

PATENT SPECIFICATION

DRAWINGS ATTACHED

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839,549



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COMPLETE SPECIFICATION

Improvements in or relating to Variable-Speed Gears

5 We, THE BIRMINGHAM SMALL ARMS COMPANY LIMITED, of Armoury Road, Small Heath, Birmingham, 11, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to variable-speed gears, and is concerned more particularly with gear shifting means of the kind wherein provision is made for the shifting of the gears under preselective control simultaneously with and directly as a result of the clutch release action.

15 It is an object of the present invention to provide a simple form of pre-selection of gears which is more particularly applicable to a two-speed gear, i.e. one having two forward gear ratios and a neutral position, such as may be fitted to a motor cycle or the like.

20 According to this invention a variable-speed gear is provided having a movable gear-change member adapted to effect a change of gear ratio actuated by an intermediary or gear shift member secured to a hollow cylindrical control device and adapted to be spring-loaded in two directions to provide one position on each side of a central or neutral position, characterised in that the control device incorporates a control member and is slidably supported in parallel relationship to a shaft in the gear box, said shaft having mounted thereon gear wheels for pre-selective engagement by a gear-change member mounted on said shaft, the control device having formed on or secured thereto an intermediary member for engaging the gear-change member, said intermediary member being spring-loaded on each side of a central or neutral position of the gear-change member and co-operating with locking means releasable on actuation of the clutch, whereupon the intermediary member upon its spring-loading applies movement to

the gear-change member to cause its engagement with a gear wheel and effect a change of gear ratio. 45

The gear-change member is preferably of the known kind of sliding member splined to a shaft in the gear box and provided with dogs on opposite faces which are adapted to engage with one or other adjacent gear wheels normally loose on the shaft and thereby cause the one engaged to rotate with the shaft. 50

The means for retaining the intermediary member in position preferably comprises a notched or similar locking member which is adapted to be moved out of engagement with the intermediary member when the clutch of the engine and gear box system is disengaged. 55

It will be observed that the force applied to the gear-change member is controlled by the spring or springs referred to and thus the user cannot apply excessive force to the gear-change member when effecting a change of gear ratio. 60

In order that the invention may be fully understood and more readily carried into practice, we have caused to be appended hereto drawings illustrating a constructional example thereof, wherein— 65

Figure 1 is a side view in detached medial section of gear-change mechanism according to the invention, 70

Figure 2 is a fragmentary end elevation of a portion of the mechanism illustrated in Figure 1, 75

Figure 3 is a side elevation of the mechanism illustrated in Figure 1, part being broken away, and 80

Figure 4 is a side elevation of a detail.

Referring to the drawings, in the construction shown therein as applied by way of example to a two-speed gear box for a motor scooter, the gear box 1 is of any suitable construction and on splines 4 of a suitable shaft 85 2 a gear-change member 3 having opposed dogs 5 and 6 respectively is mounted so as to

be slidable on the shaft 2 and disposed between two gear wheels 7 and 8 respectively in such a manner that the dogs 5 and 6 may occupy a position where they do not engage either of the wheels 7 or 8 (neutral position) or may be moved in one direction into a position where the dogs 5 engage the larger gear wheel 7 (low gear) or in the opposite direction into a position where the dogs 6 engage the smaller gear wheel 8 (high gear). The gear change member 3 has an annular groove 9 engaged by a yoke 10 provided at one end of a gear-change arm 11 which forms part of an intermediary member generally indicated by the reference numeral 12, the other part of the intermediary member 12 consisting of an open-ended hollow cylinder 13 which is welded or otherwise secured substantially centrally between its ends to the gear-change arm 11. That end of the gear-change arm 11 which is remote from the yoke 10 is slotted (see Figure 4), the sides of the slot being arcuately relieved and engaging corresponding slots in the cylinder 13 so as to form cheeks 14, 15 respectively, the cheeks projecting inwardly from the interior surface of the cylinder 13 and forming transverse shoulders. The cylinder 13 is slidably supported in cylindrical parts 27, 28 respectively of the gear box casing. Within the cylinder 13 are two helical compression springs 16, 17 respectively, disposed one at either side of the cheeks 14, 15, and within which is an inner hollow cylinder 18 spaced from the outer cylinder by the cheeks 14, 15, which also separate the springs 16, 17, and having an inwardly extending flange 19 at one end thereof. The cylinder 18 is slightly longer than the cylinder 13 and carries near that end remote from the flange 19 an external ring 20 which is slidable within the cylinder 13 and secured against outward axial movement by means of a ridge 21 in the cylinder 18. The ring 20 abuts one end of the spring 16 which is therefore confined within the cylinder 13 between the cheeks 14, 15, and the ring 20. Within the cylinder 18 is a compression spring 22 one end of which abuts against the flange 19 on the cylinder 18 and the other end against the inside of a portion 23 of the gear-box casing. Extending through the portion 23 of the casing and through the spring 22 is a flexible wire 24 capable of giving a push-pull operation and tensioned by the spring 22. On the inner end of the wire 24 is a slotted disc 25 in contact with the outside of the flange 19 on the cylinder 18 and slidable within the cylinder 13. The disc 25 abuts one end of the spring 17 which is therefore confined within the cylinder 13 between the cheeks 14, 15 and the disc 25. The cylinder 18, ring 20 and disc 25 together form the control member. The outer end of the wire 24 is connected to the change-speed lever or pedal (not shown). The usual hollow nut 26 for adjusting the tension of the wire 24 is screwed into the casing part

