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(54) **Title**: TRI-CAM BRAKE ASSEMBLY

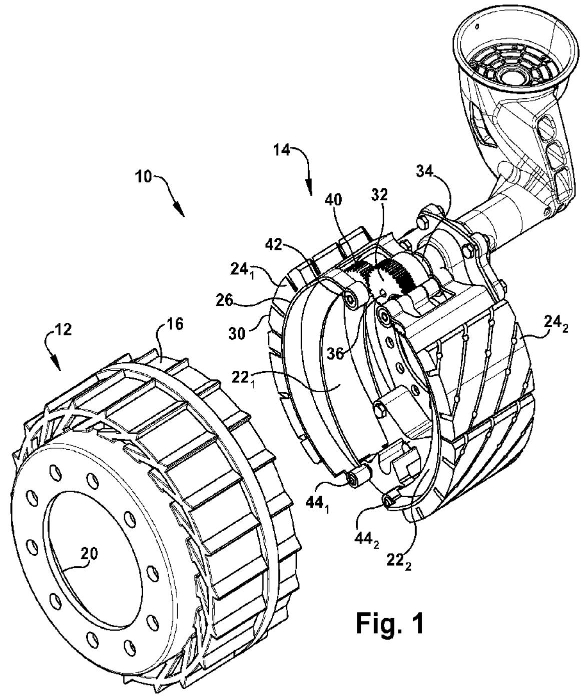

Fig. 1

(57) Abstract: A drum brake assembly for a vehicle includes a drum brake housing and a brake assembly. The brake assembly includes an action cam that is actuated by an associated cam shaft when it is desirable to decelerate the vehicle, a first reaction cam matingly engaging the action cam, and a second reaction cam matingly engaging the action cam. The first reaction cam is actuated by the mating engagement based on actuation of the action cam. The second reaction cam is actuated by the mating engagement based on actuation of the action cam.

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TRI-CAM BRAKE ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Application No. 14/104,833, filed December 12, 2013, the entire content of which is incorporated herein by reference.

Background

[0002] The present invention relates to a vehicle braking assembly. It finds particular application in conjunction with a cam assembly in a vehicle braking drum and will be described with particular reference thereto. It will be appreciated, however, that the invention is also amenable to other applications.

[0003] A vehicle brake drum housing typically includes a plurality of brake shoes. Each brake shoe includes at least one brake pad. When it is desired to decelerate an associated vehicle, an S-Cam is rotated to move the brake shoes and the corresponding brake pads toward an interior surface of the brake drum housing. Vehicle deceleration is achieved when the brake pads frictionally engage the interior surface of the brake drum housing.

[0004] S-Cam drum brakes may have adverse torque characteristics and brake noise when a cam shaft associated with the S-Cam is rotated in a direction opposite to a direction of the associated wheel while the vehicle is moving forward. The adverse torque characteristics may result in shorter than desired life of the brake pads. Some truck suspensions require opposite cam shaft installations for proper fit-up.

[0005] The present invention provides a new and improved apparatus and method for a vehicle braking assembly.

Summary

[0006] In one aspect of the present invention, it is contemplated that a drum brake assembly for a vehicle includes a drum brake housing and a brake assembly. The brake assembly includes an action cam that is actuated by an associated cam shaft when it is desirable to decelerate the vehicle, a first reaction cam matingly engaging the action cam, and a second reaction cam matingly engaging the action cam. The first reaction cam is actuated by the mating engagement based on actuation of the action cam. The second reaction cam is actuated by the mating engagement based on actuation of the action cam.

Brief Description of the Drawings

[0007] In the accompanying drawings which are incorporated in and constitute a part of the specification, embodiments of the invention are illustrated, which, together with a general description of the invention given above, and the detailed description given below, serve to exemplify the embodiments of this invention.

[0008] **FIGURE 1** illustrates a schematic representation of a simplified component diagram of an exemplary brake drum assembly in accordance with one embodiment of an apparatus illustrating principles of the present invention;

[0009] **FIGURE 2** illustrates a schematic representation of a side view of the brake drum assembly of **FIGURE 1** with brake pads that are relatively new in accordance with one embodiment of an apparatus illustrating principles of the present invention;

[0010] **FIGURE 3** illustrates a schematic representation of a side view of the brake drum assembly of **FIGURE 1** with brake pads that are relatively worn in accordance with one embodiment of an apparatus illustrating principles of the present invention;

[0011] **FIGURE 4** illustrates a partial schematic representation of a brake drum assembly having a cam-same actuation in accordance with one embodiment of an apparatus illustrating principles of the present invention;

[0012] **FIGURE 5** illustrates a partial schematic representation of a brake drum assembly having a cam-opposite actuation in accordance with one embodiment of an apparatus illustrating principles of the present invention; and

[0013] **FIGURE 6** is an exemplary methodology of an operation of a brake drum assembly in accordance with one embodiment illustrating principles of the present invention.

Detailed Description of Illustrated Embodiment

[0014] With reference to **FIGURE 1**, a simplified component diagram of an exemplary brake drum assembly **10** is illustrated in accordance with one embodiment of the present invention. The brake drum assembly **10** includes a drum housing **12** and a brake assembly **14**. The drum housing **12** is generally circular. The drum housing **12** includes an exterior surface **16** and an interior surface **20**.

