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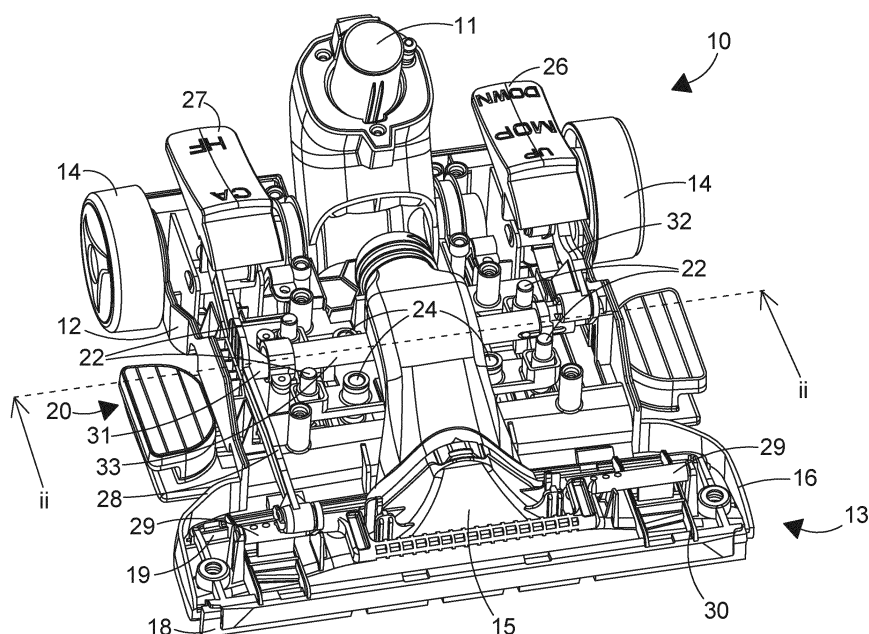
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(54) **FLOOR CLEANING APPARATUS**

(57) A vacuum cleaning appliance having a first actuator pedal 26 for raising and lowering a steam applicator 20 and a second actuator pedal 27 for raising and lowering floor engaging brushes or other members 18, 19 in hard floor and carpet cleaning modes of the cleaner respectively. The position of the steam applicator 20 relative to the floor surface being cleaned is automatically adjusted according to whether the appliance is being used in the hard floor or carpet cleaning mode. When

vacuum cleaning hard floors with steam, the lowered position of the steam applicator 20 is adjusted to be further away from the underside of a chassis 12 of the head 10 than it is when the when vacuum cleaning carpets with steam. In this manner, the steam applicator 20 is always positioned at the optimal distance from the floor surface in both the hard floor and carpet cleaning modes of the floor cleaning appliance and the steam cleaning efficiency is optimised.



**FIG. 1**

## Description

**[0001]** Floor cleaning apparatus are known which can provide the user with a plurality of different cleaning methods, which the user can select according to his/her need. EP2689704 discloses one such apparatus which comprises a steaming cleaning function and a vacuum cleaning function. In use, the user is able to carry out vacuum cleaning and steam cleaning either independently or simultaneously as desired.

**[0002]** It is generally preferable to perform vacuum cleaning of hard surfaces using a floor cleaning apparatus of the type disclosed in GB2374523 having a suction mouth on the underside of its cleaning head, which is at least partially bounded by a floor-engaging member, such as an elongate brush and/or wiper, since this is known to improve the cleaning efficiency of the floor cleaning apparatus. However, the use of such a floor-engaging member is undesirable when cleaning carpets, since it increases the tractive effort required to move the head backwards and forwards across the floor surface and also potentially damages the carpet.

**[0003]** In order to overcome the above-mentioned problems, it is well known to provide floor cleaning apparatus with floor-engaging heads having elongate brushes and/or wipers which can be selectively deployed according to whether a user is carrying out vacuum cleaning on a hard floor or a carpet.

**[0004]** Floor cleaning appliances that are able to carry out both vacuum cleaning and steam cleaning using such a selectively deployable brush and/or wiper suffer from the problem that the deployment of the brush and/or wiper effectively raises the attitude of the head of the appliance on the floor, with the result that the steam applicator is displaced further away from the floor during hard floor cleaning and hence its effectiveness at cleaning is reduced.

**[0005]** With the foregoing in mind, we have now devised an improved floor cleaning appliance.

**[0006]** In accordance with the present invention, there is provided a floor cleaning appliance comprising a floor-engaging head having a body portion, a first actuator and a displaceable portion on the underside thereof which can be selectively displaced from a raised position into a lowered position by movement of the first actuator from a first position to a second position and vice-versa, the appliance further comprising a second actuator having a first and second operating positions for respectively selecting first and second operating modes of the cleaner, wherein the degree of displacement of the displaceable portion upon movement of the first actuator from the first position to the second position is dependent upon the operating mode selected by said second actuator.

**[0007]** In the case of a floor cleaning appliance that is able to carry out both vacuum cleaning and steam cleaning, the displaceable member may comprise a steam applicator and the first and second positions of the second actuator may respectively select a hard floor cleaning

mode or a carpet cleaning mode of the floor cleaning appliance. The present invention thus enables the position of the steam applicator relative to the floor surface being cleaned to be adjusted according to whether the floor cleaning appliance is being used in a hard floor cleaning mode or a carpet cleaning mode.

**[0008]** When the hard floor cleaning mode is selected during steam cleaning, the second actuator may cause a brush, wiper or other floor-engaging member to be lowered from the underside of the body of the head. Simultaneously, the lowered position of the steam applicator is adjusted to be further away from the underside of the body portion of the head than it is when the carpet cleaning mode is selected. Likewise, when the carpet cleaning mode is selected during steam cleaning, the second actuator may cause the brush, wiper or other floor-engaging member to be raised towards the underside of the body of the head. Simultaneously, the lowered position of the steam applicator is adjusted to be nearer to the underside of the body portion of the head than it is when the hard floor cleaning mode is selected. In this manner, the steam applicator is positioned at the optimal distance from the floor surface in both the hard floor cleaning mode and the carpet cleaning mode of the floor cleaning appliance.

**[0009]** The steam applicator or other displaceable member may be biased towards the underside of the body portion of the head. The first actuator may comprise a cam which acts against a camming surface on the displaceable member to displace the displaceable member away from the body portion of the head when the first actuator is moved from the first position to the second position and vice-versa, wherein actuation of the second actuator from the first position to the second position displaces the cam from a first portion of the camming surface to a second portion of the camming surface and vice-versa, the second portion having a different profile than said first portion.

**[0010]** Each portion of the camming surface may have a stepped profile, wherein the height of the step of said first portion is greater than that of said second portion, so that actuation of the first actuator causes the displaceable member to be displaced further when the second actuator is in the first position than it is when the second actuator is in the second position.

