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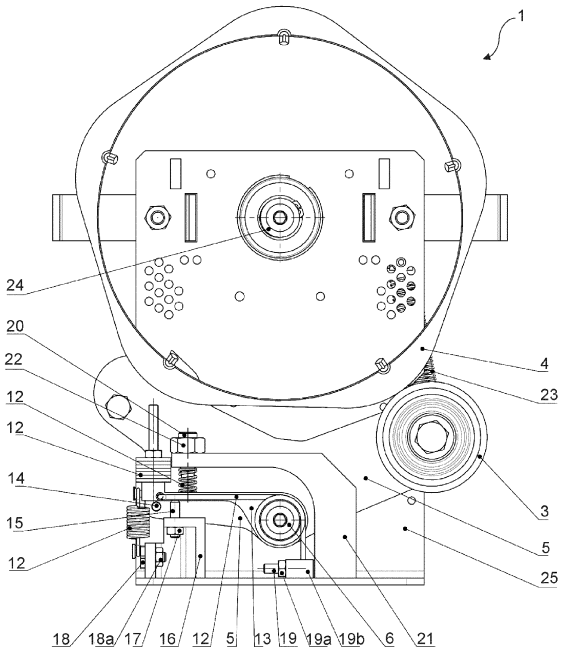
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(54) OVERSPEED GOVERNOR FOR AN ELEVATOR

(57) Overspeed governor (1) for an elevator, comprising:
a sheave (2) and a cam (4) mounted on a side so as to rotate with the sheave (2);
a pendulum member (5) mounted on the frame (25) so to rotate around a pivotal point (6) and provided with a tripping pawl (8);
a cam follower wheel (3) mounted on the pendulum member (5) to follow the profile of the cam (4) when the sheave (2) is rotating and for rotation speeds of the sheave (2) greater than a first rotation speed, the cam follower wheel (3) starts leaping at intervals;
a plurality of engaging portions (9) arranged on a side of the sheave (2) so as to rotate with the sheave (2), the engaging portions (9) and the pendulum member (5) being arranged so that at reaching of a second rotation speed of the sheave (2), the tripping pawl (8) engages one of the engaging portions (9);
a main resisting element (23) mounted between the frame (25) and the pendulum member (5);
at least one additional resisting element (12) which starts to act on the pendulum member (5) from a third intermediate rotation speed of the sheave (2).

FIG. 1



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Description

[0001] The present invention relates to an overspeed governor for an elevator and an elevator comprising such overspeed governor.

[0002] The overspeed governor is a safety device that is activated if the speed of the lift is exceeded, ensuring the safety of people inside the elevator car. If car exceeds its nominal speed during the ascent or descent, the overspeed governor triggers and make the car stop. Therefore, the overspeed governor is a crucial and indispensable product for passenger safety. For this reason, the European directive EN 81 20/50 requires the use of an overspeed governor on ropeways.

[0003] Latch overspeed governors are known. Latch governors are usually equipped with a pendulum member having a roller forced to move along a cam. The cam rotates with a sheave over which the governor rope slides. The pendulum member is provided with a tripping pawl. Typically, latch governors are equipped with an extension spring, which is acting against the centrifugal force of the tripping pawl. This centrifugal force is caused by movement of the roller along the cam. As soon as the centrifugal force is higher than the spring force, the tripping pawl starts to take off after every wave of the cam as long as it is able to touch a contact switch (contact speed). A further acceleration of the sheave leads to higher take off distances, until the tripping pawl can't move away from the sheave fast enough and trips with a latch on the sheave (tripping speed). The sheave is then blocked by the tripping pawl and the governor rope slips over the pulley.

[0004] However, the spring force and the centrifugal force increase almost linearly, therefore when a failure is about to occur, a negligible amount of time passes between a no-failure situation and a failure situation.

[0005] In this context, the technical task underlying the present invention is to propose an overspeed governor for an elevator and an elevator comprising such overspeed governor, which overcome the drawbacks in the prior art as described above.

[0006] In particular, an object of the present invention is to provide an overspeed governor for an elevator, which is safer than the previous solutions.

[0007] Another object of the present invention is to make available an overspeed governor for an elevator, which is versatile and easy to adapt to different requirements.

[0008] The stated technical task and specified objects are substantially achieved by an overspeed governor for an elevator, comprising:

a sheave rotatably mounted with respect to a frame;
a cam mounted on a side of the sheave so as to rotate with the sheave;
a pendulum member mounted on the frame so to rotate around a pivotal point, the pendulum member being provided with a tripping pawl at a second end thereof;
a cam follower wheel mounted on the pendulum member at a first end thereof so as to follow the profile of the cam when the sheave is rotating, the cam having a profile such that for rotation speeds of the sheave greater than a first rotation speed, the cam follower wheel momentarily loses contact with the cam at intervals;
a plurality of engaging portions arranged on a side of the sheave so as to rotate with the sheave, the engaging portions and the pendulum member being arranged so that at reaching of a second rotation speed of the sheave which is greater than the first one, the tripping pawl engages one of the engaging portions;
a main resisting element mounted between the frame and the pendulum member.

[0009] Originally, the overspeed governor comprises at least one additional resisting element which is configured to be active on the pendulum member starting from a third rotation speed of the sheave. The third rotation speed is intermediate in value between the first rotation speed and second rotation speed.

[0010] According to one aspect of the invention, the overspeed governor comprises a lever mounted on the pivotal point of the pendulum member.

[0011] The resisting element is arranged to act on the lever.

[0012] According to one aspect of the invention, the overspeed governor comprises a drive pin protruding from the pendulum member.

[0013] Preferably, the drive pin and the lever are mutually arranged so that the drive pin comes in contact with the lever at reaching of the third rotation speed of the sheave.

[0014] Preferably, the overspeed governor comprises an adjustable mechanical stopper operatively active on the lever to set a desired distance of the lever from the drive pin.