[0015] **FIGURES 2 and 3** illustrate side views of the brake drum assembly **10**. The brake assembly **14** includes at least one brake shoe **22** and a braking material **24** secured to the shoe **22**. In one embodiment, the braking material **24** is a brake pad having an inner surface **26** secured to the brake shoe **22**. The brake pad **24** is a frictional material having an outer surface **30** that acts as a braking surface and engages the interior surface **20** of the brake drum housing **12** when it is desired to slow an associated vehicle. As discussed in more detail below, the brake assembly **14** is illustrated as including two (2) brake shoes $\mathbf{22}_{1,2}$ (collectively referred to as **22**) and respective brake pads $\mathbf{24}_{1,2}$ (collectively referred to as **24**) secured to the brake shoes $\mathbf{22}_{1,2}$. The brake pad $\mathbf{24}_1$ is secured to the brake shoe $\mathbf{22}_1$, and the brake pad $\mathbf{24}_2$ is secured to the brake shoe $\mathbf{22}_2$.

[0016] The brake pads **24** illustrated in **FIGURE 2** are relatively new, while the brake pads **24** illustrated in **FIGURE 3** are relatively worn. Therefore, the brake pads **24** shown in **FIGURE 2** are illustrated as relatively thicker than the brake pads **24** shown in **FIGURE 3**. It is contemplated that brake pads $\mathbf{24}_{1,2}$ having thicknesses of more than 1", which are relatively thicker than convention pads that may be about 1/2" thick, may be used.

[0017] With continued reference to **FIGURES 2 and 3**, the brake assembly **14** includes an action cam **32** secured to an associated cam shaft **34** (see **FIGURE 1**) of the vehicle via an action cam hinge pin **36**. A first reaction cam **40** is matingly engaged to the action cam **32**. The first reaction cam **40** is secured to the first brake shoe $\mathbf{22_1}$ via a first reaction cam hinge pin **42**. The first brake shoe $\mathbf{22_1}$ is pivotally mounted to the drum brake housing **12** via a first fastener $\mathbf{44_1}$. A second reaction cam **46** is matingly engaged to the action cam **32**. The second reaction cam **46** is secured to the second brake shoe $\mathbf{22_2}$ via a second reaction cam hinge pin **50**. The second brake shoe $\mathbf{22_2}$ is pivotally mounted to the drum brake housing **12** via a second fastener $\mathbf{44_2}$. In one embodiment, respective bearings **52** are around each of the action cam hinge pin **36**, the first reaction cam hinge pin **42**, and the second reaction cam hinge pin **50**.

[0018] In the illustrated embodiment, the mating engagement between the action cam **32** and the first reaction cam **40** includes gear teeth **54** and gear landings **56** on both the action cam **32** and the first reaction cam **40**. The gear teeth **54** and gear landings **56** on the action cam **32** and the first reaction cam **40** act as engagement surfaces that matingly engage so that the first reaction cam **40** is rotated (e.g., actuated) when the action cam **32** rotates (e.g., actuates). In other words, the first reaction cam **40** is rotated (e.g., actuated) based on, and the mating engagement with, the rotation (e.g., actuation) of the action cam **32**. Therefore, the first reaction cam **40** is indirectly rotated (e.g., actuated) when the cam shaft **34** rotates (e.g., actuates) the action cam **32**.

[0019] The mating engagement between the action cam **32** and the second reaction cam **46** also includes the gear teeth **54** and the gear landings **56** on both the action cam **32** and the second reaction cam **46**. The gear teeth **54** and gear landings **56** on the action cam **32** and the second reaction cam **46** act as engagement surfaces that matingly engage so that the second reaction cam **46** is rotated (e.g., actuated) when the action cam **32** rotates (e.g., actuates). In other words, the second reaction cam **46** is rotated (e.g., actuated) based on the rotation (e.g., actuation) of, and the mating engagement with, the action cam **32**. Therefore, the second reaction cam **46** is indirectly rotated (e.g., actuated) when the cam shaft **34** rotates (e.g., actuates) the action cam **32**.

[0020] The respective actuations of the first reaction cam **40** and the second reaction cam **46** are coordinated (synchronized) by the respective mating engagements with the action cam **32**. In other words, the coordination of the respective actuations of the first reaction cam **40** and the second reaction cam **46** creates substantially equal (e.g., equivalent) braking forces applied by the first brake pad $\mathbf{24_1}$ and the second brake pad $\mathbf{24_2}$ to the drum brake housing **12**.

[0021] In one embodiment, the means for creating substantially equal (e.g., equivalent) braking forces applied by the first brake pad $\mathbf{24_1}$ and the second brake pad $\mathbf{24_2}$ to the drum brake housing **12** includes the action cam **32**, the first reaction cam **40**, and the second reaction cam **46**.

[0022] In one embodiment, it is assumed the brake drum housing **12** rotates in a counterclockwise direction as indicated by arrow **60**. It is also assumed that the action cam **32** is rotated (e.g., actuated) in a counterclockwise direction as indicated by arrow **62**. The counterclockwise rotation (e.g., actuation) **62** of the action cam **32** causes the first reaction cam **40** to be indirectly rotated (e.g., actuated) in the clockwise direction as indicated by arrow **64**. The counterclockwise rotation (e.g., actuation) of the action cam **32** also causes the second reaction cam **46** to be indirectly rotated (e.g., actuated) in the counterclockwise direction as indicated by arrow **66**. Since the action cam **32** is rotated (e.g., actuated) in the counterclockwise direction **62**, the first reaction cam **40** is referred to as the leading reaction cam, and the second reaction cam **46** is referred to as the trailing reaction cam.

[0023] Since the action cam **32** is rotated (e.g., actuated) in the same direction as the brake drum housing **12** in the illustrated embodiment (i.e., in the counterclockwise direction as illustrated by the arrows **62, 60**). The action cam **32** rotation is referred to as cam-same. Other embodiments, in which the action cam **32** is rotated (e.g., actuated) in a different direction as the brake drum housing **12** (i.e., the action cam **32** is rotated (e.g., actuated) in the counterclockwise direction while the brake drum housing **12** is rotated in the clockwise direction) are also contemplated. In such other embodiments, the action cam **32** rotation is referred to as cam-opposite.

