the large number of actuators makes it difficult and excessively time-consuming to unload the airplane in the event the tractor breaks down.

~~The~~Embodiments of the invention aim~~s~~ to avoid these drawbacks by proposing an airplane tractor comprising a gripping device making it possible to improve the loading and unloading of the airplane on the tractor, and in particular a gripping device adapted to pull an airplane toward a takeoff runway.

According to an aspect, there is provided a method for pulling an airplane by an airplane tractor, the method comprising: blocking primary brakes of the airplane; gripping a nose gear of the airplane by a tractor; exerting a pulling force on the airplane by the tractor prior to releasing the primary brakes of the airplane; releasing the primary brakes of the airplane, thereby causing the resistance force of the airplane to be less than the pulling force of the tractor; and allowing the pulling force to drive the tractor together with the airplane.

~~To that end,~~Disclosed herein is an airplane tractor is proposed having a gripping system for gripping the nose gear of the airplane, comprising:

- a chassis;
- wheel modules connected to the chassis, each wheel module including at least one actuator for inducing a vertical movement of the module in relation to the chassis;
- a gripping platform of the nose gear of an airplane, the platform together with the chassis having freedom of movement substantially in circular translation; and
- an actuating means connecting the platform and the chassis, said actuating means also constituting a damping means for damping the free movement of the platform in relation to the chassis.

The above tractor ~~according to the invention~~ can also comprise at least one of the following features:

- at least one gate intended to oppose the force exerted on at least one wheel of the nose gear of the airplane by the gripping platform;

- the gripping platform comprises a locking device for locking at least one wheel of the nose gear of the airplane;

- the locking device of said at least one wheel of the nose gear is installed on a turret positioned on the gripping platform, the turret rotating freely around a substantially vertical axis in relation to the gripping platform;

- the locking device for said at least one wheel comprises:

- a wheel abutment for the nose gear of the airplane;

- a tightening device to maintain the wheel of the nose gear of the airplane against the abutment;

- the tightening device comprises a tightening plate connected to a triangle actuated by a cylinder;

- the tightening plate is retractable in the absence of an airplane wheel on the platform;

- the abutment has an adjustable location;
- the actuator of each wheel module is a hydraulic cylinder;
- the cylinder of the tightening device is a hydraulic cylinder;
- the damping and actuating means constitutes a sensor of the relative movement between the platform and the chassis;
- the platform has a base connected to the chassis by vertical tie rods;
- an actuator for inducing an incline of the base of the platform in relation to a horizontal plane;
- the vertical tie rods have adjustable lengths and/or adjustable fastening points to the chassis;
- each wheel module has a respective angle of rotation in relation to a longitudinal axis of the tractor and around an axis of rotation substantially vertical to the chassis of the tractor;
- the turret comprises at least one sensor measuring an angular displacement of the turret in relation to the gripping platform, and each respective angle of rotation is determined as a function of the measured angular displacement of the turret.

~~Also proposed~~Disclosed herein is a method for gripping the nose gear of an airplane using an airplane tractor comprising:

- a chassis;
- wheel modules connected to the chassis, each wheel module including at least one actuator for inducing a vertical movement of the module in relation to the chassis;
- a gripping platform for gripping the nose gear of an airplane, the platform being moveable substantially in circular translation in relation to the chassis, the platform going from a retracted position to a gripping position by way of an equilibrium position;
- a damping and actuating means connecting the platform and the chassis.

The above method comprises the following steps:

- actuating the damping and actuating means to place the gripping platform in the retracted position;
- lowering the chassis;
- moving the tractor so as to place the retracted gripping platform in contact with at least one wheel of the nose gear of the airplane;
- actuating the damping and actuating means to move the gripping platform from its retracted position toward its gripping position while adjusting the height of the

chassis by controlling the actuators of at least two wheel modules so as to slide the gripping platform under the wheel;

- raising the chassis;

- bringing the platform back to its equilibrium position.

The above gripping method for gripping the nose gear of an airplane using an airplane tractor can also include at least one of the following features:

- a step consisting of closing a gate of the tractor when the gripping platform is in contact with said at least one wheel of the nose gear of the airplane;

- a step consisting of opening the gate of the tractor when the chassis raises;

- when the gripping platform has been slid under the wheel, a step consisting of moving the tractor to bring said at least one wheel onto a locking device;

- steps consisting of:

  - setting the location of an abutment as a function of the type of airplane and/or the type of wheel;

  - bringing said at least one wheel onto the locking device against the abutment;

  - bringing a tightening plate against the wheel to maintain it against the abutment;

- a step consisting of inclining the platform in relation to a horizontal plane.

