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Transport device

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(56) Related Art
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EP 800977
US 5263547

Abstract

A transport device (10) with wheels (13) provided on a frame (11) and a stair-climbing device driven by an electric motor, wherein the electric motor of the stair-climbing device drives first eccentric levers (26), on which two eccentric levers (30) each are rotatably mounted, which are rotatably mounted with their ends on supports (17) with support feet (21) provided on their bottom ends, wherein the supports (17 are guided linearly on the device (10) and between the first and second eccentric levers gears (28, 34, 36) with a transmission ratio of 1:2 are provided.

(Fig.1)

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ORIGINAL

COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

Transport device

The following statement is a full description of this invention including the best method of performing it known to us:-

Transport Device

Description

The invention concerns a transport device with wheels provided on a frame and a stair-climbing device driven by an electric motor.

Such a transport device with a stair-climbing device having a particularly compact construction is known from DE 196 14 319.5. The stair-climbing device of this transport device has supports with support rollers, which carry out the lifting and horizontal stepping movements necessary for the device. At the same time the horizontal movement is relatively large, resulting in great changes of the load on the handles of a transport device used, for example, as a barrow for sacks.

An advantage of this present invention is to produce a transport device having a reduced horizontal movement component.

This advantage is achieved by means of a transport device with wheels provided on a frame and a stair-climbing device driven by an electric motor, wherein the electric motor of the stair-climbing device drives first eccentric levers, on which two second eccentric levers each are rotatably mounted, which are rotatably mounted with their ends on supports with support feet or rollers provided on their bottom ends, wherein the supports are guided linearly on the device and between the first and second eccentric levers gears with a transmission ratio of 1:2 are provided.

The gears with a transmission ration of 1:2 has the effect that when the first eccentric lever executes a rotation about 90°, the second eccentric levers carry out a rotation about 180°. This will achieve that when the first eccentric levers are horizontal, the second eccentric levers with their ends, with which they are joined to the supports, will be directed towards the centre of rotation of the large eccentric levers. Thus the supports with their pivoting points are at a distance from the centres of rotation of the first

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eccentric levers, which distance is shorter than the length of the levers. When the large eccentric levers are vertical, the second eccentric levers lengthen the first levers, thus achieving a very high lift. The fact that the horizontal movement of the support is shorter when compared with the known devices, has an advantageous affect on the reduction of the load changes on the handles of the transport device. The operation of the device is simplified by this and is clearly more comfortable. As transmission spur gears or also chain sprockets can be used between the eccentric levers. The supports may be guided in the rails on the device by means of guide rollers. The use of telescopic guides or the like is also conceivable. For an optimum stepping movement of the supports they may be slightly angled in the region of the pivoting of the second eccentric levers. In a useful manner the wheels can be mounted on pivot pins of the frame, while the stair-climbing device is arranged on the frame between the wheels. Thus the step-climbing device does not protrude laterally from the device. Further advantages can be achieved by that the eccentric levers are so dimensioned that they do not protrude past the wheels in the radial direction. This will reliably prevent collisions of the levers with the edges of the stairs.

In the following a preferred embodiment of a transport device is described based on the drawing. They show in:

Fig.1 - a partial side view of a transport device with a stair-climbing device,

Fig.2 - a rear view of the transport device according to Fig.1,

Figs.3 to 10 - side views of the transport device according to Fig.1 with the load in different positions when climbing a staircase.

The transport device 10 according to the Figs.1 and 2 has a frame 11 with a base plate 12 to accommodate loads and with wheels 13 and 14. In addition, the frame 11 is provided with

guide rails 15, 16 for the supports 17, 18. The supports 17 and 18 are sliding in the rails 15, 16 by means of guide rollers 19, 20. At the bottom ends the supports 17 and 18 have support feet 21 and 22. As this can be seen particularly from Fig.2, the supports 17 and 18 are part of a stair-climbing device 23, which is provided between the rails 15 and 16. The stair-climbing device 23 has a motor and a gearbox 24. The motor 24 drives via a shaft 25 first eccentric levers 26, 27 as well as fixed spur gears 28, 29. At the end of the eccentric levers 26, 27 there are second, smaller eccentric levers 30, 31 mounted in a rotatable manner.