[0024] With reference to **FIGURE 4**, the action cam **32** rotation is cam-same. The action cam **32** applies a first downward force vector **70** to the first reaction cam **40**. The action cam **32** also applies a second downward force vector **72** to the second reaction cam **46**.

[0025] With reference to **FIGURE 5**, the action cam **32** rotation is cam-opposite. More specifically, the brake drum housing **12** rotates in a clockwise direction as indicated by arrow **74**. It is also assumed that the action cam **32** is rotated (e.g., actuated) in the counterclockwise direction as indicated by the arrow **62**. The counterclockwise rotation (e.g., actuation) **62** of the action cam **32** causes the first reaction cam **40** to be indirectly rotated (e.g., actuated) in the clockwise direction as indicated by the arrow **64**. The counterclockwise rotation (e.g., actuation) of the action cam **32** also causes the second reaction cam **46** to be indirectly rotated (e.g., actuated) in the counterclockwise direction as indicated by the arrow **66**. The action cam **32** applies the first downward force vector **70** to the first reaction cam **40**. The action cam **32** also applies the second downward force vector **72** to the second reaction cam **46**. Since the action cam **32** is rotated (e.g., actuated) in the counterclockwise direction **62**, the second reaction cam **46** is referred to as the leading reaction cam, and the first reaction cam **40** is referred to as the trailing reaction cam.

[0026] With reference to **FIGURES 4 and 5**, the action cam **32** applies downward force vectors to the first reaction cam **40** (see **70**) and the second reaction cam **46** (see **72**) when the action cam **32** rotation is cam-same (**FIGURE 4**) and when the action cam **32** rotation is cam-opposite (**FIGURE 5**). Applying downward force vectors to the first reaction cam **40** and the second reaction cam **46** results in substantially equal braking forces applied to the first and second brake pads $\mathbf{24}_{1,2}$ regardless of whether the action cam **32** rotation is cam-same or cam-opposite. Applying substantially equal braking forces to the first and second brake pads $\mathbf{24}_{1,2}$ results in better braking performance and improved brake pad life. With reference to **FIGURE 2**, it is contemplated that brake pads $\mathbf{24}_{1,2}$ that are more than 1" in thickness can be used. For example, a thickness **76** illustrated in **FIGURE 2** is, for example, about 1.04". The three (3) separately hinged cams (i.e., the action cam **32** rotating around the action cam hinge pin **36**, the first reaction cam **40** rotating around the first reaction cam hinge pin **42**, and the second reaction cam **46** rotating around the second reaction cam hinge pin **50**) improve the force application at both of the brake shoes $\mathbf{22}_{1,2}$ and, furthermore, increase the available space within the drum housing **12** for the relatively thicker brake pads $\mathbf{24}_{1,2}$ (e.g., to accommodate the about 1.04" pads $\mathbf{24}_{1,2}$ illustrated, or even thicker).

[0027] **FIGURE 6** illustrates an exemplary methodology of the system shown in **FIGURES 1-5**. As illustrated, the blocks represent functions, actions and/or events performed therein. It will be appreciated that electronic and software systems involve dynamic and flexible processes such that the illustrated blocks and described sequences can be performed in different sequences. It will also be appreciated by one of ordinary skill in the art that elements embodied as software may be implemented using various programming approaches such as machine language, procedural, object-oriented or artificial intelligence techniques. It will further be appreciated that, if desired and appropriate, some or all of the software can be embodied as part of a device's operating system.

[0028] With reference to **FIGURES 2, 3, and 6**, when it is desired to decelerate (e.g., brake) the associated vehicle, the action cam **32** is actuated in a step **110** by rotating the cam shaft **34**. Rotating the cam shaft **34** in the step **110** causes the action cam **32** to rotate around the action cam hinge pin **36**. As discussed above, in a step **112** the first and second reaction cams **40, 46**, respectively, are indirectly actuated in a coordinated (synchronized) manner by the actuation of the action cam **32** and the cam shaft **34**. The actuation of the first reaction cam **40** causes the first reaction cam **40** to rotate around the first reaction cam hinge pin **42**. The actuation of the second reaction cam **46** causes the second reaction cam **46** to rotate around the second reaction cam hinge pin **50**.

[0029] In one embodiment, it is assumed the brake drum housing **12** rotates in a counterclockwise direction as indicated by arrow **60**. It is also assumed that the action cam **32** is rotated (e.g., actuated) in a counterclockwise direction as indicated by arrow **62** in the step **110**. The counterclockwise rotation (e.g., actuation) of the action cam **32** causes the first reaction cam **40** to be indirectly rotated (e.g., actuated) in the clockwise direction as indicated by arrow **64** in the step **112**. The counterclockwise rotation (e.g., actuation) of the action cam **32** also causes the second reaction cam **46** to be indirectly rotated (e.g., actuated) in the counterclockwise direction as indicated by arrow **66** in the step **112**.

[0030] As discussed above, the coordinated (synchronized) actuation of the first and second reaction cams **40, 46**, respectively, causes the first brake shoe **22_1** to apply the first brake pad **24_1** to the drum housing **12** and the second brake shoe **22_2** to apply the second brake pad **24_2** to the drum housing **12** to create substantially equal braking forces of the first and second brake pads **$24_{1,2}$** against the drum housing **12**.

[0031] In addition, as also discussed above, the step **112** of indirectly actuating the first reaction cam **40** includes matingly engaging the action cam **32** and the first reaction cam **40** with the gear teeth **54** and gear landings **56**. Similarly, the step **112** of indirectly actuating the second reaction cam **46** includes matingly engaging the action cam **32** and the second reaction cam **46** with the gear teeth **54** and gear landings **56**.

