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(54) **DRIVE SYSTEM FOR A WEAVING MACHINE**

ANTRIEBSSYSTEM FÜR EINE WEBMASCHINE

SYSTÈME D'ENTRAÎNEMENT POUR UNE MACHINE À TISSER

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## Description

### TECHNICAL FIELD AND PRIOR ART

**[0001]** The invention relates to a drive system for a weaving machine comprising a first drive gear wheel for driving a first group of elements, a second drive gear wheel for driving a second group of elements, a switching gear wheel, wherein the switching gear wheel is displaceable between a first position, in which the switching gear wheel is in drive connection with the first drive gear wheel and the second drive gear wheel, and a second position, in which the switching gear wheel is not in drive connection with the first drive gear wheel. The invention further relates to a weaving machine with such a drive system.

**[0002]** Such a drive system is shown for example in US 5617901 and US 7857011, wherein a first drive gear wheel is used for driving a first group of elements including a sley drive and a second drive gear wheel is used for driving a second group of elements including a shed formation device. In normal operation, the switching gear wheel is in drive connection with the first drive gear wheel and the second drive gear wheel for driving the first group of elements and the second group of elements in synchronization. For a so-called pick finding, the switching gear wheel is displaced into the second position, in which the switching gear is not in drive connection with the first group of elements, so that upon rotation of the switching gear wheel, the first drive gear wheel is not rotated.

**[0003]** The drive system shown in US 7857011 further comprises a holding element in the form of a gear wheel, which is axially displaceable with the switching gear wheel, wherein in the second position of the switching gear wheel, the holding element engages with the first drive gear wheel for holding the first drive gear wheel against rotation, and a displacement device for displacing the switching gear wheel and the holding element between the first position and the second position.

### SUMMARY OF THE INVENTION

**[0004]** It is the object of the invention to provide a drive system and a weaving machine with an improved displacement device adapted to counter forces acting on the displacement device upon displacement of the switching gear wheel and the holding element.

**[0005]** This object is solved by the drive system and the weaving with the features of claims 1 and 16. Preferred embodiments are defined in the dependent claims.

**[0006]** According to a first aspect, a drive system for a weaving machine is provided, which drive system comprises a first drive gear wheel for driving a first group of elements, in particular including a sley device, a second drive gear wheel for driving a second group of elements, in particular including a shed formation device, a switching gear wheel, wherein the switching gear wheel is displaceable between a first position, in which the switching gear wheel is in drive connection with the first drive gear

wheel and the second drive gear wheel, and a second position, in which the switching gear wheel is not in drive connection with the first drive gear wheel, a holding element, which is displaceable with the switching gear wheel, wherein in the second position of the switching gear wheel, the holding element engages with the first drive gear wheel for holding the first drive gear wheel against rotation, and wherein in the first position of the switching gear wheel, the holding element is disengaged from the first drive gear wheel, and a displacement device for displacing the switching gear wheel and the holding element between the first position and the second position, wherein the displacement device comprises a stationary rod extending in parallel to a rotation axis of the first drive gear wheel and a slider element slideably mounted to the rod, wherein the holding element is arranged at the slider element.

**[0007]** Throughout this specification and the following claims, the indefinite article "a" or "an" means "one or more". Reference to a "first element" does not mandate presence of a "second element". Further, the expressions "first" and "second" are only used to distinguish one element from another element and not to indicate any order of the elements.

**[0008]** The rod, along which the holding element is moved, is mounted stationary, and thus also referred to as stationary rod. The stationary rod allows a precise positioning of the holding element with respect to the first drive gear wheel, and a reliable guidance of the holding element upon its displacement between a first position of the holding element, in which the holding element is disengaged from the first drive gear wheel, and a second position of the holding element, in which the holding element engages with the first drive gear wheel for holding the first drive gear wheel against rotation, as well as for a stable positioning of the holding element in its second position against forces acting on the holding element in the second position.

**[0009]** The holding element is arranged at the slider element, in particular the holding element in embodiments is formed integrally with the slider element or is fixed to the slider element.

**[0010]** The first drive gear wheel, the second drive gear wheel and the switching gear wheel are individually or jointly referred to as gearwheels.

**[0011]** In one embodiment, in the second position of the switching gear wheel, the switching gear wheel is offset from the first drive gear wheel in the direction of the rotation axis of the first drive gear wheel, so that for interrupting the drive connection teeth of the gear wheels are separated in the axial direction. In another embodiment, a teeth area of the first drive gear wheel is provided with at least one notch or clearance running over part of the axial length and several teeth, for example four to fifteen teeth, so that a drive connection is interrupted in case the switching gear wheel is arranged in the area of the at least one notch or clearance. As a result, an axial displacement of the switching gear wheel between the

first position and the second position, and thus a required space for interrupting a drive connection between the switching gearwheel and the first drive gear wheel can be reduced.

**[0012]** In particular, compared to prior art devices, in which a holding element is arranged at a distal end of a moveable rod, a risk of a movement of the holding element due to an unintended bending of the rod can be reduced.

**[0013]** The weaving machine comprises a frame, wherein the frame is defined as a structure onto which other components of the weaving machine including the drive system are fitted. The frame in embodiments comprises several frame parts joined with each other by welding and/or using bolts and screws.

**[0014]** In an embodiment, the stationary rod has a first end and a second end, wherein the first end of the rod and the second end of the rod are housed in a drive system housing. In an embodiment, the drive system housing comprises a main body formed integrally with a frame part of the frame of the weaving machine and an intermediate body, which can be bolted or screwed onto the main body, wherein the main body and the intermediate body are provided with mounting structures adapted for receiving the first end of the rod and the second end of the rod.

**[0015]** In an embodiment, the first drive gear wheel is arranged between the first end of the stationary rod and the second end of the stationary rod. In other words, the rod extends past the first drive gear wheel at both sides. This allows the rod to be supported at either side of the first drive gear wheel.

**[0016]** In an embodiment, an extension of the slider element in an axial direction of the stationary rod is larger than a thickness of the first drive gear wheel. The slider element having a large extension allows a wide or large support or contact surface with the rod, resulting in low surface forces between the rod and the slider element.

**[0017]** In an embodiment, the switching gear wheel is coupled to a drive arm formed integrally with or mounted to the slider element, so that the switching gear wheel is displaceable together with the slider element in parallel to the rotation axis of the first drive gear wheel. In an embodiment, the switching gear wheel and the first drive gear wheel are spur gears or straight-cut gears, wherein by movement of the switching gear wheel in parallel to the rotation axis of the first drive gear wheel the switching gear wheel and the first drive gear wheel can engage or disengage. In an alternative embodiment, the switching gear wheel and the first drive gear wheel are helical gear wheels, wherein for engaging or disengaging the switching gear wheel and the first drive gear wheel, a movement of the switching gear wheel in parallel to the rotation axis of the first drive gear wheel is combined with a controlled rotation of the switching gear wheel.

**[0018]** In an embodiment, the switching gear wheel is rotatably coupled to the drive arm via a stub fixed to a shaft of the switching gear wheel. A diameter of the stub

in embodiments is smaller than a diameter of the shaft to allow the dimensions of the drive arm being kept small.

**[0019]** In an embodiment, the shaft of the switching gear wheel is supported via bearings in the drive system housing.

**[0020]** In an embodiment, the stub protrudes from a side of the drive arm opposite the switching gear wheel, so that in the first position of the switching gear wheel, the stub can be housed in a structure of the drive system housing. By housing the stub in a structure of the drive system housing, a greasing of the stub from an outside of the drive system housing is possible. In embodiments, the stub can in particular be housed in the intermediate body of the drive system housing.

**[0021]** The drive arm in embodiments of the invention is arranged at a motor side of the switching gear wheel. This allows for a compact design. In the context of the application, a motor side of the switching gear wheel is defined as a side of the switching gear wheel at which a drive motor of the drive system, in particular a main drive motor is arranged.

**[0022]** In an embodiment, a sensor system is provided for detecting whether the switching gear wheel is in the first position or the second position. The sensor system in embodiments is a proximity sensor system able to sense the presence of an object without any physical contact. In an embodiment, the sensor system is proximity sensor system. For example, the sensor system can be an optical sensor system or an inductive sensor system. In one embodiment, the sensor system comprises exactly one detector, which is adapted for detecting whether the switching gear wheel is in the second position, wherein the arrangement of the switching gear wheel in the first position follows from its absence in the second position. In other embodiments, the sensor system comprises two detectors, wherein in an embodiment, one detector is adapted to detect whether the switching gear wheel is in the first position and the other detector is adapted to detect whether the switching gear wheel is in the second position.

**[0023]** In one embodiment, the drive system comprises a drive arm to which the switching gear wheel is coupled, wherein the sensor system is arranged to cooperate with the drive arm for sensing a presence of the drive arm in at least one position, in particular in at least two positions. In one embodiment, the sensor system comprises detectors that are arranged to cooperate with the drive arm for sensing a presence of the drive arm in at least one position associated with one of the first position and the second position of the switching gear wheel, in particular in at least two positions associated with the first position and the second position of the switching gear wheel.

**[0024]** In an embodiment, the displacement device comprises an axially displaceable piston extending in parallel to the stationary rod, wherein the piston is operable for displacing the holding element along the stationary rod. The piston in embodiments is arranged at a motor side of the drive system.

**[0025]** In one embodiment, the drive system comprises a drive arm to which the switching gear wheel is coupled, wherein the piston interacts with the drive arm for displacing the switching gear wheel. The piston in one embodiment is formed integrally with or fixed to the drive arm, for a reliable back-and-forth movement of the drive arm with the piston. The piston in embodiments is arranged between an axis of the switching gear wheel and the stationary rod, in particular at least essentially halfway between the axis of the switching gear wheel and the stationary rod, and acts at the drive arm between the axis of the shaft of the switching gear wheel and the stationary rod. This allows for a compact design, even when a large drive motor is provided.

