

Nov. 16, 1965

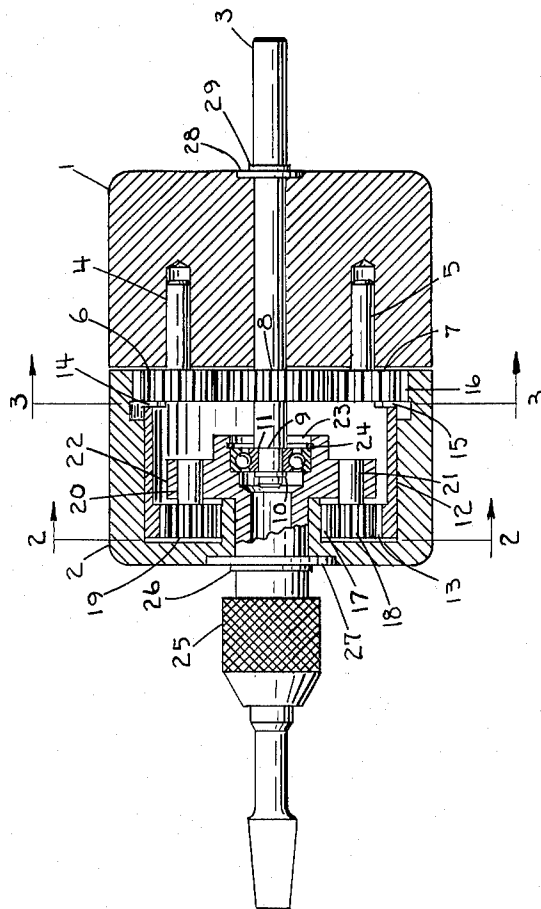
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3,217,565

REVERSIBLE TOOL DRIVING ATTACHMENT

Original Filed May 26, 1961

6 Sheets-Sheet 1



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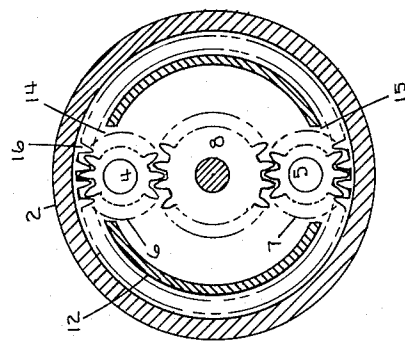


FIG. 3

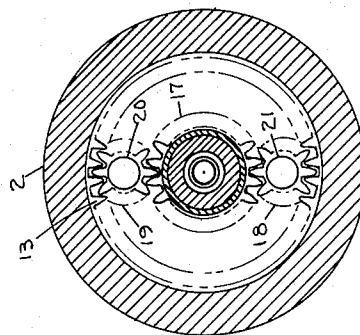


FIG. 2

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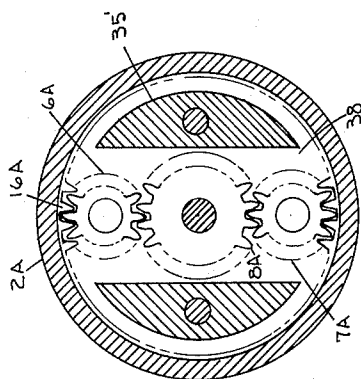