[0032] In a step **114**, since the action cam **32** rotation is cam-same, the first downward force vector **70** is applied by the action cam **32** to the first reaction cam **40** while the first reaction cam **40** is indirectly actuated in the step **112**. In addition, in the step **114**, the second downward force vector **72** is applied by the action cam **32** to the second reaction cam **46** while the second reaction cam **46** is indirectly actuated in the step **112**.

[0033] In the step **114**, if the action cam **32** rotation was cam-opposite, the first downward force vector **70** would be applied by the action cam **32** to the first reaction cam **40** while the first reaction cam **40** was indirectly actuated in the step **112**. In addition, the second downward force vector **72** would be applied by the action cam **32** to the second reaction cam **46** while the second reaction cam **46** was indirectly actuated in the step **112**.

[0034] While the present invention has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention, in its broader aspects, is not limited to the specific details, the representative apparatus, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicant's general inventive concept.

I/We claim:

1. A drum brake assembly for a vehicle, comprising:

a brake assembly, comprising:

an action cam that is actuated by an associated cam shaft when it is desirable to decelerate the vehicle;

a first reaction cam matingly engaging the action cam, the first reaction cam being actuated by the mating engagement based on actuation of the action cam; and

a second reaction cam matingly engaging the action cam, the second reaction cam being actuated by the mating engagement based on actuation of the action cam.

2. The drum brake assembly for a vehicle as set forth in claim 1, wherein:

the respective actuations of the first reaction cam and the second reaction cam are coordinated by the respective mating engagements with the action cam.

3. The drum brake assembly for a vehicle as set forth in claim 2, further including:

a first brake shoe;

a second brake shoe;

a first brake pad secured to the first brake shoe; and

a second brake pad secured to the second brake shoe;

the coordination of the respective actuations of the first reaction cam and the second reaction cam creates substantially equal braking forces applied by the first and second brake pads to an associated drum brake housing.

4. The drum brake assembly for a vehicle as set forth in claim 3, wherein:

the substantially equal braking forces applied to the first and second brake pads increases a life of the first and second brake pads.

5. The drum brake assembly for a vehicle as set forth in claim 3, wherein:

respective thicknesses of at least about 1" for the first and second brake pads can be accommodated between the first and second brake shoes, respectively, and the associated drum brake housing.

6. The drum brake assembly for a vehicle as set forth in claim 3, wherein:

respective force vectors are applied in corresponding respective directions to the first reaction cam and the second reaction cam when the action cam is actuated.

7. The drum brake assembly for a vehicle as set forth in claim 6, wherein:

the respective force vectors are applied in the corresponding respective directions to the first reaction cam and the second reaction cam in both a cam same direction and a cam opposite direction.

8. The drum brake assembly for a vehicle as set forth in claim 7, wherein:

the respective force vectors are applied in corresponding respective downward directions to the first reaction cam and the second reaction cam when the action cam is actuated.

9. The drum brake assembly for a vehicle as set forth in claim 1, further including:

respective hinge pins around which each of the action cam the first reaction cam, and the second reaction cam rotates; and

bearings around the respective hinge pins.

10. The drum brake assembly for a vehicle as set forth in claim 1, wherein:

the action cam rotates in a first direction when actuated by the associated cam shaft to decelerate the vehicle;

the first reaction cam rotates in a second direction when actuated by the mating engagement of the actuated action cam;

the second reaction cam rotates in the first direction when actuated by the mating engagement of the actuated action cam.

11. A brake assembly for a vehicle, the brake assembly comprising:

an action cam that is rotated by an associated cam shaft when it is desirable to decelerate the vehicle;

a first reaction cam matingly engaging the action cam, the first reaction cam being rotated by the mating engagement based on the rotation of the action cam; and

a second reaction cam matingly engaging the action cam, the second reaction cam being rotated by the mating engagement based on the rotation of the action cam.

12. The brake assembly for a vehicle as set forth in claim 11, wherein:

the respective rotations of the first reaction cam and the second reaction cam are synchronized by the respective mating engagements with the action cam.

13. The brake assembly for a vehicle as set forth in claim 12, further including:

a first brake shoe;

a second brake shoe;

a first brake pad secured to the first brake shoe; and

a second brake pad secured to the second brake shoe;

the synchronization of the respective rotations of the first reaction cam and the second reaction cam apply substantially equivalent braking forces to the first and second brake pads.

14. The brake assembly for a vehicle as set forth in claim 13, wherein:

respective force vectors are applied in corresponding respective directions to the first reaction cam and the second reaction cam when the action cam is actuated.

15. The brake assembly for a vehicle as set forth in claim 14, wherein:

the respective force vectors are applied in the corresponding respective downward directions to the first reaction cam and the second reaction cam in both a cam same direction and a cam opposite direction.

16. A drum brake assembly for a vehicle, comprising:

a drum brake housing; and

a brake assembly, comprising:

a first brake pad;

a second brake pad; and

means for creating substantially equal braking forces applied by the first and second brake pads to the drum brake housing.

17. The drum brake assembly for a vehicle as set forth in claim 16, wherein the means for creating substantially equal braking forces includes:

an action cam that is actuated by an associated cam shaft when it is desirable to decelerate the vehicle;

a first reaction cam matingly engaging the action cam;

a second reaction cam matingly engaging the action cam.

18. The drum brake assembly for a vehicle as set forth in claim 17, further including:

a first brake shoe, the first brake pad being secured to the first brake shoe; and

a second brake shoe, the second brake pad being secured to the second brake shoe.