**[0026]** During standstill of the second drive gear wheel, the switching gear wheel in drive connection with the second drive gear wheel has to counter forces acting on the second drive gear wheel. In particular, when a jacquard system driven by the second drive gear wheel is in a standstill position, normally several warp threads are in the open shed position and exert a large force on the second drive gear wheel. In this case, the second drive gear wheel needs to be kept in standstill by the counter force applied via the switching gear wheel. Due to the force and counter force between the switching gear wheel and the second drive gear wheel, high frictional forces may occur between the teeth of the switching gear wheel and the second drive gear wheel as well as in bearings of the switching gear wheel, which are acting against a movement of switching gear wheel by the drive arm. Due to the frictional forces, a momentum is exerted on the drive arm, wherein the stationary rod allows to counter the momentum exerted by the drive arm on the stationary rod.

**[0027]** In an embodiment, the displacement device comprises a cylinder, wherein the piston is arranged moveable in the cylinder. The cylinder in embodiments is housed in the drive system housing.

**[0028]** In an embodiment, the piston forms part of a pneumatic actuator. In other embodiments, the piston forms part of a hydraulic actuator. The use of a hydraulic actuator allows a reliable movement of the piston back-and-forth.

**[0029]** In an embodiment, the switching gearwheel is arranged to be driven by the main drive motor. In an embodiment, the switching gear wheel can be disconnected from the main drive motor and manually driven or driven by an auxiliary drive motor during pick finding.

**[0030]** In an embodiment, the holding element is one single tooth engaging with teeth of the first drive gear wheel. This allows for a simple design, wherein the single tooth is sufficient for holding the first drive gear wheel against rotation.

**[0031]** According to a second aspect, a weaving machine with a drive system having a displacement device as described above is provided.

**[0032]** In an embodiment, the weaving machine comprises a first drive gearwheel used for driving a first group

of elements including a sley drive and a second drive gear wheel used for driving a second group of elements including a shed formation device, in particular a jacquard system.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0033]** In the following, embodiments of the invention will be described in detail with reference to the drawings. Throughout the drawings, the same elements will be denoted by the same reference numerals.

FIG. 1 shows a simplified perspective view of a drive system for a weaving machine comprising a holding element in a first position of the switching gear wheel.

FIG. 2 shows a simplified perspective view of the drive system of FIG. 1 in a second position of the switching gearwheel.

FIG. 3 shows a front view of the drive systems of FIG. 2.

FIG. 4 shows a detail of the drive system of FIG. 1 with a main body of a drive system housing in a perspective view.

FIG. 5 shows the detail of FIG. 4 in another perspective view.

FIG. 6 shows the detail of FIG. 4 in still another perspective view.

FIG. 7 shows in a sectional view the drive system with the drive system housing in the first position of the switching gear wheel of FIG. 1.

FIG. 8 shows in a sectional view the drive system with the drive system housing in the second position of the switching gear wheel of FIG. 2.

FIG. 9 shows a detail of FIG. 7 in an intermediate position of the switching gear wheel between the first position and the second position.

FIG. 10 shows the drive system housed in the drive system housing.

## DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

**[0034]** FIGS. 1 and 2 show a drive system 1 for a weaving machine (not shown) comprising a first drive gear wheel 2 for driving a first group of elements including a sley device (not shown), a second drive gear wheel 3 for driving a second group of elements including a shed formation device (not shown), a switching gear wheel 4, a

holding element 5, and a main drive motor 6 with a drive motor gear wheel 7 that engages the switching gear wheel 4, so that the switching gear wheel 4 can be driven to rotate by the main drive motor 6, and a brake system 8 for braking the shaft 34 of the main drive motor 6 and the drive motor gear wheel 7. The shed formation device can be a known cam system, a dobby system, or a jacquard system.

**[0035]** The drive system 1 further comprises a displacement device 9, wherein by means of the displacement device 9 the switching gear wheel 4 is displaceable between a first position shown in FIG. 1, in which the switching gear wheel 4 is in drive connection with the first drive gear wheel 2 and the second drive gear wheel 3, and a second position shown in FIG. 2, in which the switching gear wheel 4 is not in drive connection with the first drive gear wheel 2.

**[0036]** In the embodiment shown, in the second position shown in FIG. 2, the switching gearwheel 4 is in drive connection with the second drive gear wheel 3 and with the drive motor gear wheel 7. Hence, after interrupting a drive connection between the switching gear wheel 4 and the first drive gear wheel 2, the main drive motor 6 can be operated to move the second group of elements, for example for removing a broken weft thread.

**[0037]** In the embodiment shown, a drive arm 10 is provided. The holding element 5 is mounted via the slider element 14 to the drive arm 10 and the switching gearwheel 4 is coupled to the drive arm 10. The holding element 5 and the switching gearwheel 4 are conjointly displaceable by means of the displacement device 9. In the second position of the switching gear wheel 4 shown in FIG. 2, the holding element 5 engages with the first drive gear wheel 2 for holding the first drive gear wheel 2 against rotation. In the first position of the switching gearwheel 4 shown in FIG. 1, the holding element 5 is disengaged from the first drive gear wheel 2. The holding element 5 shown is one single tooth engaging with teeth of the first drive gear wheel 2.

**[0038]** The drive arm 10 is arranged at a motor side of the switching gear wheel 4, i.e. a side of the switching gear wheel 4 at which the main drive motor 6 is arranged. In the embodiment shown, the gear wheels 2, 3, 4 and 7 are spur gears or straight-cut gears, wherein all rotation axes of these gear wheels are arranged in parallel. In an alternative embodiment (not shown) all gear wheels 2, 3, 4 and 7 can be helical gear wheels, while the holding element 5 is profiled to cooperate with the helical gears.

**[0039]** As best seen in FIG. 3, the first drive gear wheel 2 has at least one notch 11, more particular, in the embodiment shown, the first drive gear wheel 2 has two notches, at its circumference in the tooth area. The notches 11 can be provided as known from US 5617901, which is herewith incorporated by reference.

**[0040]** In the second position shown in FIG. 2 and 3, the switching gearwheel 4 is positioned in the area of one of the notches 11. This allows interrupting a drive connection between the switching gear wheel 4 and the first

drive gear wheel 2 in the second position, even though the second position is chosen such that the switching gear wheel 4 and the first drive gear wheel 2 still overlap in the axial direction of the first drive gear wheel 2.

**[0041]** The displacement device 9 comprises a stationary rod 12 extending in parallel to a rotation axis 13 of the first drive gear wheel 2 and a slider element 14 slideably mounted to the stationary rod 12. The holding element 5 is mounted to the slider element 14 and is moveable with the slider element 14 along the stationary rod 12. In the embodiment shown, the slider element 14 is in the form of a sleeve surrounding the stationary rod 12. The holding element 5 is fixed to the slider element 14 using screws 15 (see FIGS. 1 and 2).

**[0042]** The slider element 14 has a large extension, in particular an extension of the slider element 14 in an axial direction of the stationary rod 12 is larger than a thickness of the first drive gear wheel 2. The large extension allows a large contact surface between the slider element 14 and the stationary rod 12, resulting in low surface forces between the stationary rod 12 and the slider element 14.

**[0043]** FIGS. 4 to 6 show a detail of the drive system 1 with a main body 17 of a drive system housing 16 in different perspective views. FIGS. 7 and 8 show in sectional views the drive system 1 with the drive system housing 16 in the first position and the second position of the switching gear wheel 4, and FIG. 9 shows a detail of FIG. 7 in an intermediate position of the switching gear wheel 4.

**[0044]** In the embodiment, the drive system housing 16 comprises a main body 17 formed integrally with a frame part of the frame of the weaving machine and an intermediate body 18, which can be fixed to the main body 17 using bolts and/or screws. As best seen in FIGS. 7 and 8, the main body 17 and the intermediate body 18 are provided with mounting structures 19, 20 adapted for receiving a first end 21 of the stationary rod 12 and a second end 22 of the stationary rod 12, so that the stationary rod 12 is held stationary in position between the main body 17 and the intermediate body 18.

**[0045]** The stationary arranged rod 12, referred to as stationary rod 12, allows for a reliable guidance of the slider element 14 with the holding element 5 upon the displacement of the holding element 5 between a first position of the holding element 5 shown in FIG. 7, in which the holding element 5 is disengaged from the first drive gear wheel 2, and a second position of the holding element 5 shown in FIG. 8, in which the holding element 5 engages with the first drive gear wheel 2 for holding the first drive gear wheel 2 against rotation. Further, as the stationary rod 12 is supported at either side of the first drive gear wheel 2, the support of the stationary rod 12 prevents the stationary rod 12 from bending and allows for a stable positioning of the holding element 5 in its second position against forces acting on the holding element 5 in the second position.

**[0046]** As best seen in FIGS. 7 to 9, the switching gear wheel 4 is arranged on a shaft 23 and rotatably mounted

in the drive system housing 16 via two bearings 24, whereby one bearing 24 is arranged in the main body 17 and the other bearing 24 is arranged in the intermediate body 18. In addition, the switching gear wheel 4 is coupled to the drive arm 10, so that the switching gear wheel 4 and the holding element 5 are conjointly displaceable using the displacement device 9.

**[0047]** In the embodiment shown, the switching gear wheel 4 is rotatably coupled to the drive arm 10 via a stub 25 fixed to the shaft 23 of the switching gear wheel 4. At a side of the switching gear wheel 4 facing the drive arm 10, the stub 25 protrudes from the shaft 23 of the switching gear wheel 4, so that in the first position of the switching gear wheel 4 shown in FIG. 7, the stub 25 can be housed in a structure 33 of the intermediate body 18 of the drive system housing 16, wherein the structure 33 is provided with a duct 26 for a greasing.