FIG. 6

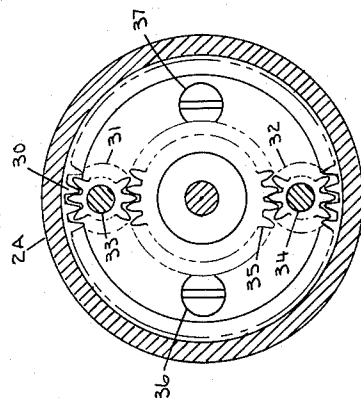


FIG. 5

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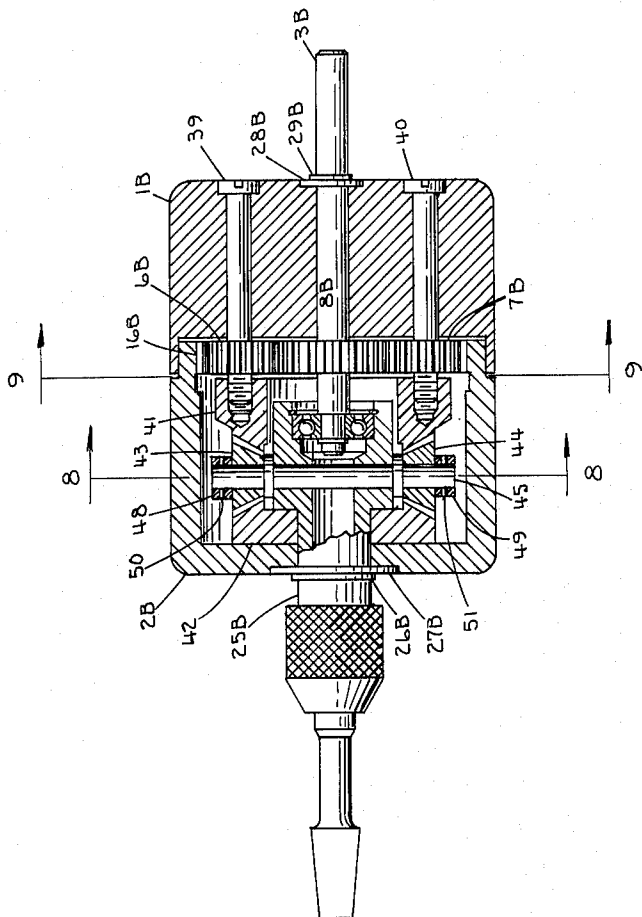


FIG. 7

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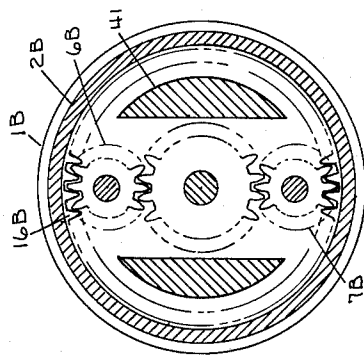


FIG. 9

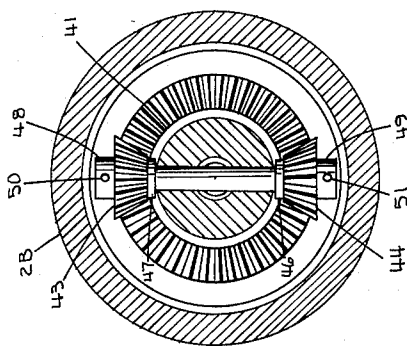


FIG. 8

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REVERSIBLE TOOL DRIVING ATTACHMENT

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Continuation of application Ser. No. 112,874, May 26, 1961. This application Mar. 9, 1964, Ser. No. 350,455
3 Claims. (Cl. 74-764)

This invention relates to reversible tool driving attachments adapted for connecting rotatable tools to sources of unidirectional rotary power such as a portable electric drill, drill press or motor driven flexible shaft. This application is a continuation of Ser. No. 112,874, filed May 26, 1961 now abandoned.

The main object of the invention is to provide a tool driving attachment that is simple in construction, yet highly efficient in operation, which can be simply and instantly reversed while the tool is being driven by a source of power, rotating continuously in one direction.

Other objects of the tool driver and advantageous features will become apparent from the following description and the accompanying drawing, wherein like numerals are used to designate like parts throughout the views, in which:

FIG. 1 is a longitudinal sectional view of the attachment which shows details of construction made in accordance with the first embodiment of my invention.

FIG. 2 is a view in section substantially on line 2-2 of FIG. 1.

FIG. 3 is a view in section substantially on line 3-3 of FIG. 1.

FIG. 4 is a view similar to FIG. 1 but showing a second embodiment of my invention.

FIG. 5 is a view in section substantially on line 5-5 of FIG. 4.

FIG. 6 is a view in section substantially on line 6-6 of FIG. 4.

FIG. 7 is a view similar to FIG. 1 but showing a third embodiment of my invention.

FIG. 8 is a view in section substantially on line 8-8 of FIG. 7;

FIG. 9 is a view in section substantially on line 9-9 of FIG. 7.

Referring to FIG. 1, body portions 1 and 2 are detachably secured in spaced relation on a common axis as shown. Body portion 1 has two planet gears 6 and 7 orbitably rotatable on pins 4 and 5, which may be held in place in body portion 1 by a press fit. It is not my intention to limit this planet gear train to two planet gears, as three or more may be found necessary or desirable in some applications.

Drive shaft 3 is free to rotate in body portion 1, and is adapted to be driven by the source of power. A sun gear 8 is mounted on shaft 3 and rotates with it. The gear end of shaft 3 is reduced in diameter as shown at 9, and is provided with a groove for retaining ring 10, which fastens a bearing 11 to the shaft. At 12 is shown an annular extension of body portion 1 carrying an internal ring gear 13. Extension 12 may be journaled in body portion 2 to form a support for it. Slots are cut in extension 12 at 14 and 15 for planet gears 6 and 7. These slots are also shown in FIG. 3. It will thus be seen that annular extension 12 constitutes means directly connecting one element (the planet carrier) of the gear train of body portion 1 with another element (ring gear 13) of the gear train of body portion 2.