19. The drum brake assembly for a vehicle as set forth in claim 17, wherein:

the means for creating substantially equal braking forces coordinates respective actuations of the first reaction cam and the second reaction cam based on the actuation of the action cam.

20. The drum brake assembly for a vehicle as set forth in claim 17, wherein:

the means for creating substantially equal braking forces results in respective force vectors applied in corresponding respective downward directions to the first reaction cam and the second reaction cam when the action cam is actuated.

21. A drum brake assembly for a vehicle, comprising:

a drum brake housing; and

a brake assembly, comprising:

an action cam that is actuated by an associated cam shaft when it is desirable to decelerate the vehicle;

an action cam engagement surface;

a leading reaction cam including a leading reaction cam engagement surface matingly engaging the action cam engagement surface, the leading reaction cam being actuated by the mating engagement based on actuation of the action cam; and

a trailing reaction cam including a trailing reaction cam engagement surface matingly engaging the action cam engagement surface, the trailing reaction cam being actuated by the mating engagement based on actuation of the action cam, the respective actuations of the leading reaction cam and the trailing reaction cam being coordinated by the respective mating engagements of the leading reaction cam engagement surface and the trailing reaction cam engagement surface with the action cam engagement surface.

22. The drum brake assembly for a vehicle as set forth in claim 21, wherein:

the respective actuations of the first reaction cam and the second reaction cam are coordinated by the respective mating engagements of the leading reaction cam engagement surface and the trailing reaction cam engagement surface with the action cam engagement surface.

23. The drum brake assembly for a vehicle as set forth in claim 21, wherein:

each of the action cam engagement surface, the leading reaction cam engagement surface, and the trailing reaction cam engagement surface includes respective gear teeth and landings;

the gear teeth and landings of the action cam matingly engage the gear teeth and landings of the leading reaction cam; and

the gear teeth and landings of the action cam matingly engage the gear teeth and landings of the trailing reaction cam.

24. The drum brake assembly for a vehicle as set forth in claim 21, further including:

a first brake shoe;

a second brake shoe;

a first brake pad secured to the first brake shoe; and a second brake pad secured to the second brake shoe;

wherein respective force vectors are applied in corresponding respective downward directions to the first reaction cam and the second reaction cam when the action cam is actuated.

25. The drum brake assembly for a vehicle as set forth in claim 24, wherein:

the coordination of the respective actuations of the first reaction cam and the second reaction cam creates substantially equal braking forces applied by the first and second brake pads to the drum brake housing.

26. A method for applying brake pads to a drum brake housing in a drum brake assembly for a vehicle, the method comprising:

actuating an action cam when it is desirable to decelerate the vehicle;

indirectly actuating a first reaction cam engaged to the action cam;

indirectly actuating a second reaction cam engaged to the action cam; and

causing a first brake shoe associated with the first reaction cam to apply first brake pads against the drum brake housing while causing, in a coordinated manner with applying the first brake pad against the drum brake housing, a second brake shoe associated with the second reaction cam to apply second brake pads against the drum brake housing.

27. The method for applying brake pads to a drum brake housing as set forth in claim 26, wherein the step of causing the first brake shoe associated with the first reaction cam to apply the first brake pads against the drum brake housing while causing, in a coordinated manner with applying the first brake pad against the drum brake housing, the second brake shoe associated with the second reaction cam to apply the second brake pads against the drum brake housing includes:

indirectly actuating the first and second reaction cams to create substantially equal braking forces applied by the first and second brake pads to the drum brake housing.

28. The method for applying brake pads to a drum brake housing as set forth in claim 26, wherein the step of actuating the action cam includes:

rotating the action cam via an associated cam shaft.

29. The method for applying brake pads to a drum brake housing as set forth in claim 26, wherein:

the step of indirectly actuating the first reaction cam includes:

matingly engaging the action cam and the first reaction cam with gear teeth and landings; and

the step of indirectly actuating the second reaction cam includes:

matingly engaging the action cam and the second reaction cam with gear teeth and landings.

30. The method for applying brake pads to a drum brake housing as set forth in claim 26, further including:

while indirectly actuating the first reaction cam, applying a downward force vector to the first reaction cam; and

while indirectly actuating the second reaction cam, applying a downward force vector to the second reaction cam.

