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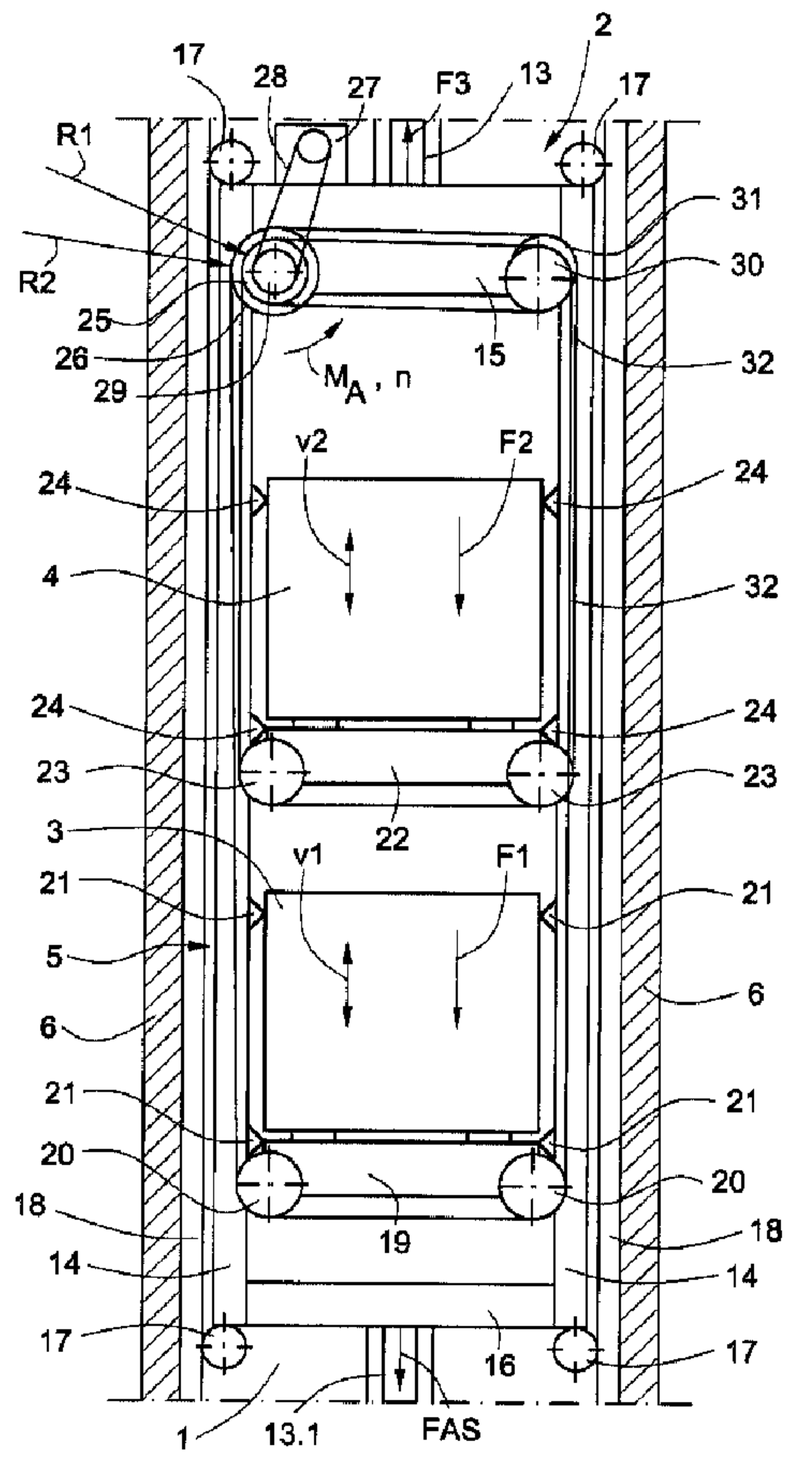
(54) Titre : EQUIPEMENT DE REGLAGE FIN DE LA POSITION DES CAGES D'UN SYSTEME A CAGES MULTI-ETAGES D'ASCENSEUR

