United States Patent [19]

Wakamatsu

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[54] **ESCALATOR**

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[52] **U.S. Cl.** **198/16**

[51] **Int. Cl.** **B66b 9/12**

[58] **Field of Search** 198/16–18

[56] **References Cited**

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[57] **ABSTRACT**

A portable escalator for use in a structure, such as a cargo hold of large ships, comprising a number of step means pivotally mounted one after the other on a pair of endless chain members each entrained about two sprocket wheels which are rotatably mounted on a main frame of the escalator respectively at each end thereof. Either one of the two sprocket wheels is operatively connected to a suitable actuating power source. Each of step means includes a desired number of crescent-shaped vertical plates spaced one from each other similarly to comb teeth so as to eliminate the need of feathering action of each step means during operation even when the portable escalator is used at different inclinations.

1 Claim, 8 Drawing Figures

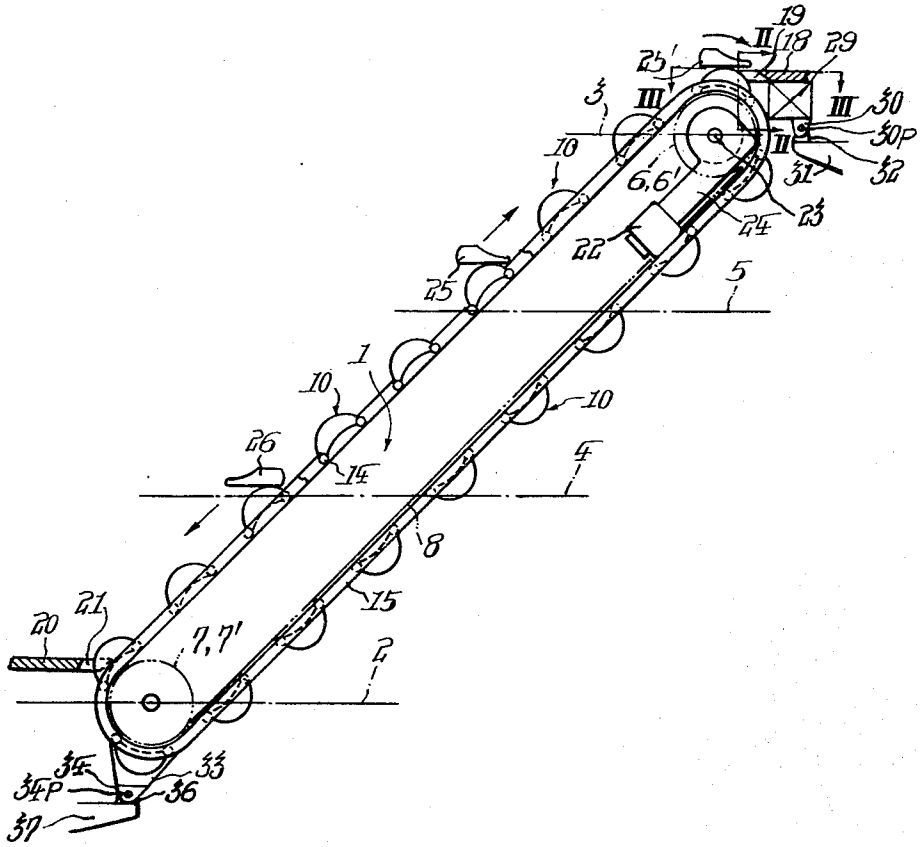


Fig. 6

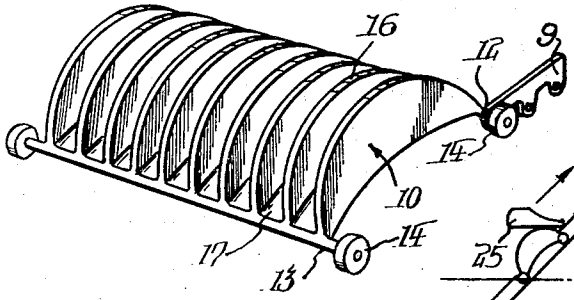


Fig. 1

Fig. 2

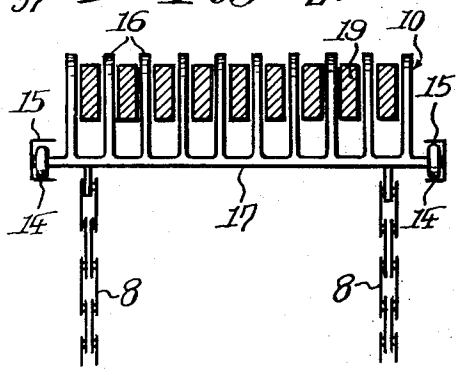


Fig. 3

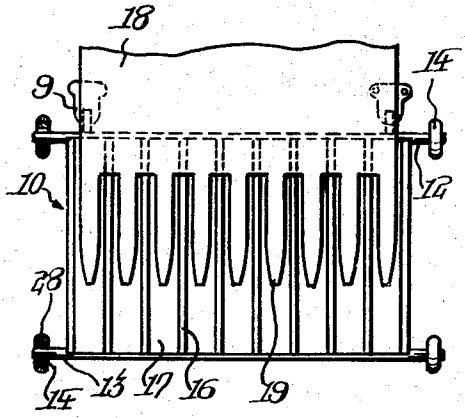


Fig. 4

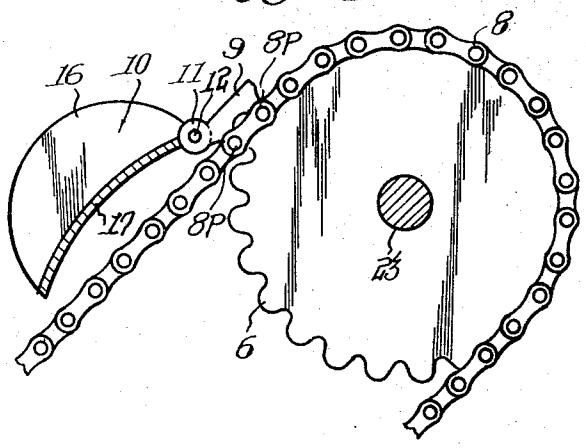

16
10
11
12
9
8P
8
17
8P
23
6

Fig. 5

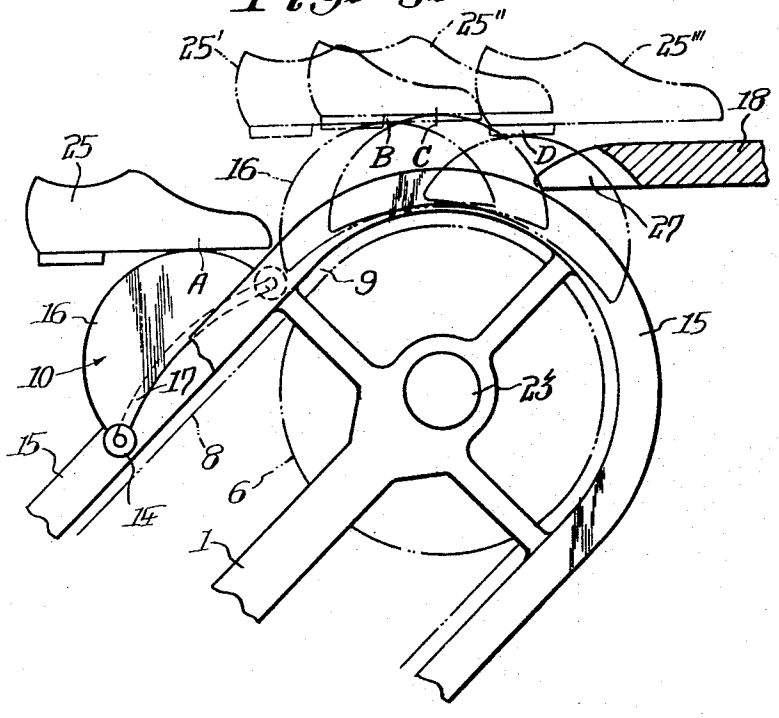

25'
25"
25'''
18
25
16
B
C
D
27
A
9
16
15
10
17
23
15
8
6
14
1

Fig. 7

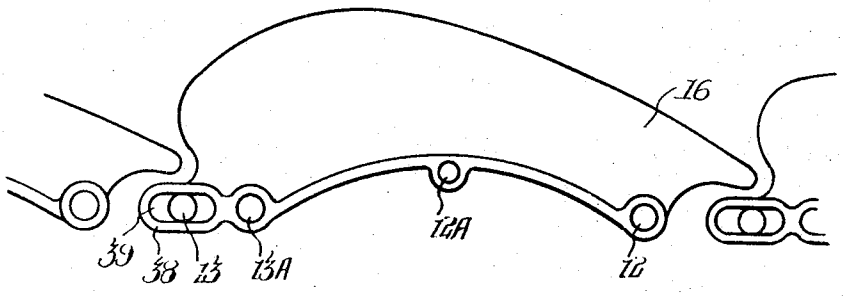
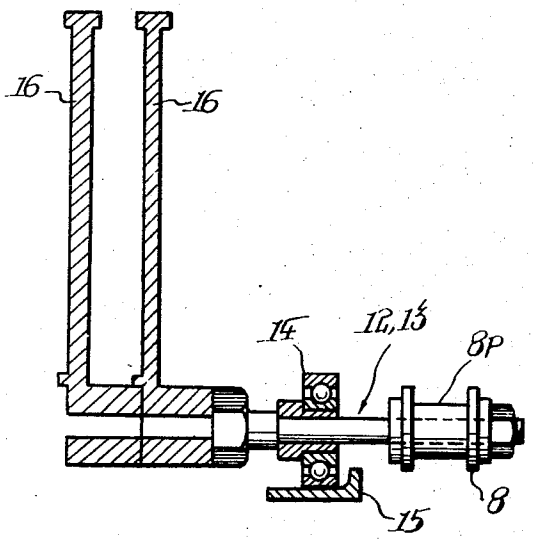


Fig. 8



ESCALATOR

The present invention relates to a portable escalator, more particularly a portable escalator used at different angles of inclination in a structure, such as a cargo hold of large ships.

In case of a large ship carrying automobiles in her cargo hold by using a number of decks including foldable temporary decks, suitable escalators will become necessary for transportation between many decks of different levels. The portable escalator according to the present invention has been devised to answer this kind of demand.

