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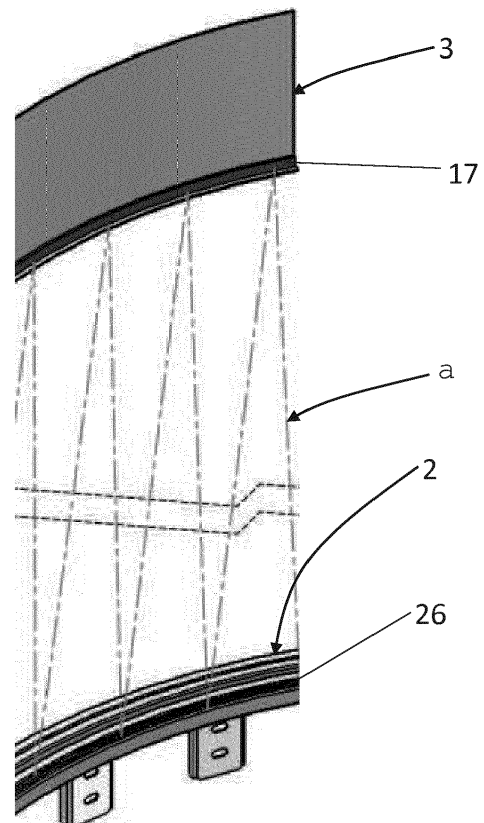
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(54) **CABIN DOOR WITH A CIRCULAR OPENING**

(57) A cabin door (1) with a circular opening, comprising:
a lower jamb (2) and an upper jamb (3) having an arched extension,
arranged substantially parallel and aligned;
a plurality of door panels (4) having an arched extension;
a photoelectric safety barrier comprising a first strip (16) of flexible material bearing a plurality of electromagnetic radiation and a second strip (17) of flexible material bearing a plurality of receivers, the first strip (16) being installed on the lower jamb (2) and the second strip (17) being installed on the upper jamb (3).

FIG. 3



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Description

[0001] The present invention relates to a cabin door with a circular opening, in particular for an elevator or an elevator platform.

[0002] As known, inside an elevator shaft a vertically sliding cabin is arranged.

[0003] Said cabin has one or more gaps or openings with which a door comprising a plurality of horizontally opening sliding door panels is associated.

[0004] For safety reasons, crush-prevention devices are associated with the automatic sliding doors. Such devices prevent the closure of the door in the presence of obstacles (people or objects) in the gaps and determine an inversion of the motion of the door panels.

[0005] One of the first solutions developed consists of the use of a pair of photocells arranged respectively on the lateral opposing stiles (or jambs) of the door, or on two opposing door panels of a central-opening rectilinear door. Upon detecting an obstacle in the gap, at the height of the photocells (generally at a 50 cm height from the floor surface), the beam of radiation coming from one of the photocells is interrupted, therefore the photocell positioned on the opposite lateral jamb does not receive the signal. In response to such an event, the control unit blocks the closing sliding action of the door panels.

[0006] From an individual pair of photocells there has been a transition to flat vertical barriers, i.e. pairs of photocells arranged vertically on opposite sides of the door (on the jambs or on the door panels). In practice, the pair of photocells define a planar area of horizontal radiation that allows any obstacles present in the gap to be reliably intercepted, even at different heights (unlike with the individual pair of photocells).

[0007] Upon detecting the obstacle, the control unit also determines the inversion of the movement direction of the door panel.

[0008] The solution just described was designed for doors sliding horizontally on a rectilinear trajectory.

[0009] However, this solution cannot be used in circular systems, in which the cabin doors have door panels sliding along an arched extension. In fact, the beam coming from a lateral jamb would never be detected by the opposite jamb.

[0010] In this context, the technical task underlying the present invention is to propose a cabin door with a circular opening, which obviates the drawbacks in the known art as described above.

[0011] In particular, an object of the present invention is to provide a cabin door with a circular opening able to reliably perform a crush-prevention function of any obstacles present in the gap.