[0015] According to one embodiment, the additional resisting element is a weight. According to one alternative embodiment, the additional resisting element is an extension spring.

[0016] According to one alternative embodiment, the additional resisting element is a torsion spring.

[0017] According to one alternative embodiment, the additional resisting element is a compression spring.

[0018] According to a preferred embodiment, the main resisting element is an extension spring.

[0019] According to one aspect of the invention, the overspeed governor comprises a switch arranged so that the pendulum member activates it when the third rotation speed is reached by the sheave.

[0020] Additional features and advantages of the present invention will become more apparent from the non-limiting, description of a preferred, but non-exclusive embodiment of an overspeed governor for an elevator

and an elevator comprising such overspeed governor, as illustrated in the appended drawings, in which:

- figures 1-3 illustrate an overspeed governor for an elevator, according to the present invention, respectively in a rear view, a perspective view and a front view;
- figures 4-7 illustrates different embodiments of an additional resisting element of the overspeed governor of figures 1-3, in a rear view.

[0021] With reference to the figures, number 1 indicates an overspeed governor for an elevator. In particular, the overspeed governor is of the latch type, as will emerge below. In the following, the overspeed governor 1 will be briefly indicated as "governor".

[0022] The governor 1 comprises a sheave 2 rotatably mounted with respect to a frame 25. In particular, the sheave 2 rotates with respect to a rotation axis X. Preferably, the rotation axis X is defined by a sheave bearing 24.

[0023] The governor 1 comprises a cam 4 mounted on a side of the sheave 2 so as to rotate with the sheave 2. In particular, the cam 4 rotates with the sheave 2 around the rotation axis X.

[0024] The governor 1 comprises a pendulum member 5 mounted on the frame 25 so to rotate around a pivotal point 6. Preferably, the pendulum member 5 has a first end and a second end. Preferably, the first end and the second end are on opposite sides of the pendulum member 5 with respect to the pivotal point 6. In this way, during a rotation about the pivotal point, when a first end goes up, the second end goes down, and vice versa.

[0025] The governor 1 comprises a cam follower wheel 3 mounted on the pendulum member 5 at a first end thereof. The cam follower wheel 3 is arranged to follow the profile of the cam 4 when the sheave 2 is rotating.

[0026] The governor 1 comprises a tripping pawl 8 provided on the pendulum member 5 at a second end thereof.

[0027] The governor 1 comprises a plurality of engaging portions 9 which are arranged so as to rotate with the sheave 2. Preferably, the engaging portions 9 are latches. In alternative, the engaging portions 9 are notches.

[0028] Preferably, the engaging portions 9 are arranged on a support plate 10 which is mounted on a side of the sheave 2 so as to rotate with the sheave 2. Preferably, the engaging portions 9 are distributed in a circumferential direction around the rotation axis X.

[0029] The cam 4 has a profile such that for rotation speeds of the sheave 2 greater than a first rotation speed, the cam follower wheel 3 momentarily loses contact with the cam 4 at intervals. In other words, the cam follower wheel 3 make leaps with respect to the cam 4 at intervals.

[0030] Typically, the cam 4 is shaped as a polygonal figure with rounded corners. In particular, the minimum configuration is a square with rounded corners. The preferred solution, illustrated in figures, is a pentagon with rounded corners. Also a hexagon with rounded corners would be suitable.

[0031] Appropriately, the number of engaging portions 9 needs to correspond with the number of rounded corners of the cam.

[0032] The engaging portions 9 and the pendulum member 5 are arranged so that at reaching of a second rotation speed of the sheave 2, the tripping pawl 8 engages one of the portions 9. The second rotation speed is greater than the first one. The second rotation speed is known as tripping speed.

[0033] Preferably, the engaging portions 9 are notches.

[0034] The governor 1 comprises a main resisting element 23 mounted between the frame 25 and the pendulum member 5, preferably in correspondence of the first end thereof.

[0035] The movement of the cam follower wheel 3 along the cam 4 generates a centrifugal force on the pendulum member 5. The resistance force offered on the pendulum member 5 against the centrifugal force is key to determine when the cam follower wheel 3 starts to loses contact with the cam 4 (first rotation speed) and when the tripping pawl 8 engages one of the notches 9 (second rotation speed).

[0036] The main resisting element 23 is always active on the pendulum member 5 to oppose the centrifugal force. Therefore, the main resisting element 23 offers always the same resisting force.

[0037] Originally, the governor 1 comprises at least one additional resisting element 12 which is configured to be active on the pendulum member 5 starting from a third rotation speed of the sheave 2. The third rotation speed is intermediate in value between the first rotation speed and second rotation speed.

[0038] The additional resisting element 12 acts on the pendulum member 5 in addition to the main resisting element 23. This allows to adjust the spring rate between the third speed and the second speed, thus generating a non-linear spring (i.e. resistance) curve.

[0039] Indeed, the resisting element 12 may only take effect when the third rotation speed has been reached. Before that, only the main resisting element 23 is acting.

[0040] Here follows a brief description of the overspeed governor in function. As the speed of the sheave 2 increases, the pendulum member 5 reaches such a point at which the cam follower wheel 3 no longer follows entirely the cam 4 due to the inertia of the pendulum member 5 (first rotation speed mentioned above). The point at which the cam follower wheel 3 can no longer follow the cam 4 is primarily determined by main resisting element 23.

[0041] When the rotation speed of the sheave 2 increases further, the motion of the pendulum member 5 will also increase correspondingly up to a level at which the cam follower wheel 3 takes off from the cam profile reaching a certain distance from it. In this situation, one of

notches 9 will catch the tripping pawl 8 of the pendulum member 5. Then, the rotation of the sheave 2 is prevented, giving rise to generation of a traction between the sheave 2 and the governor rope. By making use of this traction force, the upward or downward safety device attached to the rope of the governor is put into actuation.

