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(54) **Drive device**

(57) In a drive device (1) for a printing unit comprising a first functional unit (11), a second functional unit (12) and a third functional unit (13), the first functional unit (11) comprising a toner, a printer cartridge and an output means, the second functional unit (12) comprising a receiving roll and the third functional unit (13) comprising a conveyor means, it is proposed that a common motor (2) be configured for regulated driving of the first functional unit (11), the second functional unit (12) and the third functional unit (13).

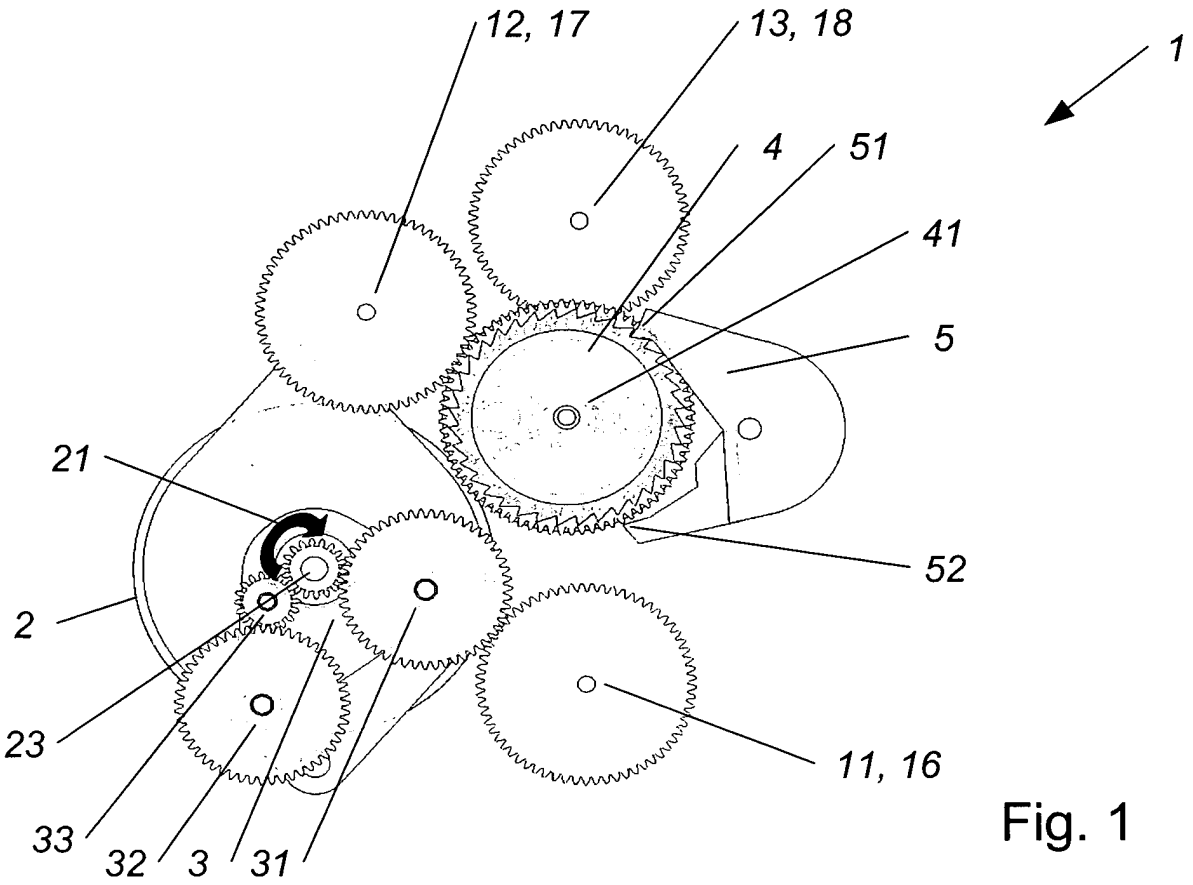

Fig. 1

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Description

[0001] The invention relates to a drive device according to the preamble of claim 1.