The ends of these eccentric levers 30, 31 are, in turn, mounted on the supports 17, 18 via pivot pins 32, 33. The drive of the eccentric levers 30, 31 is carried out via further spur gears 34, 35, 36, 37, which together with the spur gears 28, 29 form a transmission having a transmission ratio 1:2.

The modus operandi of the stair-climbing device 23 is illustrated in Figs.3-10. Fig.3 shows the transport device 10 with a load 40 at the state of rest, i.e. with the base plate 12 resting on the floor. The wheel 13 is situated directly in front of the edge of a stair 41. Following this, according to Fig.4, the transport device 10 is tilted and the stair-climbing device is activated, i.e. the motor 24 is switched on. This will make the first eccentric lever 28 and the second eccentric lever 30 rotate. By virtue of the 1:2 transmission ratio the second, smaller, eccentric lever 30 carries out a 180° rotation, whereas the first eccentric lever 28 carries out a 90° rotation. This will result in the situation shown in Fig.5, wherein the second eccentric lever 30 with its end points in the direction of the centre of rotation 42 of the eccentric lever 26. In this position the support foot 21 is resting already on the floor and presses the device 10 upwards. The transport device 10 reaches its highest position in Fig.6. Both eccentric levers 26 and 30 are directed downwards and their lengths are combined. As Fig.7 shows, when the motor keeps rotating, the wheel 13 moves horizontally over the edge of the

stair 41 and it settles thereupon. Further rotation of the motor causes a pulling up of the support 17, so that it cannot get caught on the edge of the stair 41 when the transport device 10 is moved on in the direction of the next stair 43 (Fig.9). Fig.10 shows the device 10 when it reaches the edge of the next stair 43. To overcome this stair 43 the steps carried out in Figs.4 to 9 are repeated. If the device 10 is to be moved down on the steps, the motor is reversed and the sequence of movements of Figs.3 to 10 is carried out in reverse order.

If required, the device can be provided with a brake.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A transport device with wheels provided on a frame and a stair-climbing device driven by an electric motor, wherein the electric motor of the stair-climbing device drives first eccentric levers, on which two second eccentric levers each are rotatably mounted, which are rotatably mounted with their ends on supports with support feet or rollers provided on their bottom ends, wherein the supports are guided linearly on the device and between the first and second eccentric levers gears with a transmission ratio of 1:2 are provided.

2. A device according to claim 1, characterised in that the gears are spur gears.

3. A device according to claim 1, characterised in that the gears are chain sprockets.

4. A device according to any one of the claims 1 to 3, characterised in that the supports are guided in rails on the device by means of guide rollers.

5. A device according to any one of the claims 1 to 4, characterised in that the supports are slightly angled in the region of the pivoting of the second eccentric levers.

6. A device according to any one of the claims 1 to 5, characterised in that the wheels are mounted on pivot pins of the frame, while the stair-climbing device is arranged on the frame between the wheels.

7. A device according to any one of the claims 1 to 6, characterised in that the eccentric levers are so dimensioned that they do not protrude past the wheels in the radial direction.

8. A transport device substantially as described with reference to the drawings.

Dated this 29th day of May 2001

ALBER ANTRIEBSTECHNIK Gmb
Patent Attorneys for the Applicant:

F B RICE & CO

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Offenlegungsschrift

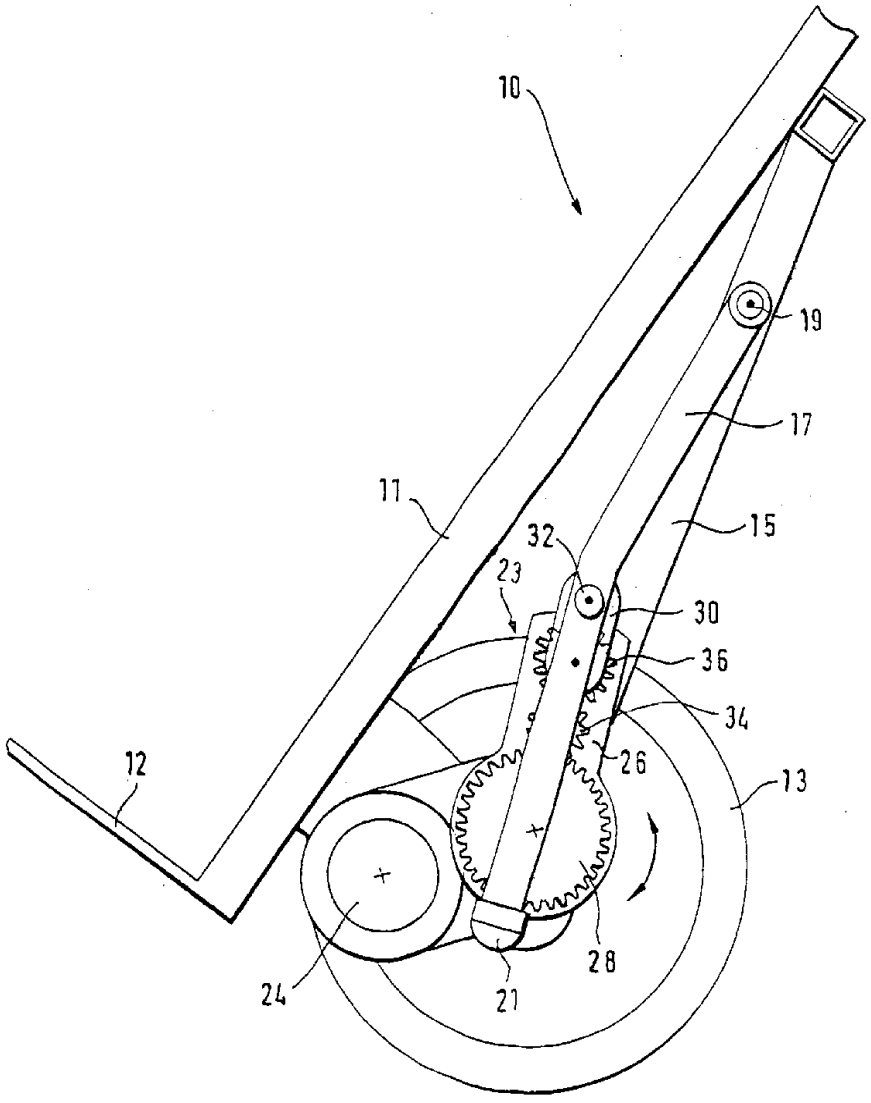


Fig. 1

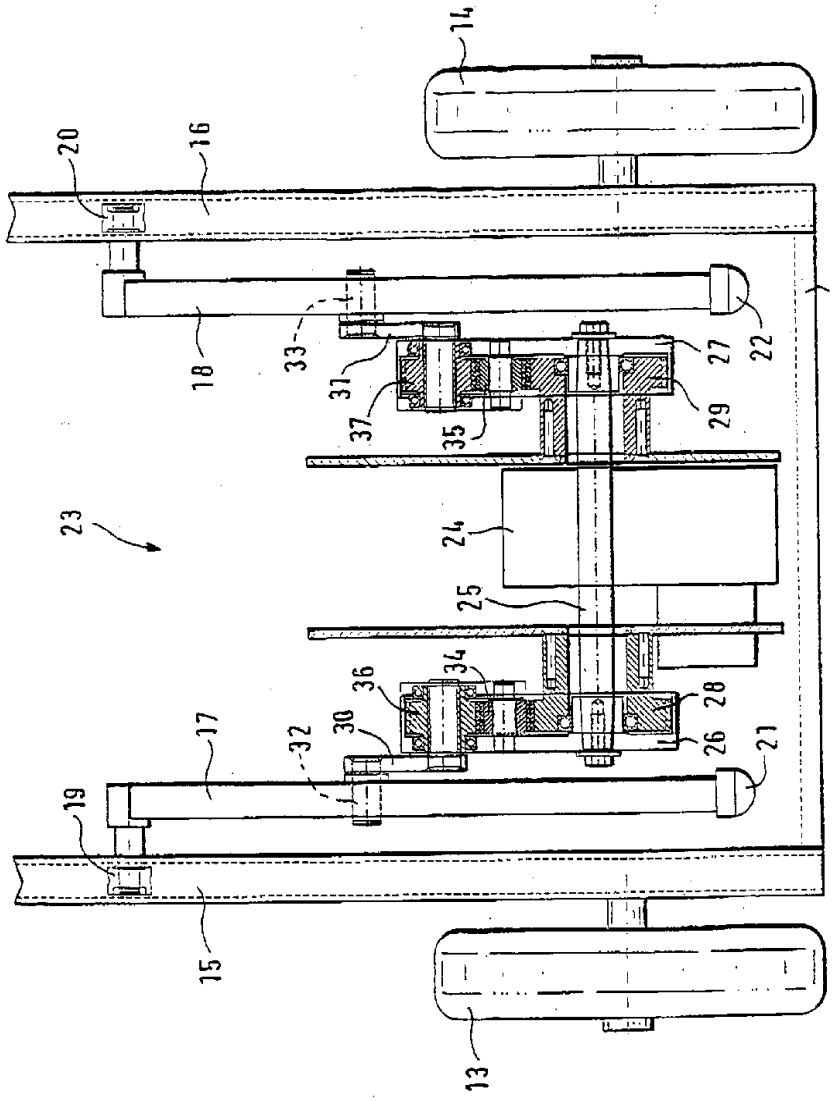

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Fig. 2

