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Remarks:
Claims 11-15. are deemed to be abandoned due to non-payment of the claims fees (Rule 31 (2) EPC).

(54) Machine-room-less elevator

(57) A machine-room-less elevator is described, in which the motor is a winch positioned upward in the elevator shaft, with the electric motor turned downward. In this way, a reduction of the elevator shaft's overhead space extension is obtained, although respecting all safety measures related to elevator's use and maintenance.

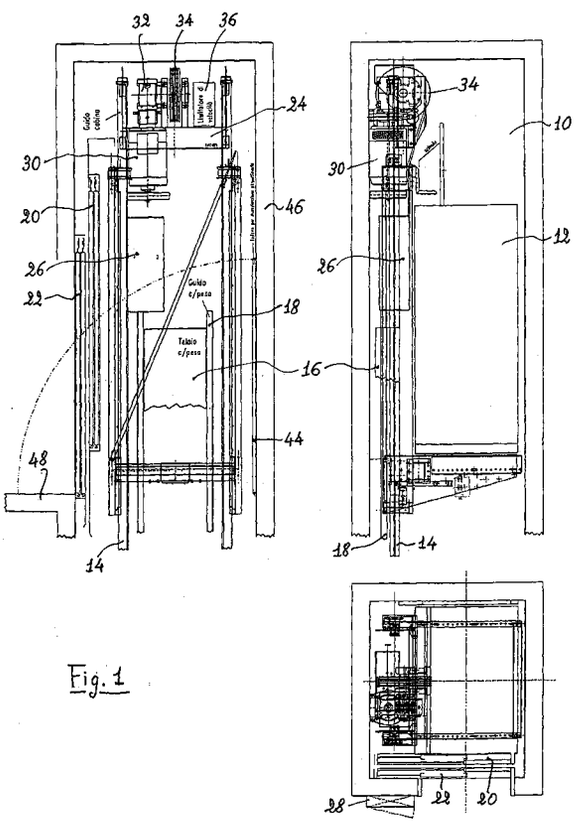

Fig. 1

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Description

[0001] The present invention is about a machine-room-less elevator with a winch positioned in the elevator shaft having considerable innovative characteristics.

[0002] In the present evolution of the elevator technique, due to changes made by the European Community in the rules concerning elevator systems' manufacture, use and maintenance, it is now possible to make use of winches as driving unit for an elevator system.

[0003] In particular, vertically arranged winches have been realized, to be positioned high above at the overhead room of the elevator shaft, that means in the area delimited by the elevator car's wall during its stroke, including the excess stroke, and the elevator shaft's wall over the counterweight projection.

[0004] However, such prior-art winches have the electric motor positioned upward and consequently the whole elevator's traction system is in a higher position, obliging to increase overhead room's height and creating considerable problems to obtain such space, for instance when the elevator is installed in existent buildings.

[0005] These problems are brilliantly solved by an elevator without the machine room according to the present invention, which characteristics are described in the annexed claims.

[0006] System objects, characteristics and advantages will be better highlighted in the following detailed description, with reference to the annexed drawings, wherein:

Figure 1 is a schematic view of the elevator system, taken at the last floor, with the traction system placed between the elevator car guide rails, in its direct drive version;

Figure 2 is a similar view, in suspension in 2:1 ratio version;

Figure 3 is a schematic view of the elevator system with an auxiliary motor; and

Figure 4 is a schematic view similar to Figure 3, in which the elevator system is however equipped with two motors.

[0007] Referring to the figures of the annexed drawings, in the elevator shaft 10 the elevator car 12, of the overhang type (rücksack), travels across guide rails 14, while the counterweight 16 travels across counterweight rails 18. The elevator car 12 has at last one car door 20 obviously turned towards the floor's door 22, but it is possible to have up to three car doors on the three elevator car free sides, when doors of different floors are not all positioned on the same elevator shaft side.

[0008] The entire elevator system is self-bearing, since the traction machinery is supported and fixed to the elevator car guide rails 14 and/or to the counterweight rails through a beam 24. However, the driving unit could also be fixed to a wall and/or to the elevator shaft ceiling.

