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ENGINE STARTER DRIVES

Filed Dec. 21, 1959

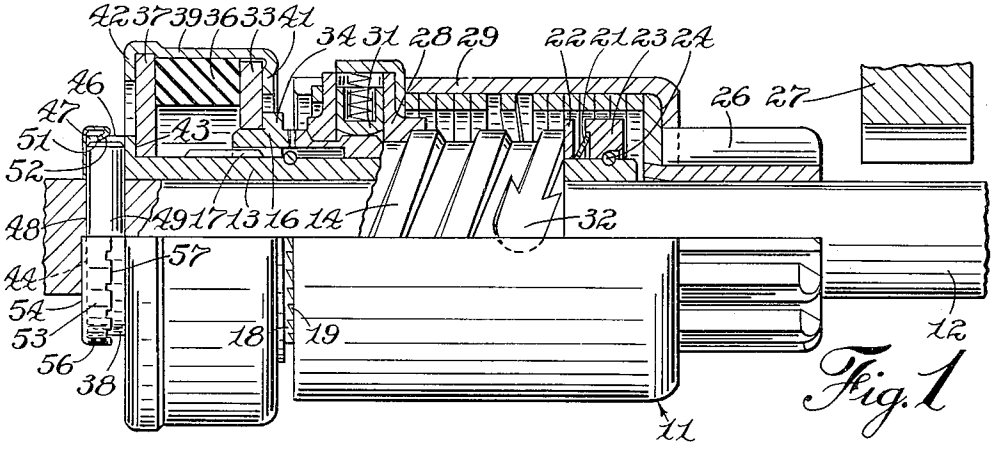


Fig. 1

Fig. 2

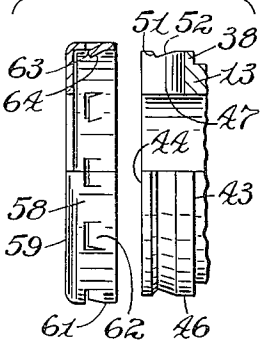


Fig. 3

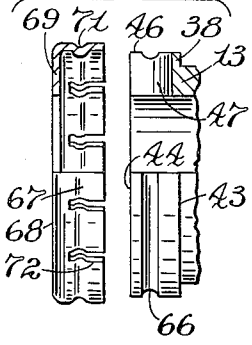
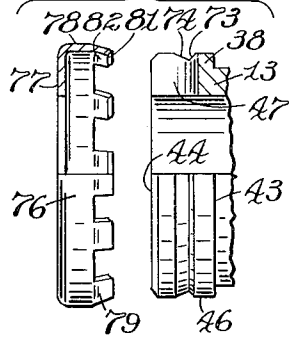


Fig. 4



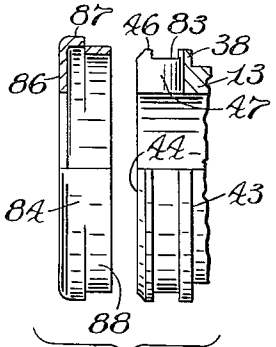


Fig. 6

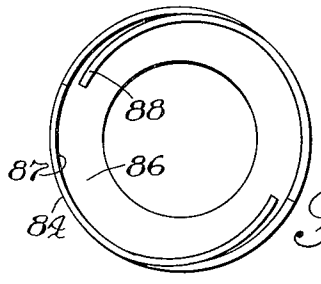


Fig. 5

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ENGINE STARTER DRIVES

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The present invention relates to engine starter drives and more particularly relates to an improved arrangement for securing the drive assembly to the starting motor armature shaft.

Starter drives are generally sub-assemblies adapted to be mounted on an extension of the starter motor armature shaft. Until recently starter drives, similar to the illustrated rubber "folo-through" type, have been secured to the armature shaft by means of a pin passing through the sleeve at a point generally located under the rotatable and slidable threaded screw shaft. This method and means of securing the drive to the armature shaft is not desirable. In order to mount the drive the screw shaft must be provided with a radial hole intermediate its extremities to permit the insertion of the retaining pin in the aligned armature and sleeve mounting holes. The provision of the screw shaft hole is, of course, an extra machining operation and this hole serves no function after the drive assembly is mounted on the armature shaft.

The old method of mounting a drive is a time consuming operation since the assembler must align at least three holes in order to be able to secure the drive to the armature shaft. The pin required to be used to secure the drive assembly has in the past in order to eliminate pin drift been what is referred to as a roll pin which expands within the aligned mounting holes. Radial drift of the retaining pin would be detrimental since the displacement would interfere with the relative rotation between the concentric sleeve and screw shaft.

