

Lift shaft closure and method of fulfilling fire protection requirements of a lift shaft closure and of mounting the same

The invention relates to a lift shaft closure according to the definition of the patent claims, which is preferably used for lift installations with fire protection requirements as are demanded in known Standards such as BS476, UL10B or DIN4102.

The lift shaft closure enables access from the storey to the cage. It consists of the principal parts of door frame and door leaf. The door frame is alternately connected, depending on the type of building, directly with walling or on a foundation frame. At least one door leaf is slidably mounted in the door frame. Depending on the possible forms of arrangement of the door leaves distinction is then made between single-leaf or multi-leaf telescopic doors or centre doors. Telescopic doors close and open on one side, whereas centre doors open and close at both sides from or towards the middle of the door opening.

In the case of the closed lift shaft closure of telescopic doors, the closing-side door leaf together with the closing-side door frame forms a closing edge region. The closing edge region is usually formed as a labyrinth, as is described in, for example, the transcript of the 'Vereinigung der Technischen Überwachungsvereine' expert committee of the 12th sitting of 5 May 1999 (Berlin).

In this lift shaft closure the problem results of distortion of the closing-side door frame when acted on, in accordance with Standard, by fire and the thereby defined thermal stress. This distortion has the consequence that the closing-side door leaf is forced away and consequently a larger gap, which is not acceptable to the Standard, results. In the Standard requirement according to BS476: part 20 (Integrity), for example, a permissible gap size of 6 millimetres is defined.

Usual present-day solutions counteract this distortion and the resulting forcing away of the door leaf by the closing-side door frame being connected by stiff connecting supports with the walling or by the labyrinth depth being formed to be appropriately deep, partly greater than 35 millimetres. These solutions are expensive in production and assembly or they have a non-aesthetic effect.

GB-A-2352754 discloses a smoke sealing element in the form of brushes which seal the gap between door leaf and door frame. The object of this gap seal is to prevent propagation of cold smoke in the building. This solution fails in the case of direct exposure of the lift doors to flame, as is given in the case of fire in the immediate vicinity of the access to the lift shaft closure. The brushes melt or burn away and the lift shaft closure is deformed under the influence of thermal loading in such a manner that large door gaps arise, whereby the risk of fire propagation in the lift shaft and thus also in other storeys is increased.

The invention is based on the object of proposing a lift shaft door for telescopic doors which ensures that, in the case of fire, unacceptably large gap openings do not arise due to the effect of heat. The invention shall eliminate the disadvantages arising from the usual present-day solutions.

The invention defined by the patent claims meets this object.

In the case of a lift shaft closure for a telescopic door a closing-side door leaf together with a closing-side door frame forms, in closed state, a closing edge region. According to the invention the door frame is constructed to be multi-part in the closing edge region. At least one door frame part at least partly changes its position relative to another door frame part under defined thermal stress. The door frame parts are independently fastened to the walling or a foundation construction to be thermally separate from one another or thermally separable from one another. The advantage of the invention resides particularly in the fact that in the case of fire a part of the door frame can displace in front of the door leaf by the thermal stress defined by the fire without in that case forcing away the door leaf. The labyrinth depth can be formed to be correspondingly small in the closing edge region. This enables aesthetic and space-saving solutions.

The two door frame parts advantageously form a labyrinth. The separation of the two parts is preferably disposed at an edge defined by the labyrinth. Due to this constructional solution the gap formation is reduced and a beneficially aesthetic shape results.

In an advantageous construction the two door frame parts are fastened directly to the walling or to a foundation frame. This enables an economic and assembly-optimised solution in correspondence with the type of building.

The thermal separability is advantageously achieved by the fact that the two parts are held together by, for example, plastics material rivets or adhesive or that the two parts are pressed together by bias of the fastening. These forms of construction form economic methods, which are non-critical in processing, of connection of the two door frame parts. In addition, replacement of the individual part is possible in the case of damage. Moreover, the two parts can be fixedly joined together in the non-thermally loaded lower and upper regions of the door frame part. This fastening relieves the thermally separable connection of the load due to operation and thus prevents damage in the case of stronger loading.

In accordance with proposal the two door frame parts can consist of different materials. This enables aesthetic solutions corresponding with customer wish.

Overall, the advantages achieved by the invention are particularly to be seen in that in the case of fire a part of the door frame can displace in front of the door leaf without the door leaf itself in that case being pushed away, and the second part of the door frame, due to the fact that it is thermally separately guided on the foundation frame or the walling, exerts a significantly reduced pressure on the door leaf, whereby unacceptably large gap openings in the closing edge region do not result.