[0002] Drive devices are known in printing units, for example in printers, fax devices and/or copiers. The drive devices drive differing functional units, a first functional unit comprising a toner, a printer cartridge and an output means, a second functional unit comprising a receiving roll and a third functional unit comprising a conveyor means, the various functional units being required at differing moments in the printing process and thus having to be driven in differing directions of rotation and at differing speed. A drawback of this is that the known printing units are heavy and take up a lot of space for the required drive.

[0003] The object of the invention is therefore to specify a drive device of the type mentioned at the outset that allows the aforementioned drawbacks to be avoided, that is simple and reliable in its construction, is light and can be manufactured cost-effectively.

[0004] According to the invention, this is achieved by the features of claim 1.

[0005] This gives rise to the advantage that there is configured in the drive unit merely one drive motor which can drive all the differing functional groups. In this case, three functional groups can be driven differently with merely one motor. This motor can ensure a short switching time, coordination of the start-up and shut-down times of a plurality of motors not being required. Furthermore, the number of adjusting units required can be kept low, so the probability of failure is low.

[0006] The fact that further motors are not used for the purposes of driving gives rise, in particular, to the advantages, that the drive device takes up little space, that the activator and the activation electronics can be manufactured simply and cost-effectively, that the power consumed by the drive device can be kept low and that the noise of the drive device is reduced.

[0007] As a result of the provision of just one motor for the purposes of driving, compared to a plurality of motors, the quality of the motor can be improved while the manufacturing costs are lowered, as a result of which the formation of heat, the formation of noise and the amount of energy required can be especially low. Furthermore, a long service life and high reliability of the drive device are easily ensured.

[0008] The invention further relates to a method according to the preamble of claim 5.

[0009] A further object of the invention is to specify a method with which the advantages of the drive device described at the outset can be provided simply and cost-effectively.

[0010] According to the invention, this is achieved by the features of claim 5.

[0011] The sub-claims, which at the same time, like claim 1 and claim 5, form part of the description, relate to further advantageous configurations of the invention.

[0012] The invention will be described in greater detail with reference to the appended drawings which show, by way of example, merely preferred embodiments and in which:

Fig. 1 is a schematic side view of a drive device according to a first embodiment in a first transmission position of a first transmission mechanism and in a first adjusted position of an adjustment mechanism;

Fig. 2 is a schematic side view of the drive device according to Fig. 1 in a second transmission position of the first transmission mechanism and in a second adjusted position of the adjustment mechanism; and

Fig. 3 is a schematic side view of the drive device according to Fig. 1 in the second transmission position of the first transmission mechanism and in the first adjusted position of the adjustment mechanism.

[0013] Fig. 1 to 3 show a drive device 1 according to a preferred embodiment for a printing unit comprising a first functional unit 11, a second functional unit 12 and a third functional unit 13, the first functional unit 11 comprising a toner, a printer cartridge and an output means, the second functional unit 12 comprising a receiving roll and the third functional unit 13 comprising a conveyor means, a common motor 2 being configured for regulated driving of the first functional unit 11, the second functional unit 12 and the third functional unit 13.

[0014] The drive device 1 facilitates a method for operating a printing unit in which the first functional unit 11, the second functional unit 12 and the third functional unit 13 are driven, the first functional unit 11 comprising a toner, a printer cartridge and an output means, the second functional unit 12 comprising a receiving roll and a third functional unit 13 comprising a conveyor means, and the first functional unit 11, the second functional unit 12 and the third functional unit 13 being driven by means of a common motor 2.

[0015] The drive device 1 may advantageously drive all of the components to be driven, in particular the first functional unit 11, the second functional unit 12 and the third functional unit 13 and also the associated transmission mechanisms and gear-wheels, of the printing unit.

[0016] The illustrated preferred drive device 1 and the method facilitated by the drive device 1 give rise to the advantages and advantageous effects mentioned in the introductory part of the description.