~~Also proposed~~Disclosed herein is a method for pulling an airplane comprising the following steps:

- loading the airplane on a tractor according to the gripping method for gripping the nose gear of an airplane using an airplane tractor;

- making the tractor travel at a constant speed;

- regulating the speed of the tractor as a function of the force measured by the damping and actuating means.

The above method for pulling a airplane can also comprise at least one of the following features:

- the speed of the tractor is checked when the measured force exceeds a dynamically determined threshold level;

- the platform of the tractor comprises a turret receiving said at least one wheel of the nose gear of the airplane, the turret freely rotating around a substantially vertical axis in relation to the gripping platform, the direction of the tractor being modified as a function of the rotation of the turret in relation to the gripping platform;

- the rotation of the turret is induced by a rotational movement of the nose gear;

CLAIMS:

1. A method for pulling an airplane by an airplane tractor, the method comprising:

blocking primary brakes of the airplane;

gripping a nose gear of the airplane by a tractor;

exerting a pulling force on the airplane by the tractor prior to releasing the primary brakes of the airplane;

releasing the primary brakes of the airplane, thereby causing the resistance force of the airplane to be less than the pulling force of the tractor; and

allowing the pulling force to drive the tractor together with the airplane.

2. The method according to Claim 1, wherein gripping a nose gear of the airplane is performed before blocking primary brakes of the airplane.

3. The method according to Claim 1, wherein the tractor includes a chassis; wheel modules connected to the chassis, each of the wheel modules includes at least one actuator for inducing a vertical movement thereof in relation to the chassis; a gripping system for gripping the nose gear of an airplane, the gripping system including a gripping platform moveable substantially in circular translation in relation to the chassis, the gripping platform going from a retracted position to a gripping position by way of an equilibrium position; and a damping means and an actuating means connecting the gripping platform and the chassis; and wherein gripping a nose gear of the airplane by a tractor includes:

actuating the damping and actuating means to place the gripping platform in the retracted position;

lowering the chassis;

moving the tractor so as to place the retracted gripping platform in contact with at least one wheel of the nose gear of the airplane;

actuating the damping and actuating means to move the gripping platform from the retracted position toward the gripping position, while adjusting a height of the chassis by controlling the actuators of at least two of the wheel modules so as to slide the gripping platform under the at least one wheel of the nose gear;

raising the chassis; and

bringing the gripping platform back to the equilibrium position.

4. The method according to Claim 1, wherein releasing primary brakes of the airplane is performed by the airplane's pilot.

5. The method according to Claim 1, further comprising accelerating the tractor until the tractor reaches a constant cruising speed.

6. The method according to Claim 1, further comprising regulating the speed of the tractor as a function of the force measured by the damping and actuating means.

7. The method for pulling an airplane according to Claim 6, wherein the speed of the tractor is controlled such that the measured force exceeds a dynamically determined threshold level.

CLAIMS

1. A method for pulling an airplane by an airplane tractor comprising:
   - blocking the primary brakes of the airplane;
   - gripping the nose gear of the airplane by tractor;
   - exerting a pulling force on the airplane by the tractor;
   - releasing the primary brakes of the airplane thereby causing the resistance force of the airplane to be less than the pulling force of the tractor, and allowing the pulling force to drive the tractor together with the airplane.

2. A method according to Claim 1, wherein the step of gripping the nose gear of the airplane is performed before the step of blocking the primary brakes of the airplane.

3. A method according to Claim 1, wherein said tractor comprises: a chassis; wheel modules connected to the chassis, each wheel module includes at least one actuator for inducing a vertical movement of the module in relation to the chassis; a gripping system for gripping the nose gear of an airplane, the gripping system comprising a gripping platform moveable substantially in circular translation in relation to the chassis, the platform going from a retracted position to a gripping position by way of an equilibrium position; a damping and actuating means connecting the platform and the chassis; and wherein said step of gripping the nose gear of the airplane comprises:
   - actuating the damping and actuating means to place the gripping platform in the retracted position;
   - lowering the chassis;
   - moving the tractor so as to place the retracted gripping platform in contact with at least one wheel of the nose gear of the airplane;
   - actuating the damping and actuating means to move the gripping platform from its retracted position toward its gripping position while adjusting the height of the chassis by controlling the actuators of at least two wheel modules so as to slide the gripping platform under the wheel of the nose gear;
   - raising the chassis;
   - bringing the platform back to its equilibrium position.

4. The method according to Claim 1, wherein the step of releasing the primary brakes of the airplane is performed by the airplane's pilot.

5. The method according to Claim 1, further comprising a step of accelerating the tractor until it reaches a constant cruising speed.

6. The method according to Claim 1, further comprising a step of regulating the speed of the tractor is performed as a function of the force measured by the damping and actuating means.

7. The method for pulling an airplane according to Claim 6, wherein the speed of the tractor is controlled such that the measured force exceeds a dynamically determined threshold level.