[0012] The technical task and the objects specified are substantially achieved by a cabin door with a circular opening, comprising:

- first guide means and second guide means having an arched extension, arranged substantially parallel

and aligned;

- a plurality of panels slidable along the guide means, each of the panels having an arched extension;
- a photoelectric safety barrier comprising a first device configured to emit electromagnetic radiation and a second device configured to receive the electromagnetic radiation coming from the first device,

characterised in that the first device is installed on the first guide means and is conformed so as to follow the arched extension of the first guide means, and in that the second device is installed on the second guide means and is conformed so as to follow the arched extension of the second guide means.

[0013] The first device comprises a first strip of flexible material bearing a plurality of emitters and the second device comprises a second strip of flexible material bearing a plurality of receivers.

[0014] The first strip is installed on the first guide means so as to follow its arched extension.

[0015] The second strip is installed on the second guide means so as to follow its arched extension.

[0016] Preferably, the cabin door comprises a first tubular element made of rigid material in which the first strip is housed.

[0017] The first tubular element has an arched extension so as to follow the arched extension of the first guide means and has a slit that crosses it along its arched extension.

[0018] For example, the first tubular element is made of metal or alloy or plastic material.

[0019] More preferably, the first tubular element has a C-shaped cross-section.

[0020] In one embodiment, the first device comprises a plurality of emitters arranged one after the other along the arched extension of the first guide means. In such embodiment, the second device comprises a plurality of receivers arranged one after the other along the arched extension of the second guide means.

[0021] Further characteristics and advantages of the present invention will become more apparent from the following indicative, and hence nonlimiting, description of a preferred, but not exclusive, embodiment of a cabin door with a circular opening, as illustrated in the appended drawings, in which:

- figures 1 and 2 illustrate a cabin door with a circular opening, according to the present invention, in a perspective view from the inside of the shaft, in an open and in a closed configuration, respectively;
- figure 3 illustrates some elements of the cabin door with a circular opening (in which the door panels have been removed) of figures 1 and 2, in a perspective view from inside the shaft;
- figures 4 and 5 illustrate some elements of the cabin door with a circular opening (first strip and first tubular element) of figures 1 and 2, in a perspective exploded view from two different angles;

- figure 6 illustrates some elements of the cabin door with a circular opening (second strip) of figures 1 and 2, in an exploded perspective view.

[0022] With reference to the figures, number 1 indicates a cabin door with a circular opening, that can be used in the cabin of an elevator or an elevator platform.

[0023] The cabin door 1 comprises first guide means 2 and a second guide means 3, and a plurality of door panels 4 slidable along such guide means 2,3.

[0024] Since the cabin door 1 has a circular opening, both the two guide means 2, 3 and the door panels 4 have an arched extension.

[0025] The first guide means 2 and the second guide means 3 are arranged substantially parallel and aligned.

[0026] In particular, the first guide means 2 is part of a lower jamb of the cabin door 1, while the second guide means 3 is part of an upper jamb of the cabin door 1, or vice versa.

[0027] The cabin door 1 is provided with a photoelectric safety barrier comprising a first device 6 configured to emit electromagnetic radiation and a second device 7 configured to receive the electromagnetic radiation coming from the first device 6. In particular, the electromagnetic radiation is infrared rays.

[0028] The first device 6 is installed on the first guide means 2 and the second device 7 is installed on the second guide means 3.

[0029] The first device 6 is conformed so as to follow the arched extension of the first guide means 2.

[0030] The second device 7 is conformed so as to follow the arched extension of the second guide means 3.

[0031] In other words, the photoelectric safety barrier is configured to define an arched area of vertical radiation that extends between the two guide means 2, 3 (or between the lower and upper jambs of the cabin door 1), as illustrated in figure 3.

[0032] In a first embodiment, illustrated in figures 4-5, the first device 6 comprises a first strip 16 of flexible material bearing a plurality of emitters.

[0033] The second strip 16 is installed on the first guide means 2 so as to follow its arched extension.

[0034] For example, in the embodiment described and illustrated herein, the first strip 16 is installed on the lower jamb.

[0035] Preferably, the first strip 16 is housed inside a first tubular element 26 having an arched extension such as to follow the arched extension of the first guide means 2.

[0036] In particular, the first tubular element 26 has a slit that crosses it along its arched extension so as to allow the emission of electromagnetic radiation.