[0017] Fig. 1 to 3 show the first functional unit 11, the second functional unit 12 and the third functional unit 13, merely the gear-wheels which are coupleable to the first transmission mechanism 3 or the second transmission mechanism 4, the first gear-wheel 16, the second gear-wheel 17 and the third gear-wheel 18 of these functional units being shown. In this case, the first gear-wheel 16 is operatively connected to movable parts of the first functional unit 11, the second gear-wheel 17 is operatively

connected to movable parts of the second functional unit 12 and the third gear-wheel 18 is operatively connected to movable parts of the third functional unit 13.

[0018] The printing unit may, for example, be configured as a laser printer, as an ink-jet printer, as a fax machine, as a copier and/or as a thermal sublimation printer and also as a black-and-white printer or as a colour printer. The printing unit is provided for the imprinting of received media, preferably of sheets. The sheets which are preferably used can advantageously comprise paper and/or plastics material film and can advantageously have standard sizes, for example the size of "A6" to "A2", in particular "A4", "US legal" and/or "US letter".

[0019] The printing device can be divided into functional groups, the division preferably being made into the functional group for imprinting, which is referred to as the first functional unit 11, into the functional group for receiving the received medium, preferably the sheet, which is referred to as the second functional unit 12, and into the functional group for conveying the received medium, preferably the sheet, along a path of conveyance through the printing unit, which is referred to as the third functional unit 12.

[0020] Over the course of a printing process, i.e. in the sequence of the process from receiving via imprinting up to ejection of the received medium, preferably the sheet, the differing functional units place differing requirements on the direction of rotation and/or the rotational speed of the movable parts in the functional units, the various functional units being required at differing moments in the printing process and thus having to be driven in differing directions of rotation and at differing speed.

[0021] Fig. 1 shows the drive device 1 in a position in which merely the first functional unit 11 is operatively connected in a driveable manner to the motor 2.

[0022] Fig. 2 shows the drive device 1 in a position in which the first functional unit 11 and the second functional unit 12 are operatively connected in a driveable manner to the motor 2.

[0023] Fig. 3 shows the drive device 1 in a position in which the first functional unit 11 and the third functional unit 13 are operatively connected in a driveable manner to the motor 2.

[0024] The motor 2 is configured as a rotary motor for regulated driving of the three functional units, the first functional unit 11, the second functional unit 12 and/or the third functional unit 13, and can be configured, for example, as a DC motor, as an AC motor, as a servomotor and/or as a universal motor.

[0025] Preferably, provision may be made for a motor pinion 23 of the motor 2 to be operatively connected merely to the first functional unit 11, by means of a first transmission mechanism 3 in a first direction of rotation 21, and for the motor pinion 23 to be operatively connected to the first functional unit 11 and a second transmission mechanism 4, which is selectively coupleable to the second functional unit 12 or to the third functional unit 13 by means of an adjustment mechanism 5, by means of the first transmission mechanism 3 in a second direction of rotation 22 opposing the first direction of rotation 21. As a result, merely the first functional unit 11 can be driven by means of a first transmission mechanism 13 on rotation of the motor pinion 23 of the motor 2 in a first direction of rotation 21, and the first functional unit 11 and also a second transmission mechanism 4, which is selectively coupleable to the second functional unit 12 or to the third functional unit 13 by means of an adjustment mechanism 5, are driven on rotation of the motor pinion 23 in a second direction of rotation 22 opposing the first direction of rotation 21. An advantage of this is that merely the one motor 2 can drive either merely the first functional unit 11, or the first functional unit 11 and the second functional unit 12 or the third functional unit 13, thus allowing all of the operating states of the printing unit to be provided by means of the first motor. As a result, the printing unit can be configured in a simple, low-weight and cost-effective manner.

[0026] The fact that the motor pinion 23 of the motor 2 is operatively connected merely to the first functional unit 11 in the first direction of rotation 21 can be controlled, for example by an actuator (not shown in the figure). For example, the actuator can form, as a function of a direction of the flow of current through the actuator, a first position - for operative connection of the motor pinion 23 to merely the first functional unit 11 - or a second position which differs from the first position - for operative connection of the motor pinion 23 to the first functional unit 11 and the second transmission mechanism 4.

