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CHANGE SPEED GEAR.
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3 SHEETS—SHEET 1.

Fig. 1.

[Diagram of a change speed gear with labeled parts: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25.]

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To all whom it may concern:

Be it known that I, Cornellis Dominicus, Junior, a subject of the Kingdom of the Netherlands, residing at Baarn, Netherlands, Tromplaan 6, have invented a new and useful Improvement in or Relating to Change-Speed Gears, of which the following is a specification.

I, Cornellis Dominicus, Junior, engineer, of Tromplaan 6, Baarn (Netherlands) do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

This invention relates to improvements in a device for changing the speed of a shaft, which by means of gear wheels, being constantly in engagement with each other, is actuated by a shaft, driven with a certain speed by motive power.

The operating device according to the invention consists of a block, loosely mounted perpendicularly to the axis of the two parallel shafts and shiftably between and symmetrically with respect to both the clutches, an operating shaft for the clutches, said block being provided at the under- and upper side with projections, which block is located between two arms, firmly fixed to the operating shaft and provided with pins, which also can engage the grooves of the clutches in such a manner, that when moving the block to cause that one of these pins to engage the groove of one clutch, so that said clutch can be moved into clutching position, simultaneously the projection of the block situated at the same side as the engaging pin enters into the groove of the other clutch to lock the latter against movement.

On the accompanying drawing the invention is further illustrated:

Figure 1 represents an elevation of the change speed gear according to the invention;

Fig. 2 represents a section, according to line A—B in Fig. 1.

Fig. 3 represents an elevation of a modified execution form of the change speed gear.

In the Figs. 1 and 2 in a casing 1 two shafts 2 and 3 are arranged parallel with each other. The shaft 2 is supposed to be driven by motive power. The shaft to be actuated by the latter is indicated at 3. On the shaft 2, symmetrically with respect to the middle of the casing 1, two gear wheels are arranged at both sides. Both the inner wheels 4 and 5 are loosely mounted on the shaft, while both the outmost wheels 6 and 7 are firmly fixed to said shaft. Both the gear wheels 4 and 5 are respectively firmly connected to or are integral with claws 8 and 9, which are adapted to rotate freely with their gear wheels around the shaft 2. The portion of the shaft 2 between these claws has a square cross section on which a clutch 10 is shiftably arranged, to couple either one of the adjacent gear wheels 4 or 5 firmly to the shaft 2. The gear wheels 4 and 5 respectively are in constant engagement with gear wheels 11 and 12, which are firmly fixed to the shaft 3, so that when moving the clutch 10 either to the left or to the right two different speeds of the shaft 3 may be obtained.

On the outer sides of the gear wheels 11 and 12 on the shaft 3 are gear wheels 13 respectively, 14 loosely mounted on said shaft. The gear wheels 13 and 14 respectively are in constant engagement with the fixed gear wheels 6 and 7 on the shaft 2. By means of the clutch 15 the gear wheels 13 and 14 separately can be coupled firmly to the shaft 3 by moving said clutch to the left or to the right, whereby one of the prolonged claws of the clutch 15 passes through the adjacent fixed wheel 11 or 12 to engage one of the loose gear wheels 13 or 14. For this purpose the fixed gear wheels are provided with two suitable openings through which the claws of the clutch may pass, and these claws are formed in halves which engage in corresponding recesses of the wheel boss. In this way either of two different speeds of the shaft 3 may be obtained.

It is obvious that, to cause the speed gear to work properly, the operating device must satisfy the conditions that, when one of the gear wheels 4 or 5 is to be coupled firmly to the shaft 2, the clutch 10 on that moment is permitted to move along and to rotate together with the shaft 2, while at the same time the clutch 15 must be locked in its normal position against shifting along the shaft 3, but allowed to rotate with said
shaft. On the other hand if one of the gear wheels 13 or 14 is to be coupled to the shaft 3, the clutch 15 on that moment should be movable lengthwise and allowed to freely rotate with the shaft 3, while at the same time the clutch 10 should be locked in its normal position, against shifting along the shaft 2 being however permitted to rotate with said shaft. Moreover both the clutches in their normal position must not be hindered to rotate freely with their shafts.

For this purpose the operating device according to the invention consists of a block 16 (Fig. 2), which at its under and upper side is provided with projections 17 and 18 arranged opposite each other. This block is shiftably and symmetrically placed with respect to both the clutches 10 and 15 in such a manner, that it crosses the shafts perpendicularly. Each clutch is provided with a circumferential groove 19 and 20 (Fig. 1), in which can engage the projections 17 and 18 in such a way, that sufficient play is left between the groove and the projection to allow a free rotation of the clutches.

The block 16 further is provided in longitudinal direction with a boring through which an operating shaft 21 is passed, which can freely rotate therein. The shaft 21 is supported in bearings arranged against the wall of the casing 1. The block 16 is kept in position on the shaft by two arms 24 and 25, which are at both sides of the block and extend from the shaft in opposite directions. The arms 24 and 25 are further provided with pins 26 and 27, which are also adapted, just as the projections 17 and 18, to engage in the grooves 19 and 20 of the clutches 10 and 15. In the normal position the pins 26 and 27 are situated in a same vertical plane perpendicularly to the shaft 2 and 3, with the projections 17 and 18. A handle is arranged on the operating shaft 21 by which said shaft can be turned and moved to and fro.

