

SPECIFICATION

Sliding door for an elevator

5 This invention relates to a sliding door for an elevator.

According to the present invention, there is provided a sliding door for an elevator, comprising a plurality of vertical sections which are slidable
 10 between an open position in which all the sections overlap one another and a closed position in which the sections lie side by side, and means for opening and closing the door comprising a drive connected to displace one of the sections and a transmission
 15 connecting the sections to one another and disposed above the door so that the sections move at different speeds, wherein there is provided a lost motion coupling which is effective only in the event of a fault in the transmission to limit the extent of relative
 20 movement between adjacent sections.

The present invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

25 *Figure 1* is a fragmental front view of the essential portion of a conventional elevator sliding door device;

Figure 2 is a sectional view as taken along the line II of *Figure 1*;

30 *Figure 3* is a fragmental front view of the essential portion of one embodiment of the present invention.

Figure 4 is a sectional view as taken along the line IV-IV of *Figure 3*;

Figure 5 is a view similar to *Figure 3* but illustrating another embodiment of the invention; and

Figure 6 is a sectional view as taken along the line VI-VI of *Figure 5*.

In a conventional elevator sliding door device
 40 shown in *Figures 1* and *2* a rectangular opening for either an elevator shaft or an elevator car has two sides defined by a vertical door stop *1a* and a vertical edge of a recess *1b* for receiving the sliding door when the elevator door is open. In *Figure 1*, the door is shown
 45 in a closed position and is composed of two sections designated *2* and *3* respectively. The opening *1* is provided at its upper edge with a blocking plate *1c* located near to the door stop *1a*. With the opening fully closed, the first door section *2* is located near to the door stop *1a* to abut against the latter while the
 50 second door section *3* is located near to the recess edge *1b* with the two door sections somewhat overlapping each other. The first door section *2* moves at a higher speed than the door section *3* and
 55 has disposed thereon a driving device *4* that engages with a locking device *5*. The movement of the first sliding door *2* is transmitted to the second door section *3* by a transmission device *6* of a conventional construction including a plurality of
 60 pulleys and an extensible, flexible drive member *6a*. Thus during both door closing and opening directions the second door section *3* is moved along with the first door section *2* and at a lower speed, in this case, a speed equal to one half the speed of first
 65 door section *2*.

Assuming that the first door section *2* is in its position illustrated in *Figure 1* and is driven to open the opening *1*. Then first the locking device *5* is unlocked to permit the first door section *2* to open.

70 At the same time, the second sliding door *3* is moved in the same direction as the first sliding door *2* but more slowly the opening is fully opened.

With the opening maintained fully closed assuming that a fault such as a break in the drive member *6a* should occur in the transmission device
 75 *6* to cause the first door section *2* to disengage from the second door section *3*. Under this condition, the first sliding door *2* is still held in its predetermined position by the locking device *5* but the second door
 80 section *3* may manually open. Furthermore, in the event of a fault in the transmission device *6* when the door is open the door closing operation will result first door section *2* being driven to close the opening *1*, whilst the second door section *3* remains within
 85 the recess. This results in the danger that a passenger or passengers may fall into the particular elevator shaft through that portion of the opening *1* on which the second sliding door *3* is to be located in its closed position.

90 The purpose of the blocking plate *1c* is to prevent the second door section *3* from moving from its position illustrated in *Figure 1* toward the door stop *1a* upon the occurrence of an accident on the transmission device *6*.

95 The present invention proposes over coming the abovementioned disadvantages of the prior art practice by the provision of a sliding door which is capable of being driven in a closing direction or is maintained in its closed position even in the event of
 100 fault in the associated transmission device. To this end, the invention provides a lost motion coupling between the door sections limiting relative movement in at least one direction.

In one embodiment of the present invention shown in *Figures 3* and *4* wherein like reference numerals designate the components identical to those illustrated in *Figures 1* and *2*, the first door section *2* is provided on the upper part of that surface portion thereof directly opposite to or
 110 overlapped on the second door section *3* at their fully closed positions with an abutment lug *7* extending to be loosely fitted into a horizontal groove *8* disposed on the second door section *3*. The groove *8* has one end *9* located adjacent the vertical
 115 edge of the door section *3* on the side of the recess for sliding doors and the other end *10* located adjacent the opposite edge of the section and constituting an abutment. When the first and second door sections *2* and *3* cooperate with each other to
 120 close fully the opening *1* (not shown in *Figure 3*), the abutment *10* faces the lug *7* extending from that surface of the first door section *2* adjacent the second door section *3* with a very narrow spacing therebetween, the abutment *10* being located nearer
 125 to the door stop *1a* (not shown in *Figure 3*) than the lug *7* as best shown in *Figure 3*.

