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THE DRIVE OF A FAST MOVING FOOTWAY WITH ACCELERATING SEGMENT AT ENTRY AND THE SLOWING DOWN SEGMENT AT EXIT

Abstract: In the paper a fast autowalk with a walk-on accelerating segment and a walk-off slowing down segment for transport of both people and loading has been presented. The solution suggested in the paper ensures that its efficiency can reach a dozen or so thousand people per hour on a route of several hundred metres. In comparison with similar existing autowalks, this one has the speed of a high-speed segment around 8-10 times higher in relation with the safe speed of the first segment to be walked on.

1. The problems of fast transport of people in the places of their high concentration on the segments of 100-1000 metres

In the second part of the 20th century mobile footwalks of a constant speed reached a very high level of quality and refinement with a special impact on the safety of travelling.It is confirmed in the whole world by their mass use for transporting people, baggage, at airports, malls and car parks.Pedestrian traffic became mechanized. Mobile footwalks used previously, with the exeption of two, have a constant speed on their whole length. The speed according to EN 115 standards can be: 0.50; 0.60; 0;75 [m/s] what gives only 1.80; 2.34; 2.70 [km/h]. It is much smaller than an average speed of people moving in the street and can be compared only to the speed of a walk in the park.It secures safety for people using a footwalk especially by walking on and walking off it, but it limits the performance and is stressful for a lot of travellers in a hurry.

Ideas to build footwalks with a changing speed to transport people appeared on the turn of 19th and 20th centuries. The first prototype of such a footwalk with an entry and exit platform and with tapes working at the same time at the speed of 5,10, 15 [km/h] was used in New York. At present a mobile footwalk of a changing speed installed at metro station in Montparnasse Paris is known. It has the speed of the first and last segment 0.60 [m/s] which is 2.20 [km/h] to enter and exit and the speed of the medium segment 2.50 [m/s] what gives 9[km/h]. This over four times changing speed at the moment of passing causes a lot of accedents despite warning signals (fig.1), (tab.1) [1].

a)

b)

c)

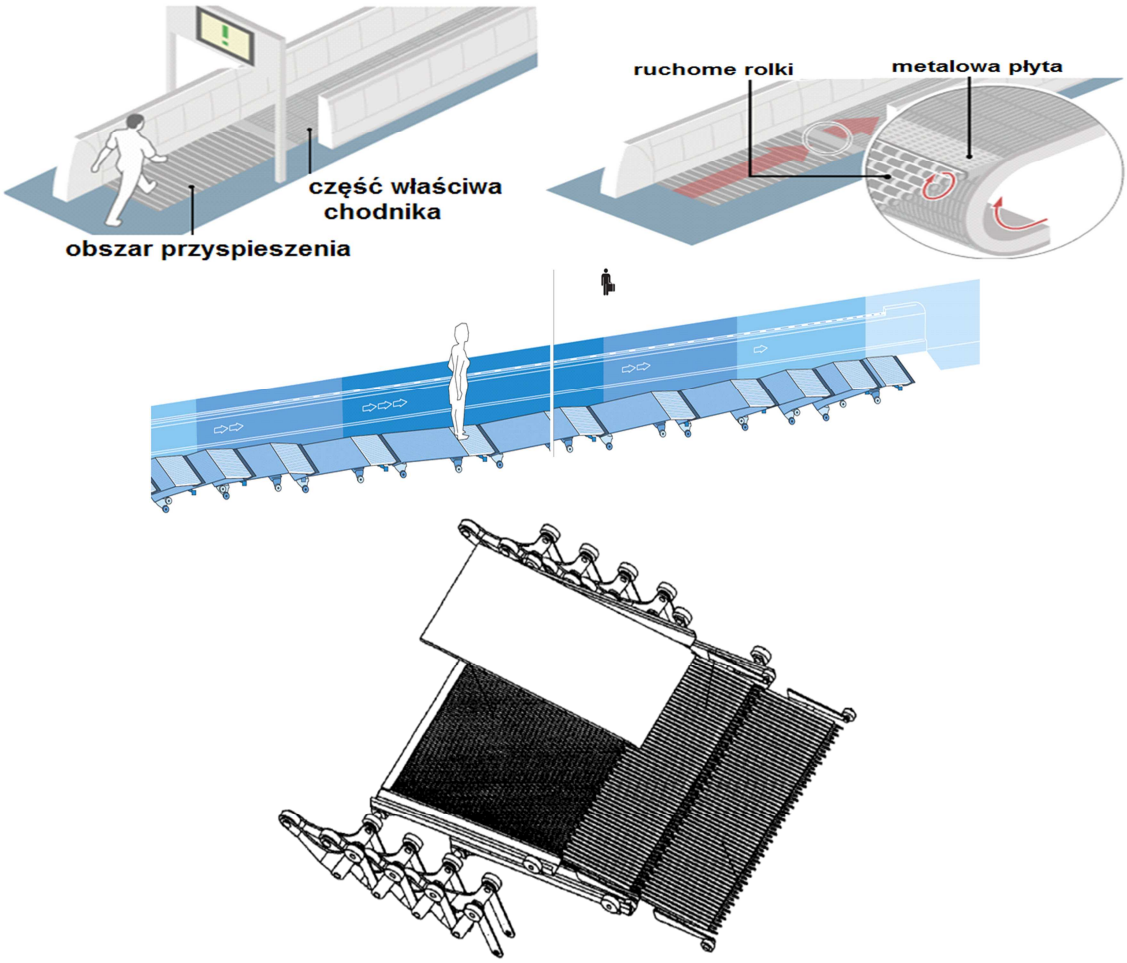

Fig. 1. Other accelerating footways a) metro station in Montparnasse Paris, b) airport terminal in Toronto, c) Thyssen Krupp Company footway

Tab. 1. Characteristic features of autowalks with constant speed.