**[0011]** The portions of the camming surface may be separated by an inclined portion which allows the cam to move from one camming surface to the other when the second actuator is moved between the first and second positions.

**[0012]** The first actuator may comprise a portion which is rotatable about an axis, the cam being displaceable axially of the rotational axis when the second actuator is actuated.

**[0013]** The cam may be provided on a rotatable shaft which is biased away from the first actuator and slidably abuts against an abutment surface on the second actuator, wherein actuation of the second actuator displaces the abutment surface such that the point of abutment of

the shaft against the second actuator moves from a first portion of the abutment surface to a second portion of the abutment surface, the portions of the abutment surface being disposed at different distances away from the first actuator such that movement of the second actuator causes axial displacement of the shaft and displaces the cam from the first portion of the camming surface to the second portion of the camming surface.

**[0014]** The shaft may comprise a ball which abuts against the abutment surface on the second the actuator and helps to reduce friction therebetween when the second actuator is displaced.

**[0015]** An embodiment of the present invention will now be described by way of an example only and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view from the front and above of the head of a floor cleaning appliance in accordance with the present invention which is able to carry out both vacuum cleaning and steam cleaning, the head being shown with an upper cover removed;

Figure 2 is a sectional view in the vertical plane along the line ii-ii of the appliance head Figure 1, when steam cleaning with the head is in its hard floor cleaning mode;

Figure 3 is a plan view of an actuator plate of a displaceable steam mop of the appliance head of Figure 1, with one end thereof also being shown in an enlarged perspective view;

Figure 4 is a part sectional view in the vertical plane along the line ii-ii of the appliance head Figure 1, when steam cleaning with the head is in its carpet cleaning mode;

Figure 5 is a cut-away plan view illustrating the position of a cam assembly against the actuator plate of Figure 3, when steam cleaning with the head is in its carpet cleaning mode;

Figure 6 is a sectional view in the vertical plane along the line ii-ii of the appliance head Figure 1, when cleaning without steam with the head is in its hard floor cleaning mode;

Figure 7 is a cut-away plan view illustrating the position of the cam assembly of Figure 5 against the actuator plate of Figure 3, when cleaning without steam with the head is in its hard floor cleaning mode;

Figure 8 is a sectional view in the vertical plane along the line ii-ii of the appliance head Figure 1, when cleaning without steam with the head is in its carpet cleaning mode;

Figure 9 is a cut-away plan view illustrating the position of the cam assembly of Figure 5 against the actuator plate of Figure 3, when cleaning without steam with the head is in its carpet cleaning mode; and

Figures 10A to 10D are side views of the appliance head Figure 1 when cleaning with and without steam its carpet and floor cleaning modes respectively.

**[0016]** Referring to the drawings, there is shown a head 10 of a floor cleaning appliance in accordance with the present invention which is able to carry out both vacuum cleaning and steam cleaning, the rear of the head 10 comprising an outlet duct 11 for coupling to a suction inlet of the cleaner body (not shown), the outlet duct 11 being pivotally mounted to a chassis 12 of the head 10.

**[0017]** The chassis 12 has a pair of large wheels 14 mounted at the rear thereof. An elongate transversely extending nozzle assembly 13 is mounted at the front of the chassis 12 for engagement with the floor surface. A hollow airflow duct 15 extends rearwardly from the nozzle assembly 13 to the outlet duct 11. The forward end of the duct 15 opens into a downwardly-facing elongate suction mouth that extends transversely of the underside of the head 10 across a soleplate 16 of the nozzle assembly 13. The chassis 12 also has a pair of small wheels 17 mounted rearwardly of the soleplate 16 of the nozzle assembly 13.

**[0018]** A pair of elongate brushes 18, 19 are displaceably mounted on the nozzle assembly 13 at respective positions, which are disposed in front and behind the suction mouth. The cleaner body (not shown) comprises a motor and fan unit, which draws air into the head 10 through the downwardly-facing elongate suction mouth.

**[0019]** A steam applicator assembly 20 is mounted to the underside of the chassis 12 between the front and rear wheels 17, 14. The steam applicator assembly 20 comprises an actuator plate 21 which is disposed above the bottom wall of the chassis 12 and is slidably mounted on two pairs of posts 22 which extend upwardly from the upper surface of the bottom wall of the chassis 12. Helical compression springs (not shown) are disposed on each post 22 between the actuator plate 21 and the upper surface of the bottom wall of the chassis 12 and serve to bias the actuator plate 21 upwardly. A steam pad carrier plate 23 is disposed below the actuator plate 21 and is mounted thereto by two pairs of posts 24 which extend upwardly from the steam pad carrier plate 23 through apertures in the actuator plate 21. The posts 24 comprise enlarged head formations at their upper ends which serve to captively retain the steam applicator assembly 20 to the actuator plate 21. Helical compression springs 25 are disposed on each post 24 between the actuator plate 21 and the carrier plate 23 and act to bias the carrier plate 22 downwardly away from the actuator plate 21.

**[0020]** A first actuator of the floor cleaning appliance comprises a pedal 26 which is pivotally mounted to the

rear of the chassis 12 at one side of the tubular duct 11 and is arranged to selectively displace the steam applicator assembly 20 from a raised position (Figures 10C, 10D) into a lowered position (Figures 10A, 10B) by rearward rotational movement of the pedal 26 of the first actuator from a raised position to a lowered position and vice-versa.

**[0021]** A second actuator of the floor cleaning appliance comprises a pedal 27 which is pivotally mounted to the rear of the chassis 12 at the opposite side of the tubular duct 11 and is arranged to selectively displace the elongate brushes 18, 19 between a retracted (raised) position (Figures 10BC, 10D) in which they extend below the plane of the soleplate 16 of the nozzle assembly 13, and an extended (lowered) position (Figures 10A, 10C) by rearward rotational movement of the pedal 27 of the second actuator from a raised position to a lowered position and vice-versa. Hard floor and carpet cleaning modes of the floor cleaning appliance are provided with the elongate brushes 18, 19 lowered and raised respectively.

**[0022]** The second actuator comprises an elongate actuator arm 28 which extends forwardly from the pedal 27 along one side of the head and rotates a pair of cams 29 which act against a displaceable plate 30 on which the brushes 18, 19 are mounted. Forwards and rearwards movement of the arm 28 (by raising and lowering the pedal 27) thus respectively causes the brushes 18, 19 to retract and extend. An abutment formation 31 extends from the arm 28 at a point disposed intermediate its opposite ends, the formation extends laterally of the head 10 towards the opposite side thereof. The abutment formation 31 provides a laterally-facing abutment surface having a ramp disposed between an inner and outer step.