[0027] The motor pinion 23 is rotatable in both directions of rotation, i.e. in the first direction of rotation 21 and in the second direction of rotation 22 opposing the first direction of rotation 21, in particular at a predefinable variable rotational speed, the direction of rotation and the rotational speed of the motor pinion 23 of the motor 2 being, in particular, regulable by means of a control unit.

[0028] According to the preferred embodiment, the motor pinion 23 is operatively connected to the first transmission mechanism 3 at all times, wherein the motor pinion 23 of the motor 2 and/or of the transmission mechanism 3 can be detachably configured, for example, for replacing the motor and/or for replacing the transmission mechanism.

[0029] In the preferred embodiment, provision may be made for the first transmission mechanism 3 to be arranged so as to be pivotable about the motor pinion 23. This ensures that when the direction of rotation of the motor pinion 23 changes, the first transmission mechanism 3 is pivoted about the motor pinion 23, the engagement of the first drive wheel 31 and/or the second drive wheel 32 being changed. The operative connection of the motor pinion 23 to the first functional unit 11 or to the first functional unit 11 and the second transmission mechanism 4 can in this case be self-controlling, the first transmission mechanism 3 also rotating up to a predefinable stop in the respective direction with the direction of rotation of the motor pinion 23. The first transmission mech-

anism 3 assumes in this case two preferred positions, the first transmission position of the first transmission mechanism 3 - which is shown in Fig. 1 - being formed in the first direction of rotation 21 of the motor pinion 23 and the second transmission position of the first transmission mechanism 3 - which is shown in Fig. 2 and 3 - being formed in the second direction of rotation 22 of the motor pinion 23. As a result of the respective transmission position of the first transmission mechanism 3, the gear-wheels of the first transmission mechanism 3 are operatively connected either merely to the first gear-wheel 16 of the first functional unit 11 or to the first gear-wheel 16 and to gear-wheels of the second transmission mechanism 4.

[0030] In an advantageous development, provision may be made for the first transmission mechanism 3 to comprise a first drive wheel 31 and a second drive wheel 32 and for the first drive wheel 31 and the second drive wheel 32 to be configured for rotation in opposite directions. This ensures that both in the first direction of rotation 21 and in the second direction of rotation 22 of the motor pinion 23, the first functional unit 11 is driven in the same direction of rotation.

[0031] According to the preferred embodiment, provision is made for when the motor pinion 23 is driven in the first direction of rotation 21, the first drive wheel 31 to be operatively connected to the first functional unit 11 and for when the motor pinion 23 is driven in the second direction of rotation 22, the first drive wheel 31 to be operatively connected to the second transmission mechanism 4 and the second drive wheel 32 to be operatively connected to the first functional unit 11. In the following paragraph, this will be described again in greater detail based on the example of the preferred embodiment illustrated in Fig. 1 to 3.

[0032] In the preferred first transmission position - shown in Fig. 1 - the motor pinion 23 rotates in the first direction of rotation 21, as a result of which the first drive wheel 31 rotates in the second direction of rotation 22 and the first gear-wheel 16 rotates in the first direction of rotation 21. In the first transmission position, the second drive wheel 32 can be arranged without engagement to the functional units. After reversal of the direction of rotation of the motor pinion 23 - shown in Fig. 2 and 3 - into the second direction of rotation 22, the entire transmission mechanism pivots about an, in particular, common axis of rotation with the motor pinion 23 into the preferred second transmission position of the first transmission mechanism 3. The motor pinion 23 then rotates in the direction of rotation 22, as a result of which the first drive wheel 31 - which, in the second transmission position of the first transmission mechanism 3, is not operatively connected to the first functional unit 11 - rotates in the first direction of rotation 21. The intermediate wheel 33 causes the second drive wheel 32 - which is then operatively connected to the first functional unit 11 - to rotate in the second direction of rotation 22, as a result of which the first gear-wheel 16 rotates, in turn, in the first direction of rotation 21. The preferred embodiment of the drive device 1 thus ensures that the first gear-wheel 16 of the first functional unit 11 is rotated, both in the first direction of rotation 21 and in the second direction of rotation 22 of the motor pinion 23, in the first direction of rotation 21, and thus always in the same direction of rotation, thus ensuring reliable driving of the first functional group 11.