It is an object of the present invention to provide a portable escalator which is movable to any desired position within a ship and enables the feet of users to be maintained in horizontal position at all times regardless of the angle of inclination at which the escalator is used.

It is another object of the present invention to construct a portable escalator that is simple in construction and handling and eliminating the need for a feathering operation of the step means even when the escalator is used at different angles of inclination.

According to the present invention, there is provided a portable escalator comprising an elongated frame member, a pair of endless chains each entrained about two sprocket wheels rotatably mounted on said frame member at both ends thereof an each side of said frame member, and a number of step means each connected to links of said pair of said endless chains at both ends thereof and including a multiplicity of vertical flat plates upstanding from a base plate of said step means at uniform spacing so as to become meshed with complementary teeth of comb-like landing platform members mounted on the frame member at upper and lower level, characterized in that each of said vertical flat plates of said step means is formed to have a profile of crescent shape.

Now, preferred embodiments of the portable escalator according to the present invention will be described in detail with reference to the accompanying drawings, in which

FIG. **1** is a side elevation view showing the portable escalator according to the present invention,

FIG. **2** is a vertical section view in enlarged scale taken along a line II—II in FIG. **1**,

FIG. **3** is a plan view taken along a line III—III in FIG. **1**,

FIG. **4** is a side elevation view in enlarged scale showing one portion of the escalator in FIG. **1**,