**[0023]** The first actuator comprises an actuator arm 32 which extends forwardly from the pedal 28 along the opposite side of the head 10 to the arm 28 and rotates a shaft 33 which extends laterally of the head 10 and which comprises a distal end that abuts the abutment formation 31 on the arm 28. The distal end of the shaft 33 comprises a captively-mounted ball which reduces the friction between the shaft 33 and the arm 28 as the arm 28 is moved forwardly and rearwardly. The shaft comprises a pair of radially-projecting cams 35 disposed adjacent respective ends thereof. The proximal end of the shaft 33 is hollow and is slidably mounted on a spigot 36 which extends laterally from the arm 32. A spring 35 mounted inside the proximal end of the shaft 33 biases the shaft 33 against the abutment formation 31 on the arm 28.

**[0024]** The cams 35 bear against respective camming regions 38 provided on the upper surface of the actuator plate 21. Each camming region 38 has a first portion 38A and a second portion 38B having respective stepped profiles, the height of the step of said first portion 38A being greater than that of the second portion 38B.

**[0025]** Referring to Figures 2 and Figure 10A, when vacuum cleaning hard floors with steam, both pedals 26 and 27 are pivoted downwardly into their lowered posi-

tions. The lowered pedal 26 rotates the shaft 33 into a position where the cams 35 extend fully downwardly. The lowered pedal 27 displaces the brushes 18, 19 into their extended (lowered) position in which they extend below the plane of the soleplate 16 of the nozzle assembly 13. In this position, the arm 28 is at its most rearward position, so that the distal end of the shaft 33 is pushed axially of itself (to the right in Figure 2) away from the arm 28 towards the arm 32 by the abutment surface on the abutment formation 31 that extends from the arm 28. This causes the cams 35 to bear against the upper (forward) steps of the first portions 38A of the camming regions 38, thereby displacing the steam applicator 20 fully downwardly.

**[0026]** Referring to Figures 4, 5 and Figure 10B, when vacuum cleaning carpet with steam, the pedal 26 is pivoted downwardly into its lowered position and the pedal 27 is pivoted upwardly into its raised position. The lowered pedal 26 rotates the shaft 33 into a position where the cams 35 extend fully downwardly. The raised pedal 27 displaces the brushes 18, 19 into their retracted (raised) position in which they do not extend below the plane of the soleplate 16 of the nozzle assembly 13. In this position, the arm 28 is at its most forward position, so that the distal end of the shaft 33 moves axially of itself (to the left in Figure 4) towards the arm 28 under the bias of the spring 36. This causes the cams 35 to bear against the upper (forward) steps of the second portions 38B of the camming regions 38, thereby displacing the steam applicator 20 partially downwardly.

**[0027]** Referring to Figures 6, 7 and Figure 10C, when vacuum cleaning hard floors without steam, the pedal 26 is pivoted upwardly into its raised position and the pedal 27 is pivoted downwardly into its lowered position. The raised pedal 26 rotates the shaft 33 into a position where the cams 35 only extend partially downwardly. The raised pedal 27 displaces the brushes 18, 19 into their extended (lowered) position in which they extend below the plane of the soleplate 16 of the nozzle assembly 13. In this position, the arm 28 is at its most rearward position, so that the distal end of the shaft 33 is pushed axially of itself (to the right in Figure 6) away from the arm 28 towards the arm 32 by the abutment surface on the abutment formation 31 that extends from the arm 28. This causes the cams 35 to bear against the lower (rearward) steps of the first portions 38A of the camming regions 38, thereby allowing the steam applicator 20 to move fully upwardly under the bias of the springs 24.

**[0028]** Referring to Figures 8, 9 and Figure 10D, when vacuum carpets without steam, the pedals 26 and 27 are pivoted upwardly into their raised positions. The raised pedal 26 rotates the shaft 33 into a position where the cams 35 only extend partially downwardly. The lowered pedal 27 displaces the brushes 18, 19 into their retracted (raised) position in which they do not extend below the plane of the soleplate 16 of the nozzle assembly 13. In this position, the arm 28 is at its most forward position, so that the distal end of the shaft 33 moves axially of itself

(to the left in Figure 8) towards the arm 28 under the bias of the spring 36. This causes the cams 35 to bear against the lower (rearward) steps of the second portions 38B of the camming regions 38, thereby allowing the steam applicator 20 to move fully upwardly under the bias of the springs 24.

**[0029]** The first and second portions 38A, 38B of the camming region 38 are separated by an inclined portion 38C which allows the cam 35 to move from between the camming surfaces 38A, 38B when the pedal 27 is raised and lowered.

**[0030]** It will be appreciated that present invention thus provides a floor cleaning appliance in which the position of the steam applicator 20 relative to the floor surface being cleaned is automatically adjusted according to whether the floor cleaning appliance is being used in a hard floor cleaning mode or a carpet cleaning mode. When vacuum cleaning hard floors with steam, the lowered position of the steam applicator 20 is adjusted to be further away from the underside of the chassis 12 of the head 10 than it is when the when vacuum cleaning carpets with steam. Likewise, when vacuum cleaning carpets with steam, the lowered position of the steam applicator 20 is adjusted to be nearer to the underside of the chassis 12 of the head 10 than it is when the hard floor cleaning mode is selected. In this manner, the steam applicator is always positioned at the optimal distance from the floor surface in both the hard floor and carpet cleaning modes of the floor cleaning appliance and the steam cleaning efficiency is optimised.

## Claims

1. A floor cleaning appliance comprising a floor-engaging head having a body portion, a first actuator and a displaceable portion on the underside thereof which can be selectively displaced from a raised position into a lowered position by movement of the first actuator from a first position to a second position and vice-versa, the appliance further comprising a second actuator having a first and second positions for respectively selecting first and second operating modes of the cleaner, wherein the degree of displacement of the displaceable portion upon movement of the first actuator from the first position to the second position is dependent upon the operating mode selected by said second actuator.
2. A floor cleaning appliance as claimed in claim 1, in which the appliance is arranged to carry out vacuum cleaning and steam cleaning, wherein the displaceable member comprise a steam applicator and the first and second positions of the second actuator may respectively select a hard floor cleaning mode or a carpet cleaning mode of the floor cleaning appliance.
3. A floor cleaning appliance as claimed in claim 2, in

which the second actuator is displaceable to lower a floor-engaging member from the underside of the body of the head in said hard floor cleaning mode.