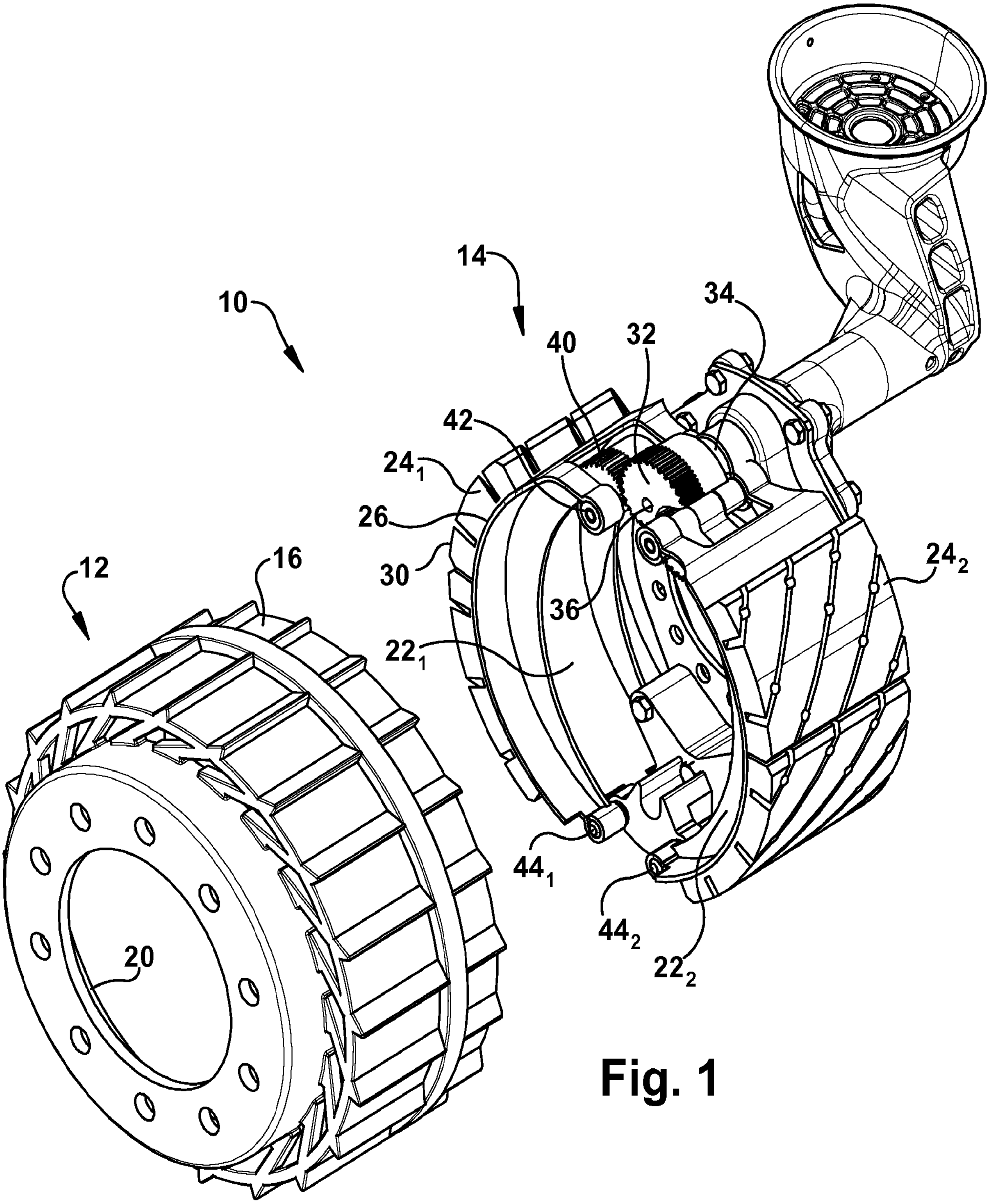
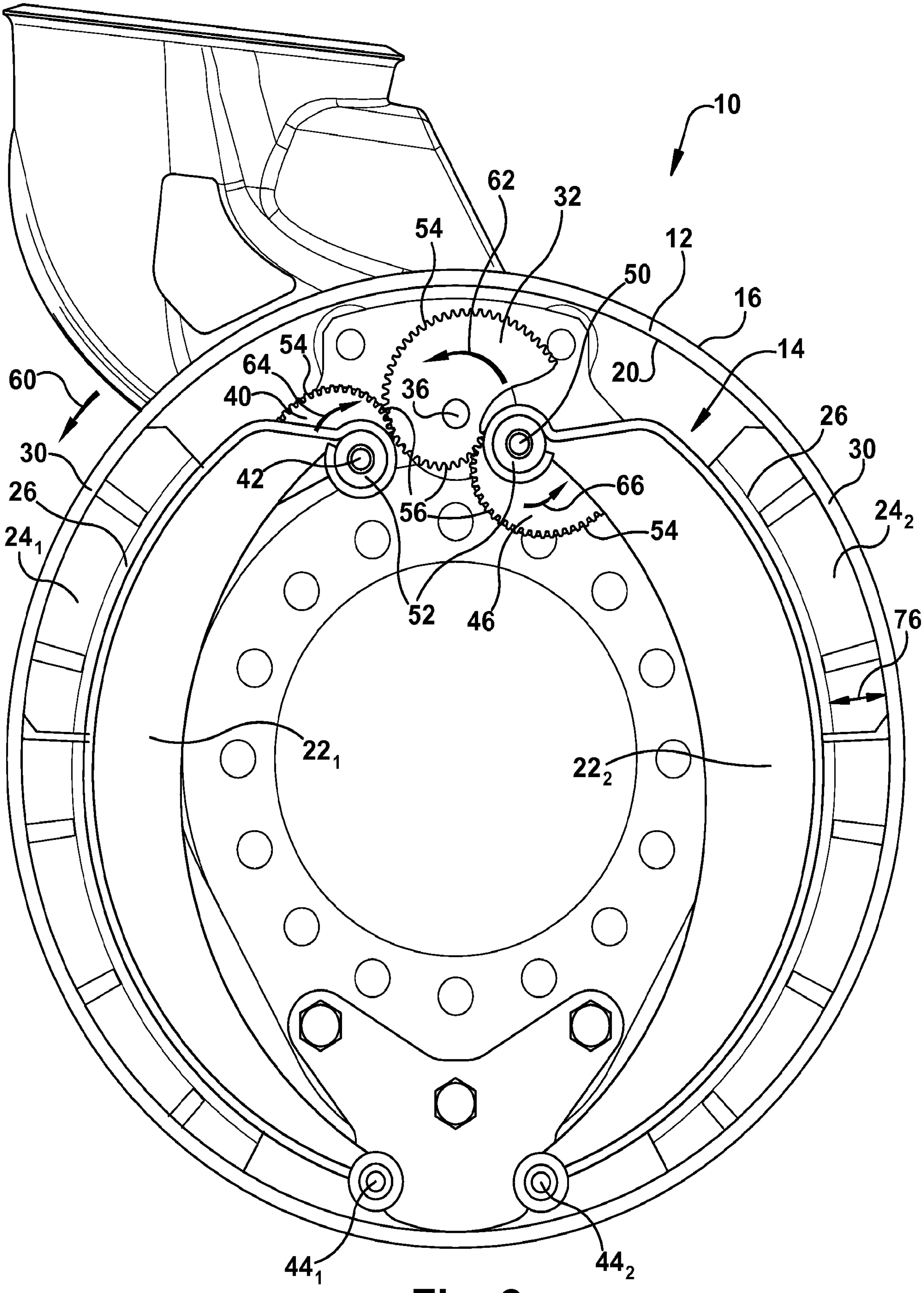