[0033] In the preferred embodiment, the adjustment mechanism 5 is provided for adjusting the second transmission mechanism 4. The position of the adjustment mechanism 5, which preferably has a first adjusted position - shown in Fig. 1 and 3 - and a second adjusted position - shown in Fig. 2 - is provided for controlling the operative connection between the second transmission mechanism 4 and the second functional unit 12 or the third functional unit 13.

[0034] In the first adjusted position of the adjustment mechanism 5, the second transmission mechanism 4 is operatively connected to the third functional unit 13, thus allowing the second transmission mechanism 4 to drive the third functional unit 13.

[0035] In the second adjusted position of the adjustment mechanism 5, the second transmission mechanism 4 is operatively connected to the second functional unit 13, thus allowing the second transmission mechanism 4 to drive the third functional unit 13.

[0036] The adjustment mechanism 5 may preferably be configured - as shown in Fig. 1 to 3 - in the form of a clamp having two blocking teeth, wherein a first blocking tooth 51 can block in the first adjusted position a portion of the second transmission mechanism 4 and wherein a second blocking tooth 52 can block in the second adjusted position another portion of the second transmission mechanism 4. The drive of the second functional unit 12 or the third functional unit 13 can thus easily be blocked, as a result of which it is easy to select - provided that the motor pinion 23 is operatively connected to the second transmission mechanism 4 - between the drive of the third functional unit 13 and the drive of the second functional unit 12.

[0037] In an advantageous development, provision may be made for the second transmission mechanism 4 to be a planetary transmission mechanism 41. This allows the second transmission mechanism 4 to be particularly compact in its configuration. Also, this allows, by blocking of a first portion of the second transmission mechanism 4 (for example, by means of the first blocking tooth 51), a second portion of the second transmission mechanism 4 to be driven and, conversely, by blocking of the second portion of the second transmission mechanism 4 (for example, by means of the second blocking tooth 52), a first portion of the second transmission mechanism 4 to be driven. Advantageously, in this case, the first portion of the second transmission mechanism 4 is operatively connected substantially permanently to the second gear-wheel 17 of the second functional means 12 and the second portion of the second transmission mechanism 4 is operatively connected substantially per-

manently to the third gear-wheel 18 of the third functional means 13. Thus, in this case too, in the first adjusted position the second transmission mechanism 4 is operatively connected to the third functional unit 13 and in the second adjusted position the second transmission mechanism 4 is operatively connected to the second functional unit 13.

[0038] In a further embodiment (not shown) of the adjustment mechanism 5, provision is made for the adjustment mechanism 5 to be configured as an actuator and for the actuator preferably to bring a connecting gear-wheel (not shown) into a first position, for driving the second functional unit 12, or into a second position, for driving the second functional unit 12. This allows - for forming the drive of the second functional unit 12 or the third functional unit 13 - merely a portion of the second transmission mechanism 4 to be driven instead of blocking of a portion of the second transmission mechanism 4.

[0039] In an advantageous development of the drive unit 1, provision may be made for the adjustment mechanism 5 to be actuated by means of the motor 2, the adjustment mechanism 5 being actuable by means of the motor 2. This allows the operating state of the printing unit to be controlled in an especially simple manner and the number of movable parts of the printing unit to be kept low.

[0040] In a further embodiment, the second functional unit 12 and the third functional unit 13 can also be driven simultaneously, at least from time to time.

[0041] In further embodiments, additional elements of the printing unit can also be allocated to the functional units 11, 12, 13 and be driven therewith.

[0042] Further embodiments according to the invention display merely some of the described features, wherein any combination of features, especially a combination of various described embodiments, may be provided.

Claims

1. Drive device (1) for a printing unit comprising a first functional unit (11), a second functional unit (12) and a third functional unit (13), the first functional unit (11) comprising a toner, a printer cartridge and an output means, the second functional unit (12) comprising a receiving roll and the third functional unit (13) comprising a conveyor means, **characterised in that** a common motor (2) is configured for regulated driving of the first functional unit (11), the second functional unit (12) and the third functional unit (13).