(54) Title: EQUIPMENT FOR FINE POSITIONING OF THE CAGES OF A MULTI-STAGE CAGE FOR A LIFT



(57) Abrégé/Abstract:
In the case of this multi-stage cage (2) equipment for fine positioning of the cages (3, 4) of a multi-stage cage (2) for a lift is provided, wherein the cage thresholds of the cages (3, 4) ace positionable at the level of the storey thresholds. Adjusting

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(57) Abrégé(suite)/Abstract(continued):
equipment operating on the principle of a differential block and pulley is provided for fine positioning of the cages (3, 4), the equipment comprising an endless cable (32) guided over deflecting rollers (25, 26, 30, 31) arranged at the main frame (5) of the multi-stage cage (2) and over deflecting rollers (20, 23) arranged at the cages (3, 4), wherein the cages (3, 4) execute vertical movements of opposite sense.

Abstract:

In the case of this multi-stage cage (2) equipment for fine positioning of the cages (3, 4) of a multi-stage cage (2) for a lift is provided, wherein the cage thresholds of the cages (3, 4) are positionable at the level of the storey thresholds. Adjusting equipment operating on the principle of a differential block and pulley is provided for fine positioning of the cages (3, 4), the equipment comprising an endless cable (32) guided over deflecting rollers (25, 26, 30, 31) arranged at the main frame (5) of the multi-stage cage (2) and over deflecting rollers (20, 23) arranged at the cages (3, 4), wherein the cages (3, 4) execute vertical movements of opposite sense.

(Fig. 2)

Description:

Equipment for fine positioning of the cages of a multi-stage cage for a lift

The invention relates to equipment for fine positioning of the cages of a multi-stage cage for a lift, wherein the cage thresholds of the cages are positionable at the level of the storey thresholds.

A lift with a double-deck cage has become known from the Specification JP 2000296971, in which the upper cage can be matched to the upper edge of the storey to be served and the lower cage can be matched to the upper edge of the storey to be served. Deflecting rollers are arranged at the upper yoke of the main frame, which carries the cages, on each side and are drivable by means of a drive arranged at the upper yoke. A cable, which is connected at one end with the upper cage and at the other end with the lower cage, is guided over each deflecting roller, wherein the cages are moved in opposite sense to the positioning at the storey level.

A disadvantage of the known equipment resides in the fact that the cables are guided at each side over driven deflecting rollers. Due to slip or inaccuracies on the driven deflecting rollers, the cage can tilt in the guides.

Here the invention will provide a remedy. The present invention meets the object of avoiding the disadvantages of the known equipment and of creating a multi-stage cage with cages able to be matched to the storeys in terms of level, whereby safe boarding and departure for the lift passengers is guaranteed.

The advantages achieved by the invention are substantially to be seen in that with the multi-stage cage according to the invention the performance capability of the multi-stage lift can be improved, because fine positioning of the stage or stages can be carried out in a shorter time. In addition, it is advantageous that a constant torque is required over the entire range of adjustment, wherein the range of adjustment is freely selectable by means of the cable length. Drive of the lift cages is based on the principle of the differential block and tackle, which operates with a large translation, which together with the overall low friction losses creates the possibility of using a gearless drive for level matching of the

cages. Moreover, the cages cannot tilt in the guides, because the selected cable guide cannot work against the cage guides.

It is further of advantage that a proven and readily manageable technology can be used, which is distinguished by low friction losses, high rates of adjustment and rapid level matching, wherein matchings are possible during travel or at standstill. The lift cages mutually form weight compensation, wherein in normal operation the forces do not extend beyond the side panels. A main frame is not absolutely necessary. An upper yoke, which is guided directly at the guide rails, is sufficient. Cage frames are not necessary in the case of self-supporting lift cages or open cages. Main yoke and cages can be guided directly at the guide rails.

In one aspect, the present invention provides an equipment for fine positioning of cars of a multi-stage car for an elevator wherein car thresholds of the cars are positionable at a level of floor thresholds comprising: adjusting equipment formed as a differential block and tackle and attached to the cars for fine positioning of the cars relative to the floor thresholds, said differential block and tackle including different diameter deflecting rollers fixedly interconnected and being drivable, and including a support means for the cars, wherein said support means is guided over each of said different diameters deflecting rollers.

