



- (51) **International Patent Classification:**
E06B 9/72 (2006.01) *F16H 1/28* (2006.01)
- (21) **International Application Number:**
PCT/EP2010/051034
- (22) **International Filing Date:**
28 January 2010 (28.01.2010)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
MC2009A000015 3 February 2009 (03.02.2009) IT
- (71) **Applicant** (for all designated States except US):
GAPOSA S.R.L. [IT/IT]; Via Ete, 90, I-63023 Fermo (FM) (IT).
- (72) **Inventors; and**
- (75) **Inventors/Applicants** (for US only): **GASPARRINI, Paolo** [IT/IT]; Via Brunforte, 33, I-63023 Fermo (FM) (IT). **MAZZONI, Alessandro** [IT/IT]; Via Donizetti, 20, I-63023 Fermo (FM) (IT).
- (74) **Agent:** **BALDI, Claudio**; Viale Cavallotti, 13, I-60035 Jesi (AN) (IT).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

- without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) **Title:** TUBULAR GEARED MOTOR FOR ROLLER BLINDS

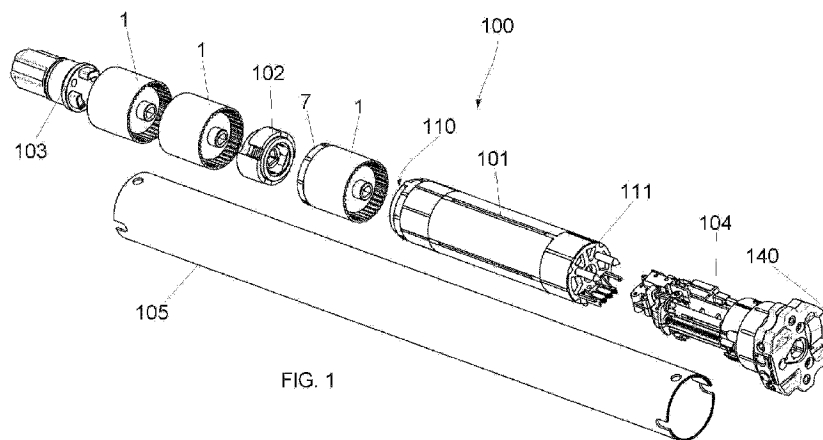


FIG. 1

(57) **Abstract:** A tubular geared motor (100) for roller blinds is disclosed, comprising: an electrical motor (101) with drive shaft (110), an output shaft (103) designed to be coupled with a winding shaft of the roller blind and at least a reduction gear (1) positioned between said drive shaft (110) and output shaft (103). The reduction gear (1) is an epicyclic reduction gear that has been improved in order to be noiseless.



Description

Tubular geared motor for roller blinds.

The present patent application relates to a tubular geared motor for the actuation of roller blinds, such as rolling shutters, sunshades, and roll-up blinds.

As it is known, in general the winding shaft of a rolling shutter is driven
5 into rotation by a tubular geared motor. The geared motor comprises an electrical motor that drives into rotation an output shaft by means of at least one reduction gear in order to reduce the number of revolutions of the output shaft with respect to the drive shaft. For this reason, in general, an epicyclic reduction gear is used, comprising:

- 10 - one central pinion (sun gear) coupled with the drive shaft,
- one or more peripheral wheels (pinion or planet gears) mounted on a discoidal flange joined with the output shaft, and
- one sleeve with internal toothing that is maintained fixed.

The planet gears arranged around the fixed gear simultaneously
15 engage with the sun gear and with the toothed sleeve.

In this way, during the rotation of the drive shaft, the fixed gear engages and drives into rotation one or more planet gears that rotate inside the toothed sleeve. Consequently, the axes of the planet gears mounted on the planet gear-holding flange move along a circumference, making a
20 revolution around the axis of the flange.

Since the internally toothed sleeve is maintained fixed, a sun and planetary gear of traditional type is obtained, in which the planet gear-holding flange rotates at reduced speed compared to the sun gear.

The following reduction ratio is obtained:

25
$$i = Z_2/Z_1 + 1$$

where Z_1 is the number of teeth of the sun gear and Z_2 is the number of teeth of the fixed toothed ring.

The epicyclic reduction gear has several advantages. In addition to

allow for a high reduction ratio, it also allows to transmit a high torque with reduced dimensions and weights. Moreover, the output shaft can be subjected to high radial loads.

