

Fire service lift

The present invention relates to an extinguishing water discharge system for a lift installation in which a lift cage is moved in a shaft. The present invention relates particularly to the design of the lift cage.

Modern lift installations or so-called fire service lifts which are designed especially for this purpose must guarantee reliable operation even in the event of fire. On the one hand the evacuation of persons and/or vulnerable material from the storeys affected by the fire must be guaranteed and on the other hand a functionally capable lift also has to be available for the transport of fire service personnel and their extinguishing material. In either case the use of extinguishing water should not have the consequence that the lift installation or the fire service lift no longer functions. This applies not only to the use of a sprinkler installation on a storey, but also to the use of extinguishing water by the fire service.

This means that electrical components of the lift installation have to remain dry. In addition, it has to be ensured that a support means on a drive pulley is still driven as desired. Extinguishing water can in that case have a negative influence on the traction of the support means on the drive pulley. On the one hand extinguishing water can directly reduce the coefficients of friction between the drive pulley and the support means and on the other hand lubricant present in the extinguishing water can additionally negatively influence the traction between support means and drive pulley. A support means wetted by extinguishing water can thus lead to reduction in traction or even to complete loss of traction. In the case of, in particular, a substantial difference between the weight of the lift cage and of a counterweight an uncontrolled travel of the lift cage can then arise, which has to be stopped by safety brakes. Faultless functioning of the safety brake or the braking retardation of the brake shoes thereof on guide rails can, however, also not be guaranteed if the brake shoes of the guide rails are moistened by extinguishing water.

The use of belt-like support means instead of steel cables has the problem of a heightened loss of traction between support means and drive pulley. The synthetic material surfaces of belt-like drive means change their traction properties in the case of wetting by extinguishing water more strongly than steel-cable-like support means. This makes it necessary to conduct away or collect the extinguishing water in controlled

manner. It is necessary to prevent support means sections which co-operate with the drive pulley from being wetted by extinguishing water.

The extinguishing water normally penetrates into the lift shaft by way of the shaft doors of the lift shaft. In that case the extinguishing water flows on a storey floor under the shaft doors through into the lift shaft. International published specification WO 98/22381 A1 discloses a lift installation with a drainage system at the shaft doors as well as mechanically positively interengaging flow barriers at each shaft door. It is attempted in this manner to keep the lift shaft at the outset free of extinguishing water over its entire height. However, a disadvantage of this solution is that each storey has to be equipped, with a high cost outlay, with appropriate drainage pipes and the said flow barriers.

It is therefore an object of this invention to provide a device, which can be realised more economically, for protection of the support means against extinguishing water.

Fulfilment of this object consists initially in the arrangement of a drain system not at the individual shaft doors, but at the lift cage itself. This concept derives from the recognition that the extinguishing water in principle does not have to be kept away from the lift shaft, but can also flow away in controlled or diversionary manner. It was observed that a principal cause of the support means becoming wet is the spraying or atomisation of the extinguishing water when impinging on the roof of the lift cage.

The invention relates to a fire service lift with a lift cage having a cage roof, wherein the lift cage is at least partly supported and driven by at least one support means. The lift cage has on the cage roof a region vulnerable to spray water and this region vulnerable to spray water is covered by an element having a surface structure of such a kind that extinguishing water falling on the element in the event of fire is substantially prevented from spraying in the direction of the at least one support means.

The element with the above-mentioned properties is termed "spray-inhibiting element" in the following.

Fire service lifts are lifts which have special adaptations so that they can remain capable of use for longer time in the case of a fire. Such adaptations are, for example, electronic components protected from spray water, fire-resistant cage elements or a specific control

mode for the case of fire. The spray-inhibiting element is equally such an adaptation. In this sense any lift which is equipped with such a spray-inhibiting element is termed fire service lift in the following.

The region vulnerable to spray water and covered by the spray-inhibiting element is preferably arranged at a side edge of the cage roof closest to the cage doors. Because the extinguishing water falls through slots under the shaft doors into the shaft it is particularly important to equip with spray-inhibiting elements that region of the cage roof which faces towards the shaft doors.

It is particularly advantageous with respect to the proposed solution that adaptations or special constructional measures do not have to be undertaken at either the lift itself or at the lift shaft. The proposed spray-inhibiting element can, for example, also be retrofitted in existing lift installations in simple mode and manner. In addition, this proposed solution is economic, because in a minimal variant it consists solely of the spray-inhibiting element.