In a further aspect, the present invention provides an equipment for fine positioning of cars of a multi-stage car for an elevator comprising: a pair of cars movably mounted in a main frame; and adjusting equipment formed as a differential block and tackle attached to said ears for fine positioning of thresholds of said ears at a level of floor thresholds, said adjusting equipment being attached to said cars and said main frame, said frame adjusting equipment including frame deflecting rollers having different diameters and being fixedly interconnected and drivable, and including a support means for said cars, wherein said support means is guided over each of said deflecting rollers having different diameters.

In yet a further aspect, the present invention provides an equipment for fine positioning of cars of a multi-stage car for an elevator wherein car thresholds of the cars are positionable at a level of floor thresholds comprising: adjusting equipment formed as a differential block and tackle and attached to the cars for fine positioning of the cars relative to the floor thresholds, said adjusting equipment including one of an endless cable and an endless belt guided over deflecting rollers arranged at a main frame of the

multi-stage car and guided over deflecting rollers arranged at the cars, and wherein the cars execute vertical movements of opposite sense upon actuation of said adjusting equipment.

The present invention is explained in more detail on the basis of the accompanying figures, in which:

Fig. 1 shows a multi-stage cage which is movable in a lift shaft and consists of a lower cage and an upper cage,

Fig. 2 shows the multi-stage cage with the adjusting equipment according to the invention for the cages and

Fig. 3 shows the principle of the adjusting equipment.

Figure 1 shows a multi-stage cage 2 movable in a lift shaft 1 and consisting of a lower cage 3 and an upper cage 4, which are arranged in a main frame 5. The lift shaft 1 is formed from shaft walls 6, wherein an opening which serves for access to the multi-stage cage 2 and which is closed by a storey door (not illustrated) is provided for each storey. The openings of the lift cages 3, 4 are closed by cage doors (not illustrated). An uneven-numbered storey is denoted by 7 and an even-numbered storey is denoted by 8. The lower cage 3 stands at the uneven-numbered storey 7 and the upper cage 4 stands at the even-numbered storey 8. After positioning of the lower cage 3 the cage threshold 9 is flush in terms of level with the storey threshold 10. After positioning of the upper cage 4 the cage threshold 11 is flush in terms of level with the storey threshold 12. The drive for the multi-stage cage 2, wherein supporting and driving means, for example cables 13, are

guided over a drive pulley is not illustrated. A counterweight (not illustrated) is provided as weight compensation for the multi-stage cage 2.

Fig. 2 shows the multi-stage cage 2 with the adjusting equipment according to the invention for the cages 3, 4. The main frame 5 consisting of side panels 14, an upper yoke 15 and a lower yoke 16 is guided by means of guide shoes 17 along guide rails 18 arranged in the lift shaft 1 and is carried by the cables 13. Compensating cables are denoted by 13.1. The lower cage 3 is mounted to be standing on a cage frame 19, at which two free-running deflecting rollers 20, so-termed lower blocks, are arranged. The cage 3 and the cage frame 19 are guided by means of guides at the side panels 14 and hang in the support means. The upper cage 4 is mounted to be standing on a cage frame 22 at which two free-running deflecting rollers 23, so-termed lower blocks, are arranged. The cage 4 and the cage frame 22 are guided by means of guides 24 at the side panels 14 and hang at the support means.

A deflecting roller 25 arranged at the upper yoke 15 and with a radius R1 or diameter D1 is fixedly connected with a deflecting roller 26 with a radius R2 or a diameter D2. The deflecting rollers 25, 26 are drivable, for example, by means of a drive 27 arranged at the upper yoke 15, wherein a belt 28 acts on a belt pulley 29 connected with the deflecting rollers 25, 26 and generates a torque M_A at a rotational speed n. The drive can be with or without gearing. Moreover, two deflecting rollers 30, 31 free-running independently of one another are arranged at the upper yoke 15.

At least one of the other deflecting rollers 20, 23, 30, 31 can also be drivable instead of the rollers 25, 26.

The deflecting rollers 20, 23, 25, 26, 30, 31 are connected by way of a support means, for example a cable 32 or several cables guided in parallel. A belt can also be provided instead of the cable. The cable 32 is endless and has the following course: deflecting roller 25 - deflecting roller 30 - deflecting rollers 20 - deflecting roller 26 - deflecting roller 31 - deflecting rollers 23 - deflecting roller 25. The cages 3, 4 execute vertical movements of opposite sense. For increase in traction, the support means 23 can be multiply looped on the rollers 25, 26, 30, 31.