2. Drive device according to claim 1, **characterised in that** a motor pinion (23) of the motor (2) is operatively connected merely to the first functional unit (11), by means of a first transmission mechanism (3) in a first direction of rotation (21), and **in that** the motor pinion (23) is operatively connected to the first functional unit (11) and a second transmission mechanism (4), which is selectively coupleable to the second functional unit (12) or to the third functional unit (13) by means of an adjustment mechanism (5), by means of the first transmission mechanism (3) in a second direction of rotation (22) opposing the first direction of rotation (21).

3. Drive device according to claim 2, **characterised in that** the first transmission mechanism (3) comprises a first drive wheel (31) and a second drive wheel (32) and **in that** the first drive wheel (31) and the second drive wheel (32) are configured for rotation in opposite directions.

4. Drive device according to either claim 2 or claim 3, **characterised in that** the first transmission mechanism (3) is arranged so as to be pivotable about the motor pinion (23).

5. Drive device according to either claim 2, 3 or claim 4, **characterised in that** when the motor pinion (23) is driven in the first direction of rotation (21), the first drive wheel (31) is operatively connected to the first functional unit (11) and **in that** when the motor pinion (23) is driven in the second direction of rotation (22), the first drive wheel (31) is operatively connected to the second transmission mechanism (4) and the second drive wheel (32) is operatively connected to the first functional unit (11).

6. Drive device according to any one of claims 2 to 5, **characterised in that** the second transmission mechanism (4) is a planetary transmission mechanism (41).

7. Method for operating a printing unit in which a first functional unit (11), a second functional unit (12) and a third functional unit (13) are driven, the first functional unit (11) comprising a toner, a printer cartridge and an output means, the second functional unit (12) comprising a receiving roll and a third functional unit (13) comprising a conveyor means, **characterised in that** the first functional unit (11), the second functional unit (12) and the third functional unit (13) are driven by means of a common motor (2).

8. Method according to claim 7, **characterised in that** merely the first functional unit (11) is driven on rotation of a motor pinion (23) of the motor (2) in a first direction of rotation (21) by means of a first transmission mechanism (3) and **in that** on rotation of the motor pinion (23) in a second direction of rotation (22) opposing the first direction of rotation (21), the first functional unit (11) and a second transmission mechanism (4), which is selectively coupleable to the second functional unit (12) or to the third func-

tional unit (13) by means of an adjustment mechanism (5), are driven.

9. Method according to either claim 7 or claim 8, **characterised in that** when the direction of rotation of the motor pinion (23) is changed, the first transmission mechanism (3) is pivoted about the motor pinion (23), the engagement of the first drive wheel (31) and/or the second drive wheel (32) being changed.

10. Method according to claims 8 or claim 9, **characterised in that** the adjustment mechanism (5) is actuated by means of the motor (2).