[0042] Thanks to the intervention of the resisting element 12 from the third rotation speed on, the resistance force offered against the centrifugal force of the pendulum member 5 can be modulated.

[0043] According to the preferred embodiment, the governor 1 comprises a lever 13 mounted on the pivotal point 6 of the pendulum member 5. The pendulum member 5 is provided with a drive pin 14 protruding thereof.

[0044] Preferably, the resisting element 12 is arranged to act on the lever 13.

[0045] Preferably, the drive pin 14 is located on a side of the pendulum member 5 which is opposite to the cam follower wheel 3 with respect to the pivotal point 6. In particular, the drive pin 14 is integral with the pendulum member 5 so as to transfer to it the forces received.

[0046] The lever 13 and the drive pin 14 are mutually arranged so that the drive pin 14 comes in contact with the lever 13 at reaching of the third rotation speed. This brings the resisting element 12 to act on the pendulum member 5.

[0047] Preferably, the lever 13 is kept at a set distance from the drive pin 14 by means of an adjustable mechanical stopper 15. The set distance is considered in a resting condition of the overspeed governor. In this way, the moment when the resisting element 12 should act can be adjusted with the stopper 15.

[0048] Preferably, the mechanical stopper 15 is supported by a bracket 16 which is mounted on the frame 25. Preferably, the mechanical stopper 15 is tightened to the bracket 16 by a nut 17.

[0049] According to a first embodiment, the resisting element 12 is a weight. The required force can be adjusted with more or less weight.

[0050] According to a second embodiment, the resisting element 12 is an extension spring. The required force can be adjusted via an eccentric cam 18. Preferably, the eccentric 18 is kept in place by a nut 18a.

[0051] In particular, the eccentric cam 18 can be used to change the pretension of the extension spring. The pretension is defined by the position of the adjustable stopper 15 and the position of the eccentric 18. For the adjustment, the spring pretension can be changed (by means of eccentric 18) as well as the speed when the extension spring 12 adds additional force to the main resisting element 23 (by means of adjustable stopper 15). As soon as the tripping pawl 8 is moving further than intended for the third speed the additional lever 13 is lifted via the drive pin 14 from the adjustable stopper 15 and the adjusted pretension force of the extension spring 12 is immediately added to the force of the main resisting element 23.

[0052] According to a third embodiment, the resisting element 12 is a torsion spring. The required force can be adjusted with a first adjustment screw 19 acting on the torsion spring itself, preferably on one end thereof. The first adjustment screw 19 is tightened with a nut 19a. The first adjustment screw 19 is preferably at least partly housed in a housing 19b.

[0053] According to a fourth embodiment, the resisting element 12 is a compression spring. The required force can be adjusted with a second adjustment screw 20 acting on a bracket 21, which compresses more or less the compression screw. Preferably, the adjustment screw 20 is tightened to the bracket 21 by a nut 22.

[0054] According to a fifth embodiment (not illustrated), the resisting element 12 is magnets with opposite polarity.

[0055] According to one embodiment, the governor 1 comprises more than one resisting element 12. The resisting elements 12 can be of the same type or of different types combined.

[0056] According to the preferred embodiment, the governor 1 comprises a switch 26 arranged to be activated by the pendulum member 5 when the third rotation speed is reached by the sheave 2. In this case, the third rotation speed is known as the contact speed.

[0057] Preferably, the pendulum member 5 comprises an activation bolt 27 protruding from an end thereof.

[0058] When the contact switch is opened, the safety chain of the elevator is opened causing the motor being shut down and the motor brake to close. In case this is not effective and the car or counterweight is still accelerating (e.g. gearbox failure, brake failure or broken hoist ropes), it trips the emergency brakes (safety gear) mechanically ensuring a mechanical stop of the car or counterweight as a second safety level.

[0059] According to the preferred embodiment, the main resisting element 23 is an extension spring. The mounting operations are the easiest and there is very little risk of wear between the parts as the main resisting element sees a very high number of cycles (for example, the extension spring is extended 5 times per revolution of the sheave) while the additional resisting element is only extended/moved in case the third speed is exceeded what is only in case of emergency or testing.

[0060] However, the same main resisting force can be offered by a torsion spring or other types of resisting element already mentioned above.

[0061] According to the preferred embodiment, illustrated in figures, more than one additional resisting element 12 is present. The additional resisting elements 12 used can be of the same type (for example, multiple extension springs or torsion springs or weights or compression springs) or can be of mixed types (for example, one extension spring, one torsion spring, one weight and one compression spring). Choice of configuration aside, all these additional resisting elements 12 become active on the pendulum member 2 only after reaching of the third speed of the sheave 2.

[0062] The characteristics of the overspeed governor

for an elevator and the elevator comprising such overspeed governor, according to the present invention, emerge clearly from the above description, as do the advantages.

[0063] In particular, the presence of at least one additional resisting element which intervene only after the reaching of the third speed allows to modulate the opposing force to the centrifugal force. This makes the governor highly versatile and safe, since the parameters can be adjusted at will.

[0064] Moreover, the different embodiments of the resisting element provide high repeat accuracy of the contact speed/tripping speed ratio.

[0065] Moreover, the different embodiments of the resisting element described allows an easy adjustment of the governor.

Claims

1. Overspeed governor (1) for an elevator, comprising:

a sheave (2) rotatably mounted with respect to a frame (25);
a cam (4) mounted on a side of the sheave (2) so as to rotate with the sheave (2);
a pendulum member (5) mounted on the frame (25) so to rotate around a pivotal point (6), the pendulum member (5) being provided with a tripping pawl (8) at a second end thereof;
a cam follower wheel (3) mounted on the pendulum member (5) at a first end thereof so as to follow the profile of the cam (4) when the sheave (2) is rotating, the cam (4) having a profile such that for rotation speeds of the sheave (2) greater than a first rotation speed, the cam follower wheel (3) momentarily loses contact with the cam (4) at intervals;
a plurality of engaging portions (9) arranged on a side of the sheave (2) so as to rotate with the sheave (2), the engaging portions (9) and the pendulum member (5) being arranged so that at reaching of a second rotation speed of the sheave (2), which is greater than the first one, the tripping pawl (8) engages one of the engaging portions (9);
a main resisting element (23) mounted between the frame (25) and the pendulum member (5),
characterized in that it comprises at least one additional resisting element (12) which is configured to be active on the pendulum member (5) starting from a third rotation speed of the sheave (2), said third rotation speed being intermediate in value between the first rotation speed and second rotation speed.