[0037] For example, the first tubular element 26 has a C-shaped cross-section.

[0038] Preferably, the first tubular element 26 is made of metal or alloy (e.g. aluminium, steel, bronze) or plastic material.

[0039] The second device 7 comprises a second strip

17 of flexible material bearing a plurality of receivers (see figure 6).

[0040] The second strip 17 is installed on the second guide means 3 so as to follow its arched extension.

[0041] For example, in the embodiment described and illustrated herein, the second strip 17 is installed on the upper jamb. For example, the upper jamb is made of metal or an alloy (e.g. aluminium, steel, bronze).

[0042] In a second embodiment, not illustrated, the first device 6 comprises a plurality of emitters arranged one after the other along the arched extension of the first guide means 2.

[0043] The second device 7 comprises instead a plurality of receivers arranged one after the other along the arched extension of the second guide means 3.

[0044] The operation of the cabin door with a circular opening, according to the present invention, is described below in the case of a door with two door panels.

[0045] The cabin door 1 is initially considered in an open configuration, i.e. with the door panels 4 at the maximum mutual distance possible, therefore the gap of the door is accessible by persons and/or objects (see figure 1).

[0046] During the passage of the cabin door 1 to a closed configuration, the door panels 4 begin to approach one another sliding along the guide means 2, 3 so that the gap is gradually reduced.

[0047] The first device 6 sends electromagnetic radiation (e.g. infrared rays) towards the second device 7. The latter communicates with a control unit (not illustrated) operatively active on the means for moving the door panels 4.

[0048] In particular, in the absence of obstacles, the second device 7 detects the electromagnetic radiation coming from the first device 6 and communicates with the control unit which does not intervene on the motion of the door panels 4 (therefore leaving them to gradually approach one another).

[0049] Whenever, during the closure of the cabin door 1, an obstacle passes through the gap, the electromagnetic radiation is interrupted by the obstacle and the second device 7 detects such interruption. In response to such detection, the control unit intervenes on the means for moving the door panels 4 to stop them and invert their movement (i.e. move the door panels 4 away from one another).

[0050] The characteristics of the cabin door with a circular opening according to the present invention emerge clearly from the above description, as do the advantages.

[0051] In particular, thanks to the installation of the first device (emitter) and the second device (receiver) on the two arched and aligned guide means and thanks to the fact that such devices are conformed so as to follow the arched extension of the guides themselves, the photoelectric safety barrier defines an arched area of vertical radiation that allows any obstacles in the gap to be intercepted.

[0052] Furthermore, the embodiment using strips of

flexible material is more advantageous since it is universally applicable to guides having different curvatures and lengths. In fact, the flexible strips are suitable for application parallel to the corresponding guides, so as to follow the arched extension thereof.

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first device (6) comprises a plurality of emitters and said second device (7) comprises a plurality of receivers, said emitters being arranged one after the other along the arched extension of the first guide means (2), said receivers being arranged one after the other along the arched extension of the second guide means (3).

Claims

1. Cabin door (1) with a circular opening, comprising: 10

first guide means (2) and second guide means (3) having an arched extension, arranged substantially parallel and aligned;

a plurality of door panels (4) slidable along said guide means (2, 3), each of said door panels (4) having an arched extension; 15

a photoelectric safety barrier comprising a first device (6) configured to emit electromagnetic radiation and a second device (7) configured to receive the electromagnetic radiation coming from the first device (6), 20

characterised in that said first device (6) is installed on the first guide means (2) and is conformed so as to follow the arched extension of said first guide means (2), and **in that** said second device (7) is installed on the second guide means (3) and is conformed so as to follow the arched extension of said second guide means (3). 25 30

2. Cabin door (1) according to claim 1, wherein said first device (6) comprises a first strip (16) of flexible material bearing a plurality of emitters and said second device (7) comprises a second strip (17) of flexible material bearing a plurality of receivers, said first strip (16) being installed on the first guide means (2) so as to follow its arched extension, said second strip (17) being installed on the second guide means (3) so as to follow its arched extension. 35 40