4. A floor cleaning appliance as claimed in claim 3, in which the lowered position of the steam applicator selected by said first actuator is configured to be further away from the underside of the body portion of the head in said hard floor cleaning mode than it is when the carpet cleaning mode is selected by said second actuator.
5. A floor cleaning appliance as claimed in claim 1, in which the displaceable member is biased towards the underside of the body portion of the head, the first actuator comprising a cam which acts against a camming surface on the displaceable member to displace the displaceable member away from the body portion of the head when the first actuator is moved from the first position to the second position and vice-versa, wherein actuation of the second actuator from the first position to the second position displaces the cam from a first portion of the camming surface to a second portion of the camming surface and vice-versa, the second portion having a different profile than said first portion.
6. A floor cleaning appliance as claimed in claim 5, in which the camming surface has a stepped profile, the height of the step of said first portion being greater than that of said second portion, so that actuation of the first actuator causes the displaceable member to be displaced further when the second actuator is in the first position than it is when the second actuator is in the second position.
7. A floor cleaning appliance as claimed in claim 5, in which the portions of the camming surface are separated by an inclined portion which allows the cam to move from one camming surface to the other when the second actuator is moved between the first and second positions.
8. A floor cleaning appliance as claimed in claim 1, in which the first actuator comprises a portion which is rotatable about an axis, the cam being displaceable axially of the rotational axis when the second actuator is actuated.
9. A floor cleaning appliance as claimed in claim 8, in which the is provided on a rotatable shaft which is biased away from the first actuator and slidably abuts against an abutment surface on the second actuator, wherein actuation of the second actuator displaces the abutment surface, such that the point of abutment of the shaft against the second actuator moves from a first portion of the abutment surface to a second portion of the abutment surface, the portions of

the abutment surface being disposed at different distances away from the first actuator such that movement of the second actuator causes axial displacement of the shaft and displaces the cam from the first portion of the camming surface to the second portion of the camming surface. 5

10. A floor cleaning appliance as claimed in claim 9, in which the shaft comprises a ball which abuts against the abutment surface on the second the actuator and helps to reduce friction therebetween when the second actuator is displaced. 10

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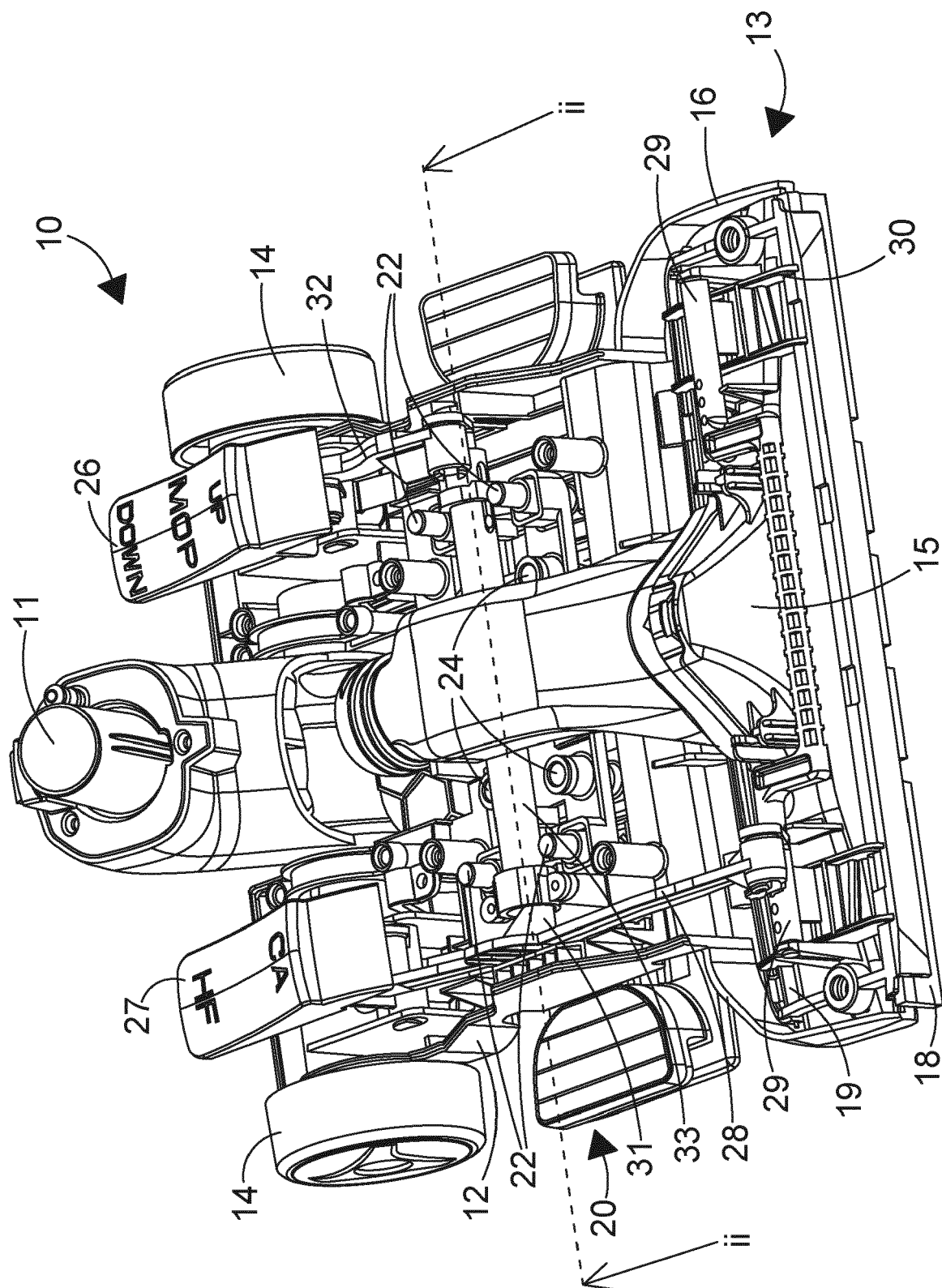
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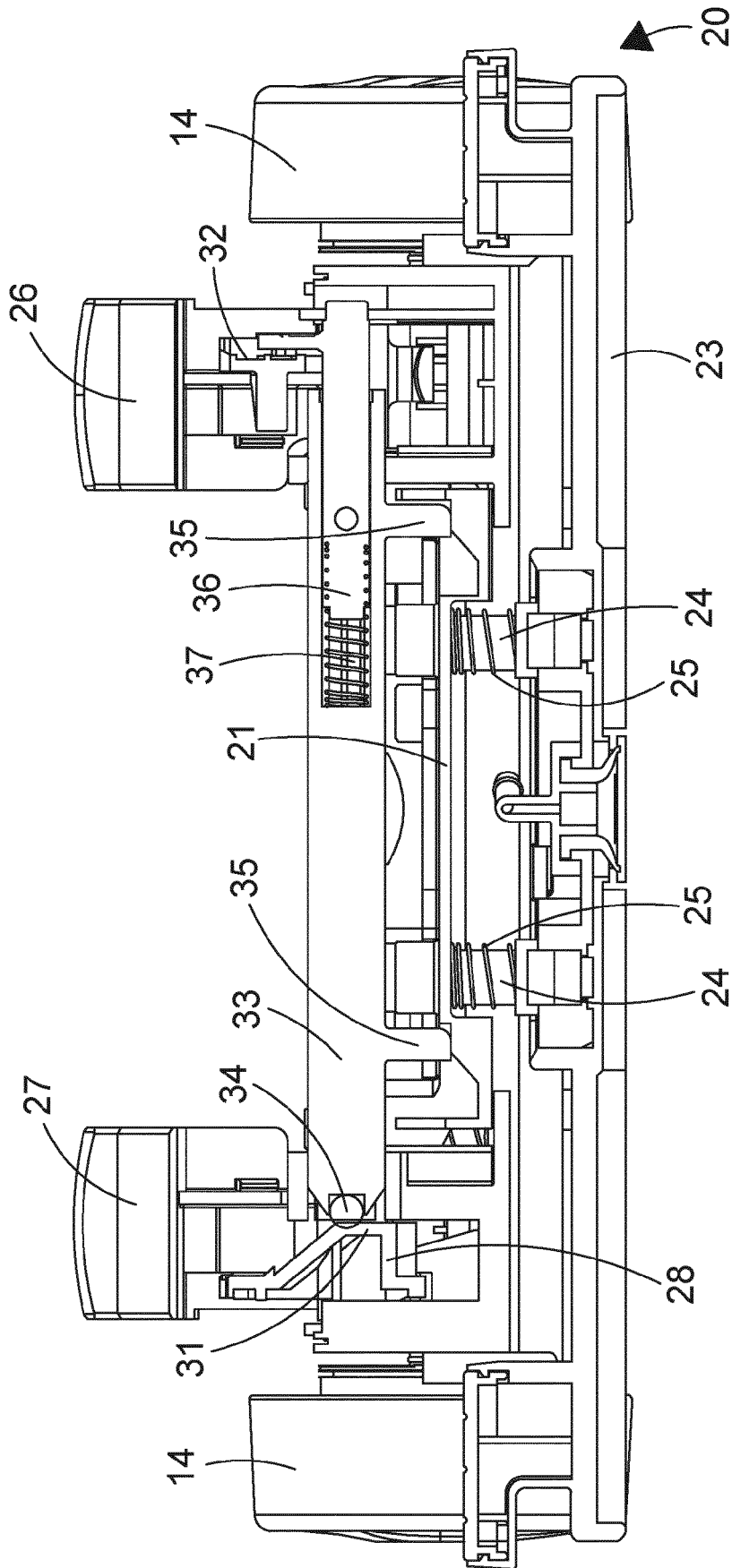