2. The overspeed governor (1) according to claim 1, comprising a lever (13) mounted on the pivotal point (6) of the pendulum member (5), the resisting element (12) being arranged to act on the lever (13); the overspeed governor (1) further comprising a drive pin (14) protruding from the pendulum member (5), the drive pin (14) and the lever (13) being mutually arranged so that the drive pin (14) comes in contact with the lever (13) at reaching of the third rotation speed of the sheave (2).

3. The overspeed governor (1) according to claim 2, comprising an adjustable mechanical stopper (15) operatively active on the lever (13) to set a desired distance of the lever (13) from the drive pin (14).

4. The overspeed governor (1) according to any one of the preceding claims, wherein the additional resisting element (12) is a weight.

5. The overspeed governor (1) according to any one of claims 1 to 3, wherein the additional resisting element (12) is an extension spring.

6. The overspeed governor (1) according to any one of claims 1 to 3, wherein the additional resisting element (12) is a torsion spring.

7. The overspeed governor (1) according to any one of claims 1 to 3, wherein the additional resisting element (12) is a compression spring.

8. The overspeed governor (1) according to any one of the preceding claims, wherein the main resisting element (23) is an extension spring.

9. The overspeed governor (1) according to any one of the preceding claims, comprising a switch (26) arranged so that the pendulum member (5) activates it when the third rotation speed is reached by the sheave (2).