23.

The gear-change arm 11 has a lateral extension 29 adapted in the neutral position of the arm 11 to enter a corresponding notch 30 in a locking arm 31 secured to a clutch-operating shaft 32 adapted to rock as the clutch (not shown) is disengaged or engaged.

In operation, assuming the gear to be in neutral and the extension 29 of the gear-change arm 11 to be engaged and locked by the locking arm 31, then the next gear to be engaged will be the first gear. The gear-change lever or pedal is moved into the appropriate position. As the gear-change arm 11 is locked there is no movement of this and consequently no movement of the member 3. However, pulling of the wire 24 causes the cylinder 18 to move and compresses the spring 17 against the cheeks 14, 15. On disengaging the clutch, the locking arm 31 is moved out of engagement with the extension 29 of the gear-change arm 11 and the pressure of the spring 17 on the cheeks 14, 15 causes the cylinder 13 and the gear-change arm 11 which is secured to it to move in the direction left to right, Figures 1 and 3, causing the member 3 to slide on the shaft 2 and its dogs 5 to engage with the gear wheel 7. On re-engaging the clutch, the locking arm 31 moves back into operative position and the gear-change arm 11 is again held in the position in which low gear is engaged. When it is desired to engage second gear, the appropriate movement of the gear-change lever or pedal allows the spring 22 (which is stronger than the spring 16) to move the cylinder 18 in the opposite direction and compress the spring 16 and again the gear-change arm 11 is not moved until it is released by the locking arm 31 on disengagement of the clutch, the spring 16 by its pressure on the cheeks 14, 15 causing the cylinder 13 and consequently the arm 11 to move from right to left (Figures 1 and 3) and the engagement of the dogs 6 with the gear wheel 8. The compression spring 22 is under constant compression and serves to move the cylinder 18 in the right to left direction (Figures 1 and 3) when the wire 24 is released by the gear-change lever or pedal.

The gear box casing is preferably divided into two portions 33, 34 for ease of accessibility and assembly. The portion 34 is shown removed in Figure 2 for the sake of clarity.

The gear box of course has at least one other shaft (not shown) and has gear wheels (not shown) meshing with the gear wheels 7, 8 to give the required different gear ratios. The gear box may also have associated with it means for starting the engine to which it is connected via the clutch.

WHAT WE CLAIM IS:—

1. Variable-speed gear having a movable gear-change member adapted to effect a change of gear ratio actuated by an intermediary or gear shift member secured to a hollow cylindrical control device and adapted to be spring-

loaded in two directions to provide one position on each side of a central or neutral position, characterised in that the control device incorporates a control member and is slidably supported in parallel relationship to a shaft in the gear box, said shaft having mounted thereon gear wheels for pre-selective engagement by a gear-change member mounted on said shaft, the control device having formed on or secured thereto an intermediary member for engaging the gear-change member, said intermediary member being spring-loaded on each side of a central or neutral position of the gear-change member and co-operating with locking means releasable on actuation of the clutch, whereupon the intermediary member under its spring-loading applies movement to the gear-change member to cause its engagement with a gear wheel and effect a change of gear ratio.

2. Variable speed gear according to Claim 1, wherein the gear change member is splined to and slidable on the shaft in the gear box and has on its opposed faces dogs which are adapted to engage with the gear wheels normally loose on the shaft and disposed on either side of the gear change member, thereby to cause the gear wheel which is engaged to rotate with the shaft.

3. Variable-speed gear according to either of Claims 1 and 2, wherein the intermediate member consists of an arm engaging an annular groove in the gear-change member and secured to a hollow cylinder constituting the slidably supported control device and containing a pair of compression springs one of which

is adapted to be loaded by movement in one direction of the control member, movable within the said cylinder, and the other of which is adapted to be loaded by movement in the other direction of the control member.