**[0048]** For moving the drive arm 10 with the holding element 5 and the switching gear wheel 4, in the embodiment shown the displacement device 9 comprises an axially displaceable piston 27 extending in parallel to the stationary rod 12. The piston 27 forms part of a hydraulic actuator 31 and is moveable for displacing the drive arm 10 with the holding element 5 and the switching gear wheel 4 back and forth. As shown in FIG. 9 the hydraulic actuator 31 comprises a cylinder 32 that is provided in the intermediate body 18 of the drive system housing 16, wherein a partition 36 of the piston 27 is arranged moveable along the cylinder 32. The displacement device 9 also comprises control valves and supply ducts for supplying fluid to the hydraulic actuator 31, in particular to supply fluid to a first chamber 37 or a second chamber 38 with respect to the partition 36. Such control valves and supply ducts are for example known from US 5617901 or US 7857011, which are herewith incorporated by reference. Further, a seal 39 is provided between the piston 27 and the intermediate body 18, and a seal 40 is provided between the stationary rod 12 and the intermediate body 18. A support plate 41 of the displacement device 9 is fixed with bolts 42 to the intermediate body 18, while the second end 22 of the stationary rod 12 is fixed with a bolt 43 to the support plate 41.

**[0049]** In the embodiment shown, the piston 27 is arranged at least essentially half-way between an end of the drive arm 10 at which the slider element 14 is provided and an end of the drive arm 10 at which the shaft 23 of the switching gear wheel 4 is provided. The piston 27 is coupled to the drive arm 10 to displace the drive arm 10 axially with respect to the stationary rod 12. This allows a compact design of the drive system 1 and the main drive motor 6. As the force for moving the switching gear wheel 4 will be larger than the force for moving the slider element 14, the drive arm 10 will exert a momentum via the slider element 14 on the stationary rod 12.

**[0050]** In order to detect a position of the switching gear wheel 4 and/or the holding element 5, a sensor system 28 is provided, for example a proximity sensor system. In the embodiment shown, the sensor system 28 is an

optical sensor system or an inductive sensor system. For example, the sensor system 28 comprises two detectors 29 and 30. As shown in FIG. 10, the two detectors 29 and 30 are housed in the drive system housing 16, in particular in the intermediate body 18, wherein connection terminals protrude to an outside of the drive system housing 16. As can be seen in FIG. 10 the holding element 5 is visible through an opening 35 in the intermediate body 18. The main drive motor 6 is mounted to the intermediate body 18.

**[0051]** As best seen in FIG. 5, the detectors 29, 30 are arranged to cooperate with the drive arm 10. The detector 29 is arranged for sensing a presence of the drive arm 10 in a first position, in which the switching gear wheel 4 is in drive connection with the first drive gear wheel 2 and the holding element 5 is disengaged from the first drive gear wheel 2. The detector 30 is arranged for sensing a presence of the drive arm 10 in a second position, in which the switching gear wheel 4 is not in drive connection with the first drive gear wheel 2 and the holding element 5 engages with the first drive gear wheel 2 for holding the first drive gear wheel 2 against rotation.

**[0052]** In use, for example, the main drive motor 6 and/or the brake system 8 are activated for stopping the weaving machine in a pick finding position. It is known to keep the switching gear wheel 4 in position by controlling a main drive motor 6 driven in position modus and/or by activating the brake system 8. In the pick finding position, the displacement device 9 can be activated for axially moving the switching gear wheel 4 together with the holding element 5 from the first position shown in FIG. 1 into the second position shown in FIGS. 2 and 3, in which the switching gear wheel 4 is no longer in drive connection with the first drive gear wheel 2. The sensor system 28 can detect via the detector 30 the presence of the drive arm 10 in its second position. Next, the main drive motor 6 can be driven in slow-motion to move the second drive gear wheel 3 and the second group of elements including the shed formation device coupled thereto for pick finding. After the pick finding is completed, the switching gear wheel 4 is kept in position and the displacement device 9 can be activated for axially moving the switching gear wheel 4 together with the holding element 5 back into the first position shown in FIG. 1, in which the switching gear wheel 4 is in drive connection with the first drive gear wheel 2. The sensor system 28 can detect via the detector 29 the presence of the drive arm 10 in its first position, so that a normal operation of the weaving machine can be enabled.

**[0053]** When during standstill the switching gear wheel 4 is held against rotation using the main drive motor 6 and/or the brake system 8, large rotational forces can be exerted on the switching gear wheel 4 to counter external forces acting on the second drive gear wheel 3. The rotational forces cause large friction forces when moving the switching gear wheel 4 axially by means of the displacement device 9. The stationary rod 12 and the slider element 14 according to the invention are particularly ad-

vantageous when large friction forces need to be countered during the displacement between the first position shown in FIG. 1, and the second position shown in FIG. 2. This is particularly the case when as shed formation device a known jacquard system is driven by the second drive gear wheel 3, in particular when several warp threads are in open shed position and exert a large rotational force via the second drive gear wheel 3 on the switching gear wheel 4. In this case, when moving the switching gearwheel 4 a rather large momentum is exerted by the slider element 14 on the stationary rod 12, wherein the stationary rod 12 supported at both ends 21, 22 is advantageous to counter this momentum.

## Claims

1. Drive system for a weaving machine comprising a first drive gear wheel (2) for driving a first group of elements, a second drive gear wheel (3) for driving a second group of elements, a switching gearwheel (4), wherein the switching gearwheel (4) is displaceable between a first position, in which the switching gear wheel (4) is in drive connection with the first drive gear wheel (2) and the second drive gear wheel (3), and a second position, in which the switching gear wheel (4) is not in drive connection with the first drive gear wheel (2), a holding element (5), which is displaceable with the switching gear wheel (4), wherein in the second position of the switching gear wheel (4), the holding element engages with the first drive gear wheel (2) for holding the first drive gear wheel (2) against rotation, and wherein in the first position of the switching gear wheel (4), the holding element (5) is disengaged from the first drive gear wheel (2), and a displacement device (9) for displacing the switching gear wheel (4) and the holding element (5) between the first position and the second position, **characterized in that** the displacement device (9) comprises a stationary rod (12) extending in parallel to a rotation axis (13) of the first drive gear wheel (2) and a slider element (14) slideably mounted to the stationary rod (12), wherein the holding element (5) is arranged at the slider element (14).
2. The drive system according to claim 1, **characterized in that** the stationary rod (12) has a first end (21) and a second end (22), wherein the first end (21) and the second end (22) are housed in a drive system housing (16).
3. The drive system according to claim 1 or 2, **characterized in that** the first drive gear wheel (2) is arranged between the first end (21) of the stationary rod (12) and the second end (22) of the stationary rod (12).
4. The drive system according to claim 1, 2 or 3, **char-**

**acterized in that** an extension of the slider element (14) in an axial direction of the stationary rod (12) is larger than a thickness of the first drive gear wheel (2).

5. The drive system according to any one of claims 1 to 4, **characterized in that** the switching gear wheel (4) is coupled to a drive arm (10) formed integrally with or mounted to the slider element (14), so that the switching gear wheel (4) is displaceable together with the slider element (14) in parallel to the rotation axis (13) of the first drive gear wheel (2), wherein in particular the drive arm (10) is arranged at a motor side of the switching gear wheel (4).
6. The drive system according to claim 5, **characterized in that** the switching gear wheel (4) is rotatably coupled to the drive arm (10) via a stub (25) fixed to a shaft (23) of the switching gear wheel (4).
7. The drive system according to claim 6, **characterized in that** the stub (25) protrudes from a side of the drive arm (10) opposite the switching gear wheel (4), so that in the first position of the switching gear wheel (4), the stub (25) can be housed in a structure of the drive system housing (16).
8. The drive system according to any one of claims 1 to 7, **characterized in that** a sensor system (28) is provided for detecting whether the switching gear wheel (4) is in the first position or the second position, wherein in particular the sensor system (28) comprises two detectors (29, 30).
9. The drive system according to claim 8, **characterized in that** the drive system (1) comprises a drive arm (10) to which the switching gearwheel (4) is coupled, wherein the sensor system (28) is arranged to cooperate with the drive arm (10) for sensing a presence of the drive arm (10) in at least one position, in particular in at least two positions.
10. The drive system according to any one of claims 1 to 9, **characterized in that** the displacement device (9) comprises an axially displaceable piston (27) extending in parallel to the stationary rod (12), wherein the piston (27) is operable for displacing the holding element (5) along the stationary rod (12), wherein in particular the piston (27) is arranged at a motor side of the drive system (1).
11. The drive system according to claim 10, **characterized in that** the drive system (1) comprises a drive arm (10) to which the switching gearwheel (4) is coupled, wherein the piston (27) interacts with the drive arm (10) for displacing the switching gearwheel (4).
12. The drive system according to claim 10 or 11, **char-**

**acterized in that** the displacement device (9) comprises a cylinder (32), wherein the piston (27) is arranged moveable in the cylinder (32), wherein in particular the cylinder (32) is housed in the drive system housing (16).

13. The drive system according to claim 10, 11 or 12, **characterized in that** the piston (27) forms part of a hydraulic actuator.
14. The drive system according to any one of claims 1 to 13, **characterized in that** the switching gear wheel (4) is arranged to be driven by a main drive motor (6).
15. The drive system according to any one of claims 1 to 14, **characterized in that** the holding element (5) is one single tooth engaging with teeth of the first drive gear wheel (2).
16. Weaving machine with a drive system (1) according to any one of claims 1 to 15.
17. Weaving machine according to claim 16, **characterized in that** the weaving machine comprises a first drive gear wheel (2) used for driving a first group of elements including a sley drive and a second drive gear wheel (3) used for driving a second group of elements including a shed formation device, in particular a jacquard system.