FIG. **5** is a side elevation view showing the operation of the escalator in FIG. **1**,

FIG. **6** is a perspective view in enlarged scale showing step means of the escalator in FIG. **1**,

FIG. **7** is a side elevation view showing a variation of step means in FIG. **6**, and

FIG. **8** is a section view showing a horizontal pin used in the step means in FIG. **7**.

Referring to FIG. **1**, there is shown a portable escalator comprising an elongated frame member **1**, a pair of endless chains **8** each entrained about a pair of sprocket wheels **6,7** and **6',7'** rotatably mounted on the frame member **1** at upper and lower end thereof, and a number of step means **10** each connected to links of the endless chains at both ends thereof. The frame member **1** is preferably a truss work formed of suitable shapes and flat plates. A short arm **29** having an eye pad **30** is mounted on the frame member **1** at the top end thereof so as to be secured to connecting member **31** welded on a deck **3** of upper level by bolting the eye pad **30** to the corresponding eye pad **32** on the connecting member. The bolt member is denoted by **30P**. Similarly, another short arm **33** having an eye pad **34** is mounted on the frame member **1** at the lower end. The frame member **1** is secured to the deck **2** of lower level by bolting the eye pad **34** to corresponding eye pad **36** provided on another connecting member **37** welded on the lower deck **2.** The bolt member is denoted by **34P**.

A pair of sprocket wheels **6,6'** are rotatably mounted on the frame member **1** adjacent to upper end thereof. The sprocket wheels **6,6'** are driving wheels and connected to an actuating power source **22** by intervention of reduction gears **24.** Another pair of sprocket wheels **7,7'** are rotatably mounted on the frame member **1** at the lower end thereof. The sprocket wheels **7,7'** are idle wheels.