[0009] A control panel 26 is placed in the elevator shaft between the guide rails and contains power supply equipments and controls for operating the traction sheave, allowing therefore to reduce the dimensions of the required control board 28, placed on the highest floor.

[0010] The winch is thus fixed in a vertical position to the beam 24, with the electric motor 30, turned downward, the reduction unit 32, the traction sheave 34 and the speed limiter 36. Through this disposition, overhead room's height can be considerably reduced so that, in excess stroke, the motor's 30 lower edge is located in a lower position in respect of the elevator car's 12 roof upper edge.

[0011] In Figure 1, showing an elevator system in direct drive version 1:1, the traction sheave 34 is placed centrally for the direct elevator car and counterweight suspension. In Figure 2, showing an elevator system in suspension in 2:1 (but 3:1 or 4:1 versions are likewise possible), the traction sheave 34 is instead positioned outside the elevator system median vertical axis and, through the deviation sheave 38, it drives the counterweight sheave 40 and the elevator car's arcade sheave 42.

[0012] The driving unit is substantially placed inside the space extension overhead of the shaft required for the counterweight, safety distance included, in direction of the counterweight thickness, but it can also exceed said counterweight thickness, still keeping all the elevator system characteristics mentioned above. Furthermore, counterweight suspension can also be of different type from the elevator car's one.

[0013] Other important feature is the maintenance footboard 44, applied in off-position against the elevator shaft wall 46, which, being pivoted at the lower end, is pulled down in horizontal position when it must be used, laying on highest floor's walking surface 48 and allowing the operator to execute his job in comfort and safeness.

[0014] Furthermore, for emergency (or rescue) handling, the driving unit can be provided with an auxiliary motor or by a coaxial spare motor for the main one, suitable for moving the elevator car in emergency situations, in case of failure, breakdown or even in case of energy cut-off.

[0015] Essential feature is that the auxiliary or spare motor 30A, or the second motor 30B, are coaxial with the main motor, to be connected to the reduction unit and to the electromagnetic brake, without requesting further transmission elements.

[0016] The auxiliary motor shall be asynchronous, or brushless of permanent magnet type, or of other type, however suitable for moving the elevator system, fed by battery and/or inverter.

[0017] It is also possible to adopt two separate motors so that, in case of breakdown of one of the two motors, the spare one is able to move the elevator car in emergency anyhow.

[0018] It is therefore evident that the elevator according to present invention fully achieves the intended objects, but it should be also pointed out that numerous elements alterations, variations, replacements and/or additions could be introduced to the system without departing from its object and even without falling outside its scope of protection, as it is also defined in the appended claims.

Claims

1. A machine room-less elevator with winch in the elevator shaft wherein the winch is positioned high above and vertically arrangrd, with the electric motor turned downward, reducing overhead room's height of the elevator shaft, so that in excess stroke, the motor's lower edge is located in a lower position in respect of the elevator car's upper edge.

2. The elevator according to claim 1, wherein the elevator system is self-bearing, the load being supported by the elevator car and/or the counterweight guide rails.

3. The elevator according to claims 1 or 2, wherein supports of the motor and of traction machinery's other components are fixed to a beam fixed to the elevator car and/or the counterweight guide rails.

4. The elevator according to claim 1, wherein the elevator is operated in direct drive 1:1 or in suspension 2:1, 3:1 or 4:1.

5. The elevator according to claim 1, wherein a control panel is placed between the elevator car or the counterweight guide rails.

6. The elevator according to one or more of the preceding claims, wherein it comprises a maintenance footboard applied against an elevator shaft wall, which could be pulled down in horizontal position when used.

7. The elevator according to one or more of the preceding claims, wherein the driving unit is substantially placed inside the space extension overhead of the elevator shaft required for the counterweight, safety distance included, in direction of the counterweight thickness.

8. The elevator according to one or more of the preceding claims, wherein the driving unit exceed the counterweight thickness, keeping the system characteristics.