3. Cabin door (1) according to claim 2, further comprising a first tubular element (26) made of rigid material in which said first strip (16) is housed, said first tubular element (26) having an arched extension so as to follow the arched extension of said first guide means (2) and having a slit that crosses it along its arched extension. 45

4. Cabin door (1) according to claim 3, wherein said first tubular element (26) has a C-shaped cross-section. 50

5. Cabin door (1) according to claim 3 or 4, wherein said first tubular element (26) is made of metal or alloy or plastic material. 55

6. Cabin door (1) according to claim 1, wherein said

FIG. 1

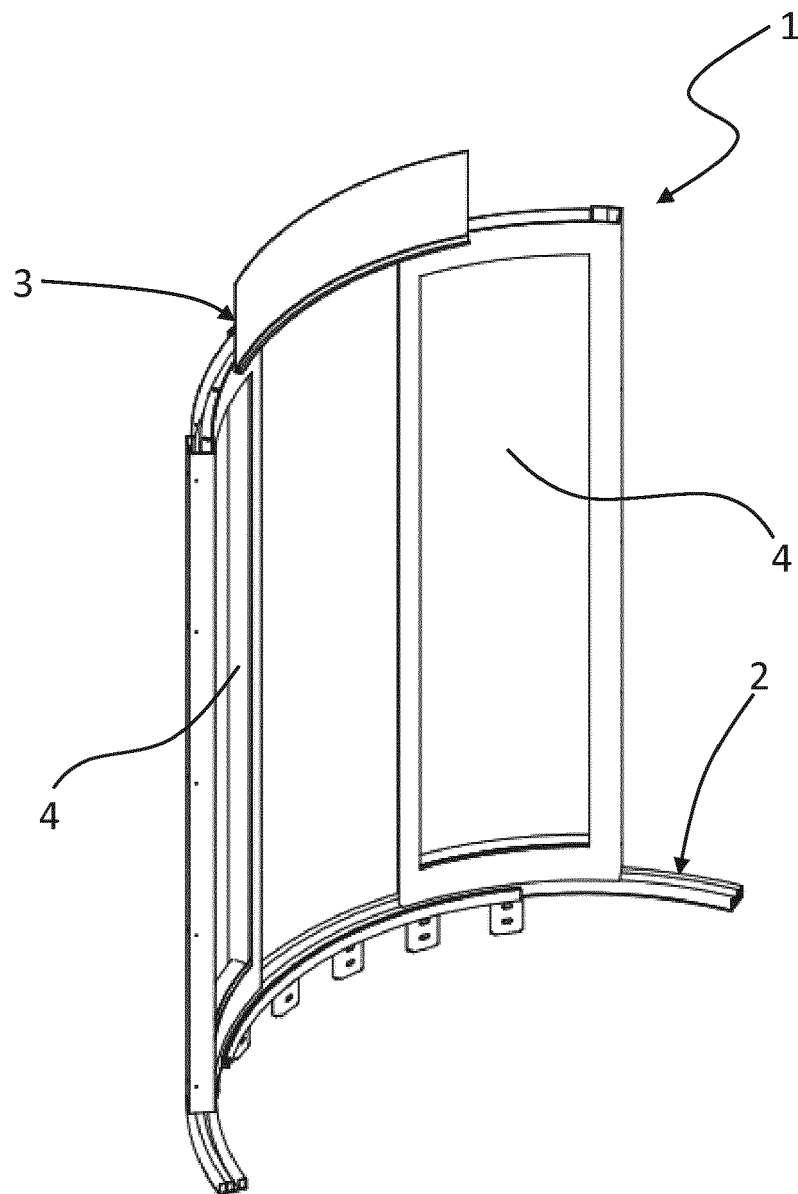


FIG. 2

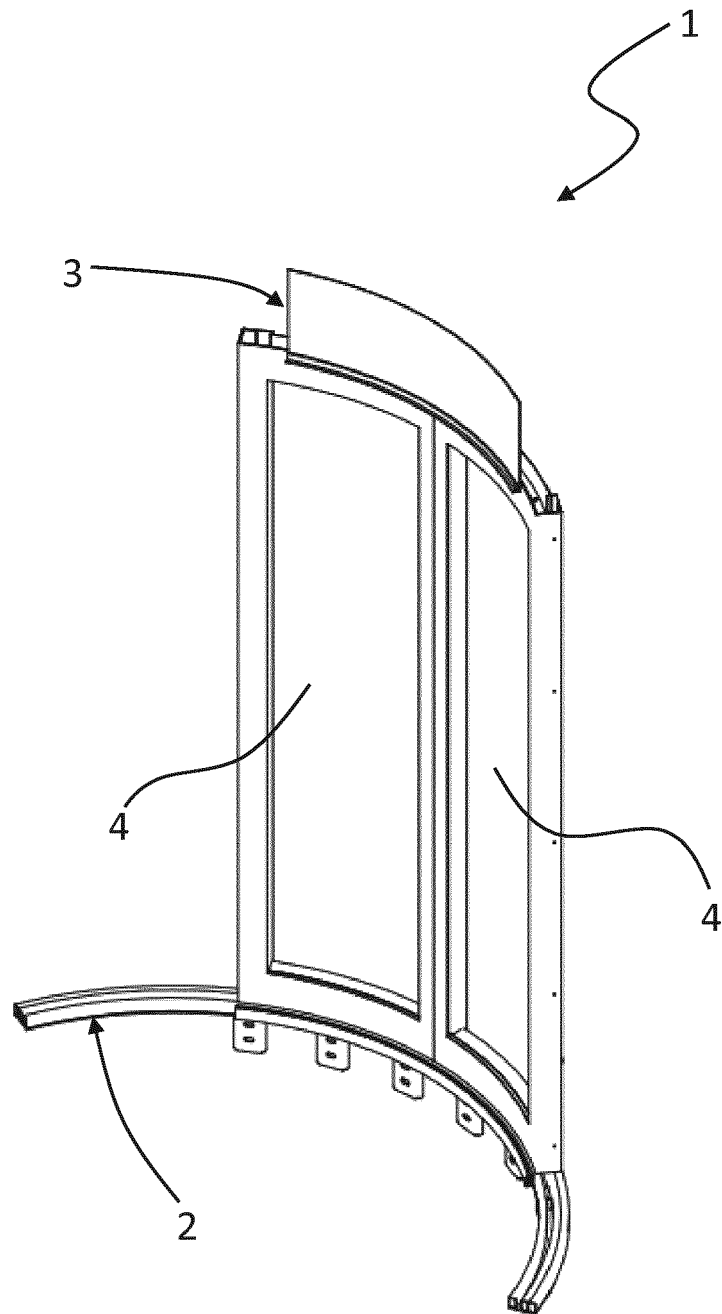


FIG. 3

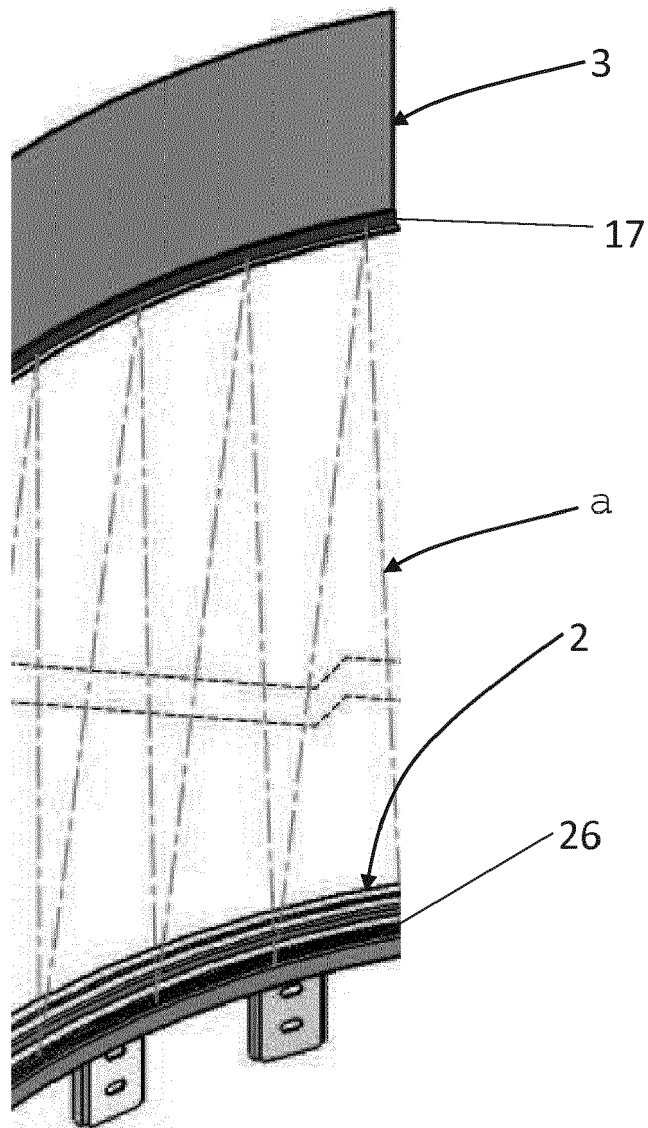


FIG. 4

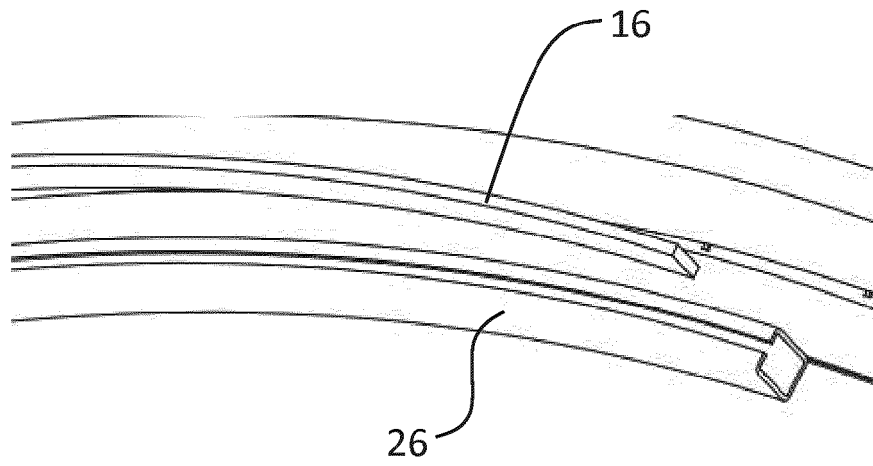


FIG. 5