Fig. 3 shows the adjusting equipment, which operates on the principle of a differential block and tackle, for the cages 3, 4. The deflecting rollers 25, 26 are variable in diameter independently of the belt pulley 29, wherein the belt pulley 29 can, for example, be of approximately the same size and diameter as the deflecting roller 25.

The speeds v, forces F and the moment M_A can be mathematically calculated as follows:

v_{cable}	=	$n \cdot \pi \cdot D1$ or $n \cdot \pi \cdot D2$	[1]
v1	=	$n \cdot \pi \cdot D1 - n \cdot \pi \cdot D2$	[2]
v2	=	$n \cdot \pi \cdot D2 - n \cdot \pi \cdot D1$	[3]
$_{delta}v$	=	$v1 - v2 = 2 \cdot n \cdot \pi \cdot (D1 - D2)$	[4]
F3	=	F1+F2+GFK+FAS	[5]
$_{delta}F$	=	F1-F2	[6]
M_A	=	$(R1 - R2) \cdot {}_{delta}F \cdot ½$	[7]

D1: diameter of deflecting roller 25

D2: diameter of deflecting roller 26

R1: radius of deflecting roller 25

R2: radius of deflecting roller 26

v_{cable}: cable speed

v1: speed of lower cage 3

v2: speed of upper cage 4

F1: total weight of the lower cage 3

F2: total weight of the upper cage 4

F3: force in the cables 13 (total weight of the multi-stage cage 2)

GFK: weight of main frame 5

M_A: torque necessary at the deflecting rollers 25, 26

n: rotational speed of the deflecting rollers 25, 26

FAS: force in the compensating cables 13.1

We Claim:

1. An equipment for fine positioning of cars of a multi-stage car for an elevator wherein car thresholds of the cars are positionable at a level of floor thresholds comprising:

adjusting equipment formed as a differential block and tackle and attached to the cars for fine positioning of the cars relative to the floor thresholds, said differential block and tackle including different diameter deflecting rollers fixedly interconnected and being drivable, and including a support means for the cars, wherein said support means is guided over each of said different diameters deflecting rollers.

2. The equipment according to claim 1 wherein said adjusting equipment includes one of an endless cable and an endless belt being said support means and guided over deflecting rollers arranged at a main frame of the multi-stage car and guided over deflecting rollers arranged at the cars, and wherein the cars execute vertical movements of opposite sense upon actuation of said adjusting equipment.

3. The equipment according to claim 2 wherein said deflecting rollers arranged at the main frame include said different diameter deflecting rollers arranged at an upper yoke of the main frame.

4. The equipment according to claim 3 wherein said one of an endless cable and an endless belt engages one of said different diameter deflecting rollers with a first diameter, is guided at a first of said deflecting rollers ranged at the main frame, then over ones of said deflecting rollers arranged at a lower one of the cars, then over another one of said different diameter deflecting rollers with a second diameter, then over a second of said deflecting rollers ranged at the main frame, then over ones of said deflecting rollers arranged at an upper one of the cars and back to said deflecting roller with the first diameter , the first diameter being different than the second diameter.

5. An equipment for fine positioning of cars of a multi-stage car for an elevator comprising:

a pair of cars movably mounted in a main frame; and

adjusting equipment formed as a differential block and tackle attached to said ears for fine positioning of thresholds of said ears at a level of floor thresholds, said adjusting equipment being attached to said cars and said main frame, said frame adjusting equipment including frame deflecting rollers having different diameters and being fixedly interconnected and drivable, and including a support means for said cars, wherein said support means is guided over each of said deflecting rollers having different diameters.

6. The equipment according to claim 5 wherein said adjusting equipment includes an endless flexible drive means as said support means, wherein said support means is guided over said frame deflecting rollers mounted at said main frame and guided over car deflecting rollers attached to said cars, and wherein said cars execute vertical movements of opposite sense upon actuation of said adjusting equipment.

7. The equipment according to claim 6 wherein said frame deflecting rollers are arranged at an upper yoke of said main frame.