10. Elevator comprising an overspeed governor (1) according to any one of the preceding claims.

FIG. 1

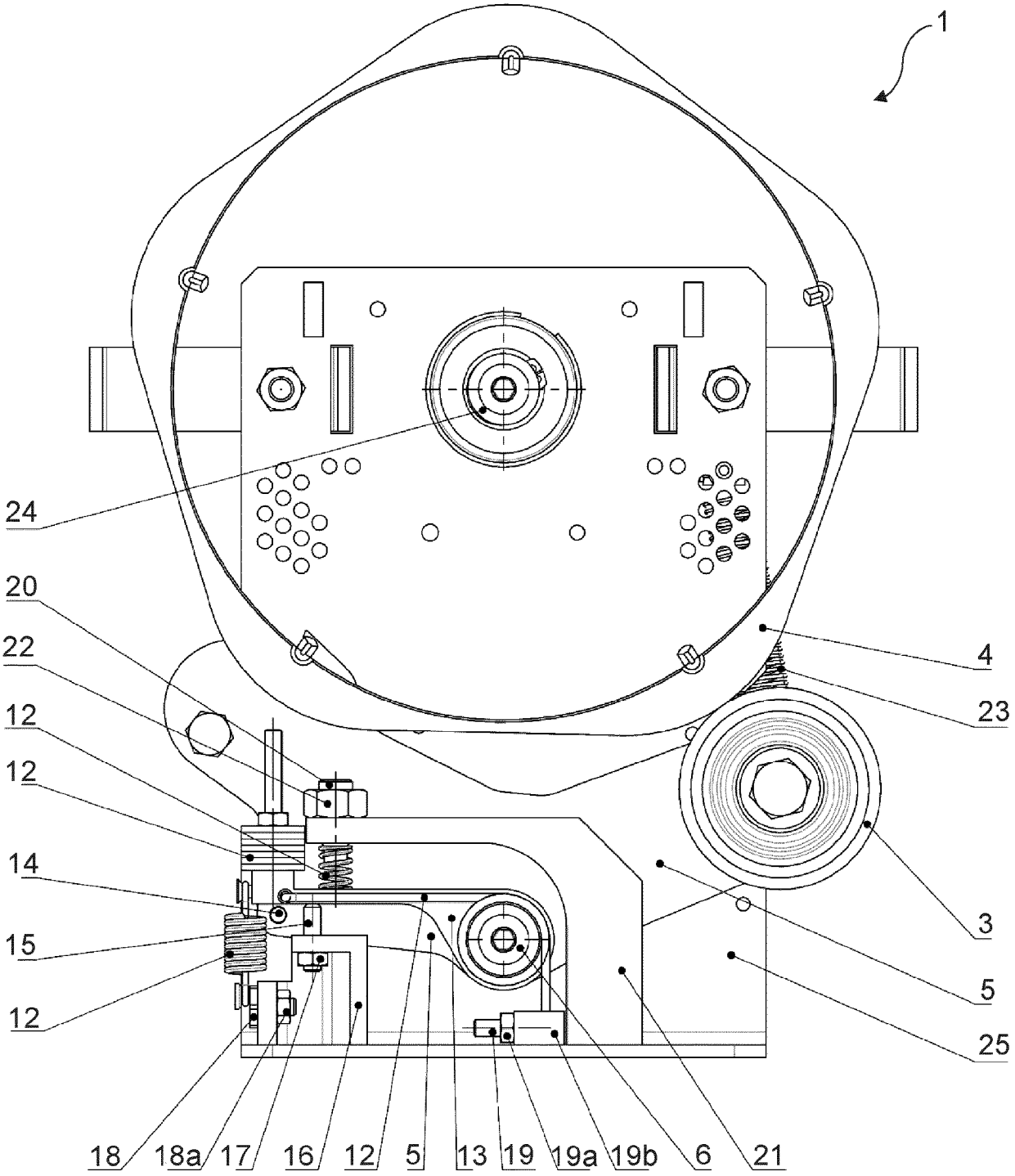


FIG. 2

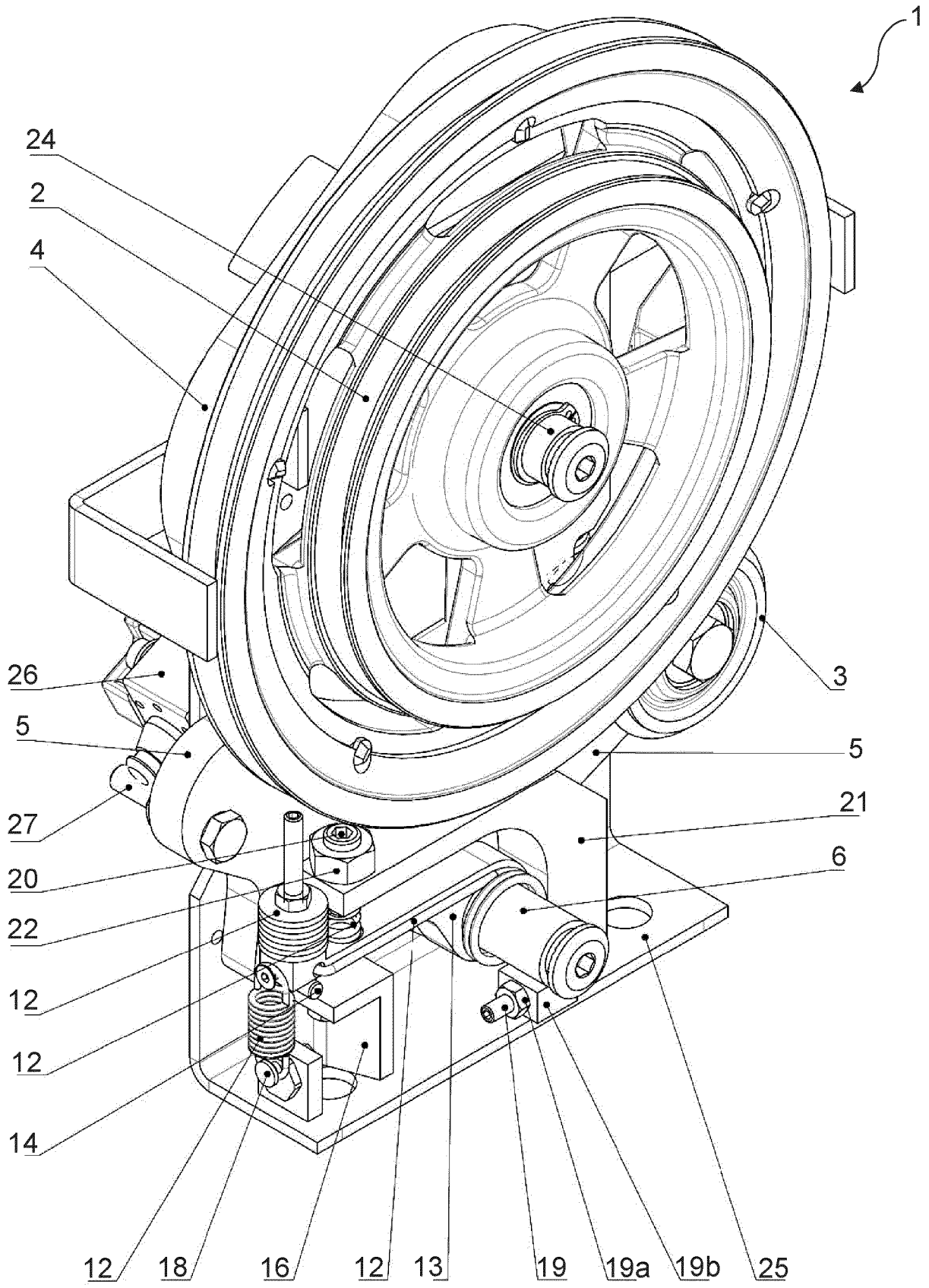