9. The elevator according to one or more of the preceding claims, wherein the driving unit can also be fixed to a elevator shaft wall and/or ceiling.

10. The elevator according to one or more of the preceding claims, wherein the counterweight suspension can also be of different type from the elevator car's one.

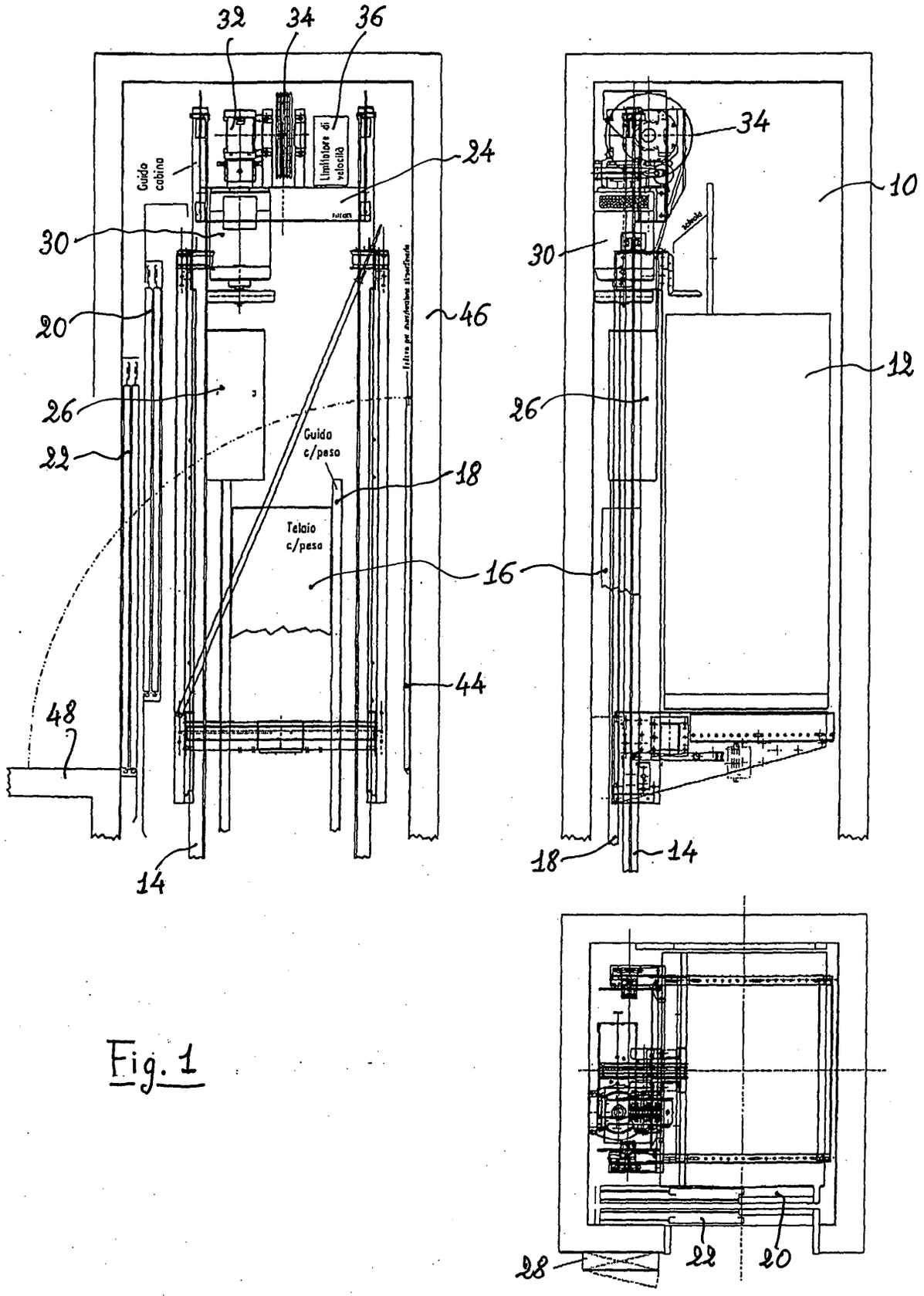
11. The elevator according to one or more of the preceding claims, wherein an emergency handling comprising a second motor coaxial with the first motor or the main one is provided, adapted to move the elevator system in case of breakdown or stop of the first motor or the main one, or even in case of energy cut-off.