8. The equipment according to claim 6 wherein said drive means engages a first of said frame deflecting rollers with a first diameter, is guided a second of said frame deflecting rollers, then over ones of said car deflecting rollers arranged at a lower one of said cars, then over a third of said frame deflecting rollers with a second diameter different than the first diameter, then over a fourth of said frame deflecting rollers, then over ones of said ear deflecting rollers arranged at an upper one of said cars and back to said frame deflecting roller with the first diameter.

9. The equipment according to claim 6 wherein said endless flexible drive means is one of a cable and a belt.

10. An equipment for fine positioning of cars of a multi-stage car for an elevator wherein car thresholds of the cars are positionable at a level of floor thresholds comprising:

adjusting equipment formed as a differential block and tackle and attached to the cars for fine positioning of the cars relative to the floor thresholds, said adjusting equipment including one of an endless cable and an endless belt guided over deflecting rollers arranged at a main frame of the multi-stage car and guided over deflecting rollers arranged at the cars, and wherein the cars execute vertical movements of opposite sense upon actuation of said adjusting equipment.

11. The equipment according to claim 10 wherein said deflecting rollers arranged at the main frame include different diameter deflecting rollers arranged at an upper yoke of the main frame, and wherein said different diameter deflecting rollers are fixedly interconnected and are drivable.

12. The equipment according to claim 10 wherein said one of an endless cable and an endless belt engages one of said different diameter deflecting rollers with a first diameter, is guided at a first of said deflecting rollers arranged at the main frame, then over ones of

said deflecting rollers arranged at a lower one of the cars, then over another one of said different diameter deflecting rollers with a second diameter, then over a second of said deflecting rollers arranged at the main frame, then over ones of said deflecting rollers arranged at an upper one of the cars and back to said deflecting roller with the first diameter, the first diameter being different than the second diameter.