4. Variable-speed gear according to claim 3, wherein the cylinder has intermediate its ends an annular or part-annular internal shoulder against which each of the said springs abuts and is adapted to be loaded on movement of the control member in the respective direction, the other ends of each spring being engaged by a corresponding shoulder on the control member.

5. Variable-speed gear according to any of the preceding claims, wherein the means for retaining the intermediary member in position comprises a notched or similar locking member adapted to be moved out of engagement with the intermediary member when the clutch of the engine and gear box system is disengaged.

6. Variable-speed gear according to claim 5, wherein the locking member is adapted to engage with and be disengaged from a lateral projection on the arm of the intermediary member.

7. Variable speed gear having gear-change mechanism substantially as hereinbefore described with reference to the accompanying drawings.

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Agent for the Applicants.

PROVISIONAL SPECIFICATION

Improvements in or relating to Variable-Speed Gears

We, THE BIRMINGHAM SMALL ARMS COMPANY LIMITED, of Armoury Road, Small Heath, Birmingham, a British Company, do hereby declare this invention to be described in the following statement:—

This invention relates to variable-speed gears and one of its objects is to provide a simple form of pre-selection of gears. The invention is particularly applicable to a two-speed gear, i.e. one having two forward gear ratios and a neutral position, such as may be fitted to a motor cycle or the like.

According to this invention a variable-speed gear comprises a movable member adapted to effect a change of gear ratio (hereinafter called "the gear-change member") which member is connected through a spring-controlled intermediary member to a control member in such a manner that movement of the control member from one position to another causes the intermediary member to move and to apply a load (or further load) to its associated spring but during such movement the gear-change member is retained against movement until released, whereupon the gear-change member is moved under the action of the force ex-

tended by the said loaded spring to effect a change of gear ratio.

The gear-change member is preferably of the known kind of sliding member splined to a shaft in the gear box and provided with dogs on opposite faces which are adapted to engage with one or other adjacent gear wheels normally loose on the shaft and thereby cause the one engaged to rotate with the shaft.

Preferably the intermediary member is adapted to be spring-loaded in two directions in order to provide one position on each side of a central position.

The means for retaining the intermediary member in position preferably comprises a notched or similar locking member which is adapted to be moved out of engagement with the intermediary member when the clutch of the engine and gear box system is disengaged.

It will be observed that the force applied to the gear-change member is controlled by the spring or springs referred to and thus the user cannot apply excessive force to the gear-change member when effecting a change of gear ratio.

The following is an example given by way of illustration of the application of the inven-

tion to a two-speed gear box suitable for a motor scooter.

