non-limiting example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment fire protective sleeve in accordance with the invention;

Figure 2 is a close-up view of a cross-sectional part of the Figure 1 sleeve;

Figure 3 is a perspective view of a second embodiment fire protective sleeve in accordance with the invention; and

Figures 4a and 4b are schematic, cross-sectional views of any one of the Figure 1 and 3 sleeves, useful for understanding their operation in the event of a fire.

Detailed Description of Preferred Embodiments

Embodiments described herein provide a fire protective sleeve for surrounding cables, pipes, ducting in buildings; typically, the sleeve is used at the point where the cables, pipes or ducting pass through a ceiling, floor or wall and the sleeve itself passes at least partially through the ceiling floor or wall with the aim of preventing or hindering the transfer of fire from one part of a building to another, at least for a particular time period.

Referring to Figure 1, a first embodiment fire protective sleeve (hereafter “sleeve”) 1 is shown ready for fitting. It will be appreciated that alternative sleeves can be of any cross-section, including circular, and have different dimensions. The sleeve 1 is formed of several layers of material, including an intumescent layer which expands in the presence of heat in a known manner. The intumescent layer can be graphite or graphite –based.

To indicate the layers employed in the sleeve 1, Figure 2 shows a close-up view of a corner cross-section 3 taken along the plane indicated by reference numeral 2.

The main part of the sleeve 1 is formed by an intumescent layer 5, to which is adhered, on both the inner and outer sides, respective layers of aluminium metallic material 7, 9 which help transfer heat to the intumescent layer 5 to promote its expansion in the presence of a fire. The metallic layers 7, 9 can be separate sheets, or a single sheet which covers the end walls (front and rear).

Onto the external surface of the external silver layer 9 is adhered a reinforced flexible material 11, of woven glass fibre cloth. The nature of the reinforced material 11 and its location external to the intumescent layer promotes mainly inwards expansion of the intumescent material in the event of a fire, into the internal cavity 15, and significantly less so in the outwards direction. This helps minimise or seal any air gaps that might allow fire to spread between different parts of a building, at least for a required period of time. Plastic pipes or ducting held within the cavity 15 tend also to be crushed as they melt in the presence of fire, again preventing its spread.

The reinforced material 11 is provided in close contact with the underlying material 9 and wrapped relatively taught around the structure so as to help minimise outwards expansion.

A further, aluminium metallic layer 13 is provided on the reinforced material 11, again, to promote the transfer of heat to the intumescent layer 5.

Figure 3 shows a second embodiment in which sleeve 20 has the same layered structure as the sleeve 1. In this case, the combined layers of reinforced material layer 11’ and the outer aluminium layer 13’ overlap themselves, as indicated by the portion with reference numeral 21. The underside of portion 21 is self-adhesive, having a peel-off layer.

In this embodiment, it is possible to encase the sleeve 20 around ducting of same or slightly larger dimensions to ensure a close fit. In use, a lengthwise cut is made, e.g. along the line

23, using a knife or saw, the sleeve 20 is located around the ducting, and the layers 11', 13' then adhered over the cut at the overlapping portion 21 using the self-adhesive base to re-connect the parts as indicated by the arrow.

It will be appreciated that the term 'sleeve' as used throughout is to be interpreted to cover sleeve-like structures sold or provided with such a cut.

Figures 4a and 4b indicate the effect of the sleeves 1, 20 in the presence of a fire. Figure 4a shows the sleeve 1, 20 surrounding a PVC duct 30 carrying first and second PVC pipes 32, 34 in normal use. Figure 4b shows the situation following a fire, in which the expansion of the intumescent material is directed substantially inwards to crush the duct 30 and pipes 32, 34. Outwards expansion is hindered by the reinforcing layer to promote this largely inwards expansion.

The aforementioned sleeves can be of any shape and dimension.

The forming of such a sleeve generally involves: (i) providing a layer of intumescent material; (ii) covering both the upper and lower surfaces of said intumescent material with metallic layers; (iii) applying a layer of reinforcing material to the metallic layer on the upper surface; and, preferably, (iv) applying an external layer of metallic material. The multi-layer material can be shaped to any suitable form, e.g. over a mould.

Fitting the aforementioned sleeves 1, 20 generally involves cutting a hole in the substrate, e.g. wall, following an outline of the sleeve. The sleeve 1, 20 is then cut to the appropriate depth, so that its near-end will be substantially flush with the wall. The sleeve 1, 20 is then located around the pipe or ducting (making a lengthwise slit and re-joining, if required, e.g. using the second embodiment sleeve 20) and then positioning the sleeve within the wall so that it is snug and flush-fitted.

It will be appreciated that the above described embodiments are purely illustrative and are not limiting on the scope of the invention. Other variations and modifications will be apparent to persons skilled in the art upon reading the present application.

Claims

1. A fire protective sleeve for surrounding cables, pipes and trunking passing through a ceiling, floor or wall of a building, the sleeve comprising a multi-layered tube which includes a tubular layer of intumescent material to the inner and outer surfaces of which are adhered layers of metallic foil, a tubular layer of reinforcement material comprising woven glass fibre cloth adhered to the outermost layer of metallic foil, and a further tubular layer of metallic foil about the outer surface of the layer of reinforcement material to resist outwards expansion of the sleeve.

2. A protective sleeve according to any preceding claim, wherein the intumescent material is graphite or graphite based.

3. A protective sleeve according to any preceding claim, wherein the sleeve is substantially rectangular or circular in cross section.

4. A method of forming a protective sleeve for surrounding cables, pipes and trunking passing through a ceiling, floor or wall of a building, the method comprising the steps of adhering a layer of metallic foil to the inner and outer surfaces of a tubular layer of intumescent material, adhering a layer of reinforcement material comprising woven glass fibre cloth to the outer surface of the layer of metallic material on the outer surface of the tubular layer of intumescent material, and adhering a layer of metallic foil to the outer surface of the layer of reinforcement material to resist outwards expansion of the sleeve.