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Flexible protector for cables and other elongate elements

This invention relates to an arrangement for protecting at least one flexible elongate component which passes through a gap between first and second elements which are pivotable relative to one another between first and second positions in which said gap is a minimum and a maximum, respectively.

Such an arrangement is frequently required in situations where one or more flexible electrically-conducting components, for example one or more electric cables or flexes, have to pass through the gap between two elements which from time to time are pivoted relative to one another. Typical examples of such pivoted elements are a door frame element and an associated door, and a window frame element and an associated window.

The present invention aims to provide an arrangement of the kind referred to which is of very simple construction, which, despite repeated pivoting movements of the two elements, will not damage the flexible elongate component(s) in any way, and which conceals the component(s) from view when the two elements occupy said first position.

According to the invention, in the combination of two elements which are pivotable relative to one another between first and second positions in which the gap between the two elements is a minimum and a maximum, respectively, and a device for protecting at least one flexible elongate component which passes through said gap, said device comprises an elongate longitudinally-extendible protecting member which allows turning movement about its longitudinal axis, which member is arranged around said component(s), has its opposite ends attached to respective ones of said two elements and is disposed with its longitudinal axis in the general direction of the pivoting axis of the two elements, and a recess in at least one of said two elements for the reception of said protecting member when said two elements

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occupy said first position.

In a preferred embodiment of the invention, said protecting member comprises a flexible tension spring through which said at least one flexible component passes from
5 end to end of the spring. The spring will

be turned somewhat and elongated when the two elements occupy said second position compared with when the two elements occupy said first position, but nevertheless, it will always protect said component(s). In this embodiment, the protecting member may be received in a recess formed in one of said two elements. Alternatively, the recess for receiving the protecting member may be provided in a separate trough element, which can be secured in one of said two elements. Such a trough element provides effective protection against any possible wearing influence from said tension spring, and one end of the tension spring may be attached to the trough element. The trough element should preferably be so dimensioned that it substantially corresponds to the length of said tension spring when said two elements occupy said first position.

In another preferred embodiment of the invention, said protecting member comprises two part-members arranged in a telescopic manner relative to each other and having their free ends swingably and turnably connected to said two elements. In this case, said protecting member may be receivable in two separate trough elements, each of which is installed in a respective one of said two elements. These trough elements would be so arranged relative to one another that, when said two elements occupy said first position, one of said part-members is received by one trough element and the other is received by the other trough element.

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

Figure 1 is a side view of one embodiment of a combination according to the invention, in which the aforesaid two elements are a door frame element and associated door, the door being shown in open position relative to the door frame element,

Figure 2 is a side view of a second embodiment of a combination according to the invention, in which again the

aforesaid two elements are a door frame element and associated door, the door being shown in closed position relative to the door frame element,

Figure 3 is an end view corresponding to Figure 2, but with the door shown in open position relative to the door frame element, and

Figure 4 shows on an enlarged scale the portion of Figure 2 enclosed in the area designated by the numeral IV.

In each of the embodiments illustrated, the reference numeral 1 designates a door frame element and the reference numeral 2 designates a door which is hinged, by means not shown, to the frame element 1.

In the embodiment shown in Figure 1, there is a helical tension spring 3 between the frame element 1 and the door 2. The spring 3 acts as a protecting member, inside which electrical cables or other elongate flexible components can be placed to run from the door frame to the door. One end of the tension spring 3 is attached to the frame element 1 by means of an end member 4a and the other end of the spring is attached to the door 2 by means of an end member 4b. As shown in Figure 1, the spring 3 is somewhat expanded and bent when the door is in its open position. When the door is closed, the helical spring 3 is received in a protecting trough element 5 let into the edge of the door 2. Alternatively, the trough element 5 may be mounted in the door frame element 1, or separate trough elements 5 may be mounted in the door frame element and the door.

In the embodiment shown in Figures 2 - 4, the protecting member includes two telescopically arranged part-members 6a and 6b. The part-member 6a is attached to the door frame element 1 by means of an end member 7a and the part-member 6b is attached to the door 2 by means of an end member 7b. As shown in Figure 2, when the door 2 is in its closed position, the member 6a and its end member 7a are received in a trough element 9 in the door, and the member 6b and its end element 7b are received in a trough element 8 in the frame element 1.

When the door 2 is moved from the closed position shown in Figure 2 to the open position shown in Figure 3, the telescopically arranged part-members 6a and 6b move axially outwardly relative to each other and, simultaneously, turn somewhat relative to each other. The end members 7a and 7b in turn have been swung and turned relative to their attachments in the frame 1 and the door 2, respectively. In order to allow these movements, the end members 7a and 7b can be journalled to their attachments in the frame 1 and the door 2, for instance by means of ball joints, but other joint mechanisms allowing said movements can be used instead.

In both of the embodiments shown, the protecting member can protect one or more cables 10 (shown only in Figure 2). The or each cable can be installed at the same time as the protecting member. Alternatively, the cable(s) can be introduced through an already installed protecting member, but this may cause some practical problems. Because the protecting member is somewhat expanded when the door is opened. compared with when the door is closed, the cable(s) should have a corresponding excess length.

Claims

1. The combination of two elements which are pivot-
able relative to one another between first and second pos-
itions in which the gap between the two elements is a min-
imum and a maximum, respectively, and a device for protect-
ing at least one flexible elongate component which passes
through said gap, said device comprising an elongate
longitudinally-extendible protecting member which allows
turning movement about its longitudinal axis, which member
is arranged around said component(s), has its opposite ends
attached to respective ones of said two elements and is
disposed with its longitudinal axis in the general direct-
ion of the pivoting axis of the two elements, and a recess
in at least one of said two elements for the reception of
said protecting member when said two elements occupy said
first position.

2. A combination according to claim 1, in which said
protecting member comprises a single hollow member surround-
ing said component(s) and end members for attaching oppo-
site ends of said hollow member to respective ones of said
two elements.

3. A combination according to claim 2, in which each
of said end members completely surrounds said component(s).

4. A combination according to claim 2 or 3, in which
said hollow member is a flexible tension spring.

5. A combination according to any of the preceding
claims, in which said recess is provided in a trough-
shaped element mounted in one of said two elements, in
which one end of said protecting member is attached.

6. A combination according to claim 5, in which said
trough-shaped element is so dimensioned that its length
corresponds substantially to the length of said protecting
member when said two elements occupy said first position.

7. A combination according to claim 1, in which said protecting member comprises two telescoping part-members, the free ends of which are turnably and swingably attached to said two elements.

5 8. A combination according to claim 7, in which said recess is provided in two separate trough-shaped elements of which one is located in one of said two elements and the other is located in the other of said two elements, said
10 trough-shaped elements being so located relative to each other that, in said first position of said two elements, one of said part-members is located substantially in one trough-shaped element and the other part-member is located in the other trough-shaped element.

15 9. The combination of two elements which are pivotable relative to one another between first and second positions in which the gap between the two elements is a minimum and a maximum, respectively, and a device for protecting at least one flexible elongate component which passes
20 through said gap, the combination being constructed and arranged substantially as herein described with reference to, and as illustrated in, Figure 1 or Figures 2 to 4 of the accompanying drawings.

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