The invention is explained in more detail in the following on the basis of an example of embodiment in conjunction with the figures, wherein:

- Fig. 1 shows a view of the lift shaft closure for a telescopic door with two door leaves,
- Fig. 2 shows a view of the lift shaft closure corresponding with Fig. 1 with the characteristic behaviour in the case of fire,
- Fig. 3 shows a cross-section according to line II-II in Fig. 1, to enlarged scale, of a currently known solution with stiff wall connection,
- Fig. 4 shows a cross-section according to line II-II in Fig. 1, to enlarged scale, of a currently known alternative with a large labyrinth depth t ,

- Fig. 5 shows a cross-section according to line II-II in Fig. 1, to enlarged scale, of the solution according to the invention with connection to a foundation upright, the figure showing schematically the characteristic behaviour of the solution according to the invention in the case of fire,
- Fig. 6 shows a cross-section according to line II-II in Fig. 1, to enlarged scale, of the solution according to the invention with connection to walling and
- Fig. 7 shows a cross-section according to line II-II in Fig. 1, to enlarged scale, of a possible form of the separating location of the two closing-side door frame parts.

In all figures the closing-side door leaf of a lift shaft closure for single-leaf or multi-leaf telescopic doors is denoted by 1a. The part of the door frame forming the closing edge is denoted in all figures by 20 (20a, 20b). The region of the closing edge is represented by 3 in Fig. 1. The arrow V represents the closing direction of the door leaf. The walling of the building, or the foundation upright, is denoted by 5a, 5b, in Figs. 3 to 6.

One possible mode of construction of the solution according to the invention is illustrated in Fig. 5. The closing-side door frame 20 consists of two door frame parts 20a and 20b which are connected together at the joint location to be thermally separable. The first frame part 20a is fastened to the illustrated foundation post 5b. The second door frame part 10b is similarly fastened to the foundation upright 5b. Together they form the overall unit of the closing-side door frame in currently usual scope.

In the event of fire the thermally separable connection 4 loses its connecting force due to the arising heat. As a consequence, the first door frame part 20a can freely deform in correspondence with the thermal stress forces without thereby forcing the door leaf 1a away. The second door frame part 20b is now protected by the first door frame part 10a from direct heat radiation. It correspondingly deforms only slightly and thereby exerts a reduced pressure on the door leaf. Moreover, a gap which possibly arises is in addition covered by the pushed-forward first door frame part 20a.

The closing edge 3 is advantageously constructed as a labyrinth, whereby an aesthetic solution is created. Fig. 6 and Fig. 7 show constructional forms of execution of the labyrinth and the connecting location of the two door frame parts 20a and 20b.

Depending on the mode of construction of the building the need for a foundation post 5b may be redundant. The second door frame part 20b can accordingly be alternately mounted on the foundation upright 5b or fastened directly to the walling 5a, depending on the type of building. The thermally separable connection 4 connects the two door frame parts 20a and 20b. As presented, this connection is effected by plastics material rivets. Alternative connecting solutions such as adhesive, or by pressing the two door frame parts together by bias of the fastening members, can selectably be used. The selection of the method of connection is carried out in dependence on the maker. This enables a cost-optimised production by making production methods flexible.

For repair or for cost-optimised production, thermally fixed connections are possible in the upper and/or lower door post region. The two frame parts 20a and 20b can consist of different materials such as, for example, chromed steel and painted sheet steel. This provides an additional aesthetic benefit.

With knowledge of the present invention the expert can change the set shapes and arrangements as desired. For example, the illustrated door frame shape and/or door frame dimension can be changed in correspondence with purpose.

Patent Claims

1. Lift shaft closure for a telescopic door with at least one door leaf (1) and a door frame (2), a closing edge region (3) being formed in closed state by a closing-side door leaf (1a) together with a closing-side door frame (20), characterised in that the door frame is constructed in the closing edge region from at least a first door frame part (20a) and a second door frame part (20b), wherein the two door frame parts (20a, 20b) are connected at least partly in thermally separable manner and that the first door frame part (20a) at least partly changes its position relative to the second door frame part (20b) under defined thermal stress.
2. Lift shaft closure according to claim 1, characterised in that the first door frame part (20a) together with the second door frame part (20b) form a labyrinth.
3. Lift shaft closure according to claim 1 or 2, characterised in that the first door frame part (20a) and the second door frame part (20b) are selectably fastened to walling or to a foundation upright.
4. Lift shaft closure according to claim 3, characterised in that the first door frame part (20a) is thermally detachably connected (4) with the second door frame part (20b) in the closing edge region (3).
5. Lift shaft closure according to claim 4, characterised in that the first door frame part (20a) and the second door frame part (20b) are additionally firmly fixedly connected in the upper and/or lower closing edge region (3).
6. Lift shaft closure according to claim 5, characterised in that the first door frame part (20b) and the second door frame part (20a) comprise different materials.
7. Method of fulfilling fire protection requirements in a lift shaft closure for a telescopic door with at least one door leaf (1) and a multi-part door frame (2), characterised in that the mutual position of these door frame parts is changed at least partly relative to one another under defined thermal stress.

8. Method of mounting a lift shaft closure for a telescopic door with at least one door leaf (1) and a multi-part door frame (2), characterised in that the door frame parts are alternately fastened to walling or to a foundation upright.