Fig. 3

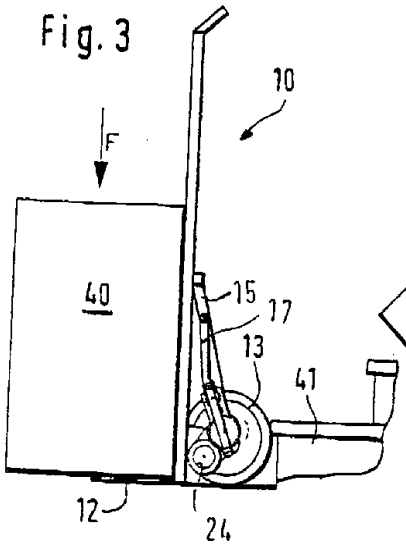


Fig. 4

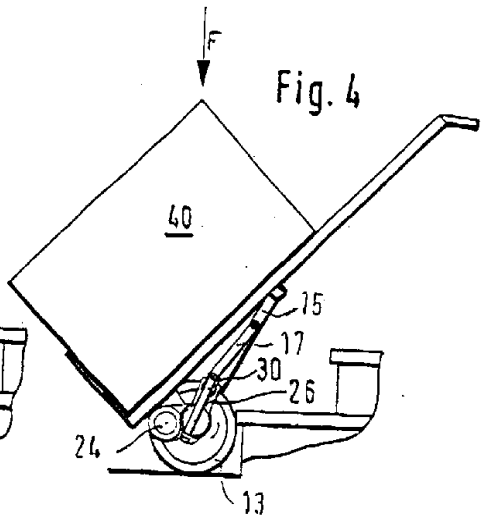


Fig. 5

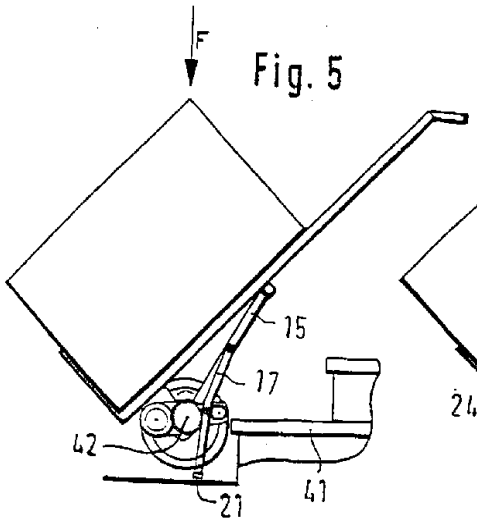
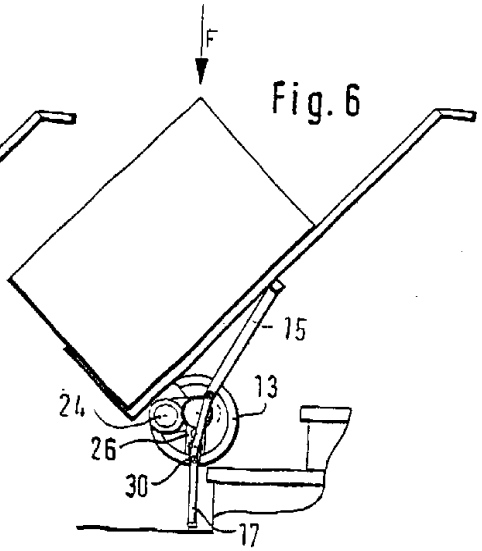