#### Patentansprüche

1. Antriebssystem für eine Webmaschine umfassend ein erstes Antriebszahnrad (2) zum Antreiben einer ersten Gruppe von Elementen, ein zweites Antriebszahnrad (3) zum Antreiben einer zweiten Gruppe von Elementen, ein Schaltzahnrad (4), wobei das Schaltzahnrad (4) zwischen einer ersten Position, in der das Schaltzahnrad (4) in Antriebsverbindung mit dem ersten Antriebszahnrad (2) und dem zweiten Antriebszahnrad (3) steht, und einer zweiten Position, in der das Schaltzahnrad (4) nicht in Antriebsverbindung mit dem ersten Antriebszahnrad (2) steht, verschiebbar ist, ein Halteelement (5), das mit dem Schaltzahnrad (4) verschiebbar ist, wobei in der zweiten Position des Schaltzahnrad (4) das Halteelement mit dem ersten Antriebszahnrad (2) in Eingriff steht, um das erste Antriebszahnrad (2) gegen Drehung festzuhalten, und wobei in der ersten Position des Schaltzahnrad (4) das Halteelement (5) außer Eingriff mit dem ersten Antriebszahnrad (2) ist, und eine Verschiebevorrichtung (9) zum Verschieben des Schaltzahnrad (4) und des Halteelements (5) zwischen der ersten Position und der zweiten Position, **dadurch gekennzeichnet, dass** die Verschiebevorrichtung (9) eine parallel zu einer

Drehachse (13) des ersten Antriebszahnrad (2) verlaufende stationäre Stange (12) und ein gleitverschiebbar an der stationären Stange (12) montiertes Schieberelement (14) umfasst, wobei das Halteelement (5) an dem Schieberelement (14) angeordnet ist.

2. Das Antriebssystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die stationäre Stange (12) ein erstes Ende (21) und ein zweites Ende (22) aufweist, wobei das erste Ende (21) und das zweite Ende (22) in einem Antriebssystemgehäuse (16) untergebracht sind.
3. Das Antriebssystem nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das erste Antriebszahnrad (2) zwischen dem ersten Ende (21) der stationären Stange (12) und dem zweiten Ende (22) der stationären Stange (12) angeordnet ist.
4. Das Antriebssystem nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** eine Ausdehnung des Schieberelements (14) in einer axialen Richtung der stationären Stange (12) größer ist als eine Dicke des ersten Antriebszahnrad (2).
5. Das Antriebssystem nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** das Schaltzahnrad (4) mit einem Antriebsarm (10) gekoppelt ist, der einstückig ausgebildet ist mit oder montiert ist am Schieberelement (14), so dass das Schaltzahnrad (4) zusammen mit dem Schieberelement (14) parallel zur Drehachse (13) des ersten Antriebszahnrad (2) verschiebbar ist, wobei insbesondere der Antriebsarm (10) an einer Motorseite des Schaltzahnrad (4) angeordnet ist.
6. Das Antriebssystem nach Anspruch 5, **dadurch gekennzeichnet, dass** das Schaltzahnrad (4) über einen an einer Welle (23) des Schaltzahnrad (4) befestigten Stummel (25) drehbar mit dem Antriebsarm (10) gekoppelt ist.
7. Das Antriebssystem nach Anspruch 6, **dadurch gekennzeichnet, dass** der Stummel (25) von einer dem Schaltzahnrad (4) gegenüberliegenden Seite des Antriebsarms (10) hervorsteht, so dass in der ersten Position des Schaltzahnrad (4), der Stummel (25) in einer Struktur des Antriebssystemgehäuses (16) untergebracht werden kann.
8. Das Antriebssystem nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** ein Sensorsystem (28) zum Erfassen, ob das Schaltzahnrad (4) sich in der ersten Position oder der zweiten Position befindet, vorgesehen ist, wobei insbesondere das Sensorsystem (28) zwei Detektoren (29, 30) umfasst.

9. Das Antriebssystem nach Anspruch 8, **dadurch gekennzeichnet, dass** das Antriebssystem (1) einen Antriebsarm (10) umfasst, an den das Schaltzahnrad (4) gekoppelt ist, wobei das Sensorsystem (28) zum Zusammenwirken mit dem Antriebsarm (10) zum Erfassen einer Anwesenheit des Antriebsarms (10) in mindestens einer Position, insbesondere in mindestens zwei Positionen, angeordnet ist. 5
10. Das Antriebssystem nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet, dass** die Verschiebevorrichtung (9) einen parallel zur stationären Stange (12) verlaufenden, axial verschiebbaren Kolben (27) umfasst, wobei der Kolben (27) zum Verschieben des Halteelements (5) entlang der stationären Stange (12) betätigbar ist, wobei insbesondere der Kolben (27) an einer Motorseite des Antriebssystems (1) angeordnet ist. 10
11. Das Antriebssystem nach Anspruch 10, **dadurch gekennzeichnet, dass** das Antriebssystem (1) einen Antriebsarm (10) aufweist, an den das Schaltzahnrad (4) gekoppelt ist, wobei der Kolben (27) zum Verschieben des Schaltzahnrad (4) mit dem Antriebsarm (10) interagiert. 15
12. Das Antriebssystem nach Anspruch 10 oder 11, **dadurch gekennzeichnet, dass** die Verschiebevorrichtung (9) einen Zylinder (32) umfasst, wobei der Kolben (27) beweglich im Zylinder (32) angeordnet ist, wobei insbesondere der Zylinder (32) im Antriebssystemgehäuse (16) untergebracht ist. 20
13. Das Antriebssystem nach Anspruch 10, 11 oder 12, **dadurch gekennzeichnet, dass** der Kolben (27) Teil eines hydraulischen Aktuators ist. 25
14. Das Antriebssystem nach einem der Ansprüche 1 bis 13, **dadurch gekennzeichnet, dass** das Schaltzahnrad (4) angeordnet ist, um von einem Hauptantriebsmotor (6) angetrieben zu werden. 30
15. Das Antriebssystem nach einem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** das Halteelement (5) ein einzelner Zahn ist, der in Zähne des ersten Antriebszahnrad (2) eingreift. 35
16. Webmaschine mit einem Antriebssystem (1) nach einem der Ansprüche 1 bis 15. 40
17. Webmaschine nach Anspruch 16, **dadurch gekennzeichnet, dass** die Webmaschine ein erstes Antriebszahnrad (2) angewendet zum Antreiben einer ersten Gruppe von Elementen enthaltend einen Ladenantrieb und ein zweites Antriebszahnrad (3) angewendet zum Antreiben einer zweiten Gruppe von Elementen enthaltend eine Fachbildungsvorrichtung, insbesondere ein Jacquardsystem, um-

fasst.

## Revendications

1. Système d'entraînement pour une machine à tisser comprenant une première roue dentée d'entraînement (2) pour entraîner un premier groupe d'éléments, une deuxième roue dentée d'entraînement (3) pour entraîner un deuxième groupe d'éléments, une roue dentée de commutation (4), dans laquelle la roue dentée de commutation (4) est déplaçable entre une première position, dans laquelle la roue dentée de commutation (4) est en liaison d'entraînement avec la première roue dentée d'entraînement (2) et la deuxième roue dentée d'entraînement (3), et une deuxième position, dans laquelle la roue dentée de commutation (4) n'est pas en liaison d'entraînement avec la première roue dentée d'entraînement (2), un élément de maintien (5), qui est déplaçable avec la roue dentée de commutation (4), dans lequel dans la deuxième position de la roue dentée de commutation (4), l'élément de maintien s'engage avec la première roue dentée d'entraînement (2) pour maintenir la première roue dentée d'entraînement (2) contre la rotation, et dans lequel dans la première position de la roue dentée de commutation (4), l'élément de maintien (5) est désengagé de la première roue dentée d'entraînement (2), et un dispositif de déplacement (9) pour déplacer la roue dentée de commutation (4) et l'élément de maintien (5) entre la première position et la deuxième position, **caractérisé en ce que** le dispositif de déplacement (9) comprend une tige fixe (12) s'étendant parallèlement à un axe de rotation (13) de la première roue dentée d'entraînement (2) et un élément coulissant (14) monté coulissant sur la tige fixe (12), dans lequel l'élément de maintien (5) est disposé sur l'élément coulissant (14).
2. Le système d'entraînement selon la revendication 1, **caractérisé en ce que** la tige fixe (12) a une première extrémité (21) et une deuxième extrémité (22), dans lequel la première extrémité (21) et la deuxième extrémité (22) sont logées dans un boîtier du système d'entraînement (16).
3. Le système d'entraînement selon la revendication 1 ou 2, **caractérisé en ce que** la première roue dentée d'entraînement (2) est disposée entre la première extrémité (21) de la tige fixe (12) et la deuxième extrémité (22) de la tige fixe (12).
4. Le système d'entraînement selon la revendication 1, 2 ou 3, **caractérisé en ce qu'une** extension de l'élément coulissant (14) dans une direction axiale de la tige fixe (12) est plus grande qu'une épaisseur de la première roue dentée d'entraînement (2).