A further disadvantage results from chips or shaving on the pins becoming lodged between the sleeve and screw shaft, or between the screw shaft and the control nut, thus causing excessive wear and detrimentally affecting the desired operation of the starter drive.

It is an object of the present invention to provide a novel starter drive which is securable to a starting motor armature shaft in an efficient and reliable manner, and which is simple and economical in construction.

It is another object to provide a more convenient and time saving means for mounting the starter drive assembly on a starting motor armature shaft.

It is still another object to provide a starter drive which is secured to the starting motor armature shaft by a securing pin and retainer means so positioned in and on the sleeve as not to interfere with relative rotating parts particularly if pin drift should occur. The attainment of this object also has the secondary effect of allowing the use of a solid securing pin and reducing the need for exacting press fit tolerances and roll pin types of securing pins heretofore required.

It is a further object to provide starter drive securing means which will considerably reduce the possibility of introducing detrimental foreign matter between contiguous rotating parts.

It is a further object to provide starter drive securing means which is easily disassembled, should the need arise.

Further objects and advantages will become more apparent from the following description taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a side elevation, partly broken away and in section, illustrating a starter drive assembly secured to a starting motor armature by one embodiment of the invention;

FIG. 2 is a fragmentary view illustrating the flanged extremity of the driving sleeve and a second embodiment of the drive securing means of the invention;

FIG. 3 is a view similar to FIG. 2 and illustrates a third embodiment of the invention;

FIG. 4 is a view similar to FIG. 2 and illustrates a fourth embodiment of the invention;

FIG. 5 is an internal end view of the retainer means of a fifth embodiment of the invention; and

FIG. 6 is a view similar to FIG. 2 but illustrating the complete embodiment disclosed in FIG. 5.

In FIG. 1 there is illustrated a starter drive sub-assembly generally indicated by the numeral 11 which is adapted to be secured to an armature shaft 12 of a starting motor (not shown). A driving sleeve 13 is adapted to be axially and non-rotatably mounted on the shaft in a relatively simple and efficient manner to be hereinafter described. A threaded screw shaft 14 is journalled on the sleeve and drivingly connected to the sleeve 13 by means of a clutch 16 axially splined as at 17 to the sleeve 13. The clutch 16 is provided with axially extending teeth 18 engageable with teeth 19 on the screw shaft 14 to provide an overrunning clutch connection. The screw shaft teeth 19 are normally held in engagement with the clutch member teeth 18 by means of a spring 21 intercalated between the thrust washer 22 and a stop abutment 23 provided on one end of the sleeve 13. The stop abutment is held on the sleeve by means of a snap ring 24.

The pinion 26 is slidably journalled on the shaft 12 for axial movement into and out of mesh with a gear 27 of the engine to be started. Means including a control nut 28 and a barrel housing 29 are provided to transmit actuation from the screw shaft to the pinion.

The control nut is provided with centrifugally operating detent means 31 which yieldably engage the threads on the screw shaft 14 and when the pinion is in the fully meshed position engages the notch means 32 and thereby insures the maintenance of mesh until such time as the engine is reliably self-operative.

Screw-jack action resulting from the control nut and screw shaft engagement upon the application of initial starting torque causes the clutch member 16 to be urged axially in a demeshing direction. This screw-jack action is absorbed by compression means comprising a thrust plate 33 seated on the clutch member 16 and abutting a flange 34 provided on the clutch member, a second pressure or thrust plate 37 and a substantially cylindrical compression element 36 of elastically deformable material such as rubber interposed between the thrust plate 33 and the second pressure or thrust plate 37. The thrust plate 37 compressively abuts a flange 38 formed on the end of sleeve 13 and has its outer peripheral portion engaged by a thimble 39 which provides a housing for the compression absorbing means. The ends of the thimble 39 are formed to provide inwardly directed radial flanges 41, 42 abutting the peripheral portions of the thrust plates 33 and 37, respectively, confining the compression elements 36 under a predetermined compressed condition.

The flange 38 side walls 43, 44 provide axially facing shoulders and the connecting peripheral top wall 46 is provided with a circumferential recess formed therein. The flange 38 is further provided with diametrically opposite slot means 47 adapted to register with a transverse shaft passage 48 in the shaft 12.

The slots 47 open to the peripheral top portion of the flange 38 as well as the flange side wall 44. A pin 49, preferably a solid pin for economy sake, is mounted in the shaft passage 48 and has its extremities engaging portions of the flange slots 47.

It will be apparent that the sleeve can be moved axially into position after the pin has been inserted in the

shaft and thereby causes the extremities of the pin to engage the slots 47. The description to this point can be considered common to all the embodiments illustrated in the attached drawing.