Fig. 6



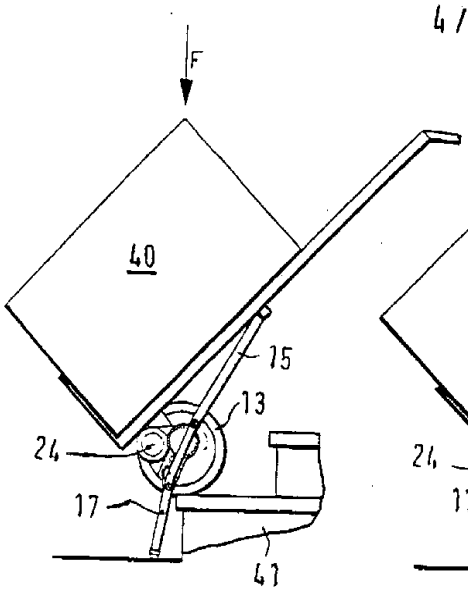


Fig. 7

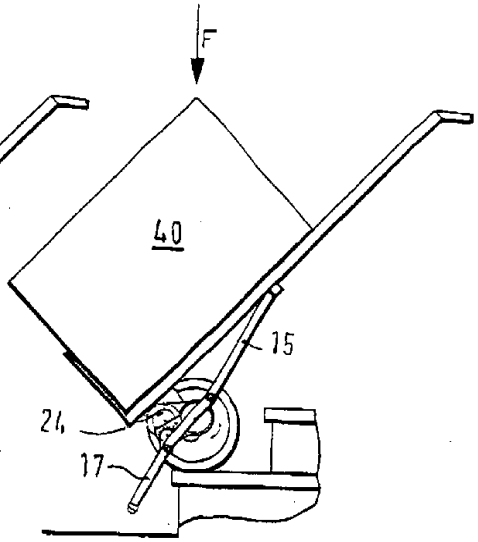


Fig. 8

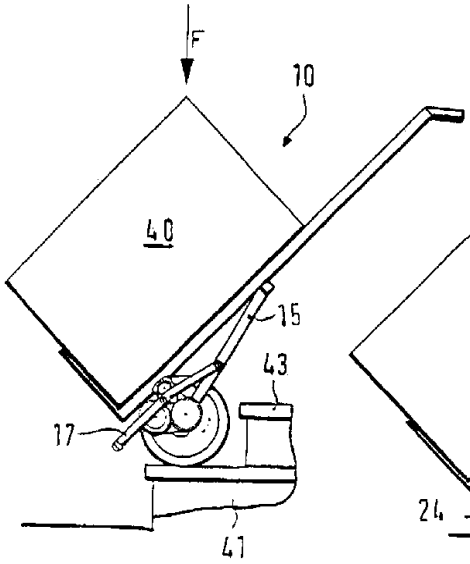


Fig. 9

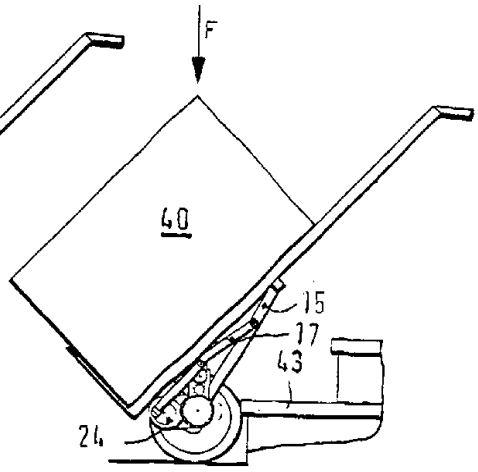


Fig. 10