5. Le système d'entraînement selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** la roue dentée de commutation (4) est couplée à un bras d'entraînement (10) formé intégralement avec ou monté sur l'élément coulissant (14), de sorte que la roue dentée de commutation (4) est déplaçable avec l'élément coulissant (14) parallèlement à l'axe de rotation (13) de la première roue dentée d'entraînement (2), dans lequel en particulier le bras d'entraînement (10) est disposé d'un côté moteur de la roue dentée de commutation (4).
6. Le système d'entraînement selon la revendication 5, **caractérisé en ce que** la roue dentée de commutation (4) est couplée en rotation au bras d'entraînement (10) via un embout (25) fixé à un arbre (23) de la roue dentée de commutation (4).
7. Le système d'entraînement selon la revendication 6, **caractérisé en ce que** l'embout (25) saillie d'un côté du bras d'entraînement (10) opposé à la roue dentée de commutation (4), de sorte que dans la première position de la roue dentée de commutation (4), l'embout (25) peut être logé dans une structure du boîtier du système d'entraînement (16).
8. Le système d'entraînement selon l'une quelconque des revendications 1 à 7, **caractérisé en ce qu'un** système de capteurs (28) est prévu pour détecter si la roue dentée de commutation (4) se trouve dans la première position ou dans la deuxième position, dans lequel en particulier le système de capteurs (28) comprend deux détecteurs (29, 30).
9. Le système d'entraînement selon la revendication 8, **caractérisé en ce que** le système d'entraînement (1) comprend un bras d'entraînement (10) auquel la roue dentée de commutation (4) est couplée, dans lequel le système de capteurs (28) est disposé pour coopérer avec le bras d'entraînement (10) pour détecter une présence du bras d'entraînement (10) dans au moins une position, en particulier dans au moins deux positions.
10. Le système d'entraînement selon l'une quelconque des revendications 1 à 9, **caractérisé en ce que** le dispositif de déplacement (9) comprend un piston (27) déplaçable axialement s'étendant parallèlement à la tige fixe (12), dans lequel le piston (27) peut fonctionner pour déplacer l'élément de maintien (5) le long de la tige fixe (12), dans lequel en particulier le piston (27) est disposé d'un côté moteur du système d'entraînement (1).
11. Le système d'entraînement selon la revendication 10, **caractérisé en ce que** le système d'entraînement (1) comprend un bras d'entraînement (10) auquel la roue dentée de commutation (4) est couplée, dans lequel le piston (27) interagisse avec le bras d'entraînement (10) pour déplacer la roue dentée de commutation (4).
12. Le système d'entraînement selon la revendication 10 ou 11, **caractérisé en ce que** le dispositif de déplacement (9) comprend un cylindre (32), dans lequel le piston (27) est disposé mobile dans le cylindre (32), dans lequel en particulier le cylindre (32) est logé dans le boîtier du système d'entraînement (16).
13. Le système d'entraînement selon la revendication 10, 11 ou 12, **caractérisé en ce que** le piston (27) fait partie d'un actionneur hydraulique.
14. Le système d'entraînement selon l'une quelconque des revendications 1 à 13, **caractérisé en ce que** la roue dentée de commutation (4) est disposée pour être entraînée par un moteur d'entraînement principal (6).
15. Le système d'entraînement selon l'une quelconque des revendications 1 à 14, **caractérisé en ce que** l'élément de maintien (5) est une seule dent s'engageant avec des dents de la première roue dentée d'entraînement (2).
16. Machine à tisser avec un système d'entraînement (1) selon l'une quelconque des revendications 1 à 15.
17. Machine à tisser selon la revendication 16, **caractérisée en ce que** la machine à tisser comprend une première roue dentée d'entraînement (2) utilisée pour entraîner un premier groupe d'éléments comprenant un entraînement de battant et une deuxième roue dentée d'entraînement (3) utilisée pour entraîner un deuxième groupe d'éléments comprenant un dispositif de formation de la foule, en particulier un système jacquard.