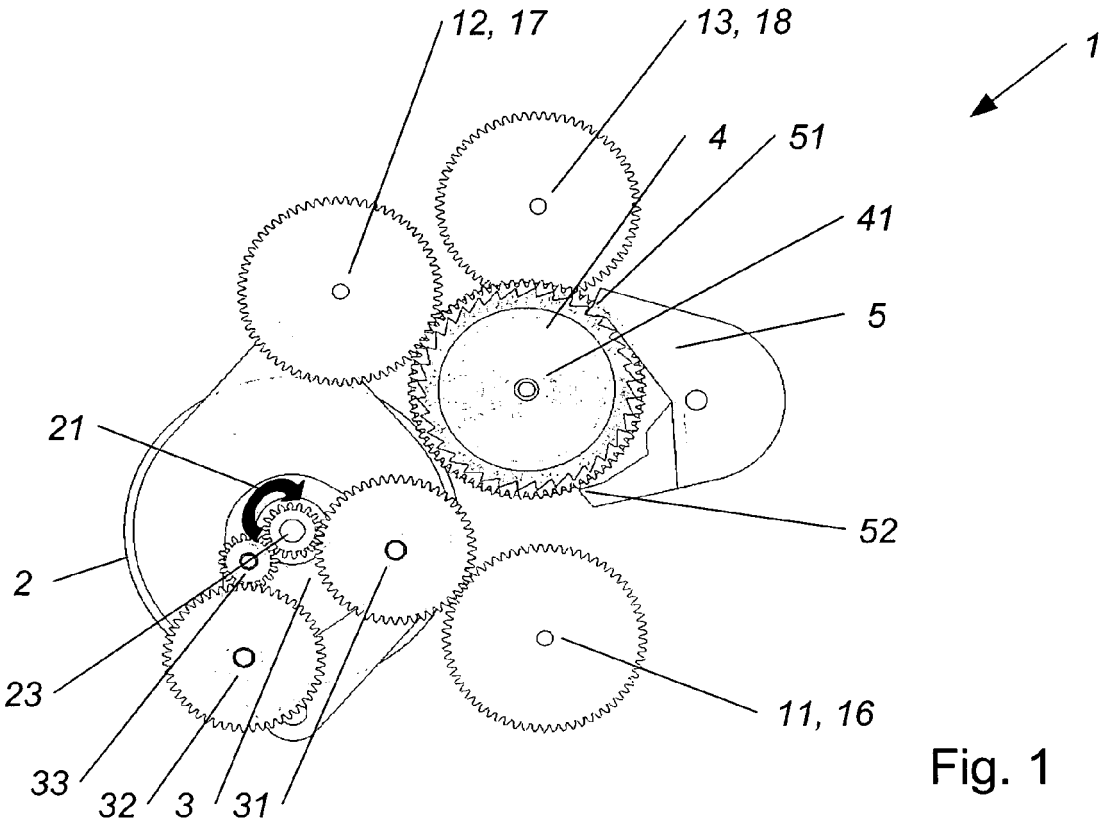
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Fig. 1

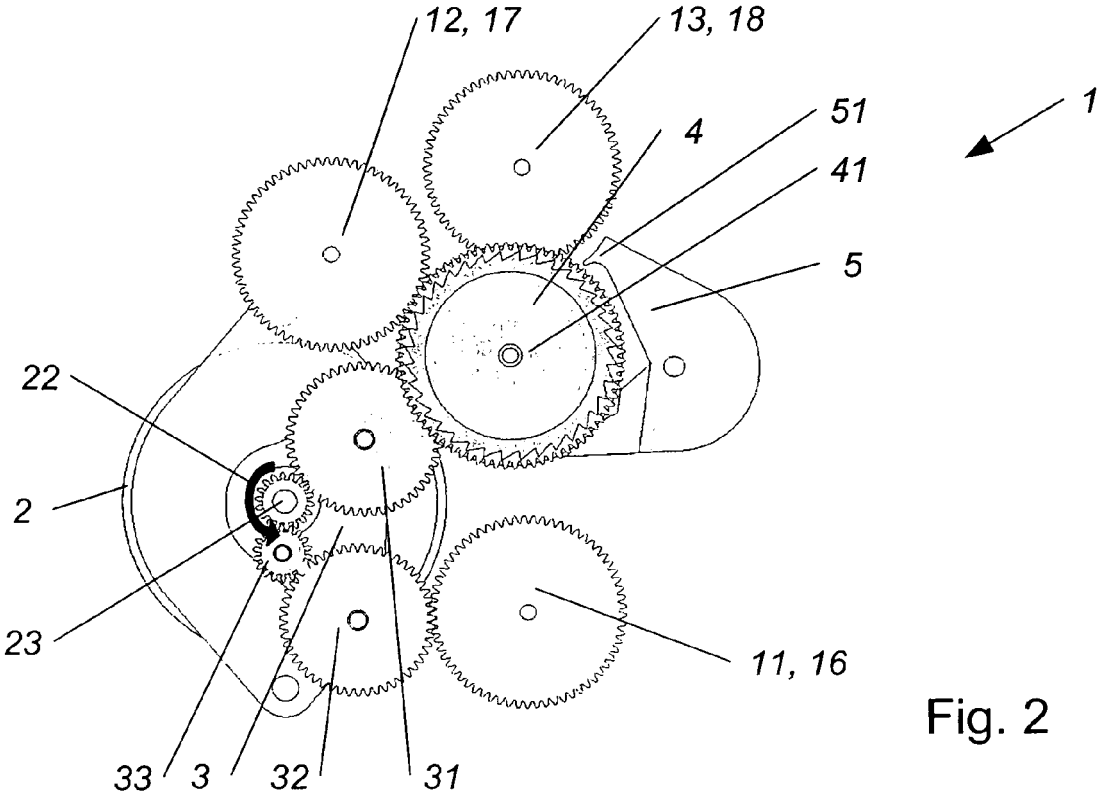
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Fig. 2