Feature	**Selected companies**			
	SCHINDLER	PANAS	OTIS	KONE
Maximum length[m]	150	100	100	250
Inclination angle [^{0}]	0 – 6; 10/11/12	0 ; 10/ 11/ 12	0 – 6; 10/ 12	0 – 6; 10/ 12
Width of the autowalk [mm]	800/1000/ 1200/1400	800/ 1000	800/1000	800/1000/ 1200/1400
Speed of the autowalk [m/s]	0,5/0,65	0,5/0,6/0,75	0,5	0,5/0,75

2. The idea of a fast autowalk with a walk-on accelerating segment and a walk-off slowing down segment

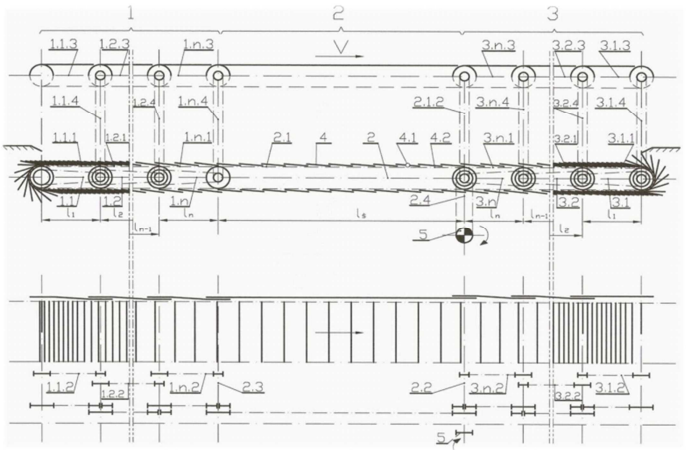

Fig. 2. Scheme of a fast footway with accelerating segment at entry and slowing down segment at exit 1 - accelerating segment, 2 - high-speed segment, 3 - slowing down segment, 4 - carrying pallets, 5 – drive

A fast mobile footwalk is characterized by the first segment acceleraing speed divided in its construction by the drive into any number of n - segments. The speed of the first segment V1 is minimal and safe to enter this segment. The speed of the second one is bigger and equals V2>V1. The drives of given parts of the accelerating segment, the drive of the middle segment and the drives of the given parts of the slowing down segment are mechanically connected in one drive system which ensures reaching the wanted speed on different fragments of the footwalk.

The electrical engine through the slowing down chain transmission drives the active shaft with chain wheels, on which the train chains of the middle segment are spread. On its other side the chains go through the chain wheel of the passive shaft. The passive shaft of this segment is the driving shaft for the last n-segment of the accelerating section.This segment thanks to another chain, drives the previous segment and the previous one through the flexible connector even the one in front of it.

This state exists as far as the first segment drive go, where from the active shift of the fast middle segment through the next chain the drive for segment n is transported. The segment n is in a very close neighbourhhod to the middle segment. The next chain directs the drive onto the next part of this segment and it goes this way until the first segment which in fact means the last one. The wanted speeds of given parts of the accelerating, middle and slowing down segments were reached by the choice of suitable diameter of chain wheels. All the chains mentioned before are spread on the wheels. The plates of carrying pallets overlap each other like scales; more in the place of a smaller speed and less in the place where it is bigger. This way they create a bearing surface for transported people.

At the end of the footwalk the palets hide under the level of transport making their way back to the first part of the accelerating segment with the same speeds as during the working traffic. (fig. 2) [2].

3. The analysis of the footwalk's utility parameters.

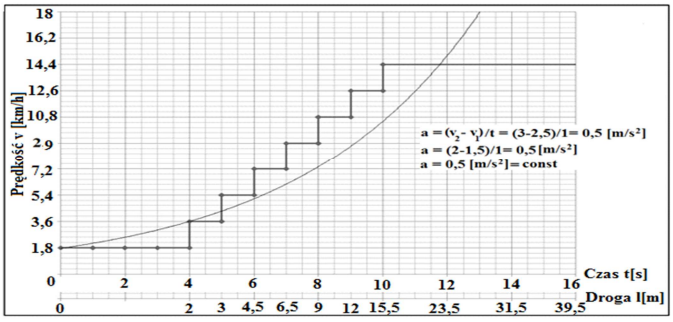

Fig. 3. The speed of an accelerating segment of the footway in function ot time and way.

It was assumed that the increase of speed on given parts is done stepwise by the magnitude of about 0,5 [m/s]. The first entry part of the footwalk spreads for about 2 [m], next parts coming one after another are not shorter than the value of speed at that moment - if the segment moves with the speed of 3 [m/s], its minimal length is 3 [m]. These conditions make passages between another segments of the accelerating segment and the slowing down segment for passengers smooth, nice and what is most important :safe. Making given parts both of the accelerating and the slowing down section longer may lead passengers to get used to a concrete speed on the basis of the place where they are at the moment.

A longer time of staying on a given part is connected with that, making the use of the footwalk even more pleasant although the speed still changes stepwise.

However, assumptions making the minimum limit were presented for the initial project. This limit cannot be exceeded because of safety reasons.

The goal is of course to obtain as fast as possible the maximum wanted speed of the footwalk which is 4 [m/s] by eliminating the possibility to create any dangers such as trips or loss of balance. (fig. 3).

4. Conclusion

The fast autowalk according to its technical assumptions in suitable conditions is able to transport up to 12 000 passengers per hour. The icrease of initial speed by almost 10 times results in optimal conditions for transport of goods. In the case of an autowalk for transport of people it is necessary to aply synchronized, moving handrails with suitable segments and installation of additional signs and warning signals is recommended.

References

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