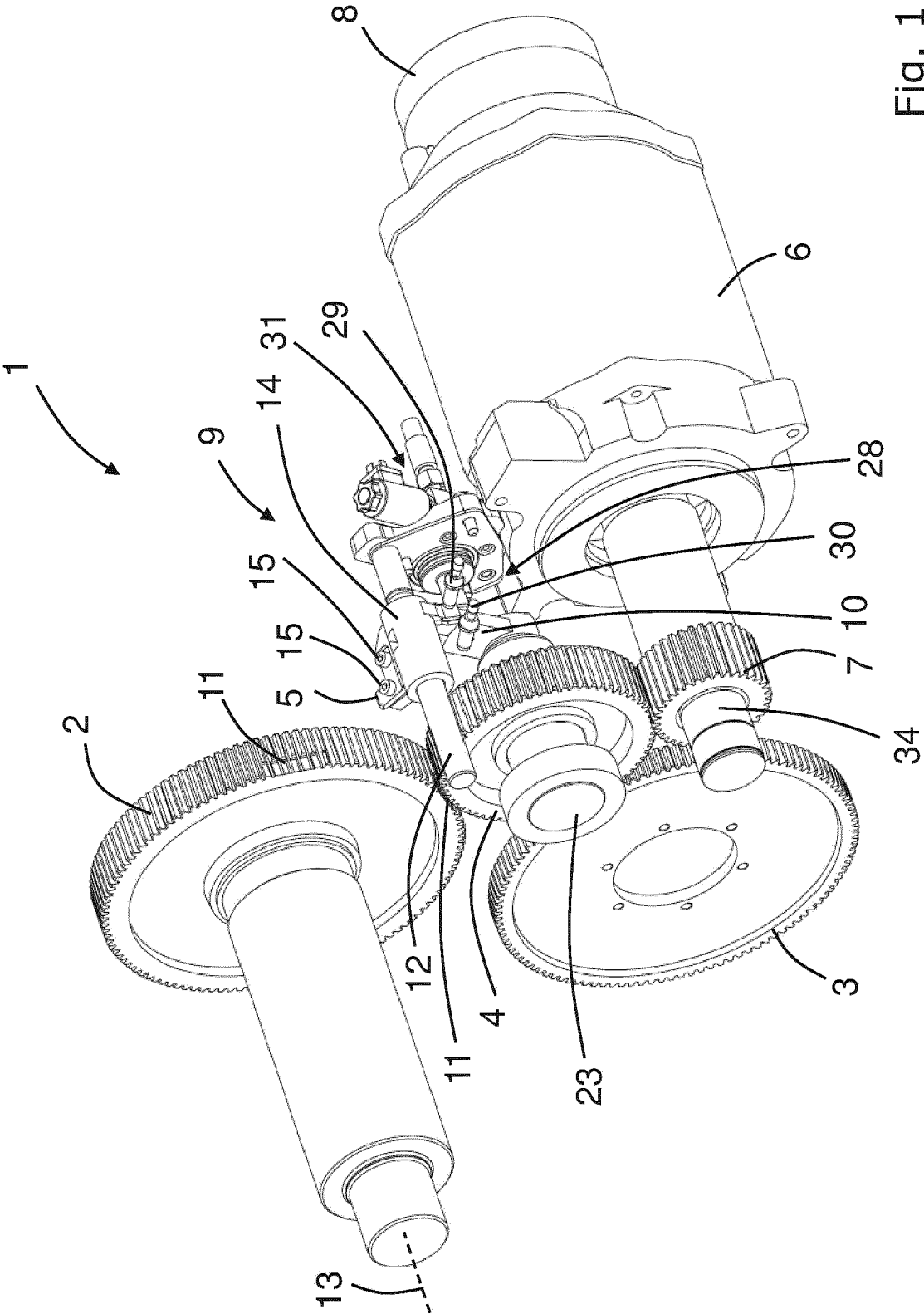


Fig. 1

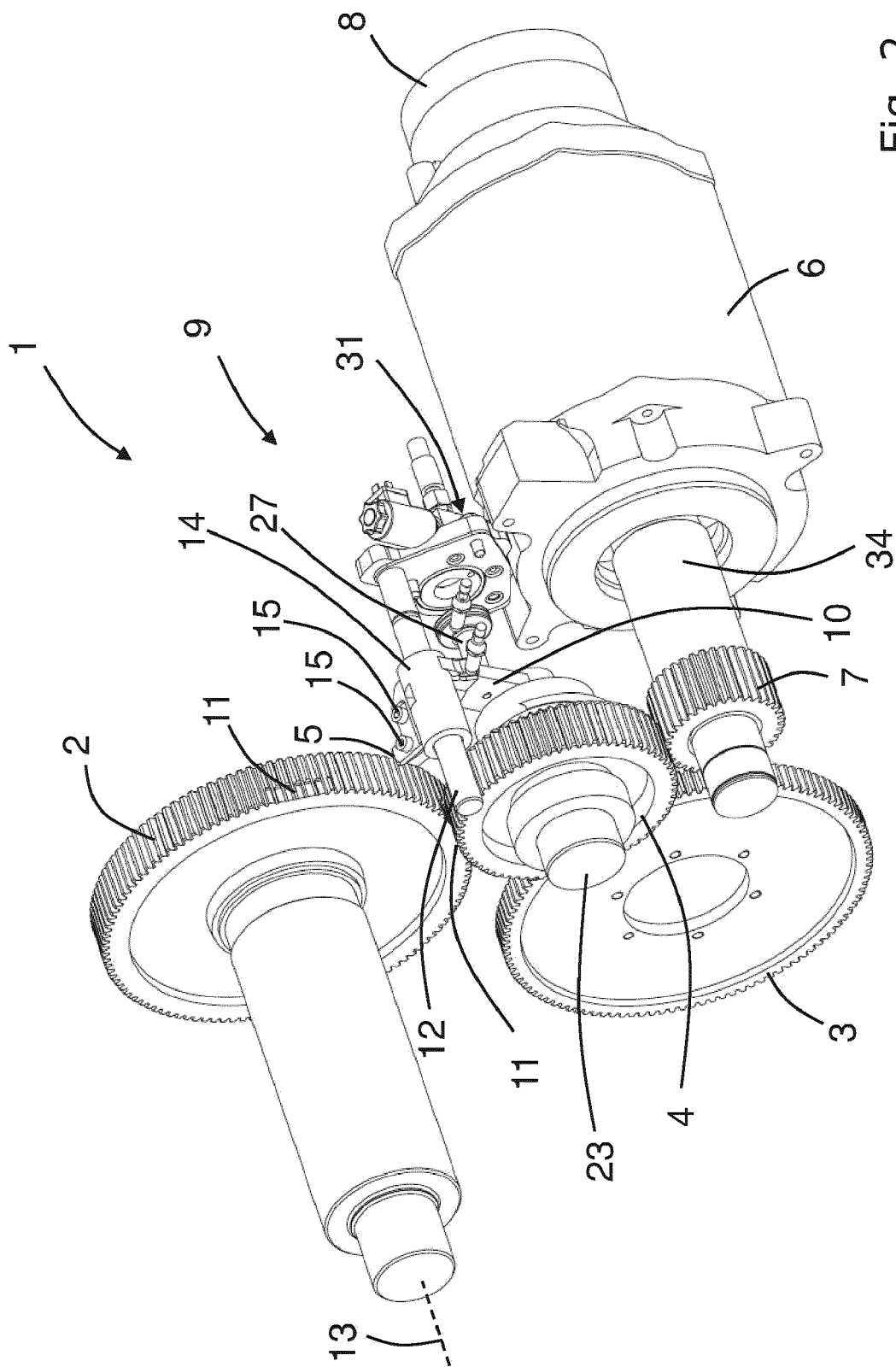


Fig. 2

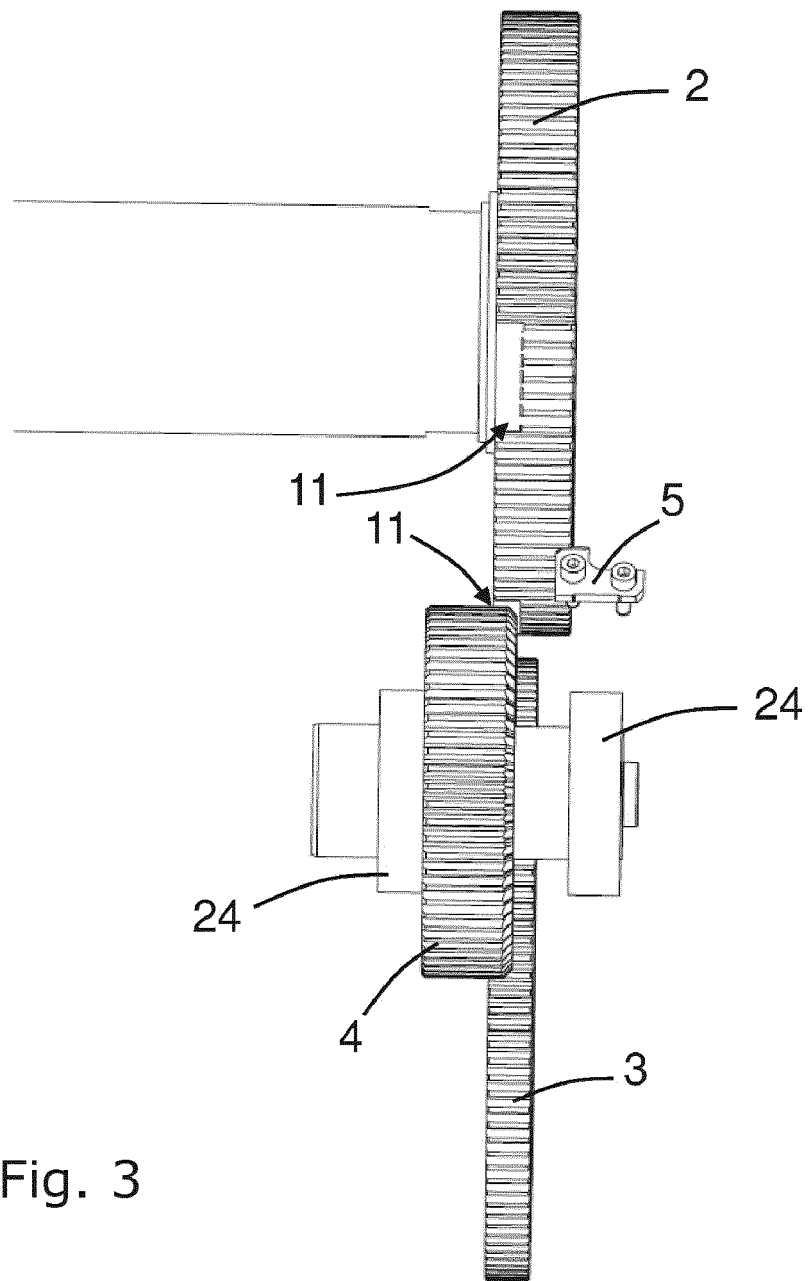


Fig. 3

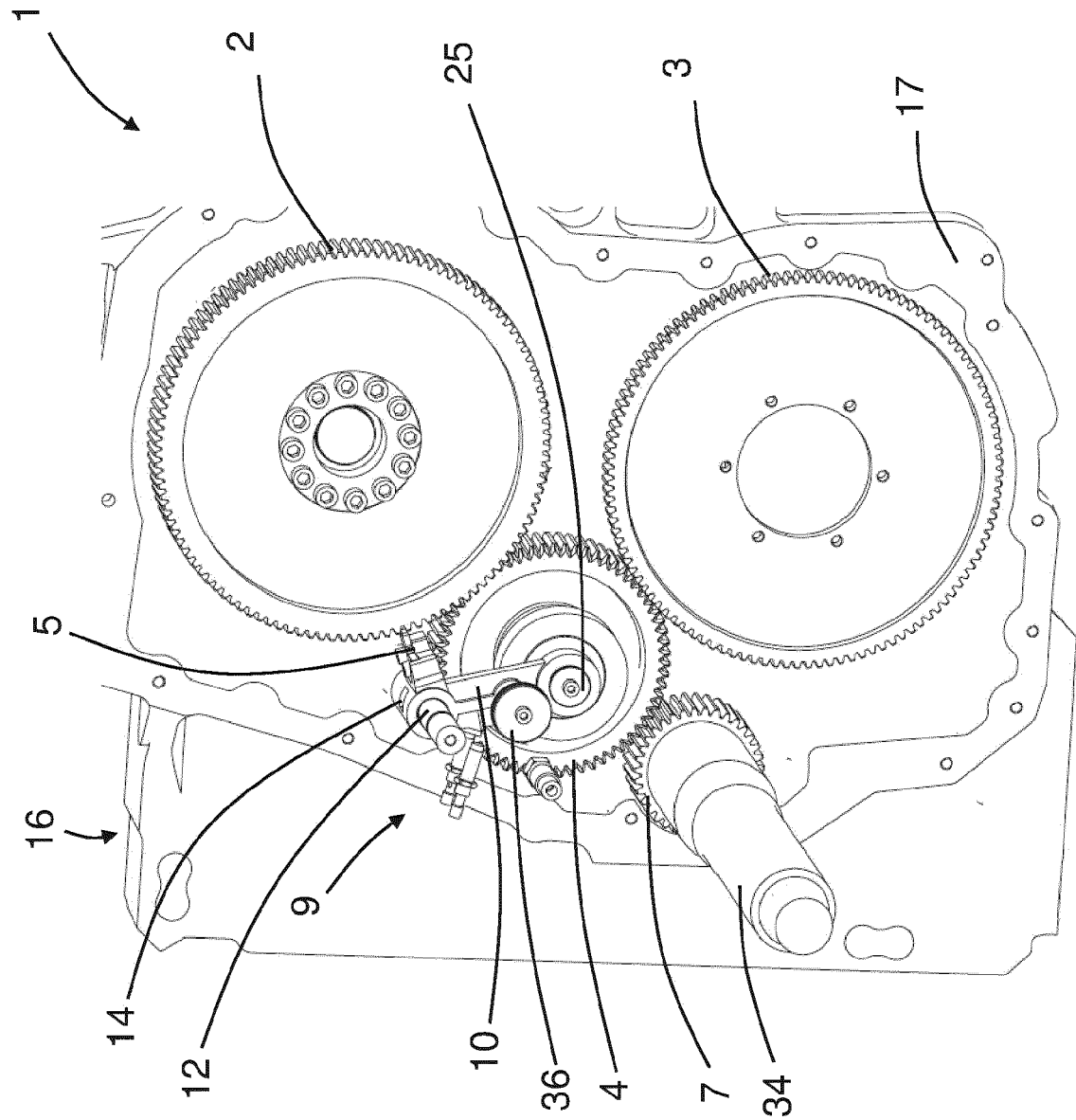
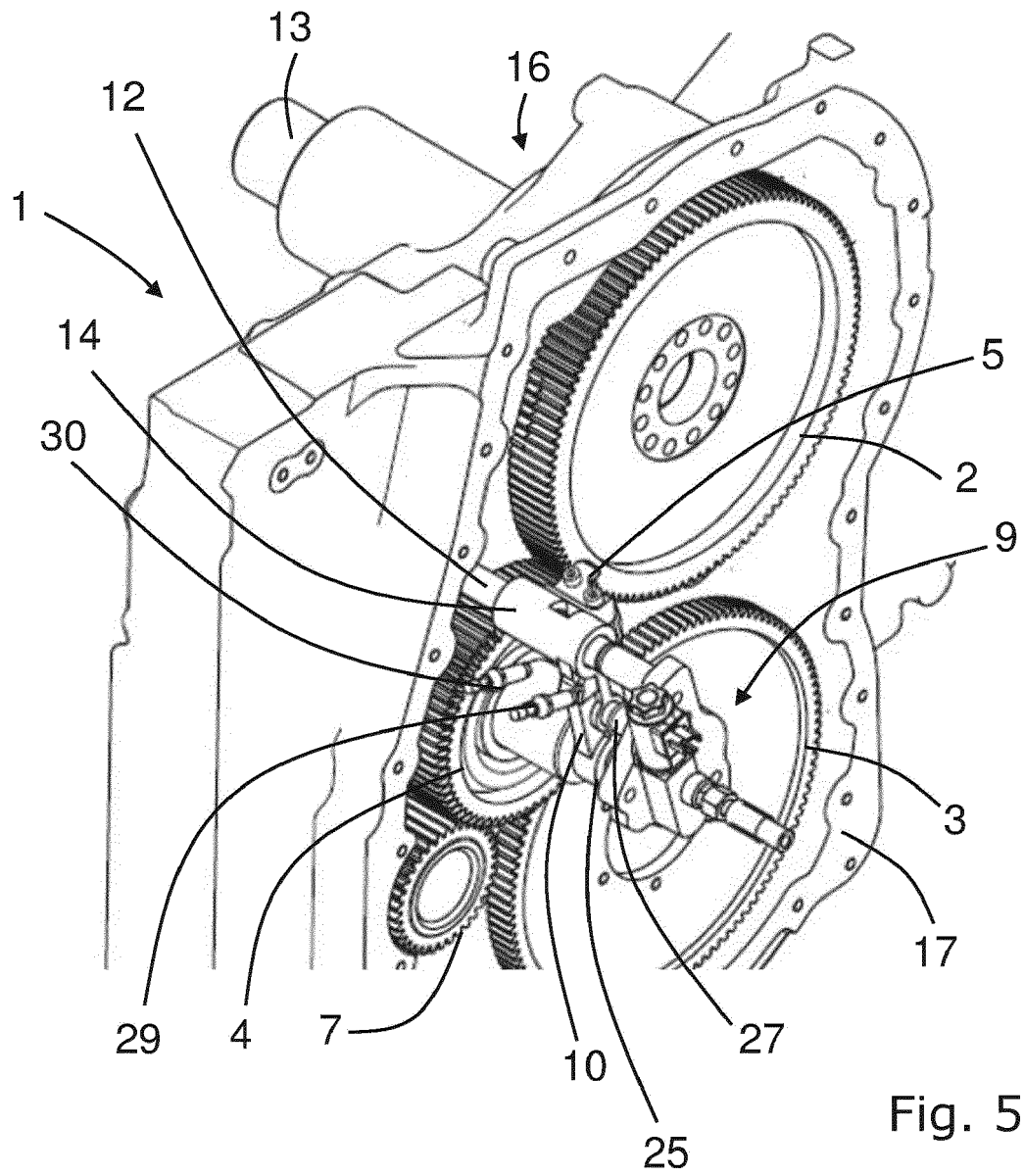