FIG. 3

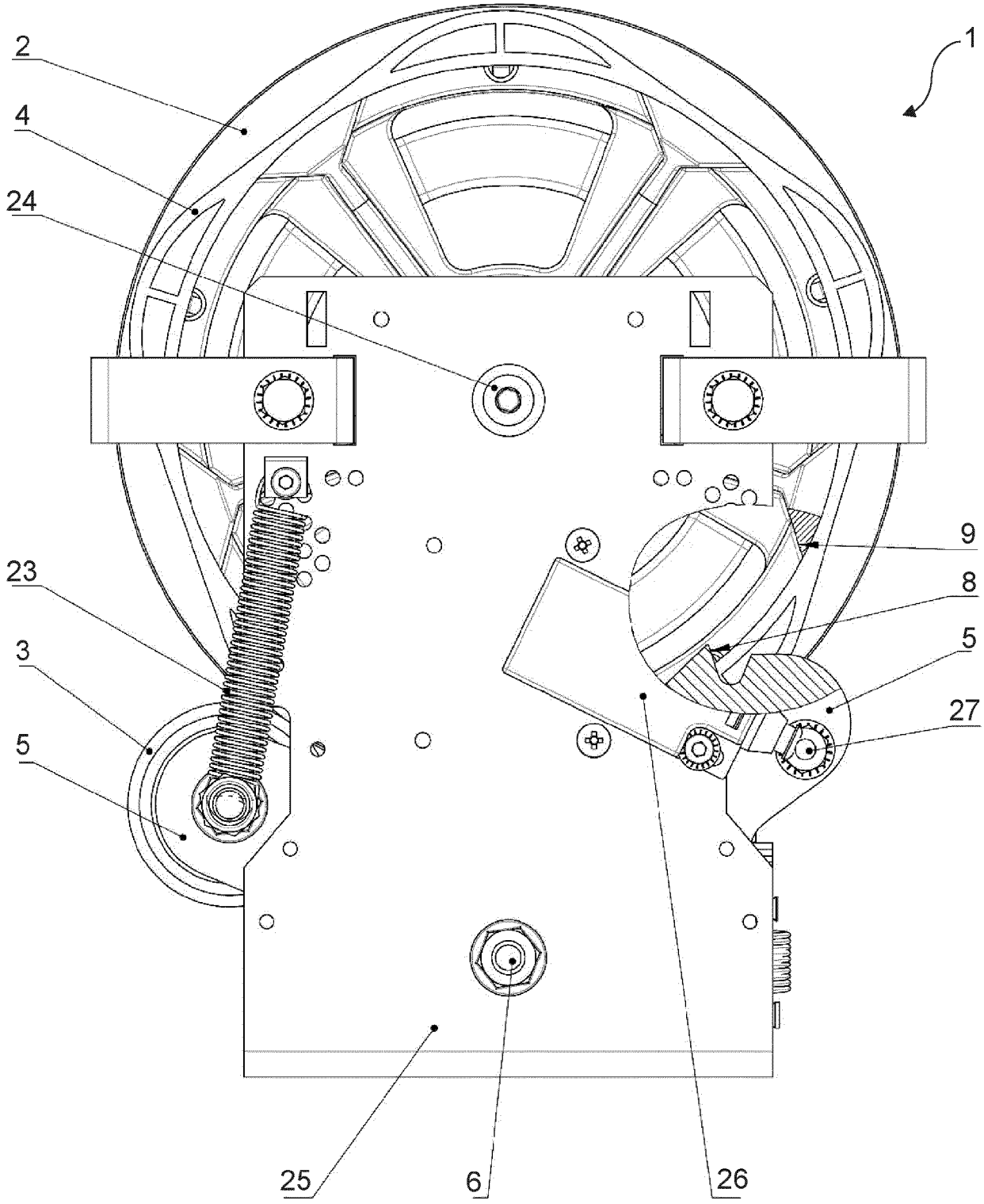


FIG. 4

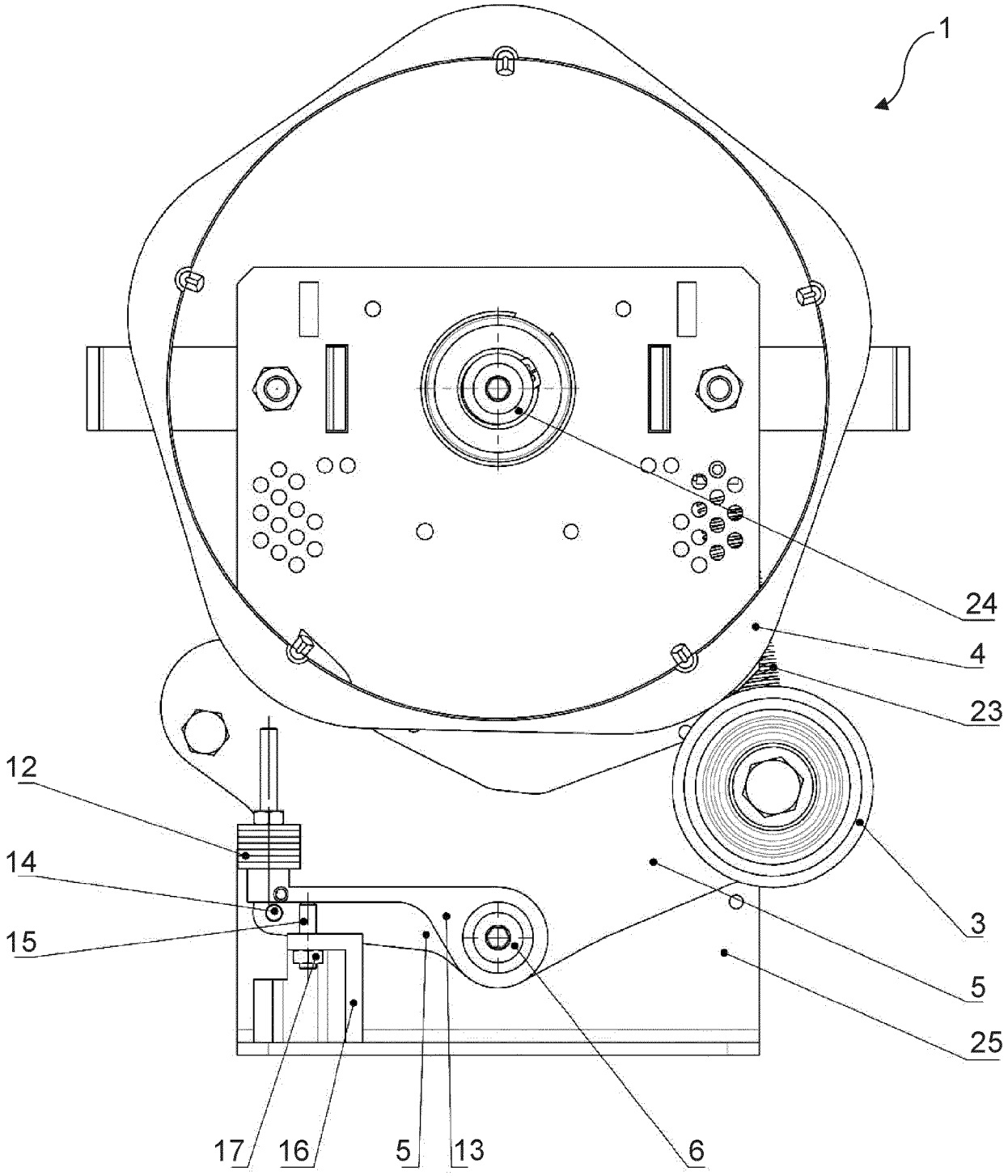


FIG. 5

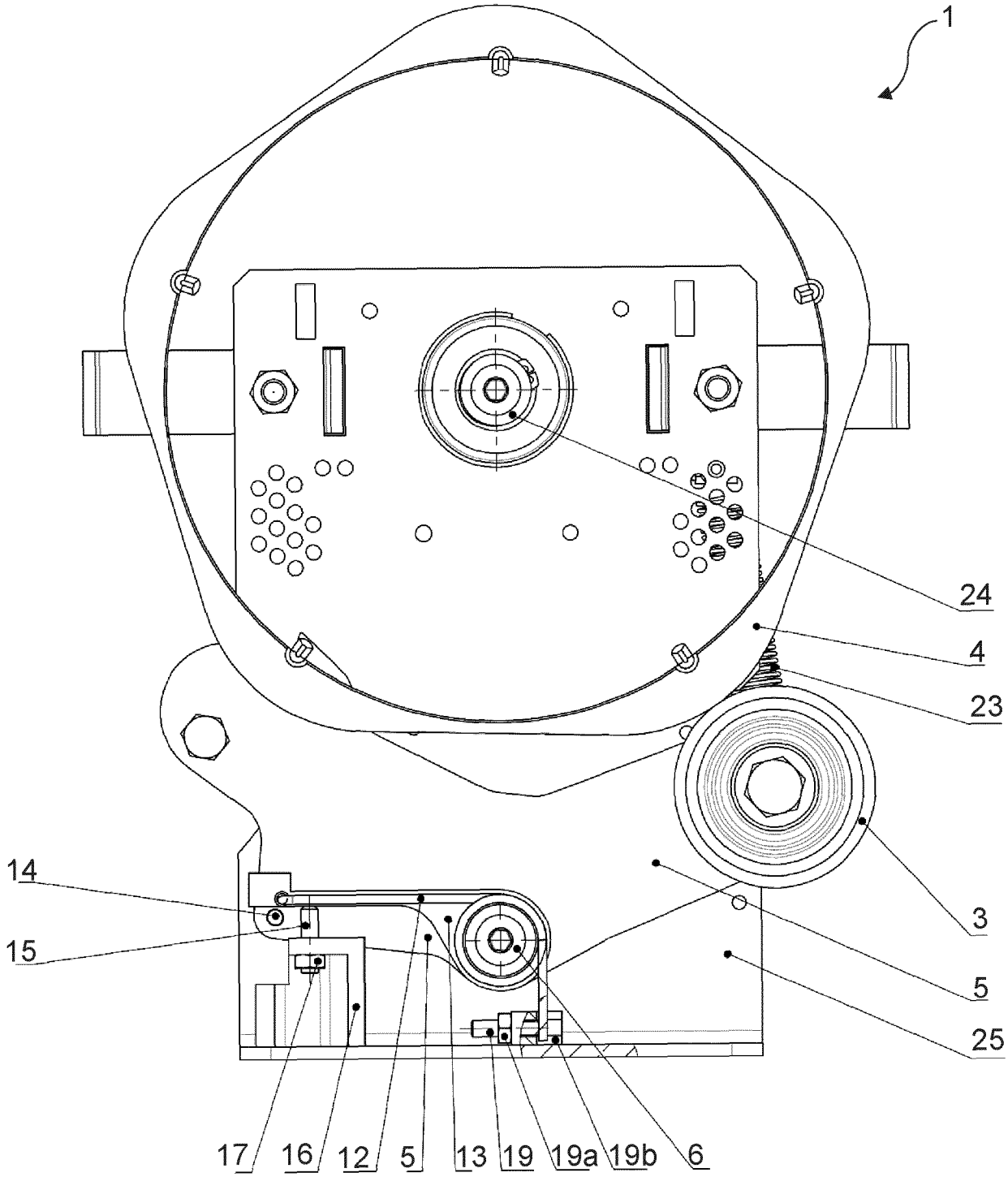


FIG. 6

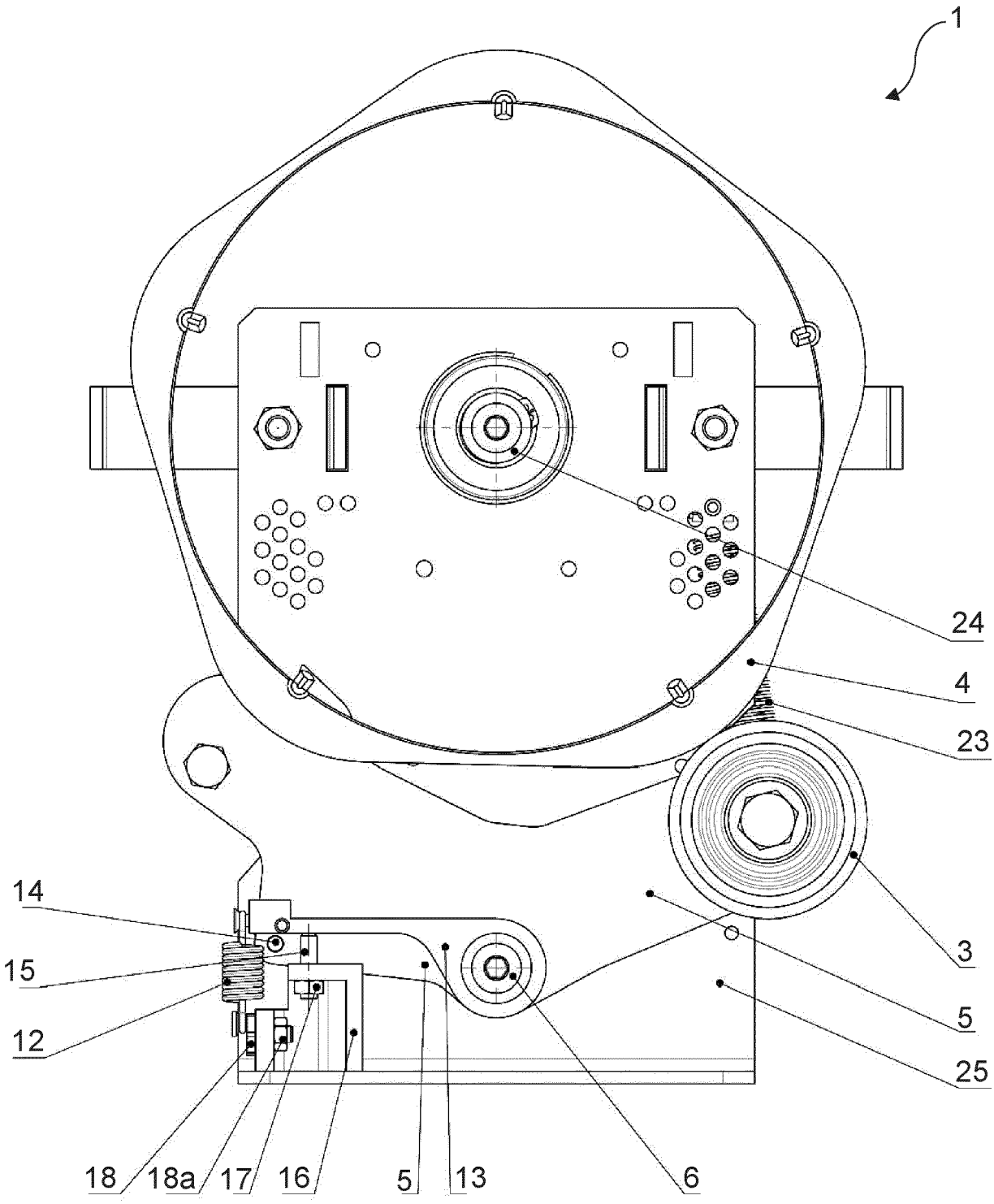
