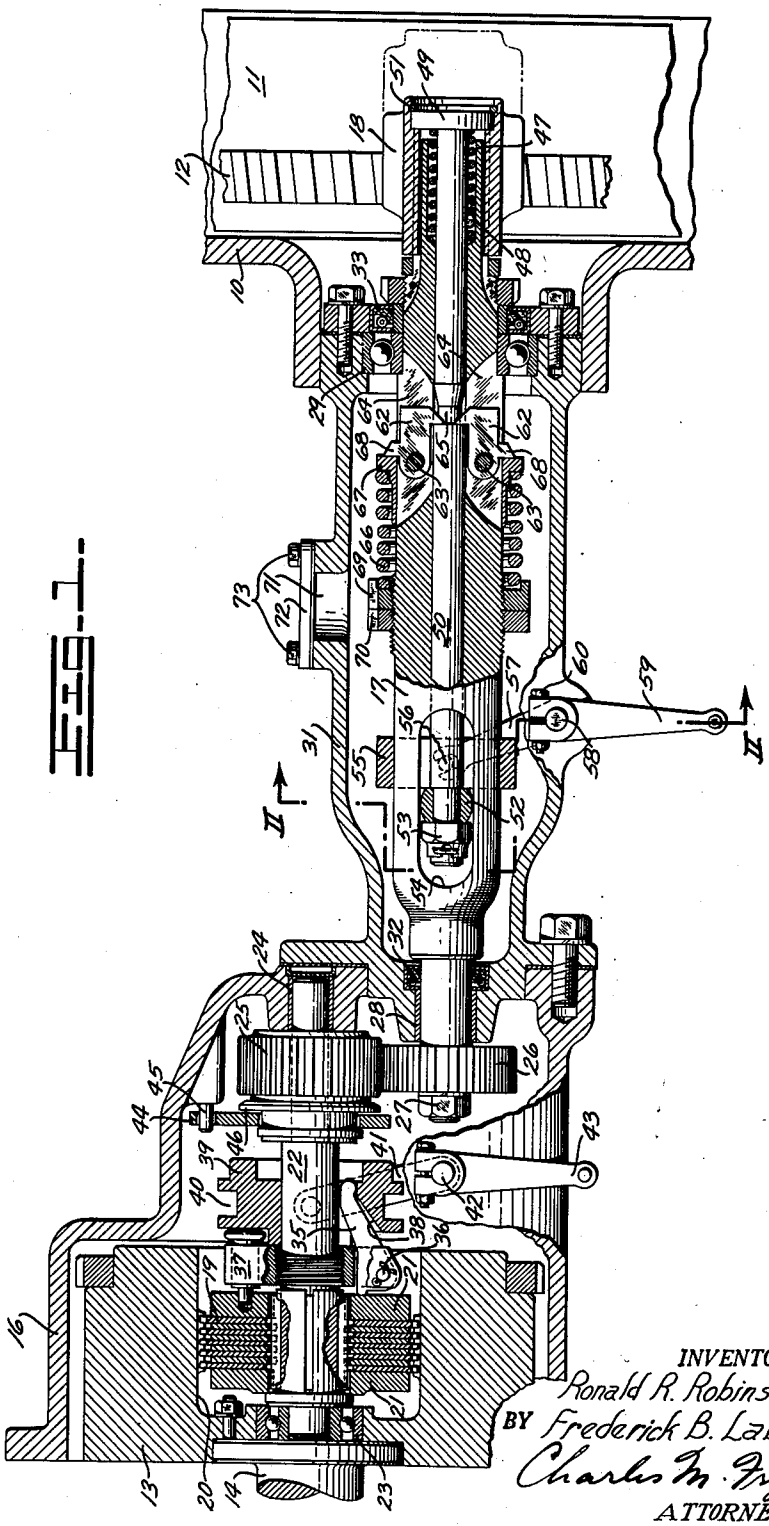
Dec. 16, 1952 R. R. ROBINSON ET AL 2,621,532

STARTER PINION ENGAGING MECHANISM

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Fig. 1



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Fig. 2.

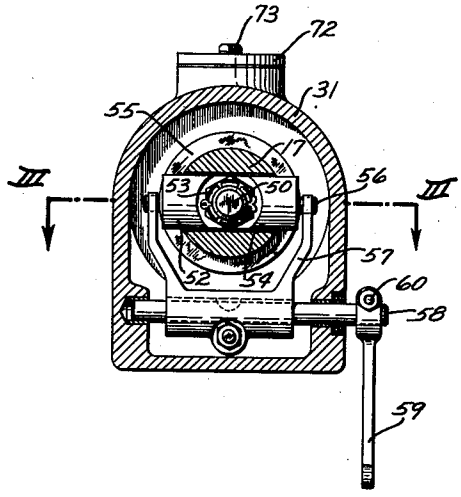
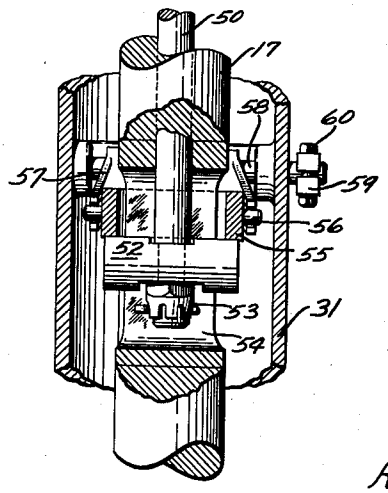


Fig. 3.