The device acts as follows:

If the handle 28 is put in the middle position and the shaft 21 is shifted in the direction of the arrow (Fig. 2) the pin 26 of the arm 24 engages the groove 19 of the clutch 10, whereas the projection 18 of the block 16 slips out of said groove at the other side. However during the longitudinal movement of the shaft 21 the projection 17 of the block has entered into the groove 20 of the clutch 15 so that this clutch is locked against sideward movement, while the pin 27 at the other side is free from the groove 20.

By moving now the handle 28 perpendicularly to the plane of the drawing the clutch 10 can be moved and either of the gear wheels 4 and 5 can be coupled to the shaft 2.

Referring to Fig. 3, which represents a modified form of the change speed gear according to the invention and which improves considerably the use of the gear, 2 indicates the shaft driven by motive power. On this shaft are successively mounted a fixed gear wheel 6, a loose wheel 4 with its claw 8 and a clutch 10 just as with the form shown in Fig. 1.

The gearwheel 5 with its claw 9 loosely mounted on the shaft 2 and the gearwheel 7 fixed to said shaft with the form according to Fig. 1 are respectively replaced by a fixed wheel 5' and a loose gear wheel 7'.

The boss 29 of this latter-wheel, supported by a bearing 30 attached to or forming one whole with the wall of the casing 1, is prolonged carrying at its outer end a flange 31 to which the shaft 32, adapted to be actuated at different speeds is connected by a flange 33. The shaft 2 bears in the supported boss 30 of the gearwheel 7'.

The shaft 3, adapted in the arrangement according to Fig. 1 to be actuated at different speeds, with this form only serves as an intermediate shaft to impart different speeds to the shaft 32.

On the intermediate shaft 3 are mounted from left to right, the loose gearwheel 13, the fixed wheel 11, the clutch 15, the loose wheel 12 and the fixed wheel 14. The clutch 15 is provided at the left side with a long claw 34 to engage through the fixed wheel 11, the loose wheel 13 to couple same to the shaft 3 and at the right side a 100 ordinary shaped claw to engage the claw of the loose wheel 12, when this latter should be coupled to the intermediate shaft.

The operation of the change speed gear is exactly the same as explained with the gear illustrated in Fig. 1.

Moving the clutch 10 to the right the long claw engages through the fixed wheel 5' the gearwheel 7', whereby a direct coupling of the driving shaft 2 and the shaft 32 is actuated is effected.

It is clear from the drawing that besides the direct coupling attained by moving the clutch 10 to the right the following transmissions may be obtained.

By moving the clutch 10 to the left the speed of the driving shaft is transmitted by the wheels 4, 11, 2 and 7' to the shaft 32.

By moving the clutch 15 to the left said speed is transmitted by 6, 13, 2 and 7' and moving said clutch to the right the transmission takes place by 5', 12, 3 and 7'.

For reversing the movement of the shaft 3 a usual reversing gear is arranged.

Having now particularly described and ascertained the nature of my said invention and as what it relates to the same is to be performed I declare that what I claim is:

1. In a change speed gear, a driving
shaft, a driven shaft parallel therewith, two pairs of gears on each shaft, one gear of each pair of gears being fast and the other being loose, and each fixed gear of one shaft being engaged with a loose gear of the other shaft; a clutch on each shaft, revolvable therewith and shifttable thereon into engagement with either of the loose gears, and common operating means for the clutches, arranged to move either of them into clenching position and to disengage the other and lock the same against clenching movement.

2. In a change speed gear, a driving shaft, a driven shaft parallel therewith, two pairs of gears on each shaft, one gear of each pair of gears being fast and the other being loose, and each fixed gear of one shaft being engaged with a loose gear of the other shaft; a clutch on each shaft, revolvable therewith and shifttable thereon into engagement with either of the loose gears, and common operating means for the clutches, arranged to move either of them into clenching position and to disengage the other and lock the same against clenching movement, one of said clutches having prolonged end claws extending through openings in the fixed gears and arranged for engagement with the loose gears of the shaft on which said clutch is mounted.

3. In a change speed gear, a driving shaft, a driven shaft parallel therewith, two pairs of gears on each shaft, one gear of each pair of gears being fast and the other being loose, and each fixed gear of one shaft being engaged with a loose gear of the other shaft; a clutch on each shaft, revolvable therewith and shifttable thereon into engagement with either of the loose gears, each of said clutches having a circumferential groove, and common operating means for the clutches, arranged to move either of them into clenching position and to disengage the other and lock the same against clenching movement, said common operating means comprising a shaft mounted for axial and oscillatory movement, a block on said shaft having projections on opposite sides, each to enter the groove of one of said clutches, and oppositely extending radial arms at the ends of said block and each having a pin to enter the groove of one of the clutches, when said groove has been disengaged by the corresponding projection.

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