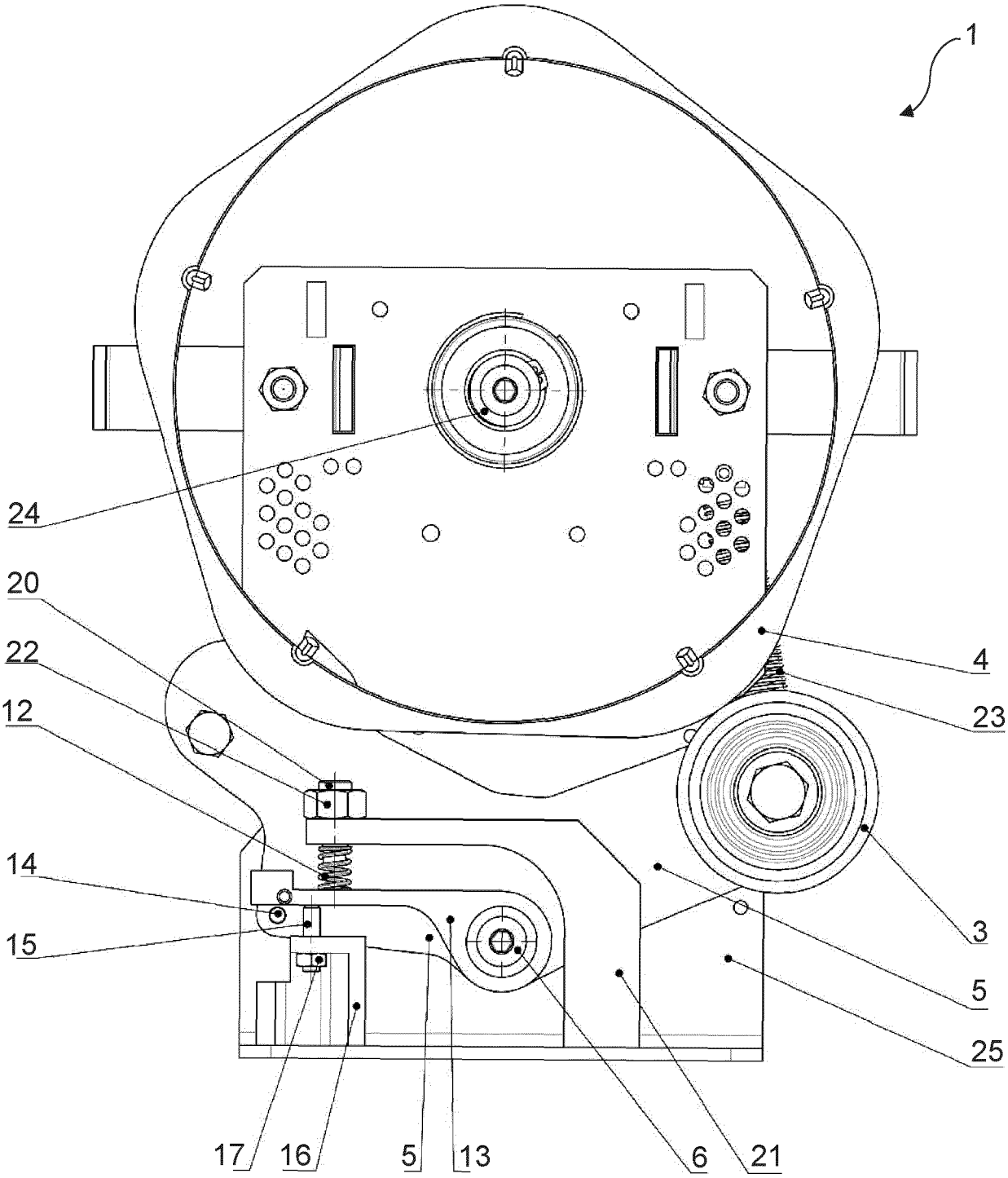


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 6273

DOCUMENTS CONSIDERED TO BE RELEVANT

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TECHNICAL FIELDS SEARCHED (IPC)

B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 February 2024	Lenoir, Xavier

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