Nevertheless, due to the friction of planet gears, this type of epicyclic
5 reducer is impaired by the fact that it amplifies the vibrations of the electrical motor it is connected to, and is therefore noisy and subject to vibrations. This drawback is considerably worsened when epicyclic reduction gears arranged in cascade are used.

Such a drawback is attenuated by the use of lubricant to reduce wear
10 and noise. However, with the passing of time, heat and dispersion inside the reduction gear, said lubricant loses its initial lubrication properties. Consequently, the reduction gear becomes noisy and deteriorated.

It appears evident that a tubular geared motor for roller blinds with a high noise level is not tolerated in public places and in all applications in
15 which the noise level is crucial. Therefore, in spite of the advantages related with an epicyclic reduction gear, a tubular geared motor with a lower noise level would be preferred and appreciated, with a higher intrinsic value.

The purpose of the present invention is to eliminate the drawbacks of the known art, by devising a tubular geared motor for roller blinds that is
20 characterised by noiseless operation and provided with reduction gear capable of reducing, instead of amplifying, the noise and vibrations produced by the electrical motor it is connected with.

This purpose has been achieved by the invention with the characteristics illustrated in the attached independent claim 1.

25 Advantageous embodiments are disclosed from the dependent claims.

The tubular geared motor for roller blinds of the invention comprises an electrical motor with drive shaft, an output shaft designed to be coupled with a winding shaft of the roller blind and at least one reduction gear positioned between the drive shaft and the output shaft.

30 The reduction gear comprises:

- a central pinion designed to be coupled with a primary shaft,
- a discoidal flange arranged in coaxial position to the central pinion

and designed to be joined with a secondary shaft, and

- a sleeve arranged in coaxial position with the flange and joined to a fixed structure of the reduction gear.

Said reduction gear also comprises: one or more pulleys rotatably
5 mounted in peripheral positions of the discoidal flange, and a belt returned by said pulleys.

The central pinion is provided with external toothing, whereas the sleeve is provided with internal toothing.

The belt is provided with external toothing that engages with the
10 external toothing of the central pinion and with the internal toothing of the sleeve.

This type of improved epicyclic reduction gear eliminates the direct contact by engagement of the planet gears on the external crown, with the interposition of a belt.

15 By creating an elastic connection between the various moving parts, the belt allows for obtaining a noiseless vibration-free reduction gear. Such an advantage is especially emphasized when multiple reduction gears are used in cascade in the gear motor.

Additional characteristics of the invention will become more evident
20 after the following detailed description, which refers to a merely illustrative, not limiting, embodiment, as shown in the enclosed figures, wherein:

Fig. 1 is an exploded perspective view of a tubular geared motor for roller blinds according to the invention;

Fig. 2 is an exploded perspective view of a reduction gear of the
25 geared motor of Fig. 1;

Fig. 3 is a perspective view of the reduction gear of Fig. 2 in assembled condition; and

Fig. 4 is a front view of the reduction gear of Fig. 3.

Referring to Fig. 1, the tubular geared motor for roller blinds of the
30 invention is generally indicated with numeral (100).

The geared motor (100) comprises a tubular electrical motor (101) with drive shaft (110) and output shaft (103) designed to be coupled with a

winding shaft of a roller blind. At least one reduction gear (1) is positioned between the drive shaft (110) and the output shaft (103). The specific example of Fig. 1 shows three reduction gears (1) in cascade, with one brake (102) positioned between the first and the second reduction gear. The first
5 reduction gear is provided with a flange (7) for coupling with the brake (102).

On the side opposite to the drive shaft (110), the motor (101) is provided with a connection section (111) that is connected to a stop device (104) provided with an external flange (140) designed to receive the electrical power supply cables of the motor.

10 After being suitably adjusted by the installer, the stop device (104) is necessary to stop the geared motor when the roller blind reaches the maximum opening or closing position.

The motor (101), reduction gears (1), brake (102), output shaft (103) and stop device (104) are all inserted in an external pipe (105) in such a way
15 that the output shaft (103) protrudes from the front end of the pipe (105) to be coupled with a winding shaft and the flange (140) of the stop device (104) protrudes from the rear end of the pipe (105) to receive the electrical power supply cables.

Referring to Figs. 3, 4 and 5, each reduction gear (1) comprises:

- 20
- a central pinion (sun gear) (2);
 - a discoidal flange (3) designed to be coupled with a secondary shaft;
- and
- a sleeve (4).