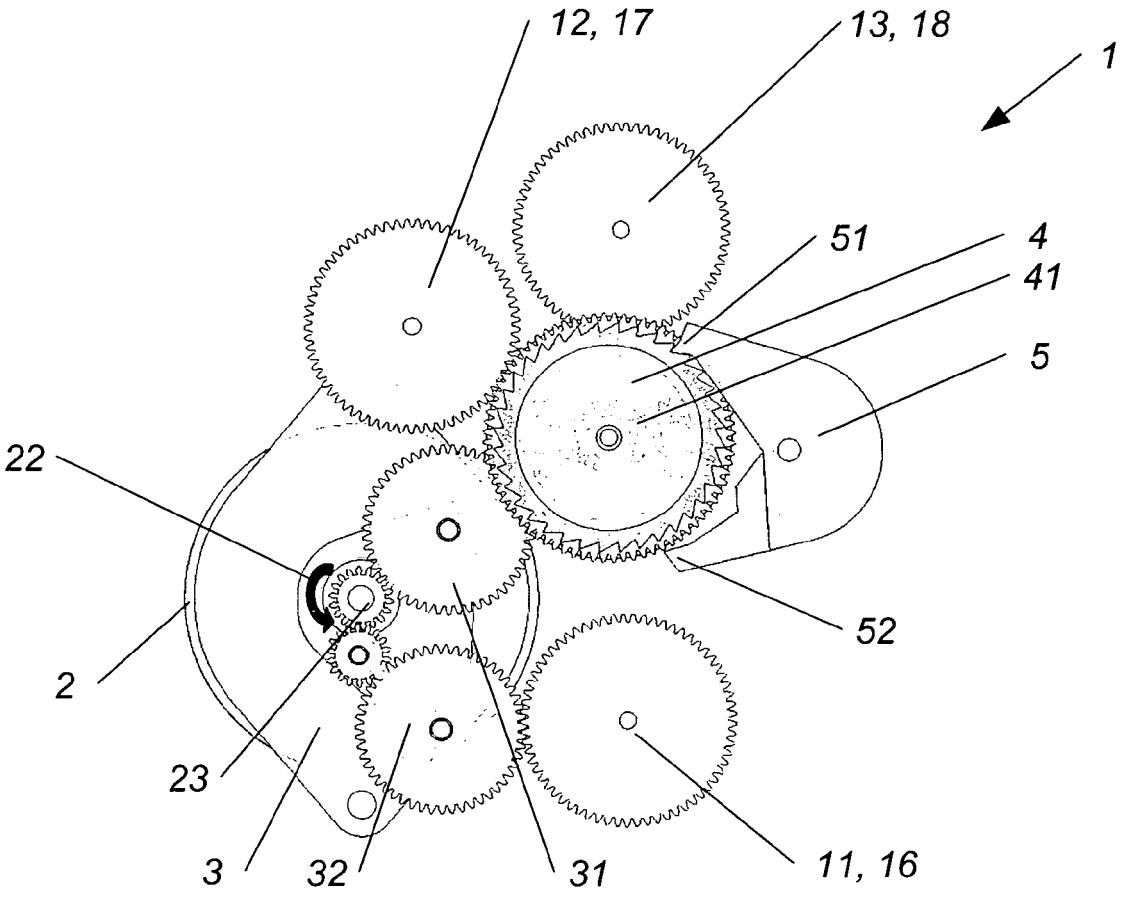

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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