Fig. 4



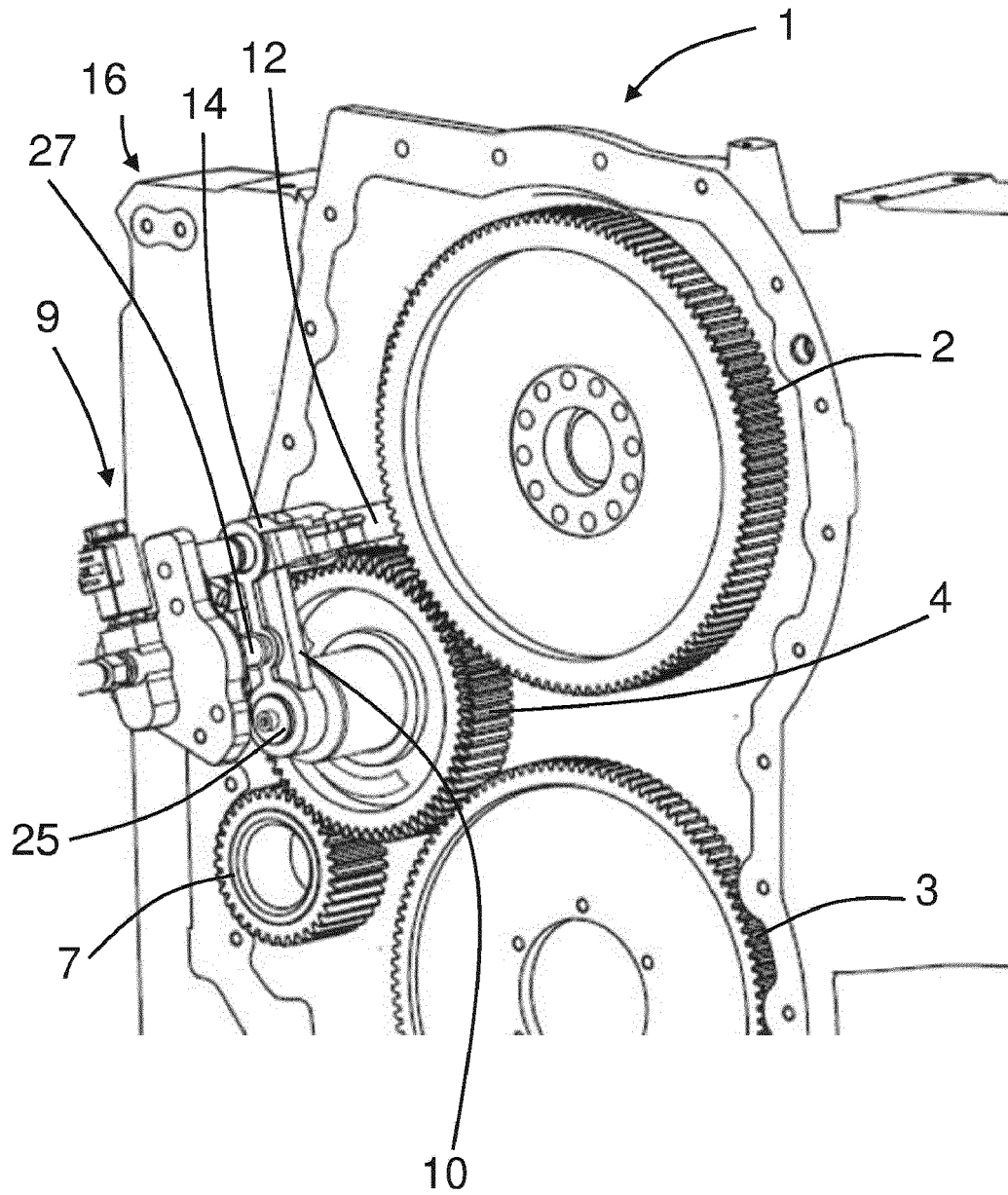


Fig. 6

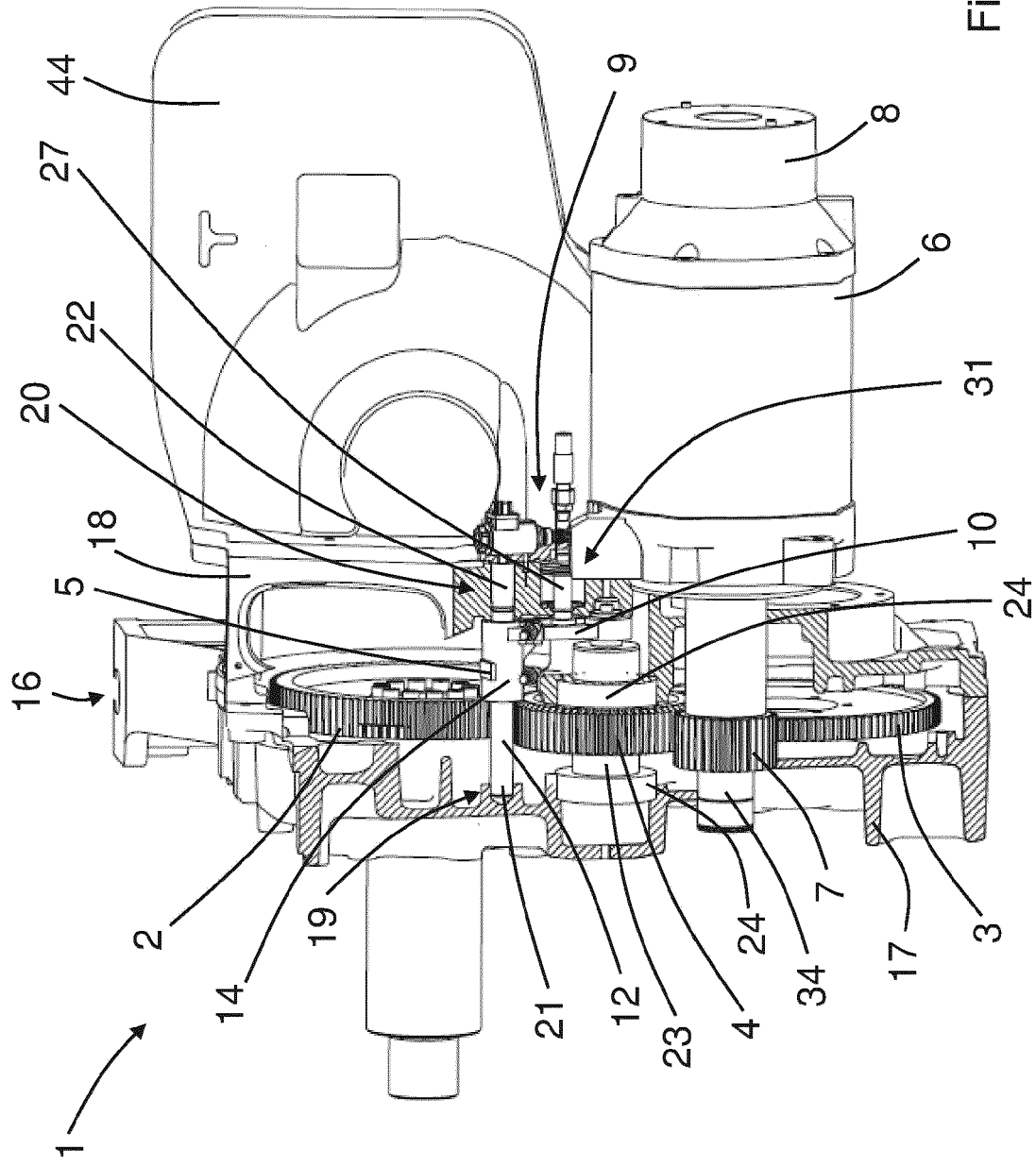


Fig. 7

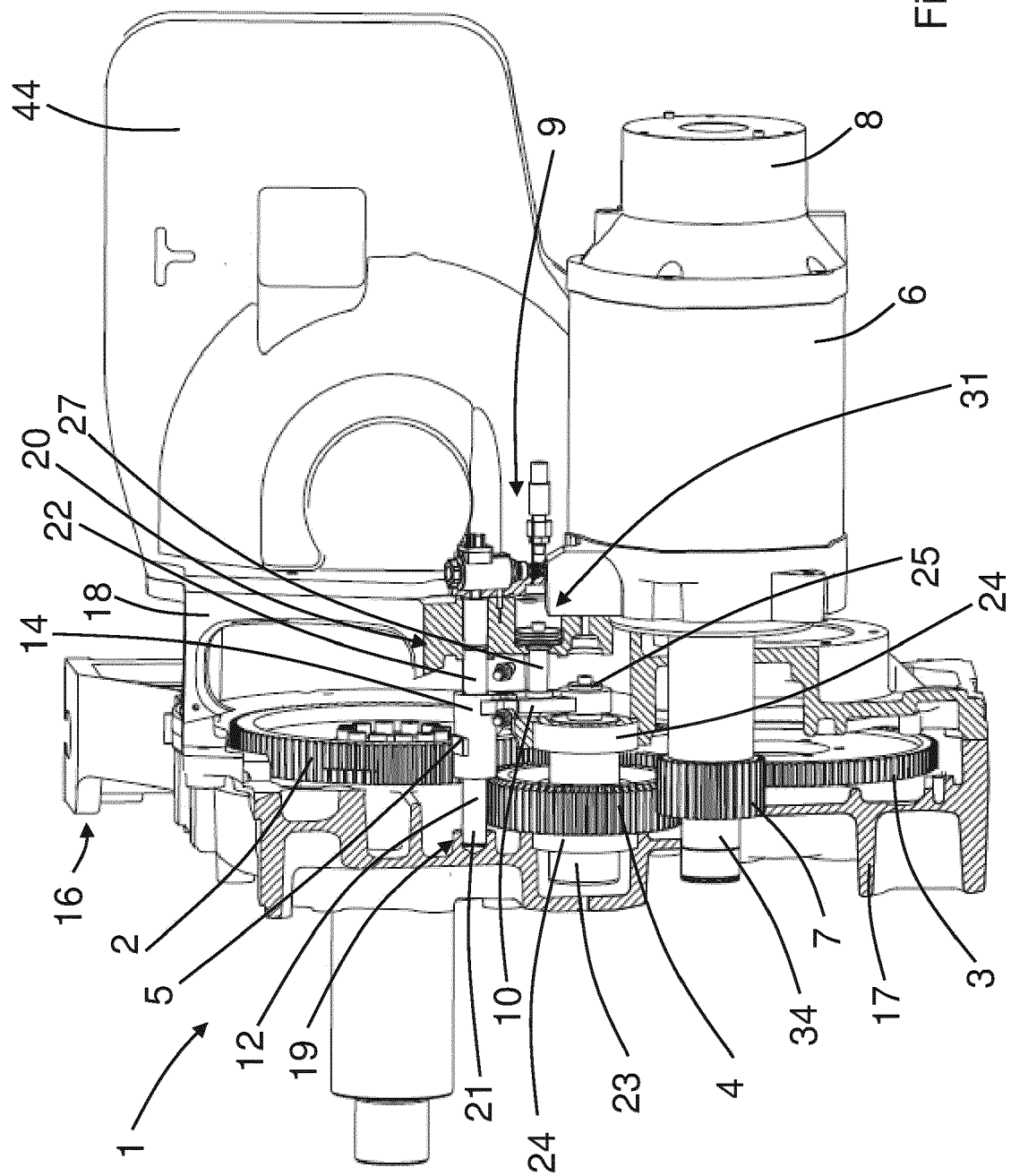


Fig. 8