The central pinion (2) is provided with external toothing (20) and with a
25 shank to be coupled to a primary shaft.

The sleeve (4) is provided with internal toothing (40) and a bottom wall (42) with axial hole (43) for the passage of the secondary shaft joined to the flange (3).

One or more cylindrical shanks (30) are arranged in peripheral position
30 on the discoidal flange (3) and joined to it. A cylindrical pulley (5) with or without toothing is rotatably mounted on each shank (30). In this way the pulleys (5) can idle on the corresponding shanks (30).

A belt (6) is returned by the pulleys (5). The belt is provided with external toothed surface (60) that engages with the toothing (20) of the central pinion and with the internal toothing (40) of the sleeve (4). The belt (6) has internal surface (61) with or without toothing, being returned only by the
5 idle pulleys (5) with or without toothing.

A barely sufficient space is left between the pulleys (5) and the internal toothing (40) of the sleeve for the passage of the belt (6). In this way the toothing (60) of the belt (6) is forced to engage with the internal toothing (40) of the sleeve.

10 When it is driven into rotation by a primary shaft, the central pinion (2) rotates the belt (6) that engages with the toothing (40) of the fixed sleeve (4). Consequently, the belt (6) exerts a thrust on the pulleys (5) that tends to produce the revolution of the axes of the pulleys (5) around the axis of rotation of the central pinion (2) that coincides with the axis of rotation of the
15 flange (3) joined with the secondary shaft.

Therefore, the secondary shaft rotates at lower speed compared to the primary shaft, with reduction ratio proportional to the ratio between the number of teeth of the fixed sleeve (4) and the number of teeth of the central pinion (2).

20 The belt (6) can be advantageously made of rubber in order to avoid any contact between hard parts and consequently the noise and vibrations due to the engagement of gear toothing.

This type of noiseless epicyclic reduction gear does not require any type of lubricant and guarantees long life.

25 By arranging a plurality of epicyclic reduction gears (1) in cascade, a high reduction ratio can be obtained while ensuring a very low noise level.

In the application of Fig. 1, the first reduction gear (1) has the central pinion (2) connected to the drive shaft (110) and the secondary shaft connected to the brake (102). So, the primary shaft of the first reduction gear
30 coincides with the drive shaft (110).

The second reduction gear (1) has the central pinion (2) connected to the brake (102) and the secondary shaft connected to the central pinion of

the third reduction gear.

Therefore the output shaft (103) is connected to the flange (3) of the third reduction gear. So, the output shaft (103) coincides with the secondary shaft of the third reduction gear.

5 Although the enclosed figures illustrate a preferred embodiment that comprises three pulleys (5) arranged with axes that are mutually spaced by 120° angle, it appears evident that the present invention is extended to any number of pulleys peripherally arranged on the pulley-holding flange (3).

10 Numerous variations and modifications can be made to the present embodiment of the invention, within the capacity of an expert of the art, while still falling within the protection scope defined in the attached claims.

Claims

- 1) Tubular geared motor (100) for roller blinds, comprising:
- an electrical motor (101) with drive shaft (110),
 - 5 - an output shaft (103) designed to be coupled with a winding shaft of the roller blind, and
 - at least one reduction gear (1) positioned between the drive shaft (110) and the output shaft (103),
 - said reduction gear (1) comprising:
 - 10 - a central pinion (2) provided with external toothing (20) and designed to be coupled with a primary shaft,
 - a discoidal flange (3) arranged in coaxial position to the central pinion (2) and designed to be joined with a secondary shaft,
 - a sleeve (4) provided with internal toothing (40) arranged in coaxial
 - 15 position with the flange (3) and joined to a fixed structure of the reduction gear,
 - characterised in that the reduction gear (1) also comprises:
 - one or more pulleys (5) rotatably mounted in peripheral positions of the discoidal flange (3), and
 - 20 - a belt (6) returned by the said pulleys (5), said belt being provided with external toothing (60) engaged with the external toothing (20) of the central pinion and with the internal toothing (40) of the sleeve.
- 2) Tubular reduction gear (100) according to claim 1, characterised in that the belt (6) is a flexible member positioned between the gears for
- 25 mechanical power transmission.
- 3) Tubular reduction gear (100) according to claim 1 or 2, characterised in that the belt (6) is provided with internal toothing and the pulleys (5) are provided with external toothing, in such a way that the internal toothing of the belt (6) is engaged with the external toothing of the
- 30 pulleys (5).
- 4) Tubular reducer gear (100) according to any of the above claims, characterised in that the discoidal flange (3) comprises one or more

shanks (30) in peripheral position, on which the pulleys (5) are rotatably mounted.