A further advantage of the proposed solution is that lift cages of different types can be retrofitted. The spray-inhibiting element can be arranged not only on flat or inclined cage roofs, but also on irregularly shaped cage roofs. This enables retrofitting of the extinguishing water diverting system according to the invention to almost all types of lifts. The spray-inhibiting element can thus be understood as an additional component which can be arranged on existing intrinsically closed lift cages.

The spray-inhibiting element is preferably arranged on a watertight surface. It is thereby achieved that the extinguishing water can flow from the spray-inhibiting element over this watertight surface to edges of the cage roof and from there to the cage walls and/or to the cage doors. However, it is also possible to arrange the spray-inhibiting element on a non-watertight surface so that the extinguishing water can flow from the spray-inhibiting element through the cage roof into the interior of the lift cage.

In a preferred exemplifying embodiment, walls protruding beyond the spray-inhibiting element are arranged in prolongations of cage side walls. It is thereby achieved that no extinguishing water can flow from the spray-inhibiting element over the cage side walls, but is guided over the cage back wall and/or the cage doors. Such walls are advantageous particularly for lift installations in which the support means are guided along

the cage side walls. Such walls can be dimensioned in such a manner that they conduct the extinguishing water, which flows from the spray-inhibiting elements over the cage roof, in desired paths.

In a particularly preferred form of embodiment these walls are, however, dimensioned in such a manner that they even keep possible residual spray water away from the support means. Conversely, a spray-inhibiting element can be used for the purpose of reducing a necessary wall height of such walls which would be required without a spray-inhibiting element. High side walls have the disadvantage that the cage hits earlier against a shaft ceiling, i.e. can be moved less high in a shaft, and that accessibility is impaired in the case of assembly operations from the cage roof, for example to a drive arranged laterally in the shaft head. Accordingly, it is advantageous to keep such walls as low as possible. The necessary wall height can be decisively reduced by a spray-inhibiting element.

The spray-inhibiting element has a surface structure which substantially prevents extinguishing water, which falls onto the element in the case of a fire, from spraying in the direction of the support means. In a preferred form of embodiment the spray-inhibiting element is constructed as porous material. The surface structure of porous material allows falling extinguishing water to penetrate at least partly into the porous material and prevents strong spraying away of extinguishing water. Foam materials, spongy materials or porous stones, for example, come into consideration as porous materials. The porous material advantageously has a low weight and is of fire-resistant construction.

In an alternative preferred form of embodiment the spray-inhibiting element is constructed as a grate-like element. This grate-like element has longitudinal elements which are arranged in such a manner that they stand substantially perpendicularly to a plane of the cage doors. These longitudinal elements substantially prevent extinguishing water, which is falling down, from spraying in the direction of the support means. For that purpose the longitudinal elements have to be so dimensioned and aligned that they effectively intercept extinguishing water sprayed from the cage roof in the direction of the support means. In addition to these longitudinal elements the grate-like element can also have transverse elements, which are connected with the longitudinal elements and arranged substantially perpendicularly thereto. In a preferred form of embodiment these transverse elements have openings through which extinguishing water which has collected in the grate-like element can escape.

The invention is explained in more detail symbolically and by way of example with reference to the figures, in which

Fig. 1 shows a schematic illustration of an exemplifying lift installation in a building with a fire extinguishing installation;

Fig. 2 shows an exemplifying form of embodiment of a lift cage in plan view;

Fig. 3 shows an exemplifying form of embodiment of a spray-inhibiting element;

Fig. 4 shows an exemplifying form of embodiment of a spray-inhibiting element;

Fig. 5 shows an exemplifying illustrative form of a lift cage with a spray-inhibiting element in perspective illustration;

Fig. 6 shows an exemplifying illustrative form of a lift cage with a spray-inhibiting element in perspective illustration;

Fig. 7 shows an exemplifying form of embodiment of a lift cage with a spray-inhibiting element in perspective illustration; and

Fig. 8 shows an exemplifying illustration of a lift cage with a spray-inhibiting element in perspective illustration.