FIG. 2



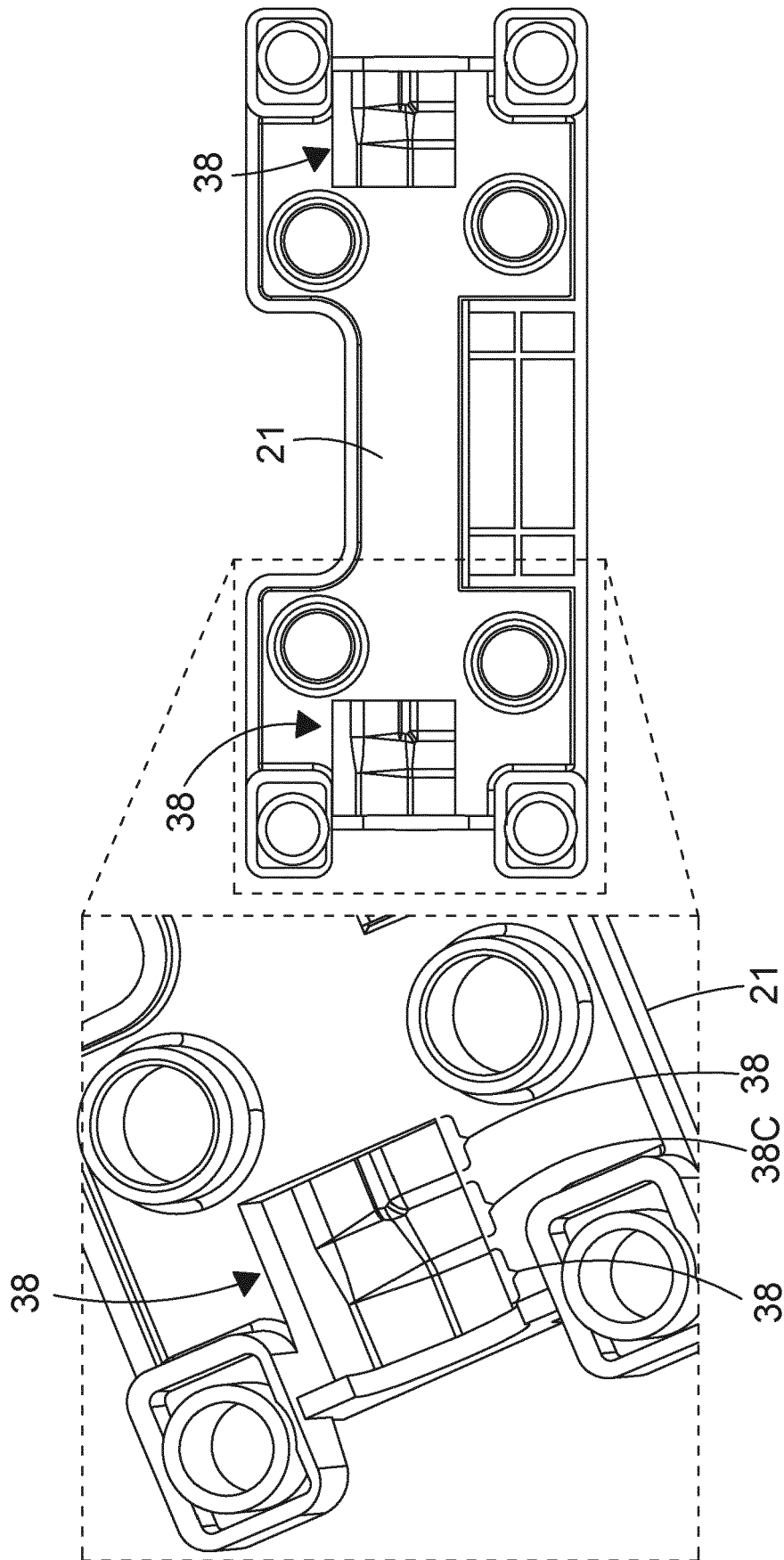
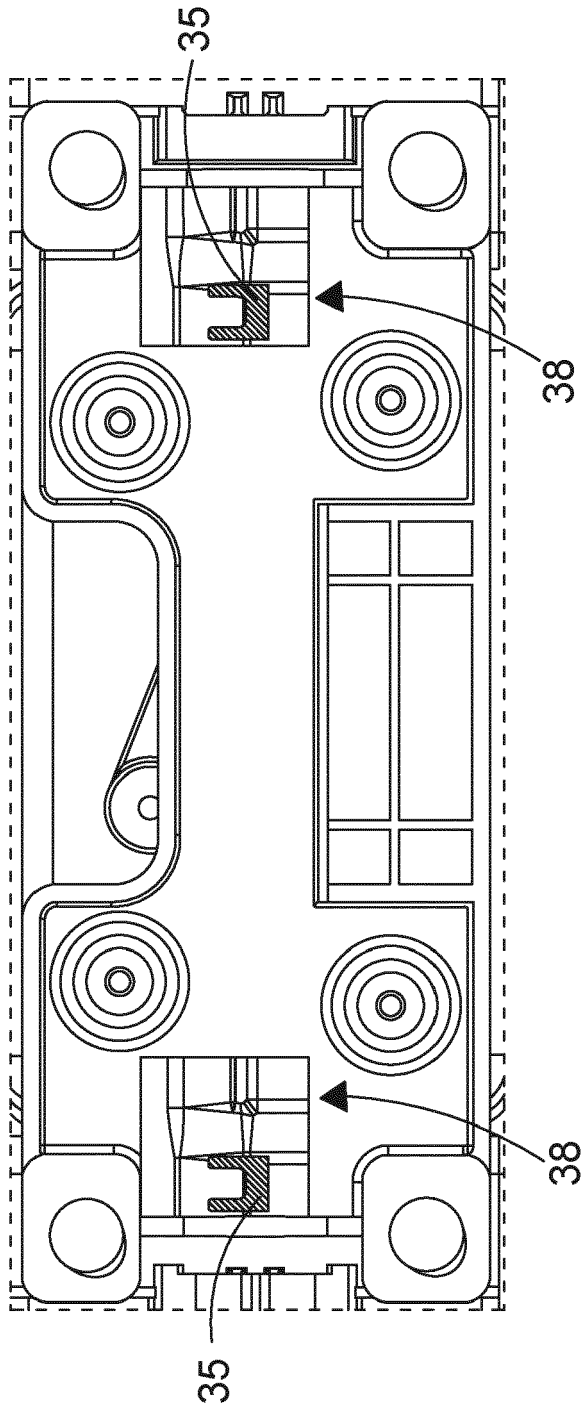
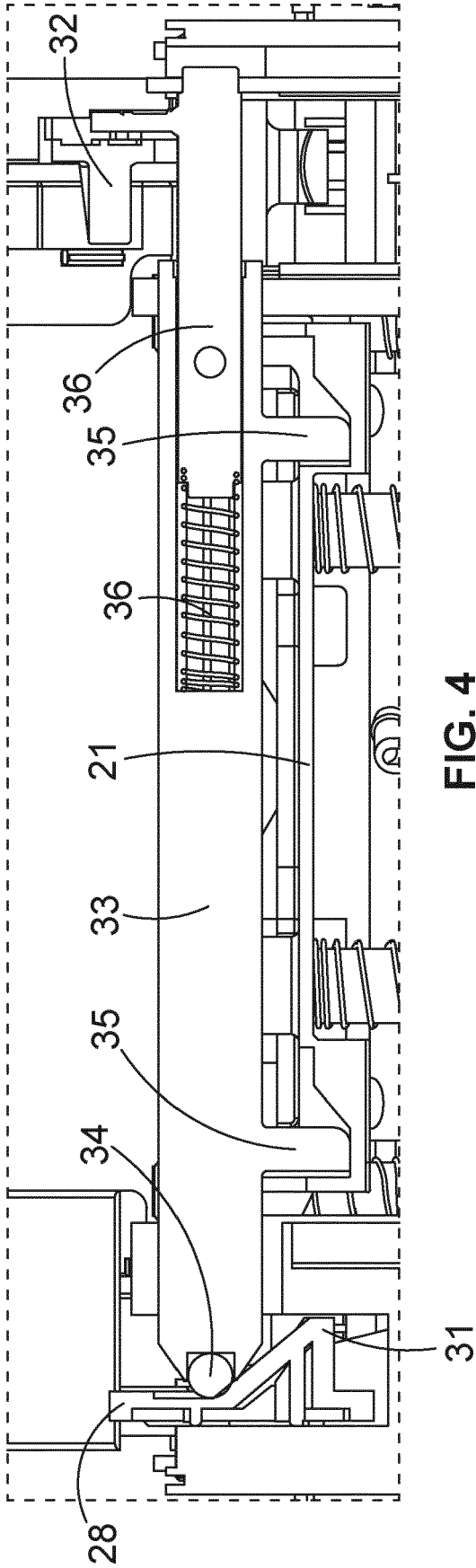