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STARTER PINION ENGAGING MECHANISM

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2 Claims. (Cl. 74—6)

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This invention relates to the starting mechanism for an internal combustion engine and more particularly to the starter pinion engaging mechanism therefor.

The invention is particularly adapted for use in connection with starting mechanisms of the type disclosed in Patent No. 2,481,783 to Robinson et al. for "Starting Mechanism for Internal Combustion Engines" which issued on September 13, 1949. This patent discloses a starting engine mounted on the side of a primary engine and a driving connection from the starting engine including a pinion gear adapted to mesh with a ring gear on the flywheel of the primary engine. The control mechanism for engaging the pinion gear with the ring gear is disclosed together with centrifugally actuated latching mechanism for holding the pinion gear in engagement with the ring gear during starting of the primary engine. It is to the control mechanism for engaging the pinion with the ring gear with which the present invention is concerned.

The control mechanism disclosed in the above identified patent has been found to have certain disadvantages when used on some engines. For example, part of the pinion engaging mechanism extends beyond the end of the pinion and interferes with the positioning of auxiliary apparatus driven by the engine such as marine gears, electric generators, and the like.

It is, therefore, an object of the present invention to provide a control mechanism for engaging the starting pinion gear with the flywheel ring gear in which none of the control parts extend beyond the end of the starter pinion gear. It is another object of this invention to provide a control mechanism of the type described in which substantially all of the sliding parts are enclosed within an oil tight housing to protect it from the accumulation of foreign material and to insure adequate lubrication of all of the sliding parts. Another object of this invention is to provide a control mechanism of the type described of unusually simple design which may be easily and cheaply manufactured.

Other objects and advantages of this invention will be made apparent in the following description wherein reference is made to the accompanying drawings.

In the drawings:

Fig. 1 is a fragmentary view in section through a portion of a starting engine and the primary engine showing in detail the clutch parts associated with the starting engine flywheel, the driving mechanism between the starting engine and

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primary engine disclosing the pinion engaging mechanism, and the control means for the pinion embodying the present invention.

Fig. 2 is a sectional view taken along line II—II of Fig. 1; and

Fig. 3 is a fragmentary sectional view taken along line III—III of Fig. 2.

In Fig. 1 of the drawings a part of a conventional internal combustion engine is illustrated as comprising a housing 10 enclosing a fly wheel 11 having a ring gear 12 which may be formed integrally therewith. The primary engine carries a separate starting engine only part of which is shown as comprising a fly wheel 13 carried on a crank shaft, part of which is shown at 14 and a housing 16 enclosing the fly wheel. Power from the starting engine is transmitted through a drive shaft 17 to a pinion gear 18 which is adapted to be brought into mesh with the ring gear 12 to crank the primary engine.

The drive shaft 17 is driven from the starting engine fly wheel through a conventional clutch comprising a stack of clutch plates 19 having a splined connection with the interior of a recess 20 provided in the fly wheel. The clutch plates are adapted to be compressed between pressure plates 21 having splined connections with a driven shaft 22 supported for rotation in bearings 23 and 24 carried in the starting engine fly wheel 13 and the housing 16 respectively. The clutch driven shaft carries a gear 25 which meshes with a gear 26 carried on the end of the drive shaft 17 and secured against axial movement by a nut 27. The drive shaft 17 is supported for rotation in spaced bearings 28 and 29 carried in a housing 31 interposed between the housings 10 and 16 enclosing the fly wheels of the primary engine and starting engine respectively. The housing 31 is adapted to contain lubricating oil for the lubrication of the drive shaft parts and is provided with seals 32 and 33 to prevent the leakage of oil into the adjacent housings.