Fig. 1 shows a lift installation such as is known from the prior art. A cage 1 and a counterweight 2 are arranged in a lift shaft 10. In that case both the lift cage 1 and the counterweight 2 are coupled with a support means 3. Through driving the support means 3 by a drive (not illustrated) the lift cage and the counterweight can be moved vertically in the shaft 10. In the illustrated exemplifying embodiment both the lift cage 1 and the counterweight 2 are suspended at support rollers 11, 12. The cage rollers 11 are in that case arranged below the cage 1 so that the cage 1 is underslung by the support means 3. By contrast thereto the counterweight support roller 12 is arranged above the counterweight 2 so that the counterweight 2 is suspended at the counterweight support

roller 12. As a result of the underslinging of the lift cage 1 the support means 3 is guided along cage side walls 30.

A shaft wall 6 has at the height of a storey 9.1, 9.2 a respective opening which can be closed by a respective shaft door 5.1, 5.2. A fire extinguishing installation 13 is installed on the second lowermost storey 9.2. The fire extinguishing installation 13 is arranged at a ceiling of the storey 9.2 so that extinguishing water 14 can reach an as large as possible number of fire sites. The extinguishing water 14 collects on the storey floor 8.2 and flows from there, at least partly, down through the shaft door 5.2 and into the lift shaft 10. As illustrated in Figure 1, the extinguishing water 14 flowing through the shaft door falls in the manner of a waterfall from above onto the lift cage 1. From the lift cage 1 the extinguishing water flows further down until it collects at the shaft base 7 (not illustrated).

The distribution of the extinguishing water 14 in the lift shaft 10 is dependent on inter alia the following factors: For entry of the extinguishing water into the lift shaft 10 initially the amount of extinguishing water and also the size of the gap between the shaft door 5.2 and the storey floor 8.2 are decisive. The greater the quantity of extinguishing water the greater the water pressure which lets the extinguishing water shoot into the shaft. The shape and size of the gap between the shaft door 5.2 and the storey floor 8.2 have a direct influence on the distribution of the extinguishing water 14 in the lift shaft 10. In addition the distribution of the extinguishing water 14 in the lift shaft 10 is formed by the difference in height between the lift cage 1 and the storey 9.2 from which the extinguishing water penetrates into the shaft. The greater the spacing between a cage roof 15 and the storey floor 8.2 from which the extinguishing water penetrates into the shaft 10 the more rapidly the extinguishing water 14 falls onto the lift cage roof 15 and the further the extinguishing water 14 is sprayed from the cage roof 15. A greater spacing between the cage roof 15 and the storey floor 8.2 from which the extinguishing water penetrates into the shaft 10 additionally has the consequence that the extinguishing water can spread wider and deeper into the shaft 10 through a higher drop path.

It is apparent from Figure 1 that the extinguishing water 14 when impinging on the cage roof 15 should not, as far as possible, be sprayed and that the extinguishing water 14 is advantageously conducted away from the cage roof 15 by way of a cage door 4 or by way of a cage back wall 29. Not only in the case of spraying onto the cage roof 15, but also in

the case of running down the cage side walls 30 is there the risk that the support means 3 is wetted by the extinguishing water 14.

It will be obvious that the principles and problems described with respect to Figure 1 also occur with other forms of fire extinguishing installations 13 or other kinds of lifts.

An exemplifying form of embodiment of a lift cage is illustrated in Figure 2 in plan view. The lift cage is laterally bounded by the side walls 30, the back wall 29 and the cage door 4. In addition, the support means 3, which is led by the cage support rollers 11 around the lift cage 1, is illustrated. A region 16 vulnerable to spray water is illustrated on the cage roof 15. This region 16 vulnerable to spray water has a width 18 and a length 17.

The path, which is explained on the basis of Figure 1, of the extinguishing water 14 has the consequence that the region 16 vulnerable to spray water can be constructed as shown in Figure 2. Thus, for example, the length 17 of the region 16 vulnerable to spray water is influenced at least partly by the shape and width of the gap between the shaft door 5.2 and the storey floor 8.2. The width 18 of the region 16 vulnerable to spray water is also critically influenced by the shape and length of the gap between the shaft door 5.2 and the storey floor 8.2. In addition, the maximum anticipated drop height of the extinguishing water 14 between the uppermost storey floor 8.2 and the cage roof 15 when the cage is as illustrated in Figure 1 located in its lowermost position has a direct influence on the shape and size of the region 16 vulnerable to spray water.