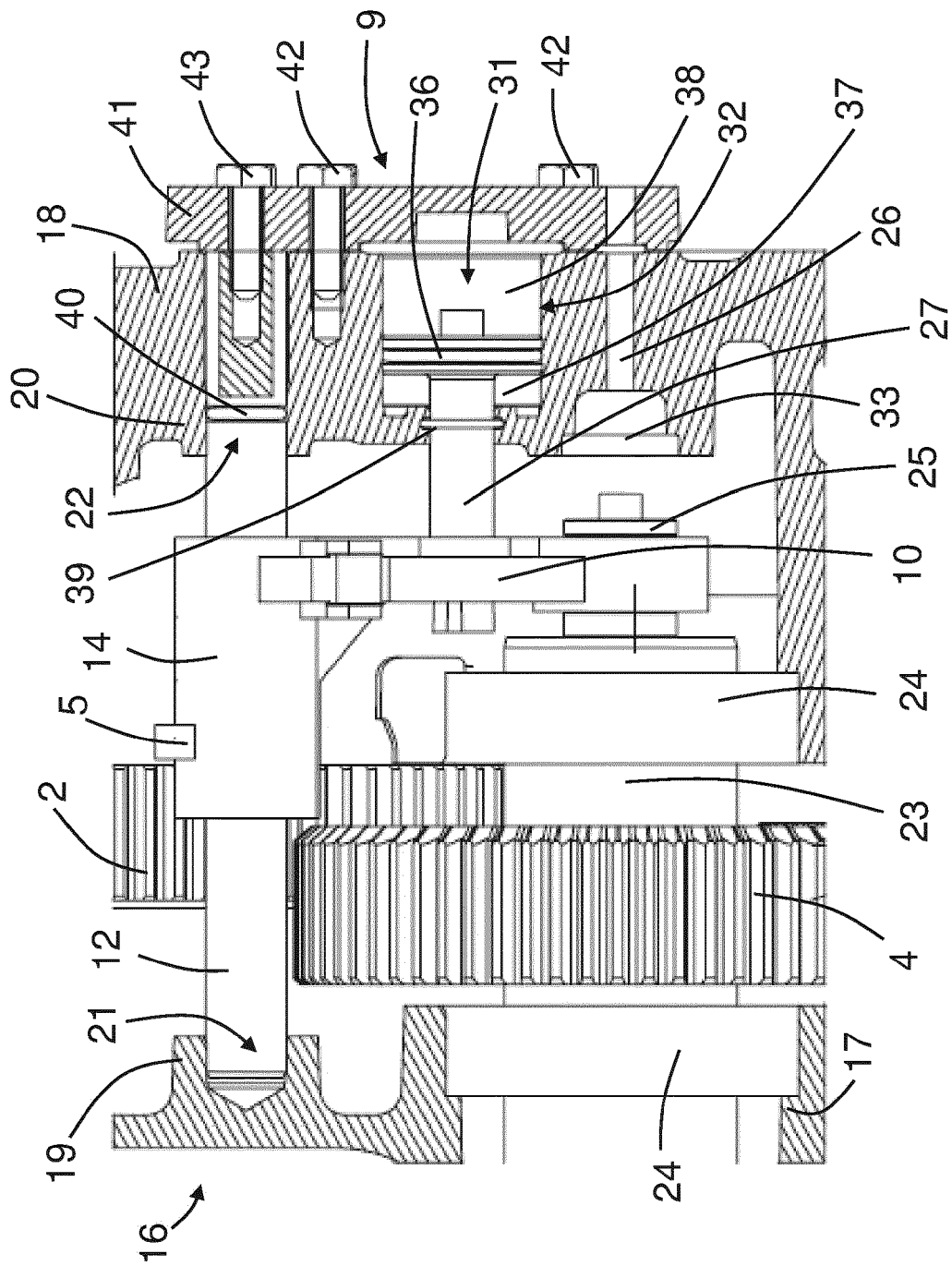
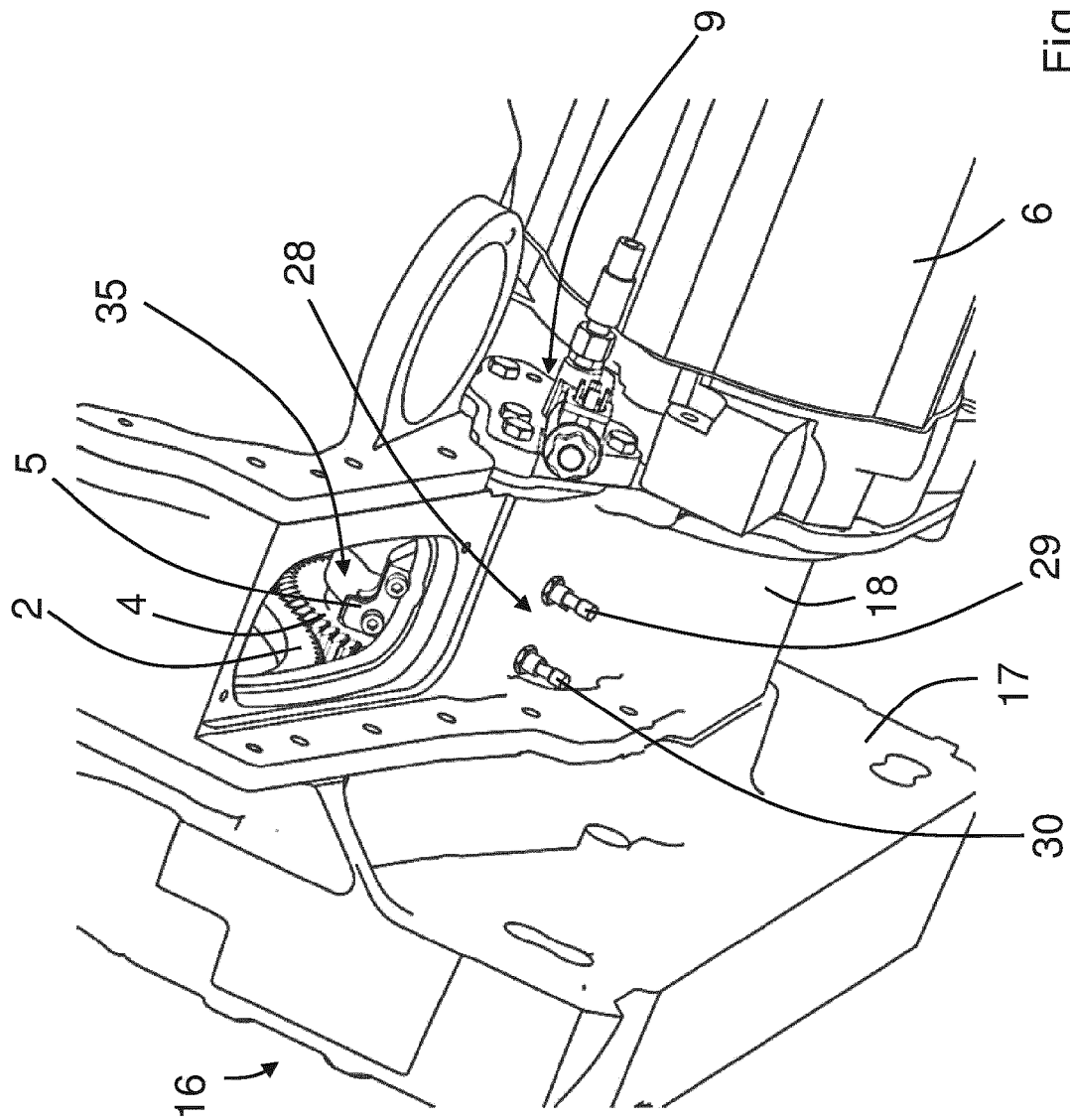


Fig. 9



**REFERENCES CITED IN THE DESCRIPTION**

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