Fig. 1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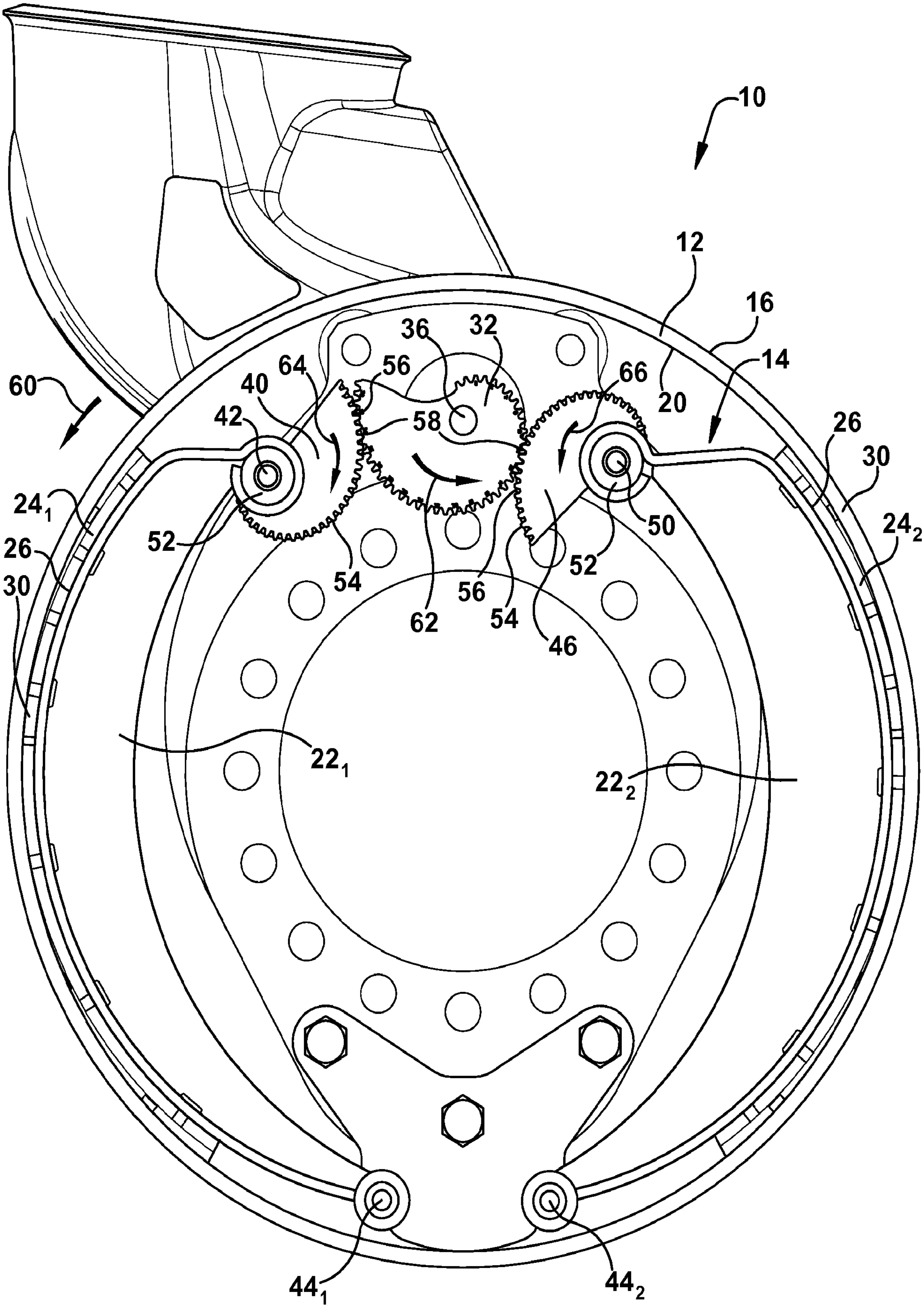
24₁
24₂
52
46
76
22₁
22₂
44₁
44₂

Fig. 2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56
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52
50
52
54
62
56
54
46
22_1
22_2
44_1
44_2