12. The elevator according to claim 11, wherein said second motor is an auxiliary asynchronous, or brushless of permanent magnet type, or of other type motor, fed by battery and/or inverter.

13. The elevator according to claim 11, wherein in case of breakdown of one of the two motors, the spare one is able to move the elevator car in emergency anyhow.

14. The elevator according to claim 11, wherein the two coaxial motors have subdivided power but altogether the same as the one required for the system, and both work at the same time but, in case of breakdown of one of the two motors, the other is able to perform emergency operations anyhow.

15. The elevator according to claims 11 - 14, wherein the two motors control the reduction unit and the electromagnetic brake through a single transmission element.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Guida cabina
Limitatore di velocità
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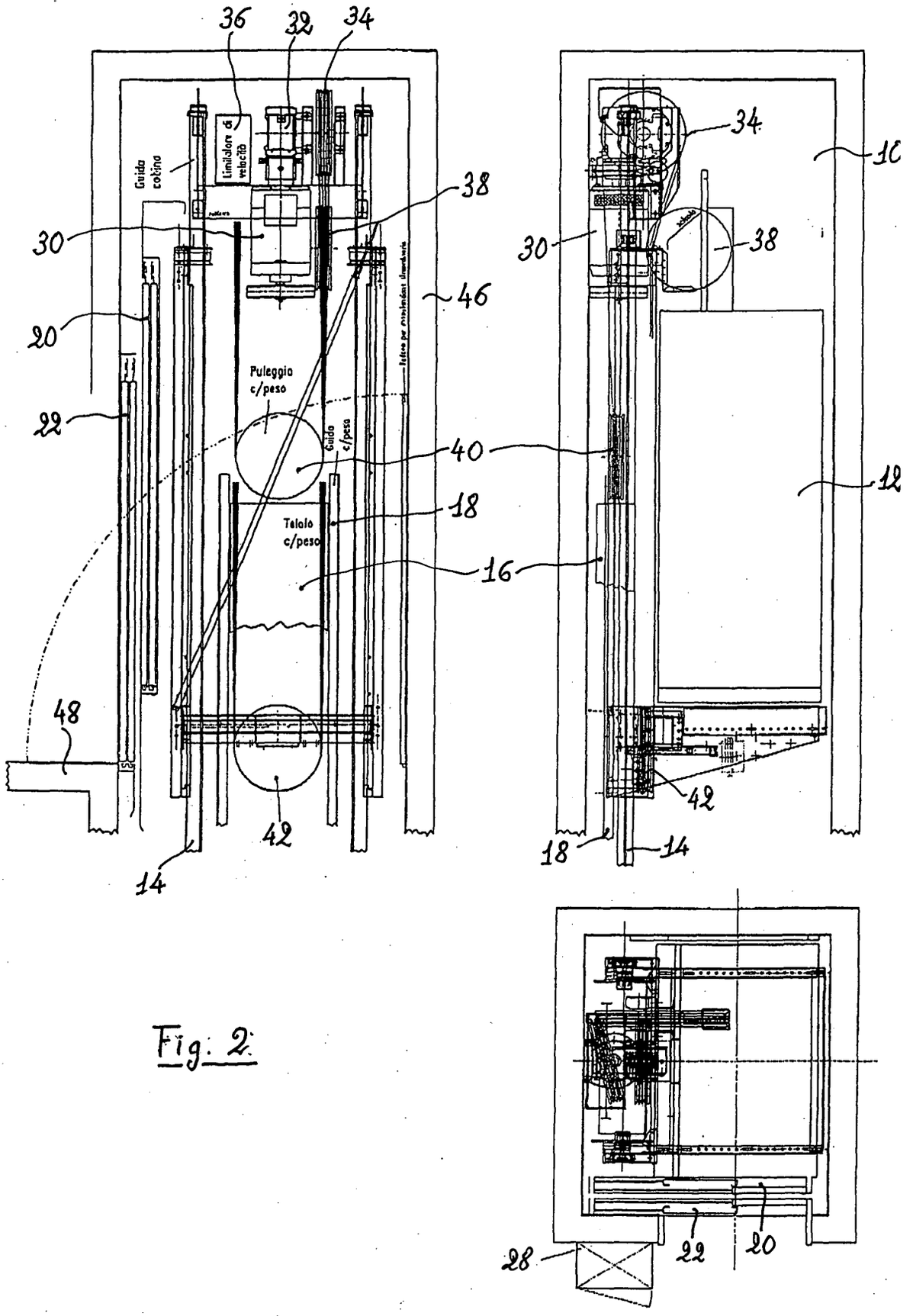
Fig. 1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Telaio c/peso
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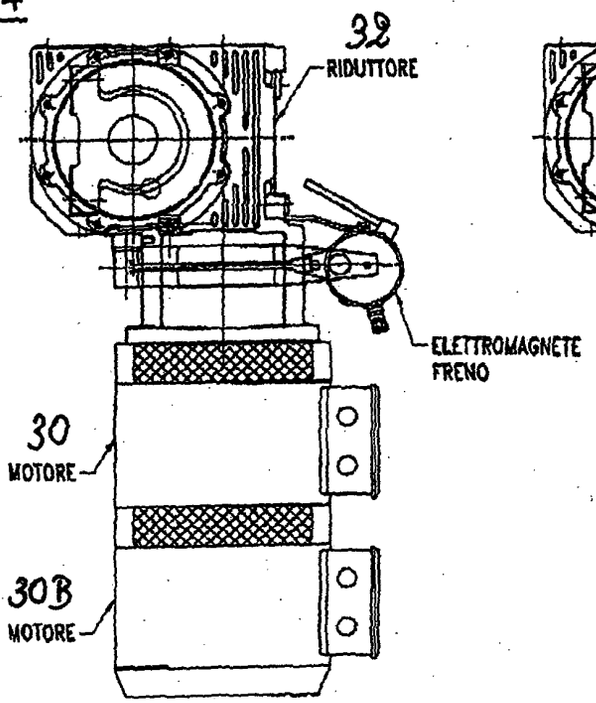
Fig. 2