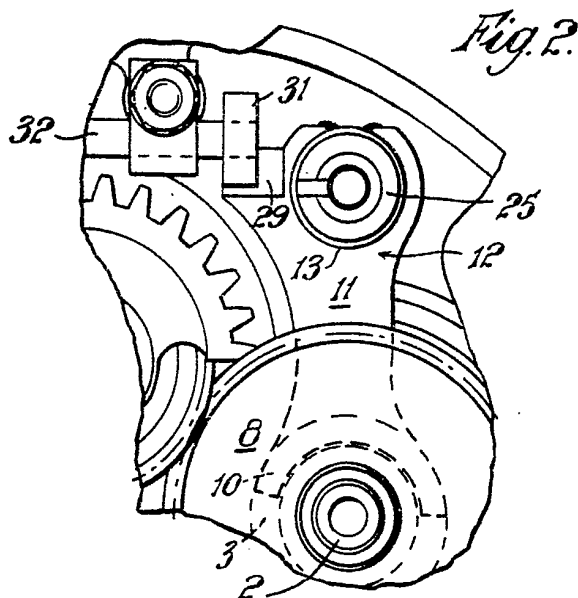
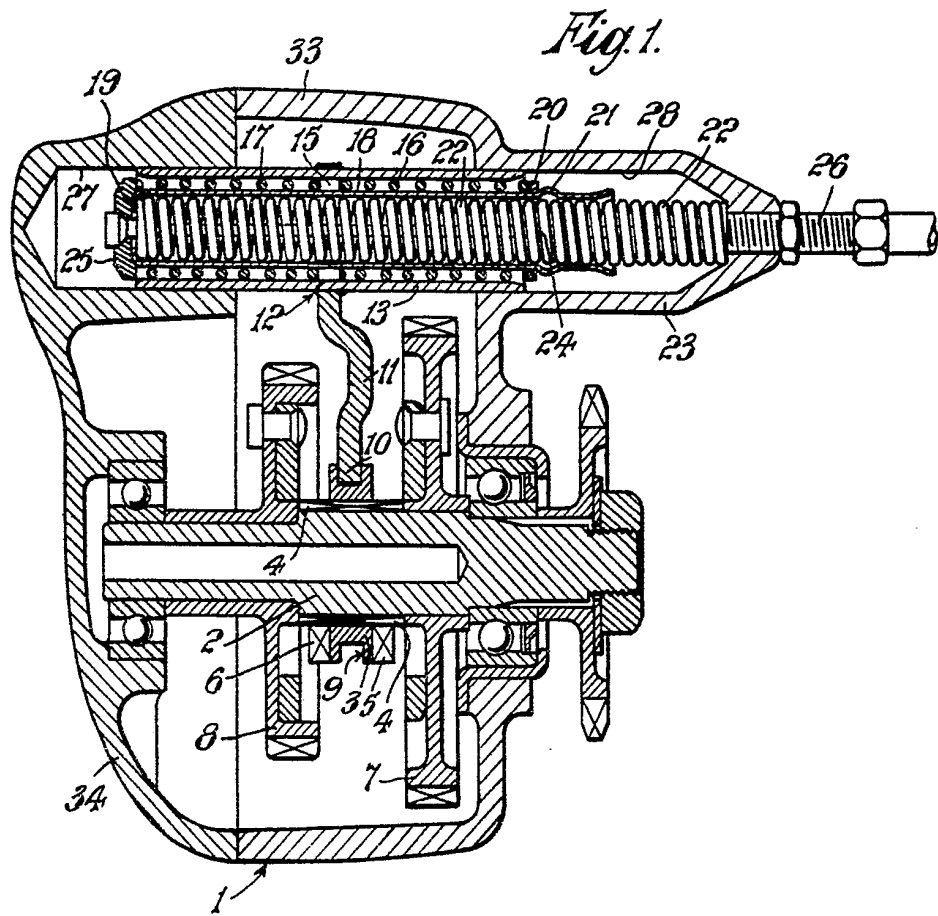
5 The gear box is of any suitable construction and on a suitable shaft is slidably splined a gear-change member in the form of a dog member which is mounted between two gear wheels in such a manner that the dogs may occupy a position where they do not engage either wheel (neutral position) or may be
10 moved in one direction into engagement with one wheel (low gear) and in the opposite direction into engagement with the other wheel (high gear). Extending from this dog member is a gear-change arm which is provided with
15 an opening to accommodate a spring-controlled intermediate unit. This comprises an open-ended outer cylinder which is welded or otherwise secured to the gear-change arm. Within
20 this cylinder are two outer helical compression springs within which is an inner cylinder spaced from the outer cylinder by a spacing washer (which also separates the two springs) and having an inwardly extending flange on its inner end. This inner cylinder is slightly
25 longer than the outer cylinder and near its outer end carries an external ring which is secured against outward axial movement by means of a ridge in the inner cylinder. Inside
30 the inner cylinder is an inner helical compression spring one end of which abuts against the flange on the inner cylinder and the other end against the inside of a portion of the gear-box casing. Extending through the casing and
35 through the inner spring is a flexible wire capable of giving a push-pull operation and tensioned by the inner spring. On the inner end of the wire is a flanged or nut portion in contact with the outside of the flange on the inner cylinder. The outer end of this flexible

wire is connected to the change-speed lever or pedal. 40

The gear-change arm extends outwardly from the intermediary unit and at this end is tapered and adapted to enter corresponding openings in a locking plate which is secured or connected to the clutch-operating shaft (or other suitable part of the clutch mechanism) in order to rock as the clutch is disengaged or engaged. 45