Engagement of the clutch to transmit the drive from the fly wheel to the driven shaft is accomplished by compressing the clutch plates through a plurality of cam levers only one of which is illustrated at 35 as supported for rocking movement about a pin 36 carried in a spider 37 having a threaded connection with the periphery of the driven shaft. The ends of the cam levers are received within rearwardly converging recesses 38 provided in a sliding collar 39 carried for sliding movement on the driven shaft so that sliding movement of the collar effects engagement or release of the clutch. The

periphery of the sliding collar 39 is provided with a groove 40 for the reception of the inwardly extending ends of a yoke 41 secured to a shaft 42 extending through and supported for rotation in the housing 16. At its extending end the shaft 42 carries a lever 43 permitting manual operation of the clutch. The clutch includes a brake for the driven shaft comprising a brake disc 44 supported for axial sliding movement but held against relative rotation by a guide pin 45 extending from the housing 16 through a suitable opening in the disc. The brake disc embraces the hub of gear 25 carried on the clutch driven shaft and is adapted to be pressed into frictional engagement with a flange 46 provided on the gear hub by movement of the sliding collar 39 away from its engaged position as is illustrated in Fig. 1.

The pinion gear 18 is provided with a splined connection with the drive shaft 17 and is adapted for sliding movement thereon to effect engagement or disengagement with the ring gear 12. The pinion gear is normally urged toward its disengaged position illustrated in broken lines in Fig. 1 by spring 47 carried in a counterbore 48 in the splined end of the drive shaft. The spring 47 bears against the end of the counterbore and a collar 49 formed on the end of a control rod 50 carried for sliding movement in an axial bore provided in the drive shaft. The collar 49 of the control rod is received within an enlarged bore in the pinion gear and is held against relative axial movement by a shoulder at the end of the bore enlargement and an internal snap ring 51. At its opposite end the control rod carries a cross bar 52 which is secured to the control rod by means of a nut 53. Elongated openings 54 are provided in the drive shaft to accommodate the ends of the cross bar 52 which is disposed between the nut 53 and a collar 55 carried for sliding movement on the exterior of the drive shaft and adapted to engage the cross bar to operate the control rod. Collar 55 is provided with a pair of extending pins 56 adapted to be received in the bifurcated ends of a shifter yoke 57 non-rotatably secured to a shaft 58. The shaft 58 is supported for rocking movement in housing 31 and at one end extends through to the exterior of the housing. At its extending end the shaft 58 carries a control lever 59 which is clamped against rotation on the shaft as by a cap screw 60.

During starting of the primary engine it is desirable that the pinion gear remain in mesh with ring gear 12 until the primary engine is brought up to sufficient speed to assure its continued operation. In order to retain the pinion in mesh with the ring gear during this period against the action of spring 47 a pair of pawls 62 are pivotally supported about pins 63 in a diametrically disposed slot 64 in the drive shaft. The pawls are engageable with a peripheral groove 65 in the control rod when the pinion is moved into its engaged position as shown by the solid lines. In this position the pawls prevent the return of the pinion to its normal position of disengagement and are continually urged toward the latching position by a spring 66 which bears at one end against a flanged sleeve 67 carried for sliding movement on shaft 17 engaging outwardly projecting fingers 68 formed on the pawls and at its opposite end against a nut 69. The nut 69 is provided with a threaded engagement with the periphery of the drive shaft 17 and is locked in its position of adjustment by a jam nut 70. Both nuts are disposed adjacent an opening 71 provided in the housing 31 to facilitate adjustment. The opening 71 is normally closed by a removable cover 72 secured to the housing by cap screws 73. The pawls are designed to act as governor weights upon rotation of the shaft 17 consequently when the primary engine has been started and attains a predetermined speed the pawls will swing outwardly under centrifugal force against the action of the spring 66. Upon outward swinging of the pawls the control rod will be released and the pinion will be moved out of engagement with the ring gear by the action of spring 47. The speed at which the pawls will move out of engagement with the control rod may be adjusted by manipulation of nuts 69 and 70.

With the improved construction just described the control mechanism for engaging the pinion gear with the primary engine ring gear is carried within a housing containing lubricating oil. Consequently the control mechanism is always adequately lubricated and is protected from the accumulation of foreign material which in the past has been the cause of undue wear interfering with the reliable operation of the control mechanism. In addition the control mechanism is of unusually simple design and no part extends beyond the face of the primary engine fly wheel to interfere with the mounting of engine driven equipment.

We claim:

1. In a starting mechanism for an engine having a ring gear and a starter driven pinion gear wherein the pinion gear is slidably supported on a hollow shaft for movement to and away from the ring gear, control means for sliding the pinion gear comprising a rod slidable in the hollow shaft, and lever means engaging the rod at a point within the shaft and operable from an external position to slide the rod.

2. In a starting mechanism for an engine having a ring gear and a starter driven pinion gear wherein the pinion gear is slidably supported on a hollow shaft for movement to and away from the ring gear, control means for sliding the pinion gear comprising a rod slidable in the hollow shaft, said shaft having diametrically opposed elongated openings therein, a cross bar carried by the rod and extending through said openings, a collar surrounding the shaft for engagement with projecting ends of the cross bar, and manually actuated means engageable with the collar to slide the pinion into meshing engagement with the ring gear.

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