- 5 5) Tubular reduction gear (100) according to any of the above claims, characterised in that it comprises at least two reduction gears (1) arranged in cascade.
- 6) Tubular reduction gear (100) according to claim 5, characterised in that it comprises at least one brake (102) positioned between the two reduction gears (1).
- 10 7) Tubular reduction gear (100) according to any of the above claims, characterised in that it comprises a stop device (104) coupled with a section (111) of the electrical motor opposite the drive shaft (110).
- 8) Tubular reduction gear (100) according to any of the above claims, characterised in that it comprises an external cylindrical pipe (105) that houses the electrical motor (101) and the said at least one reduction
- 15 gear (1).

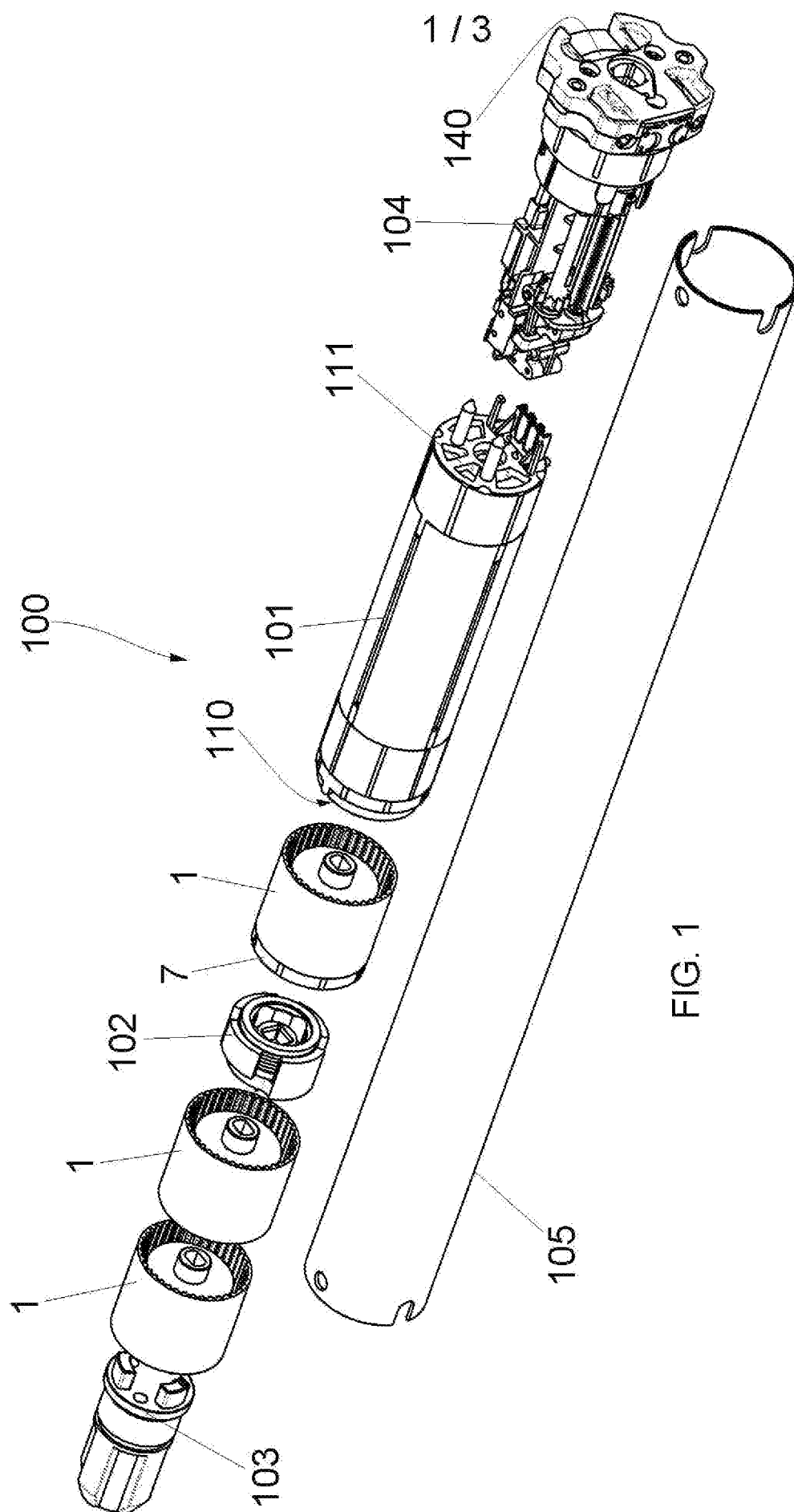


FIG. 1

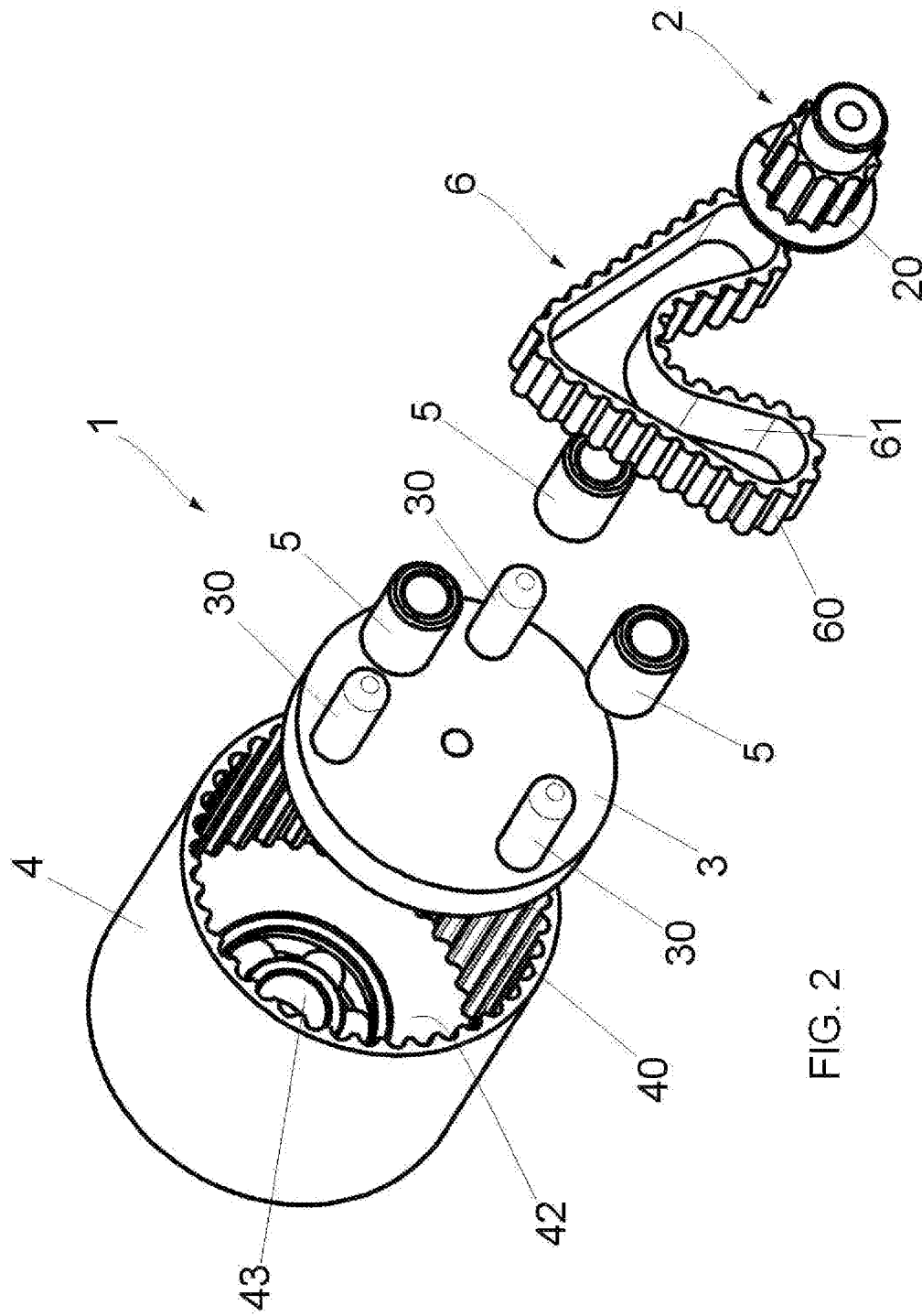


FIG. 2

3 / 3