In operation, assuming the gear to be in neutral and the gear-change arm to be in its normal locked position, then the next gear to be engaged will be the first gear. The gear-change lever or pedal is then moved into the appropriate position. As the gear-change arm is locked there is no movement of this and consequently no movement of the sliding dog member. However, the inner cylinder moves and compresses one or the other of the outer springs. On disengaging the clutch the locking plate is moved from engagement within gear-change arm and the spring pressure then causes the gear-change arm to move in the appropriate direction, causing the sliding dog member to engage with the appropriate gear wheel. On re-engaging the clutch the locking arm moves back into operative position and the gear-change arm is again held in position. When it is desired to engage second gear, movement of the gear-change lever or pedal causes compression of the other outer spring and again the gear-change arm is not moved until it is again allowed to do so under the action of the appropriate spring. 50
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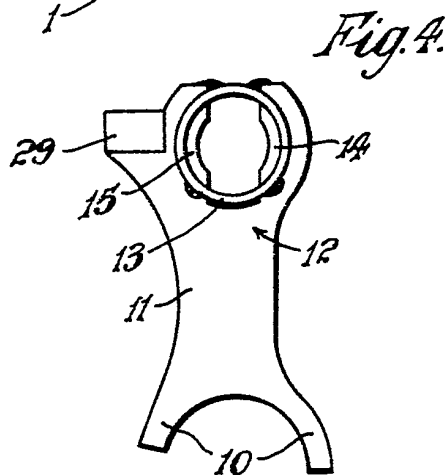
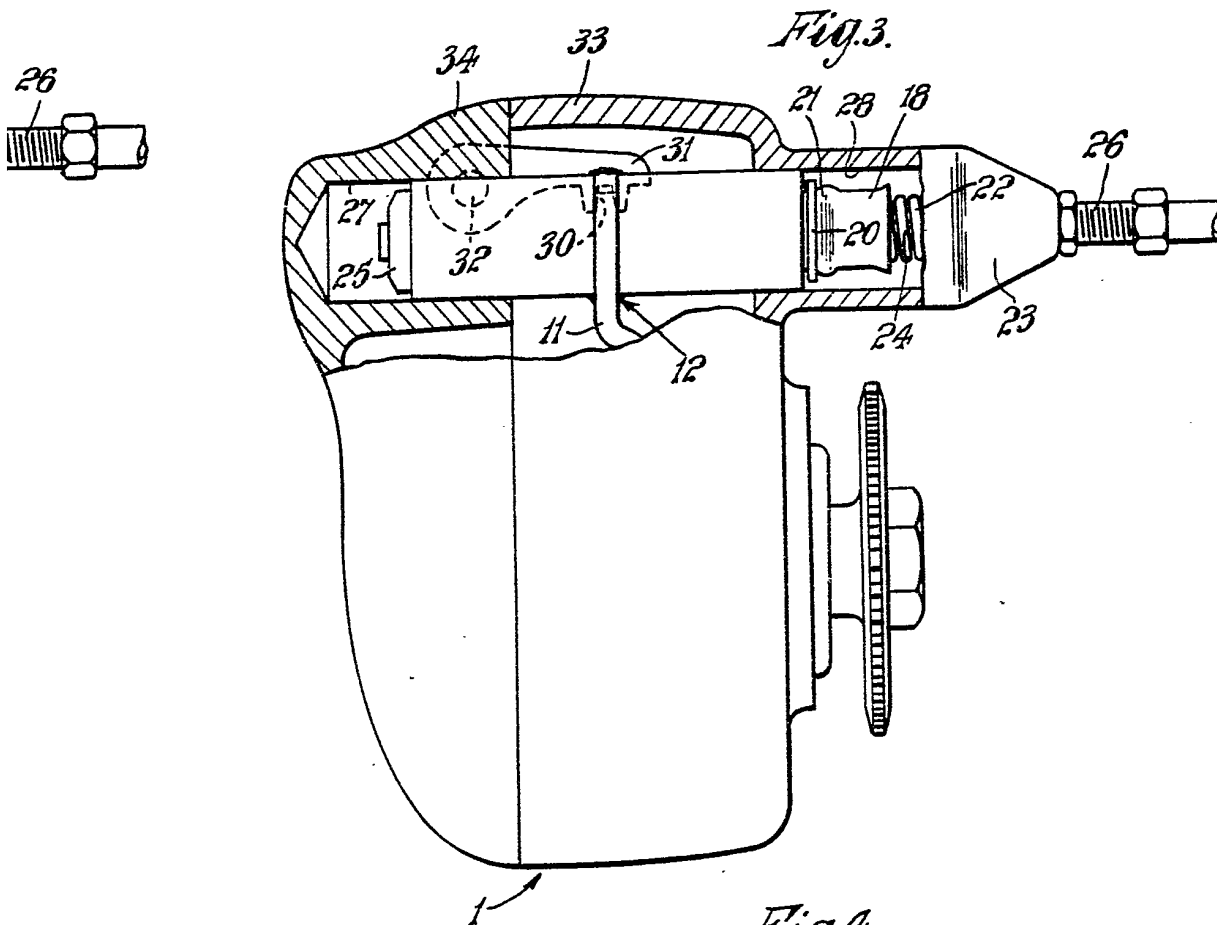


839,549 COMPLETE SPECIFICATION

2 SHEETS

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SHEETS 1 & 2



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