FIG. 3



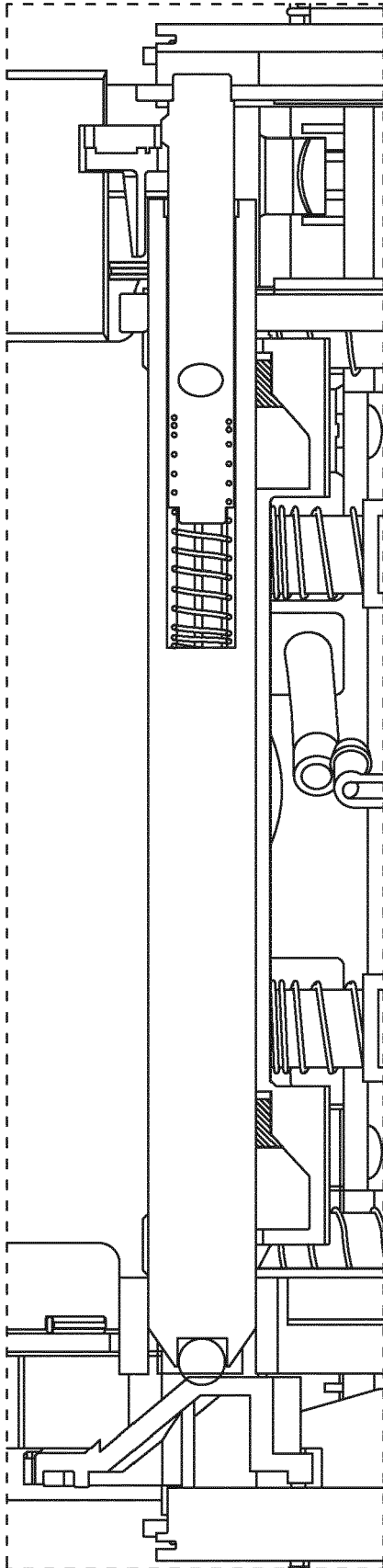


FIG. 6

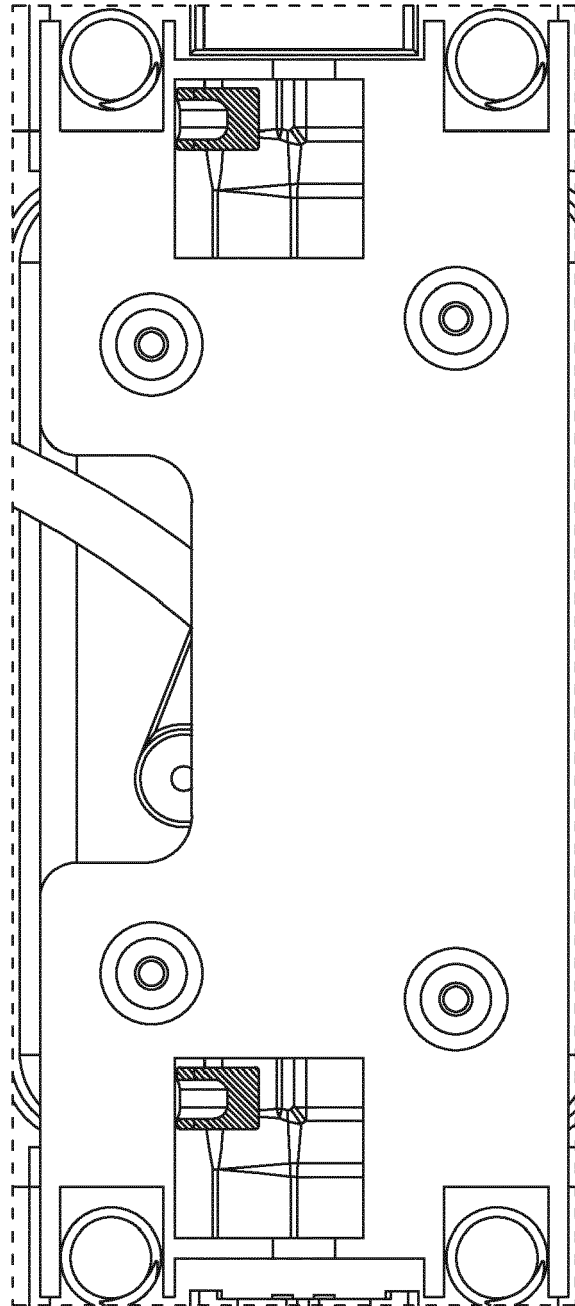


FIG. 7

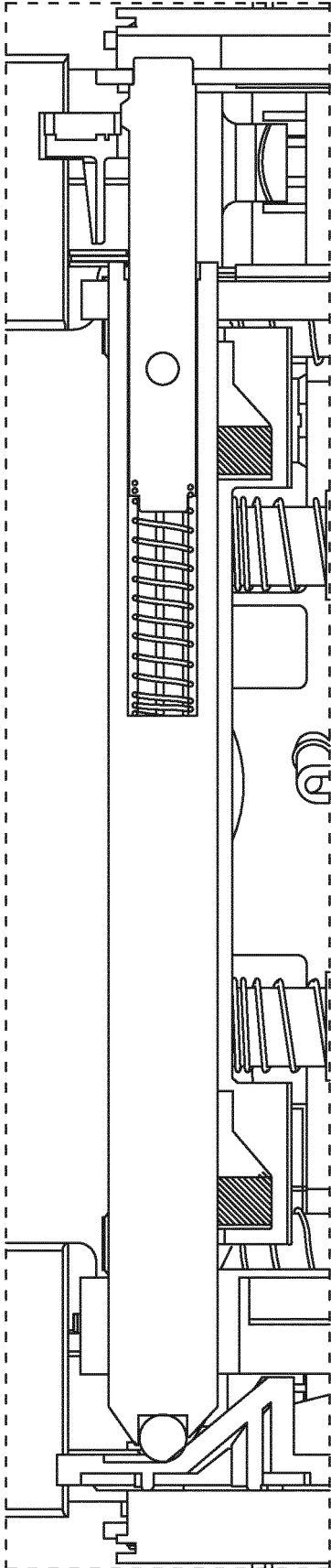


FIG. 8

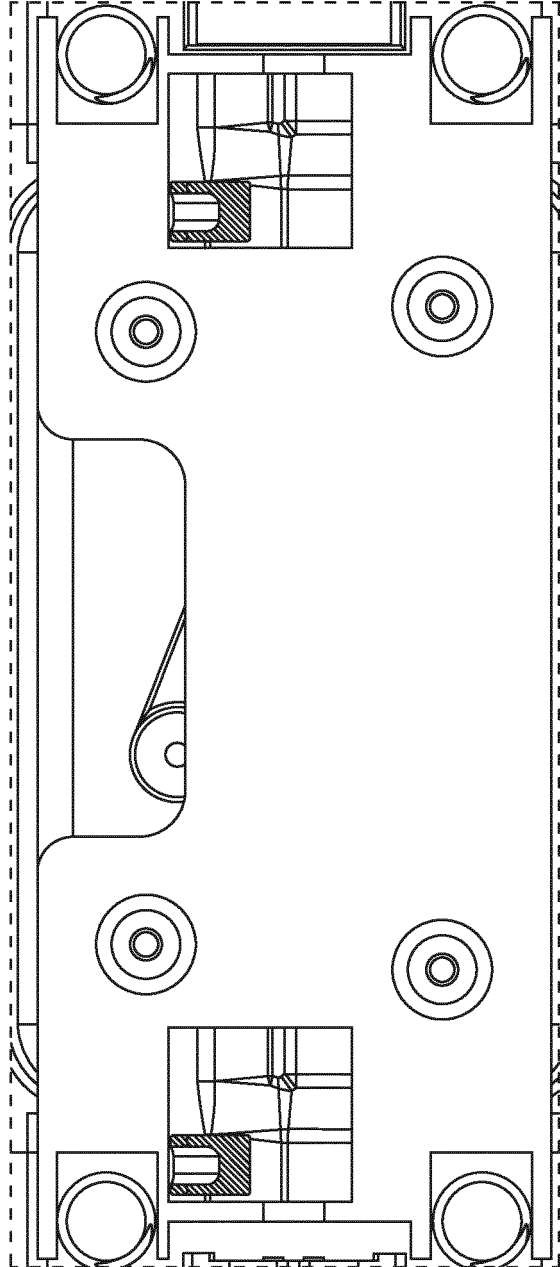


FIG. 9

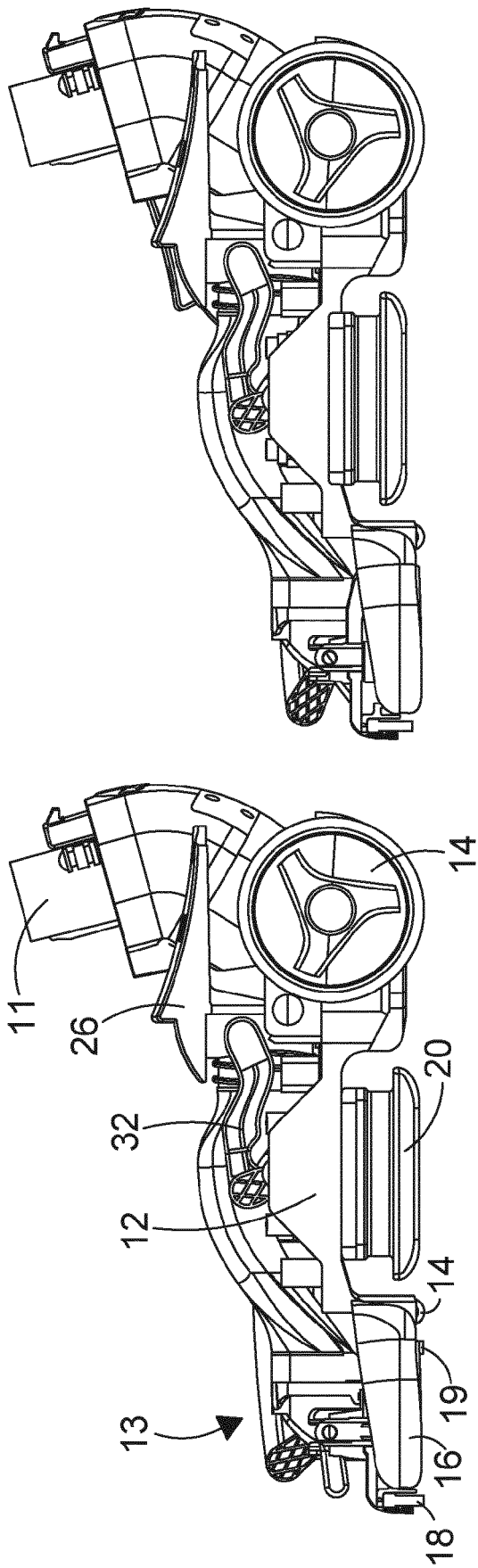


FIG. 10A

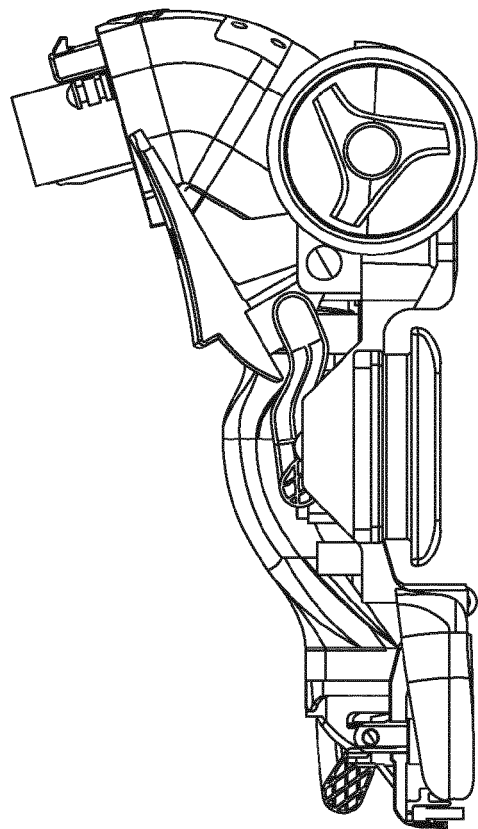


FIG. 10B

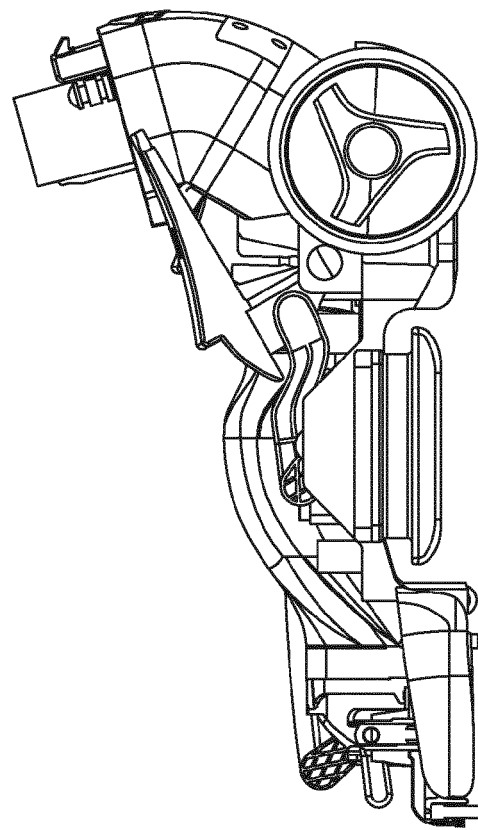


FIG. 10C

