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(54) **COMPACT ESCALATOR**

KOMPAKTE FAHRTREPPE

ESCALIER MECANIQUE COMPACT

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Description

[0001] The subject of the present invention is a compact escalator provided with stair steps arranged on different levels.

[0002] The conventional escalators have a rotating system, providing services for a mass of people. This system requires very large spaces and consuming much of energy. They are noisy and having a complicated mechanism, requires expensive maintenance. Such kind of escalators are disclosed in US-PS No. 4,378,346 and US-PS 5,330,042.

[0003] This kind of escalators are not applicable as mobile equipments or for smaller buildings, family homes. The material of the walking surfaces are not variable for matching the surroundings and can not be finished with surfaces like wood, marble or ceramic tiles. To provide escalators other than straight type is very complicated. (see the escalator shown in US-PS 4,662,502).

[0004] Further disadvantage of the conventional escalators are, that in immobile position the riser of the steps are too high to climb and in mobile position are considerably unsafe.

[0005] The object of this invention is therefor to eliminate the disadvantages of the conventional escalators and to provide an escalator to fit for smaller spaces and with different configurations, with stairs curved shapes or even for spiral stairs.

[0006] In accordance with this invention the compact escalator is provided with stair steps on different levels, wherein the height of each step is variable, the steps contain a fixed lower and a vertically movable upper element, a lifting device is between the lower and upper element and said lifting device is connected to a control unit provided with at least a direction switch. Said lifting devices are hinged joint type mechanisms or pulley block type mechanisms and are provided with electric motor or with hydraulic or pneumatic cylinders. The lifting devices are provided with starter and dead-end switches. Said starter switches are activated by weight sensors.

[0007] The stair steps are operating in order one after the other. The stair steps activated by the body weight and lifting the step to the same elevation as the next step creating an undulating movement and are elevating or sinking in accordance with the speed of the walker. Since the steps are individual units, the stairs can be used simultaneously by more people walking with different speed.

[0008] The movement of the stair steps are activated with the weight of the person. The upstairs or downstairs walking is controlled by a direction switch.

[0009] The stairs in immobile position can be used in the conventional way since the distribution of the risers are similar to the constructed type of stairs.

[0010] On the compact escalators smaller loads are easily transportable, like two wheel hand trucks or car-

riages since the steps are always in level during the operation.

[0011] A further advantage of the invention is that the compact escalator installation is possible not only in new locations, but also over on existing stairs with minor alteration. The alteration would include only the first and the last steps. The last step is recommended to be built in (levelled up) and the first step is recommended to be recessed into the slab.

[0012] According to the concept of this invention stairs can be provided with shapes other than straight types stairs with curved shapes, undulated or even stairs with spiral configurations. Compact escalators can be supplied for vehicles like: ships, aeroplanes, with exterior or interior installation.

[0013] The details of the invention explained on the attached sketch are as follows:

Fig. 1. is the view of the compact escalator layout,

Fig. 2a is the view of the step in lower position,

Fig. 2b is the view of the step in upper position,

Fig. 3 is the section of the step in lower and upper position,

Fig. 4a is the sketch of the step lifting device in lower position and

Fig. 4b is a sketch of the step lifting device in upper position.

[0014] Figure 1 is showing the escalator designed over on existing stairs 1. The new steps 2 contain upper elements 3 and lower elements 4. Between the elements there are lifting devices (not shown).

[0015] The first step 2 is recessed into the slab allowing for the upper element 3 shown in full lines to be in level with the slab. The element in upper position is shown with dashed lines. It can be seen that the position of the top of said first and second steps are in the same level and to walk from the first step to the second is only a horizontal move.

[0016] Figs 2a and 2b show a sketch of a stair step with a lifting device. The device is driven by electric motor 5. The lifting device is a hinge joint type mechanism 6 consisting of connection boxes 7 and 8, arms 9 and links 10. The lower connection box 8 is connected to the extensions 11 of the motor shaft and are moving the hinge joints.

[0017] The extended motor shafts operating the hinge joints are threaded with right and left threads, respectively. The upper connection boxes 7 are sliding on rails 12. Fig 2a is showing the lifting device in lower position (and not showing the weight sensor which is activating the device). The weight sensor is activated by the weight of the person - in this case with a delayed action. Than,

electric motor 5 rotates and closes the distance between the connection boxes 8 and moves the upper element 3 of the step to the level of the next step 2. In the position shown with dashed lines (Fig. 1), the person using the stairs can walk on the step which again is activated by the weight and moves to the following level.

[0018] When operating downstairs, the steps are in the upper position first. From the first stair step one can walk straight on the next one which starts sinking activated by the body weight to the level of the lower step and again walking to the next step until arriving to the bottom of the stairs.