In other respects the arrangement is substantially identical to that shown in *Figures 1*.

Assuming that a fault should occur in the
 130 transmission device *6* when the door is closed. Then,

even if an attempt is made to move the door section 3 manually toward the door recess (see Figures 1 and 2), the abutment 10 abuts the lug 7 to prevent the door section 3 from moving further toward the door recess.

Furthermore, if it is assumed that, a fault occurs in the transmission when the first and second door sections 2 and 3 are in their fully open positions, that is to say, with both door sections housed in the door recess then, when the first door section 2 closes, the lug 7 first abuts the abutment 10 to drive the second door section 3 to its closed position until the opening is fully closed by the door sections 2 and 3. Thus, a fault occurring in the transmission device 6 is prevented from resulting in any danger of passengers falling in the elevator shaft.

The arrangement shown in Figures 3 and 4 has additionally the following advantage: When an accident has occurred on the transmission device 6 with the first and second door sections 2 and 3 fully closed, the first door section 2 can be driven to its open position which is attended with the abutment of the lug 7 against the other end of the groove 8. Therefore the second door section 3 is driven to its fully open position. This means that the opening 1 (see Figure 1) is fully opened without the second sliding door 3 remaining in its closed position.

In a modification of the present invention shown in Figures 5 and 6 wherein like reference numerals designate the components identical or corresponding to those illustrated in Figures 3 and 4, the first door section 2 is provided on its vertical edge remote from the door stop 1a (see Figure 1) with a strip-shape abutment plate 7 coextensive with the entire edge of the door section 2.

The second door section 3 is provided on its vertical edge adjacent the first door section 2 in the closed positions with an abutment 10 of L-shaped cross section coextensive with the entire edge thereof and projecting toward the first door section 2. The abutment includes one leg directed toward the plate 7 to form normally a narrow gap therebetween.

With the opening 1 (see Figure 1) fully closed, the L-shaped abutment plate 10 faces in overlapped relationship the strip-shaped wall plate 7 to be closed to the latter and is located nearer to the door stop 1a (see Figure 1) than the plate 7 as in the arrangement shown in Figures 3 and 4.

While the present invention has been illustrated and described in conjunction with two sliding door sections 2 and 3, it is to be understood that the same is equally applicable to the high and moderate speed sliding doors or the moderate and low speed sliding door sections of sliding doors including three door sections.

CLAIMS

1. A sliding door for an elevator comprising a plurality of vertical sections which are slidable between an open position in which all the sections overlap one another and a closed position in which the sections lie side by side, and means for opening and closing the door comprising a drive connected

to displace one of the sections and a transmission connecting the sections to one another and disposed above the door so that the sections move at different speeds, wherein there is provided a lost motion coupling which is effective only in the event of a fault in the transmission to limit the extent of relative movement between adjacent sections.

2. A sliding door as claimed in Claim 1, wherein the lost motion coupling between each pair of adjacent sections comprises an abutment on each of said pair of sections, the abutments overlapping and lying adjacent one another when the door is full closed.

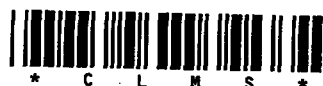
3. A sliding door as claimed in Claim 2, wherein a groove is disposed on one of each of said pairs of adjacent sections to loosely receive the abutments projecting from the other of each of said pairs of sections, the end of the groove constituting the abutment on the respective section.

4. A sliding door as claimed in Claim 2, in which the abutments are formed by a plate secured to the edge of one of each pair of adjacent sections, and an L-section strip secured to the edge of the other of each of said pair of adjacent sections.

5. A sliding door for an elevator substantially as herein described with respect to and as illustrated in Figures 3 and 4 of the accompanying drawings.

6. A sliding door for an elevator substantially as herein described with respect to and as illustrated in Figures 5 and 6 of the accompanying drawings.

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Furthermore, if it is assumed that, a fault occurs in the transmission when the first and second door sections 2 and 3 are in their fully open positions, that is to say, with both door sections housed in the door recess then, when the first door section 2 closes, the lug 7 first abuts the abutment 10 to drive the second door section 3 to its closed position until the opening is fully closed by the door sections 2 and 3. Thus, a fault occurring in the transmission device 6 is prevented from resulting in any danger of passengers falling in the elevator shaft.

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2. A sliding door as claimed in Claim 1, wherein the lost motion coupling between each pair of adjacent sections comprises an abutment on each of said pair of sections, the abutments overlapping and lying adjacent one another when the door is full closed.

3. A sliding door as claimed in Claim 2, wherein a groove is disposed on one of each of said pairs of adjacent sections to loosely receive the abutments projecting from the other of each of said pairs of sections, the end of the groove constituting the abutment on the respective section.

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