Body portion 2 is provided with an internal ring gear 16 which meshes with planet gears 6 and 7. At 17 a sun gear is provided as a part of body portion 2; gear 17 meshes with planet gears 18 and 19, orbitably rotatable on pins 20 and 21 mounted in a planet carrier 22 which may be formed integral with a tool chuck. Planet gears 18 and 19 also mesh with gear 13 of body portion 1.

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Planet carrier 22 is provided with a recess at 23 to receive bearing 11. This bearing is locked in the recess by a retainer ring 24. On the opposite end of the planet carrier 22, and preferably formed integral with carrier 22, tool chuck 25 is provided, which may take various forms depending on the type of tool to be used.

At 28 there is shown a washer and at 29 a retaining ring, which hold body portion 1 in place on the drive shaft. Similarly, a retaining ring 26 and a washer 27 hold body portion 2 in place on the tool chuck.

In FIG. 4, body portion 1A, with pins 4A and 5A, planet gears 6A and 7A, and sun gear 8A, are identical to body portion 1 of FIG. 1. Body portion 2A has an internal ring gear 16A, similar to gear 16 in FIG. 1; a second internal ring gear 30 meshes with planet gears 31 and 32, which are orbitably rotatable on a planet carrier 22A by pins 33 and 34. Planet gears 31 and 32 also mesh with a sun gear 35 on a boss 35' carried by body portion 1A by screws 36 and 37 (FIG. 5). Boss 35' is cut away, as shown at 38 in FIGS. 4 and 6, to provide clearance for the planet gears 6A and 7A and the sun gear 8A. Drive shaft 3A is similar to drive shaft 3, with the same bearing arrangement and bearing retaining feature. Tool chuck 25A is also similar to that of FIG. 1. The two body portions 1A and 2A are retained in their spaced apart relationship by rings 26A and 29A, in the same manner as in FIG. 1.

The embodiment shown in FIG. 7 operates much the same as the two embodiments described above, and has the same outward appearance, with the exception of two screws 39 and 40 that take the place of the pins 4, 5, and 4A, 5A. These screws hold bevel gear 41 in coaxial relationship with body portion 1B. Internal ring gear 16B on body portion 2B is similar to gears 16 and 16A previously described. Bevel gear 42 shown in FIG. 7 is also secured to body portion 2B in coaxial relationship. Planet bevel gears 43 and 44 rotate on a pin 45 which passes through the tool chuck shaft. Elements 46 and 47 are spacers and elements 48 and 49 are retaining collars with pins 50 and 51 that lock them to pin 45. These planet bevel gears 43 and 44 mesh with bevel gear 41 which is a part of body portion 1B and with bevel gear 42 which is a part of body portion 2B. The body portions are retained in place by rings 26B and 29B. As will be apparent to those skilled in the art, gears 41 and 42 are of the same diameter and have the same number of teeth.

Operation

To operate the tool driver attachment shown in FIG. 1, drive shaft 3 is chucked in a portable drill, if that is the source of power being used, and if viewed from this end the shaft will rotate in a clockwise direction, assuming that the drill rotates in a clockwise direction. As the drill chuck rotates, drive shaft 3 and sun gear 8 will also rotate in a clockwise direction. If the operator holds the drill in one hand and grips body portion 1 in the other hand, sun gear 8 will turn planet gears 6 and 7 in a counterclockwise direction. This will drive ring gear 16 and body portion 2 in a counterclockwise direction, as well as sun gear 17 which is a part of body portion 2. This sun gear will then drive planet gears 18 and 19 clockwise, and planet carrier 22 counterclockwise, since internal ring gear 13, fastened to body portion 1, is held stationary. Accordingly, the tool bit turns with the planet carrier 22 in a counterclockwise direction when body portion 1 is held.

If the operator releases body portion 1 and holds body portion 2, with the drill still rotating in the same direction, sun gear 8 will drive the planet carrier or body portion 1 in a clockwise direction, since internal ring gear 16, which meshes with planet gears 6 and 7, is held stationary. As body portion 1 rotates clockwise, internal

ring gear 13 of body portion 1 drives planet carrier 22 with the tool bit in a clockwise direction, since sun gear 17 is held stationary. Thus the tool bit rotates clockwise when body portion 2 is held against rotation.