FIG. 1

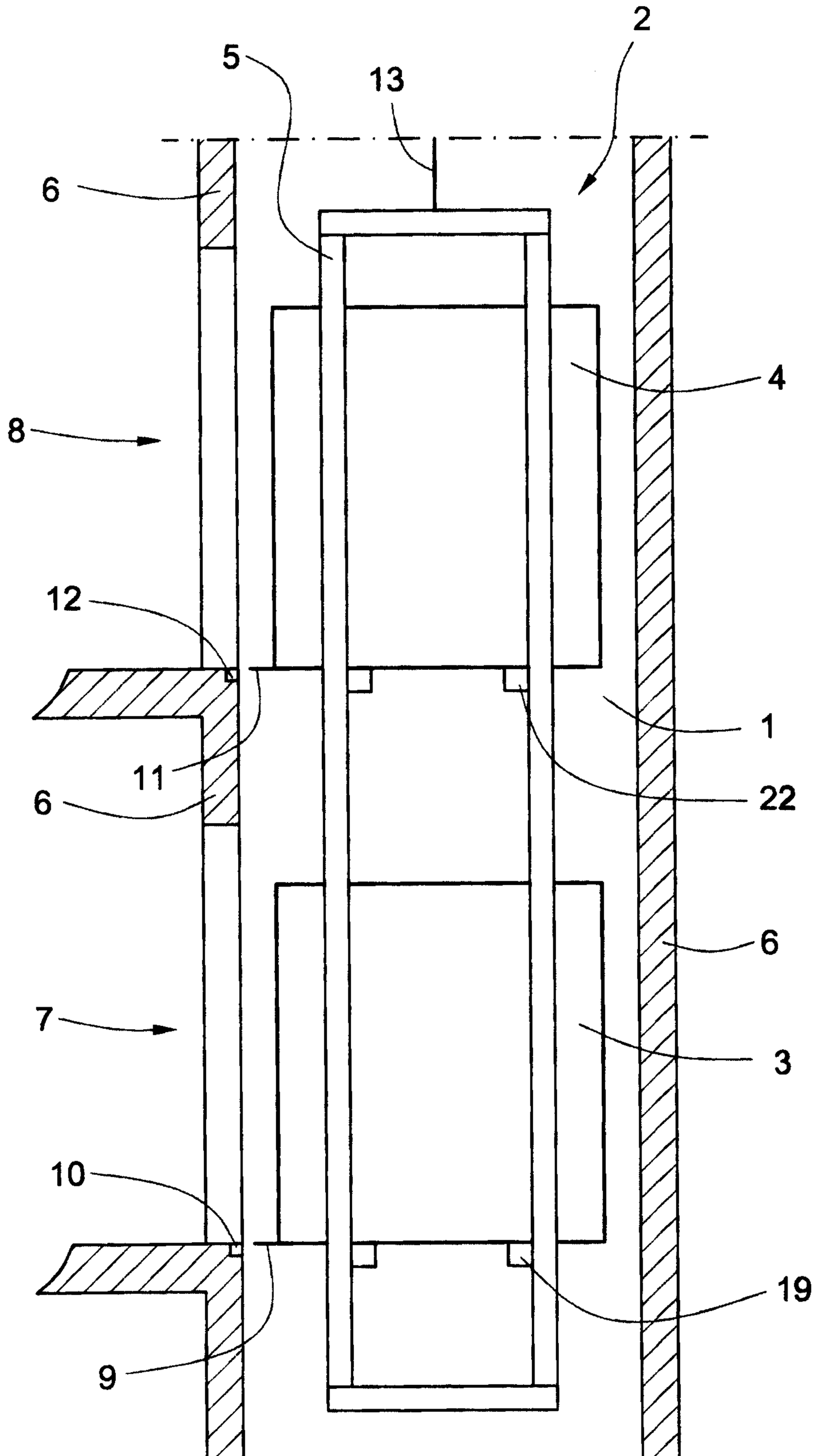

FIG. 2

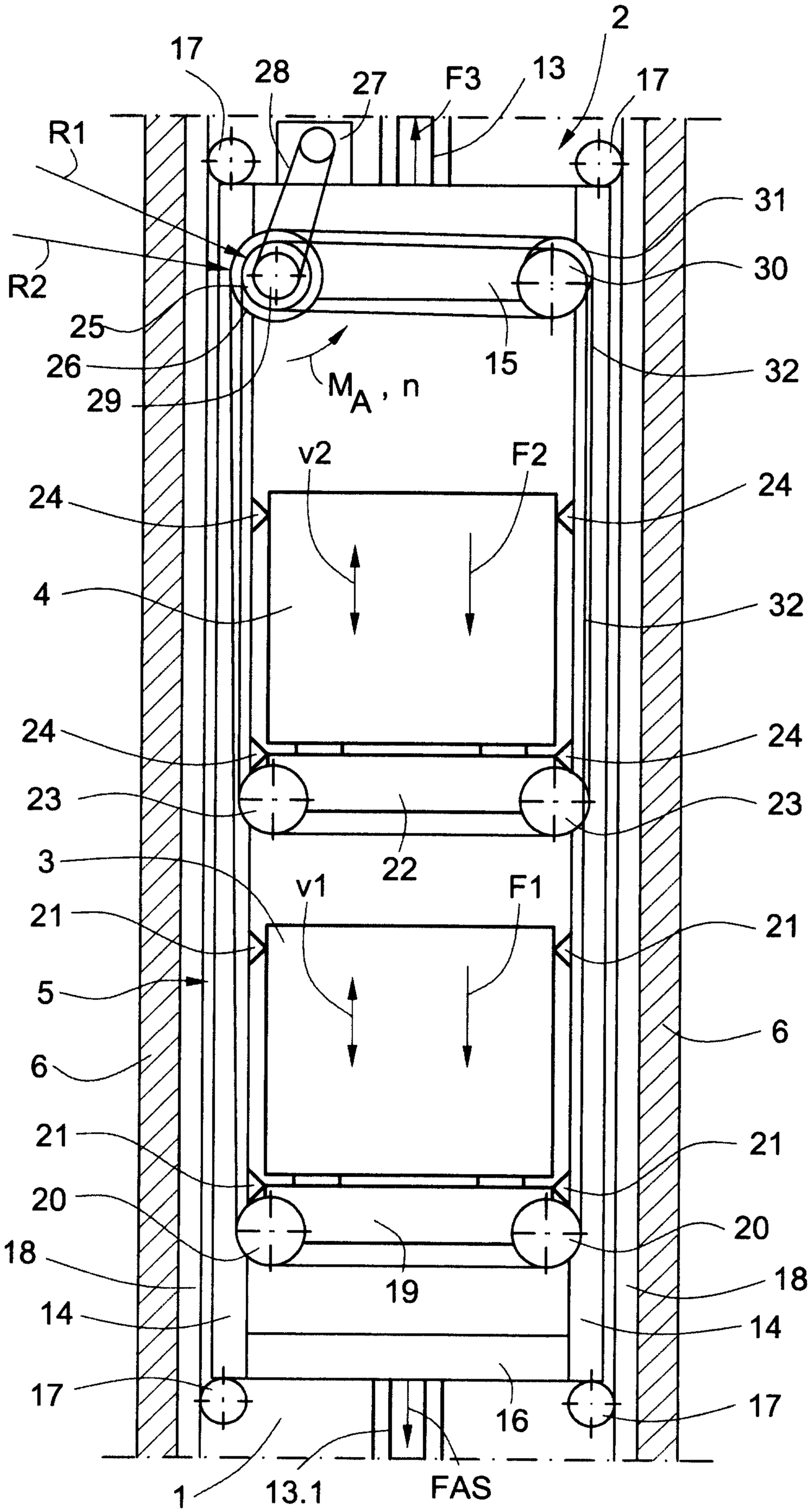