In Figure 2 the region vulnerable to spray water is illustrated as a rectangle. It will be obvious that the region 16 vulnerable to spray water can also adopt a different shape, for example the shape of a semicircle or a trapezium, or also an irregular shape. In addition, it is conceivable that the region 16 vulnerable to spray water is not arranged directly at an edge of the cage roof 15, but arranged at a spacing from an edge of the cage roof 15. Moreover, it is conceivable that the region 16 vulnerable to spray water covers the entire area of the cage roof 15. The width 18 of the region 16 vulnerable to spray water is preferably at least 1 metre and the length 17 of the region 16 vulnerable to spray water is preferably at least as large as a passage width of the opened cage doors 4.

Two forms of embodiment of a spray-inhibiting element 19, 20 are shown by way of example in Figures 3 and 4. In Figure 3 the spray-inhibiting element is constructed as

porous material 19. The porous material 19 is, by way of example, a porous foam material, a spongy material or a porous stone. The porous material 19 should have a low weight as well as be fire-resistant. In addition, it is advantageous if the porous material 19 is constructed to be tread-resistant so that walking on the cage roof is still possible without damaging the porous material 19. A thickness 21 of the porous material 19 is preferably at least 1 centimetre, but particularly preferably at least 5 centimetres. Through a suitable thickness 21 of the porous material 19 it is possible to prevent the porous material 19 from being completely saturated with extinguishing water and as a consequence thereof losing its spray-inhibiting property.

The porous material 19 has in the interior thereof a labyrinth of passages. These passages form pores at a surface of the porous material 19. A diameter of these pores is preferably less than 2 centimetres. In an alternative form of embodiment the diameter of the pores is less than 1 centimetre and in a particularly preferred alternative form of embodiment the diameter is less than 0.5 centimetres.

In a preferred form of embodiment the porous material 19 has a thickness 21 of at least 1 centimetre, preferably at least 3 centimetres and particularly preferably at least 5 centimetres.

An example of a suitable porous material 19 is a coarse-pored foam material such as is used, for example, for cleaning vehicles.

An alternative form of embodiment of the spray-inhibiting element is illustrated in Figure 4. In this example the spray-inhibiting element is constructed as a grate-like element 20. The grate-like element 20 consists of two transverse elements 27 as well as longitudinal elements 26 arranged therebetween. A height 22 of the grate-like element 20 can be varied according to the desired spray-inhibiting properties. The greater the height 22 of the grate-like element 20, the less spray water can escape laterally. In order that the grate-like element 20 is not filled with extinguishing water and thereby loses its function of inhibiting spray water, openings 28 are provided in the transverse elements 27. In an alternative form of embodiment (not illustrated) instead of the openings 28 the transverse elements are constructed to be less high than the longitudinal elements or the transverse elements do not reach up to the support surface of the grate-like element 20.

The transverse elements 27 as well as the longitudinal elements 26 of the grate-like element 20 can be constructed from, for example, plastics material or metal. It is again advantageous if the grate-like element 20 is tread-resistant, i.e. is not damaged when walked on, as well as has a low weight. A shape of the grate-like element 20 can be adapted to the respective requirements. Thus, the grate-like element 20 can be designed to be, for example, semicircular or trapezium-shaped.

In a preferred form of embodiment the longitudinal elements 26 are at least 3 centimetres, preferably at least 5 centimetres and particularly preferably at least 10 centimetres, high.

A lift cage 1 with a spray-inhibiting element 19, 20 arranged thereon is shown in perspective illustration in each of Figures 5 to 8. Figure 5 shows a grate-like element 20 which is arranged on the cage roof 15. In that case the longitudinal elements 26 of the grate-like element 20 are so oriented that they are arranged substantially perpendicularly to a plane of the cage doors 4. A maximum spray-inhibiting effect in the direction of the support means 3 can be achieved by such an arrangement of the grate-like element 20.

A lift cage 1 with a porous material 19 arranged thereon is illustrated in Figure 6. In this example the porous material 19 covers the entire area of the cage roof. As an additional protective measure in this exemplifying embodiment spray protection walls 23 are arranged in a prolongation of the side walls 30. In that case the spray walls 23 protrude beyond the porous material 19. Apart from their additional protective effect against the support means 3 becoming wet with extinguishing water the spray protection walls 23 conduct the extinguishing water, which escapes from the porous material 19, away from the cage side walls 30 so that the extinguishing water is led away via the cage doors 4 as well as via the cage back wall. The height of the spray protection walls 23 can again be adapted to the respective requirements such as, for example, the maximum drop height of the extinguishing water within the lift shaft.