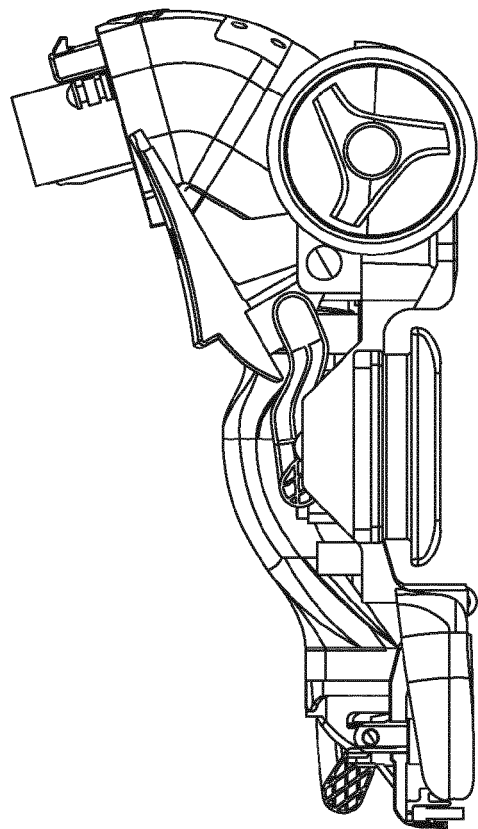


FIG. 10D



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 Application Number  
 EP 20 17 9199

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The present search report has been drawn up for all claims			
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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