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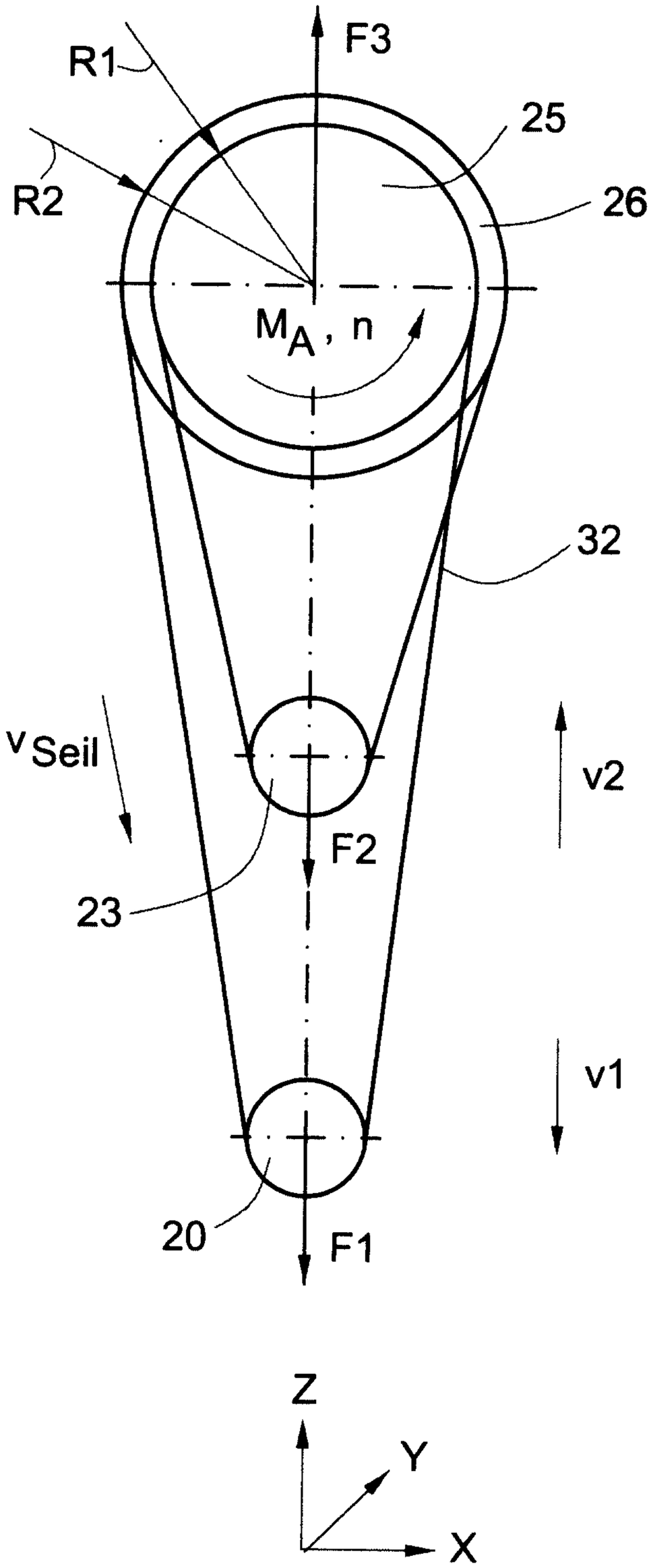