When body portion 1A of the embodiment of FIG. 4 is held against rotation, shaft 3A and sun gear 8A will turn clockwise with the drill chuck and turn planet gears 6A and 7A counterclockwise. Internal ring gear 16A, which meshes with these planet gears, will turn counterclockwise and will carry body portion 2A and the other internal ring gear 30 with it. Planet gears 33 and 34 that mesh with the internal ring gear 30 and planet carrier 22A will turn counterclockwise, since sun gear 35 is held stationary by body portion 1A. Therefore, when body portion 1A of the tool driver shown in FIG. 4 is held, and shaft 3A turns clockwise with the drill chuck, the tool bit will turn counterclockwise.

When body portion 2A is held, with shaft 3A still rotating clockwise, body portion 1A and sun gear 35 will turn clockwise in a manner previously explained. Sun gear 35 will then drive planet gears 31 and 32 that mesh with it, and planet carrier 22A, clockwise, since internal ring gear 30 is held stationary with body portion 2A. Therefore, when body portion 2A of the tool driver shown in FIG. 4 is held against rotation, and shaft 3A turns clockwise with the chuck, the tool bit will also turn clockwise.

The third embodiment of my invention, shown in FIG. 7, is similar to the other two designs in appearance and operating characteristics. When body portion 1B is held and shaft 3B turns clockwise, body portion 2B will turn counterclockwise. Bevel gear 42 which is a part of body portion 2B will then drive planet bevel gears 43 and 44 with the planet carrier and tool bit counterclockwise, since bevel gear 41 on body portion 1B is held stationary. Therefore, when body portion 1B is held against rotation, the tool bit will turn counterclockwise.

If the operator holds body portion 2B, body portion 1B will turn clockwise, and bevel gear 41 on body portion 1B will drive the planet bevel gears and the tool bit clockwise, since bevel gear 42 on body portion 2B is held stationary. Therefore, when body portion 1B is held against rotation, the tool bit will turn clockwise.

What is claimed is:

1. A hand-held reversible drive coupling comprising: first and second body portions of substantially equal cross section connected in axial alignment and in end to end relation for rotation relative to each other, first and second shaft means rotatably mounted in said first and second body portions respectively, each of said shaft means having one end extending beyond the said body portion associated therewith, the other ends of said shaft means being connected for relative rotation, a first sun gear attached to the other end of said first shaft means, a first set of planet gears rotatably mounted in said first body portion and meshing with said first sun gear, a first ring gear on said second body portion meshing with said first set, an annular extension having a second ring gear attached to said first body portion and extending into the interior of said second body portion, a second sun gear secured to said second body portion, a second set of planet gears rotatably attached to said other end of said second shaft means and meshing with said second ring and said second sun gears, and a tool chuck attached to one of said shaft means and the other of said shaft means being adapted for connection with a unidirectional source of power,

whereby the direction of rotation of said chuck means is determined by selective holding one of said first and second body portions.

2. A hand-held reversible drive coupling comprising: first and second body portions of substantially equal cross section connected in axial alignment and in end to end relation for rotation relative to each other, first and second shaft means rotatably mounted in said first and second body portions respectively, each of said shaft means having one end extending beyond the said body portion associated therewith, the other ends of said shaft means being connected for relative rotation, a first sun gear attached to the other end of said first shaft means, a first set of planet gears rotatably mounted in said first body portion and meshing with said first sun gear, a first ring gear on said second body portion meshing with said first set, an annular extension having a second sun gear attached to said first body portion and extending into the interior of said second body portion, a second ring gear secured to said second body portion, a second set of planet gears rotatably attached to said other end of said second shaft means and meshing with said second ring and said second sun gears, and a tool chuck attached to one of said shaft means and the other of said shaft means being adapted for connection with a unidirectional source of power.
3. A hand-held reversible drive coupling comprising: first and second body portions of substantially equal cross section connected in axial alignment and in end to end relation for rotation relative to each other, first and second shaft means rotatably mounted in said first and second body portions respectively, each of said shaft means having one end extending beyond the said body portion associated therewith, the other ends of said shaft means being connected for relative rotation, a sun gear attached to the other end of said first shaft means, a first set of planet gears rotatably mounted in said first body portion and meshing with said sun gear, a ring gear on said second body portion meshing with said first set, a first bevel gear attached to said first body portion and positioned on the interior of said second body portion, a second set of planet bevel gears rotatably mounted on said second shaft means and meshing with said first bevel gear, a second bevel gear attached to said second body portion, and meshing with said second set, and a tool chuck attached to one of said shaft means and the other end of said shaft means being adapted for connection with a unidirectional source of power, whereby the direction of rotation of said chuck means is determined by selective holding one of said first and second body portions.

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