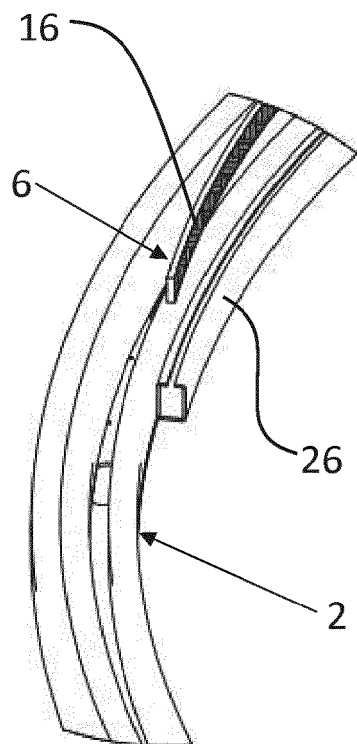
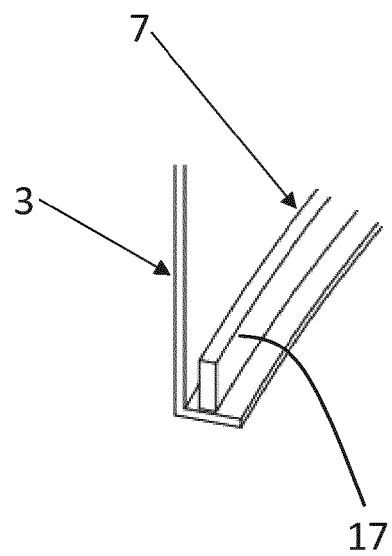


FIG. 6





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Application Number
EP 17 19 4206

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 March 2018	Examiner Nelis, Yves
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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19-03-2018

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