An upper landing platform **18** having comb-like teeth **19** (see FIG. **3**) along one edge thereof is mounted on the frame member **1** adjacent to upper end thereof. Similarly, a lower platform **20** having comb-like teeth **21** is mounted on the frame member **1** adjacent to lower end thereof. The upper and lower platforms **18** and **20** may be secured respectively to the deck **3** of higher level and the deck **2** of lower level if necessary. There may be intermediate decks **4,5,** to which the escalator will become serviceable, between the decks **2** and **3.**

As shown in FIG. **6,** step means **10** includes a large number of vertical flat plates **16** of crescent shape upstanding in parallel from a base plate **17** at uniform spacing one from each other. The step means **10** is provided with a pair of horizontal shafts **12,13** both of which are directed perpendicularly to the vertical flat plates of crescent shape. The horizontal shaft **12** is located adjacent to leading edge of the step means, with the horizontal shaft **13** adjacent to the trailing edge of the same. As shown in FIG. **4,** a connector fitting **9** having both legs connected to pins **8P** of the endless chain **8** is provided with a boss portion **11** which is fitted over the horizontal shaft **12** of the step means **10,** thereby connecting the step means **10** to the endless chain **8.**

As shown in FIGS. **1** and **2,** a pair of guide members **15,15** of channel shaped cross section is mounted on the frame member **1,** each forming a closed loop, outwardly of the endless chain **8,8.** Each step means **10** is provided with small rollers **14,14** each rotatably mounted on the horizontal shafts **12,13** at both ends thereof. Each roller **14** is provided with rubber sheathings **28** (FIG. **3**) and accomodated within a bosom of the guide member **15** described above, so as to be guided by the latter during operation.

As shown in FIGS. **2** and **3,** spacing of teeth **19** of the landing platform **18** is substantially same as that of the crescent-shaped vertical flat plates **16** of the step means. And, the teeth **19** are suitably staggered with reference to the crescent-shaped vertical plates **16** of the step means such that the latter will become meshed with the former when the step means **10** comes to turn around the sprocket wheel **6,6'.** It is noted at this point that each of the crescent-shaped vertical plates **16** is made sufficiently high such that it will project above the upper surface of the landing platform **18** as shown

in FIG. 2. The meshed portion of the step is denoted by 27 (FIG. 5).

FIGS. 7 and 8 show a variation of the step means 10 in FIG. 6. A large number of crescent-shaped segments 16 of plastics are assembled together by means of horizontal bolts 12,12A and 13A. As shown in FIG. 8, outer end of the horizontal shaft 12 carries a roller 14 described above and is piercing through a hollow pin 8P of the endless chain 8 at the extreme end thereof. The horizontal shaft 13 is passing through oval openings 39 provided on extensions 38 of each crescent-shaped segment 16 (see FIG. 7) and connected to the hollow pin 8P of the endless chain 8 in the same manner as the horizontal shaft 12 (FIG. 8).

In operation, the feet of a person using the escalator running upwardly are in a position 25 in FIGS. 1 and 5. In this position, the feet rest on the step means at point A. When the step means 10 comes to position 25', the feet rest on the step means at point B. Similarly, the feet rest at point C in the position 25'', and at point D in position 25'''. In this manner, the toe will come down on the landing platform 18 in horizontal condition from above. That is, the feet are supported in stable manner on top of the step means and transferred smoothly from step means to the landing platform without any interruption. In this case, there is no need of feathering operation for a the step means. The feet of users on the descending step means is denoted by 26.

According to the present invention, the feet of users are maintained in horizontal condition at all times due to the round top surface of the step means without any feathering operation of step means regardless of the angle of inclination at which the portable escalator is rigged, as described hereinabove. Moreover, the escalator is simple in construction and easy to handle because of its straight configuration.

What is claimed is:

1. A portable escalator comprising

elongated frame means having upper and lower ends,

a pair of sprocket wheels rotatably mounted at each of said ends,

endless chain means adapted to couple the sprocket wheels at said upper ends with the sprocket wheels at said lower ends,

a landing platform at each of said ends having comb-like teeth,

a plurality of steps operatively connected to said endless chain means for movement thereby between said upper and lower ends,

supporting shafts carrying roller means attached on both sides of said steps,

a pair of guide members disposed on either side of said frame means for supporting and guiding said roller means,

each of said steps including a plurality of plates extending above said frame means and being disposed in spaced parallel relation to each other, so as to mesh with the teeth of said landing platform, and

each of said plates having a crescent-shaped profile whereby a load is automatically transferred from said plates onto said landing platform as said plates move under the teeth of a landing platform, and

the plates in said steps being separate individual members having holes at their front and rear said shafts extending through said holes to hold said plates in position.

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