In Figure 7 a porous material 19 is again arranged on the cage roof 15 of a lift cage 1. In this exemplifying embodiment the lift cage 1 has a cage top-attachment 25. This cage top-attachment 25 can contain, for example, a cage control unit. As illustrated in Figure 7, this cage top-attachment 25 is also covered with porous material 19. The region 16 vulnerable to spray water consequently does not have to be disposed in a single plane, but can be disposed at various locations on the cage roof. In addition, in this exemplifying

embodiment the cage side walls 30 are prolonged upwardly, but not with spray protection walls as in Figure 6, instead merely with drain walls 24 which protrude only slightly beyond the porous material 19. These drain walls 24 consequently serve merely for conducting the extinguishing water away from the cage side walls 30 and not so much the additional spray-inhibiting effect.

A lift cage having a region which is vulnerable to spray water and which does not cover the entire cage roof 15 is shown in Figure 8. Consequently, the porous material 19 extends only as far as the width 18 of the region vulnerable to spray protection. Spray protection walls 23 are again arranged, but are guided along the entire edge length of the lift cage roof 15.

As shown in Figures 5 to 8, the design of the spray-inhibiting element 19, 20 as well as additional measures such as, for example, spray protection walls 23 can be tailored to the respective requirements. This capability of adaptation of the spray protection system according to the invention has the advantage that almost any kind of lift can be retrofitted with this system.

Patent claims

1. Fire service lift with a lift cage (1) comprising a cage roof (15), wherein the lift cage (1) is at least partly supported and driven by at least one support means (3), characterised in that the lift cage (1) has on the cage roof (15) a region (16) vulnerable to spray water and that this region (16) vulnerable to spray water is covered by an element (19, 20) having a surface structure of such a kind that extinguishing water (14) falling on the element (19, 20) in the case of fire is substantially prevented from spraying in the direction of the at least one support means (3).
2. Fire service lift according to claim 1, wherein the element (19, 20) is constructed as porous material (19).
3. Fire service lift according to claim 2, wherein pores of the porous material (19) have a diameter of less than 2 centimetres, preferably less than 1 centimetres, particularly preferably less than 0.5 centimetres.
4. Fire service lift according to claim 2 or 3, wherein the porous material (19) contains a porous foam material.
5. Fire service lift according to any one of claims 2 to 5, wherein the porous material is fire-resistant.
6. Fire service lift according to claims 2 to 5, wherein the porous material (19) has a thickness (21) of at least 1 centimetre, preferably at least 3 centimetres, particularly preferably 5 centimetres.
7. Fire service lift according to claim 1, wherein the element (19, 20) is constructed as a grate-like element (20).
8. Fire service lift according to claim 7, wherein the grate-like element (20) has longitudinal elements (26) so arranged that they are disposed substantially perpendicularly to a plane of cage doors (4).

9. Fire service lift according to claim 8, wherein the longitudinal elements (26) are at least 3 centimetres, preferably at least 5 centimetres, particularly preferably 10 centimetres, high.

10. Fire service lift according to any one of claims 7 to 9, wherein transverse elements (27) are so connected with the longitudinal elements (26) that the transverse elements (27) are arranged substantially perpendicularly to the longitudinal elements (26).

11. Fire service lift according to claim 10, wherein the transverse elements (27) have openings (28).

12. Fire service lift according to any one of the preceding claims, wherein the region (16) vulnerable to spray water has a length (17) and a width (18) and is disposed at a side edge of the cage roof (15) arranged closest to the cage doors (4).

13. Fire service lift according to claim 12, wherein the width (18) of the region (16) vulnerable to spray water is at least 1 metre and wherein the length (17) of the region (16) vulnerable to spray water is at least as large as a passage width of the opened cage doors (4).

14. Fire service lift according to any one of the preceding claims, wherein the element (19, 20) is arranged on a watertight surface so that the extinguishing water can flow from the element (19, 20) over this watertight surface to edges of the cage roof (15) and from there to cage walls (29, 30) and/or to the cage doors (4).

15. Fire service lift according to any one of the preceding claims, wherein walls (23, 24) protruding beyond the element (19, 20) are arranged in prolongations of cage side walls (30).