Fig. 3

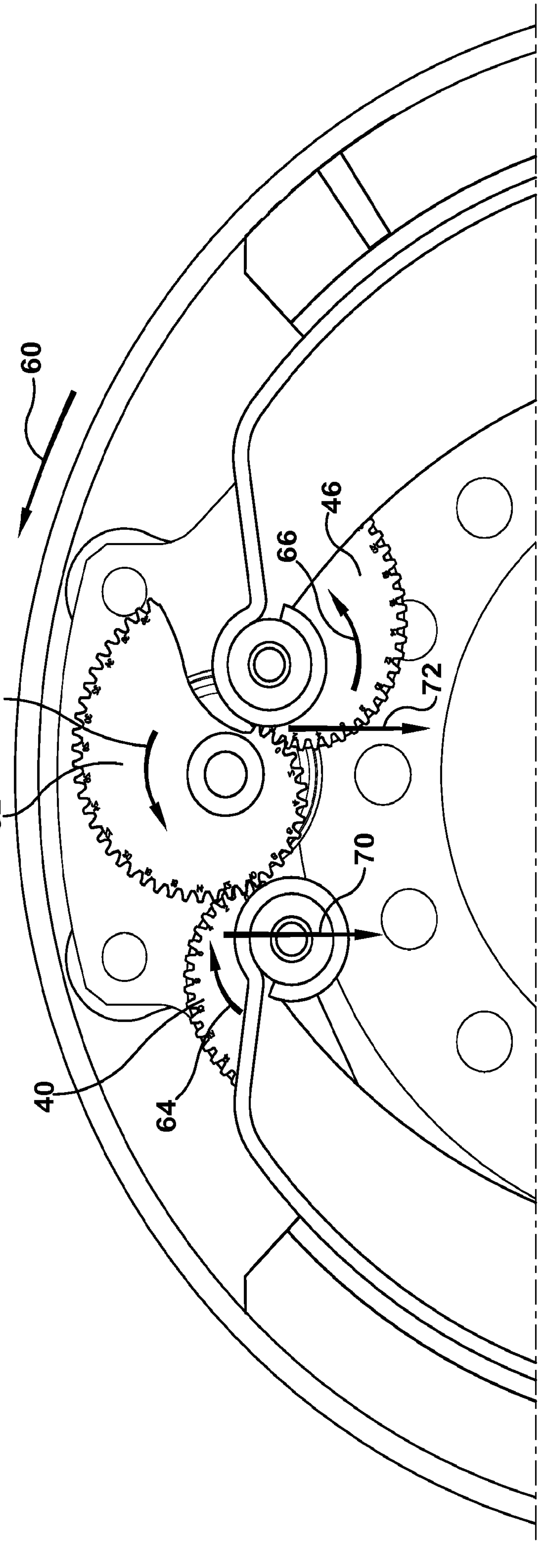
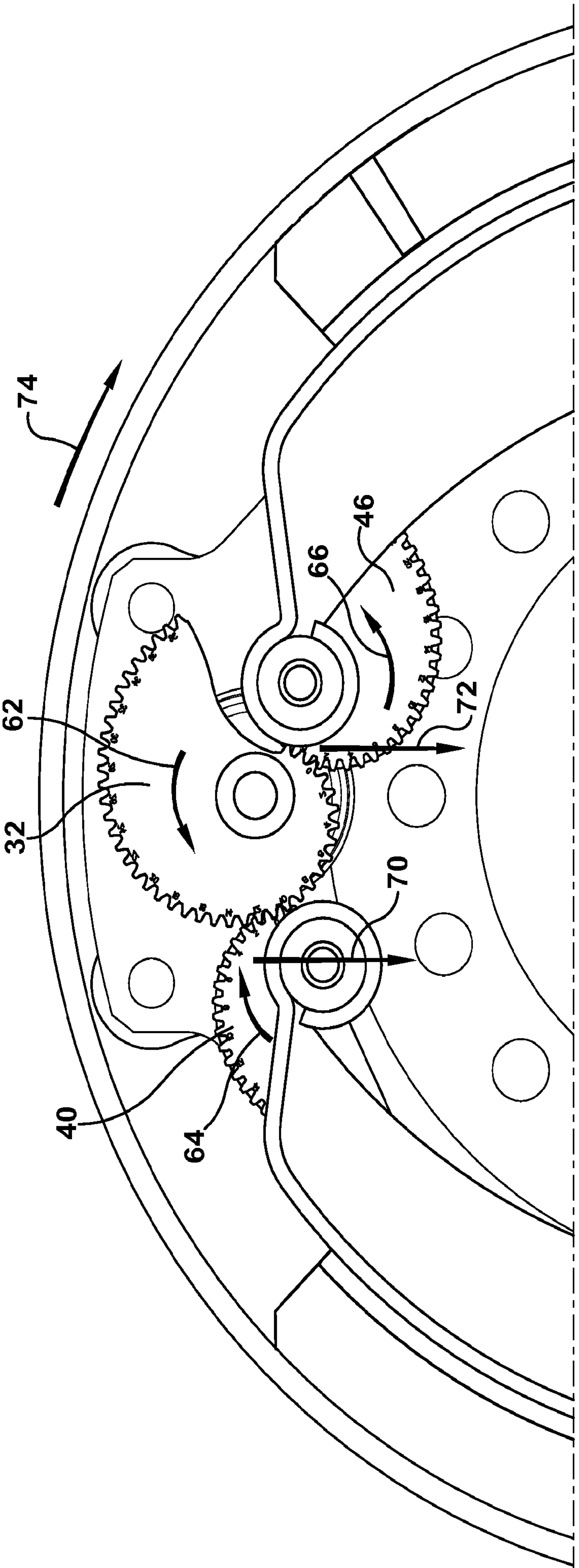


Fig. 4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64
66
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72
70

Fig. 5

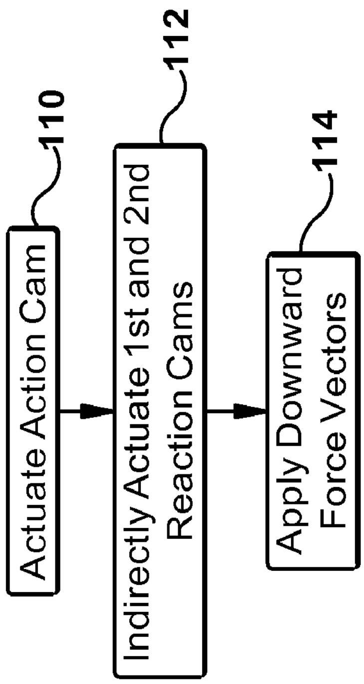
Actuate Action Cam
110
Indirectly Actuate 1st and 2nd Reaction Cams
112
Apply Downward Force Vectors
114

Fig. 6