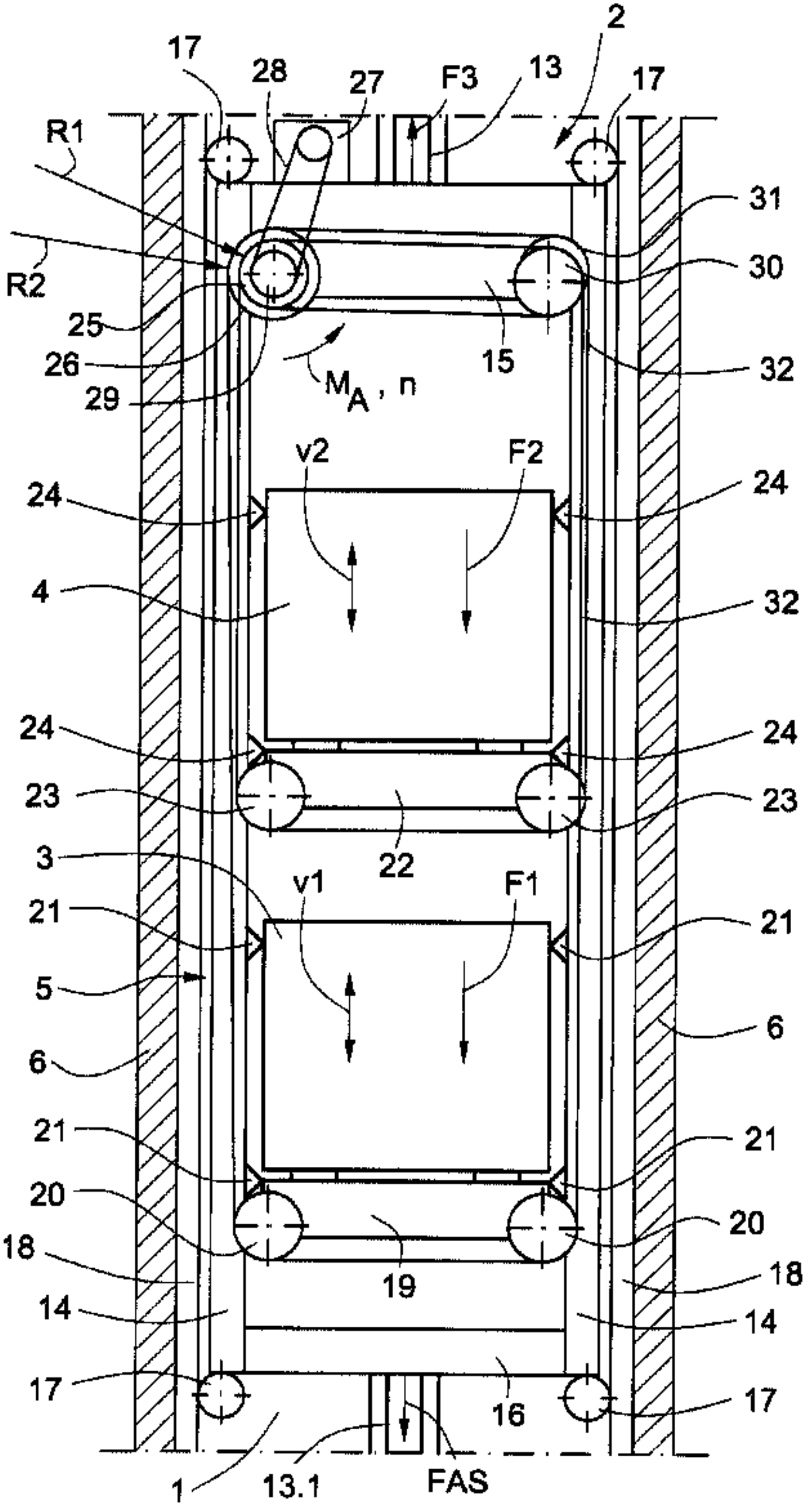
FIG. 3

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