[0019] Similar device is shown on Fig. 3, where the lifting action is driven by hydraulic or pneumatic cylinders 13 and pistons 14 moving the upper element 3 of the step 2 to the level of the next one.

[0020] Figs 4a and 4b show an alternative lifting device operated by a pulley block system. Pulleys 16 are arranged on support arms 15 fixed on the lower element 3 and moving pulleys 18 are fixed on the upper element 4. Cables 19 are arranged between the pulleys 16 and 18 in such a way that the one end of the cable is mounted to the upper element 3 and the other end to a cable drum 20 mounted to the electric motor 5. The operation of this stair step is similar to the operation described before. The weight sensor is activating the electric motor and the cables 19 are winding on the drums 20 meanwhile the upper element 3 of the stair is lifting up.

[0021] The stair steps of the compact escalator can be activated with means other than weight sensor, like photo-electric cell. The final level of the upper stair steps are controlled by dead-end switches. The total system is connected to a control unit which contains at least one direction switch. With this direction switch is able to alternate the upstairs or downstairs movement of the escalator. The control unit also activates the return of the stair step to the basic position in case of a break down or of close-down. This control unit is also operating the escalator to return the steps to the basic position after a break-down.

[0022] The above description demonstrates that the operation of the compact escalator is very simple and safe. The escalator can be installed anywhere in any shape or configuration. The demonstrated details are only to illustrate the basic operation of the invention. The compact escalator can be installed in countless alternative situation in accordance with the scope of the following claims.

Claims

1. Compact escalator provided with stair steps on different levels, **characterized in that** the height of each step (2) is variable, the steps (2) contain a fixed lower (4) and a vertically movable upper element (3), a lifting device is between the lower (4) and upper element (3) and said lifting device is con-

nected to a control unit provided with at least a direction switch.

2. The device as claimed in claim 1. **characterized in that** said lifting devices are hinged joint type mechanisms (6).
3. The device as claimed in claim 1. **characterized in that** said lifting devices are pulley block type mechanisms.
4. The device as claimed in any of claims 1 to 3 **characterized in that** the lifting devices are provided with electric motor (5).
5. The device as claimed in any of claims 1 to 3 **characterized in that** the lifting devices are provided with hydraulic or pneumatic cylinders (13).
6. The device as claimed in any of claims 1 to 5 **characterized in that** the lifting devices are provided with starter and dead-end switches.
7. The device as claimed in claim 6 **characterized in that** said starter switches are activated by weight sensors.

Patentansprüche

1. Kompakte Fahrtreppe, die mit Trittstufen auf verschiedenen Höhen versehen ist, **dadurch gekennzeichnet**, dass die Höhe jeder Stufe (2) variabel ist, wobei die Stufen (2) ein feststehendes unteres (4) und ein vertikal bewegbares oberes Element (3) umfassen, wobei eine Hebevorrichtung zwischen dem unteren (4) und dem oberen Element (3) vorgesehen ist und die Hebevorrichtung an eine Steuereinheit angeschlossen ist, die mit mindestens einem Richtungsschalter versehen ist.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, dass die Hebevorrichtungen vom Typ eines Gelenkverbindungsmechanismus (6) sind.
3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, dass die Hebevorrichtungen vom Typ eines Flaschenzugmechanismus sind.
4. Vorrichtung nach einem der Ansprüche 1-3, **dadurch gekennzeichnet**, dass die Hebevorrichtungen mit einem Elektro-Motor (5) versehen sind.
5. Vorrichtung nach einem der Ansprüche 1-3, **dadurch gekennzeichnet**, dass die Hebevorrichtungen mit Hydraulik- oder Pneumatikzylindern (13)

versehen sind.

6. Vorrichtung nach einem der Ansprüche 1-5,
dadurch gekennzeichnet, dass die Hebevorrichtungen mit Starter- und Stilllegungsschaltern versehen sind. 5
7. Vorrichtung nach Anspruch 6,
dadurch gekennzeichnet, dass die Starterschalter durch Gewichtssensoren betätigt werden. 10

Revendications

1. Escalator compact assorti des marches sur différents niveaux, **caractérisé en ce** que la hauteur de chaque marche (2) est variable, que les marches (2) contiennent un élément inférieur fixé (4) et un élément supérieur verticalement mobile (3), des moyens de levage sont disposés entre les éléments inférieur et supérieur (3 et 4), et que lesdites moyens de levage sont connectés à une unité de commande assortie au moins d'un commutateur de direction. 15 20 25
2. Escalator suivant la revendication 1, caractérisé en ce que lesdites moyens de levage sont des mécanismes de type d'un entraînement articulé.
3. Escalator suivant la revendication 1, caractérisé en ce que lesdites moyens de levage sont des mécanismes de type d'un entraînement par vis sans fin. 30
4. Escalator suivant la revendication 1, 2 ou 3, caractérisé en ce que lesdites moyens de levage sont assortis d'un moteur électrique. 35
5. Escalator suivant la revendication 1, caractérisé en ce que lesdites moyens de levage contiennent des cylindres de travail hydrauliques ou pneumatiques. 40
6. Escalator suivant l'une de revendications précédentes, caractérisé en ce que lesdites moyens de levage sont assortis des joncteurs de démarrage et de renversement de marche. 45
7. Escalator suivant la revendication 6, caractérisé en ce que ledit joncteur de démarrage est actionné par un élément sensible au poids. 50