Fig.4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RIDUTTORE
ELETTROMAGNETE
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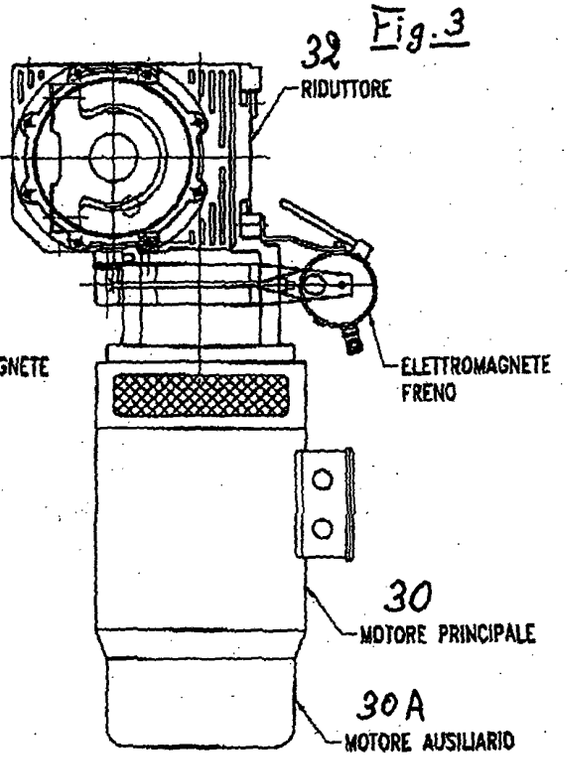
MOTORE
30B
MOTORE

Fig.3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MOTORE AUSILIARIO