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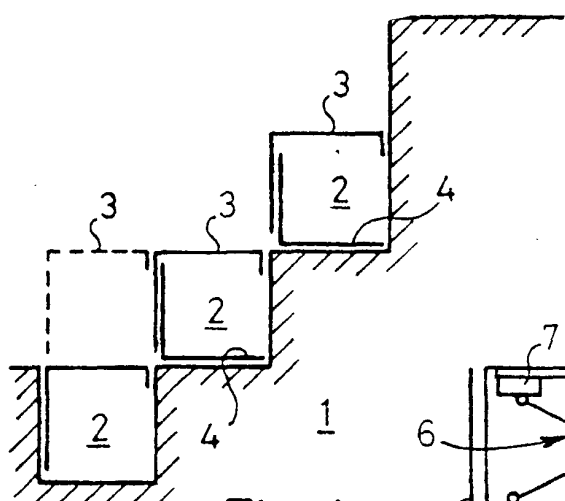


Fig. 1

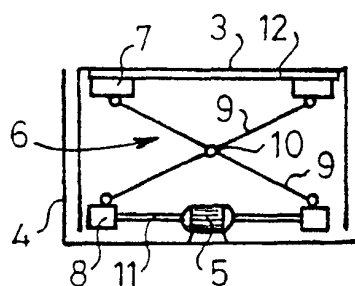


Fig. 2a

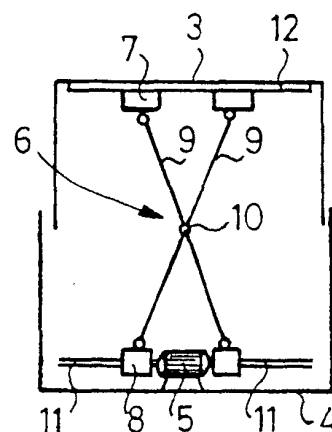


Fig. 2b

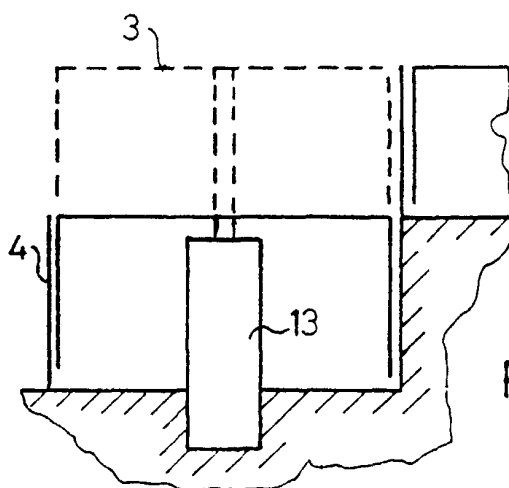


Fig. 3

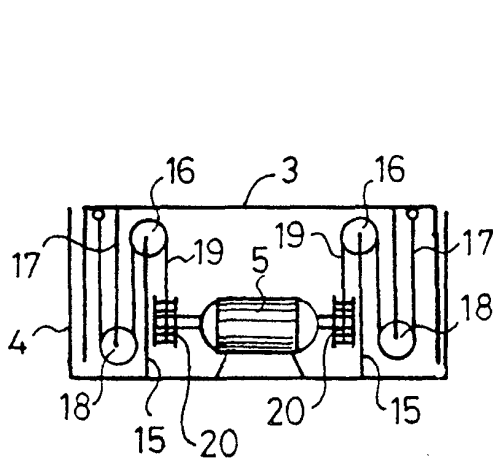


Fig. 4a

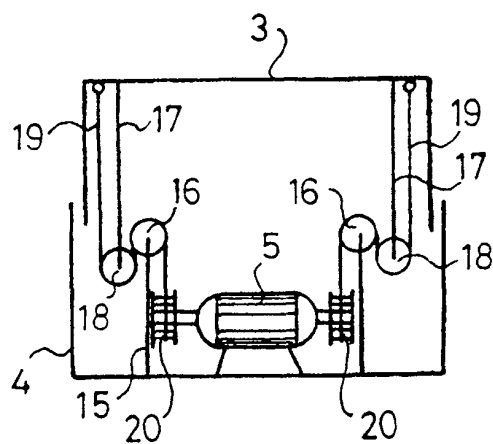


Fig. 4b