In FIGURES 1 and 2 the embodiments disclosed thereing illustrates a circumferential recess provided in the flange top wall 46 comprising a tapered slot having a first tapered surface 51 having an acute angle of inclination relative to a plane normal to the shaft axis, and a second tapered surface 52 extending in an axial direction opposite to tapered surface 51 joining therewith to form a recess opening having an obtuse apex. In the embodiments of FIGS. 1 and 2, the first tapered surface is adjacent the flange side 44 with the second tapered surface extending axially outward in a direction towards the pinion.

Retainer means 53 are provided in the embodiment illustrated in FIG. 1 comprising a substantially cup-shaped member having a bottom wall 54 centrally apertured and radially supported on the shaft 12 abutting the flange side 44. The cylindrical side wall 56 extends axially substantially parallel to the shaft axis and encompasses portions of the flange top wall 46 and portions of the flange slots 47. Spring fingers 57 are formed on the cylindrical side wall and have the extremities thereof bent back and radially inward to have the ends yieldably abut the tapered surface 51 with the intermediate body portions of 57 preferably yieldably abutting the second tapered surface 52.

The retainer means 53 is placed on the shaft prior to inserting the pin 49 in the shaft passage. After the starter drive sub-assembly is placed on the shaft with the sleeve flange engaging the pin, the retainer is forced axially towards the flange causing the spring finger extremities to snap into engagement with the flange recess formed by the tapered surfaces 51, 52. The engagement of the retainer spring fingers will cause the retainer bottom wall to properly abut the flange side wall 44 and the portion of the pin 49 exposed in the slot openings 47. By this means the starter drive sub-assembly is simply, effectively and reliably secured to the starting motor armature shaft.

The embodiment disclosed in FIG. 2 comprises a circumferential recess in the flange 38, also utilizing the tapered surfaces 51, 52. The retainer means 58 comprises substantially a cup-shaped member having an apertured bottom wall 59 journalled on the armature shaft and a substantially cylindrical side wall 61. A plurality of instruck tongues or detents 62 formed in the cylindrical side wall 61 are inclined radially inward. The tongues 62 have an abutting end portion 63 adapted to engage the tapered surface 51 when the retainer 58 is urged into engagement with the flange 38. The body portion 64 of the tongues 62 compressively but yieldably engage the second tapered surface 52 upon engagement of the retainer 58 with the flange 38.

In FIG. 3 a third embodiment is illustrated wherein the recess provided in the flange 38 comprises a substantially semi-circular or concave groove 66. The substantially cup-shaped retainer means 67 comprising an apertured bottom wall 68, slidably journalled on the armature shaft and urged into position with the flat bottom wall 68 abutting the flange side wall 44 and exposed portions of the retainer pin 49 extending beyond the slot openings in the wall 44. The cylindrical side wall 69 extends substantially parallel to the shaft axis and encompasses portions of the groove 66 and flange slots 47. A circumferential groove or depression 71 is formed in the cylindrical side wall 69 and engages the groove 66. To insure the necessary spring resiliency the cylindrical side wall 69 is provided with a plurality of axially extending notches 72.

In the embodiment illustrated in FIG. 4, the recess in the flange 38 is provided with a first tapered surface 73 and a second tapered surface 74. The recess is similar to the recess provided in the flange embodiments illustrated in FIGS. 1 and 2, but with the abutting shoulder reversed so as to be adjacent to the side wall 43, and having a second tapered surface extending radially outward in a direction away from the pinion. Substantially cup-shaped retainer means 76 is rotatably supported on the armature shaft by means of a centered aperture provided in the bottom wall 77. The cylindrical side wall 78 extends axially substantially parallel to the shaft axis, and has spring fingers means 79 formed on the edge portion thereof biased radially inwardly. The end portions 81 of the fingers 79 abut the tapered surface 73 with the intermediate body portions 82 compressively but yieldably engaging the tapered surfaces 74.

In FIGS. 5 and 6 there is illustrated still another embodiment wherein the flange 38 is provided with a substantially rectangular radially outwardly opening notch 83. A substantially cup-shaped retainer means 84 is slidably journalled on the shaft 12 and has a flat bottom wall 86 flatwise abutting the flange side wall 44 and portions of the pin 49 exposed in the flange slots 47. The cylindrical side wall 87 axially encompasses and is spatially located above the flange top 46 and the slot openings 47 as well as the notch 83. A plurality of circumferentially extending spring arms 88 formed in the cylindrical side wall 87 are biased radially inwardly to engage in the flange notch 83. When the retainer is urged into engagement with the flange the spring arms 88 will snap into engagement with the notch 83 and thereby cause the bottom wall to compressively abut the flange and pin to axially and non-rotatably secure the starter drive sub-assembly to the armature shaft. The spring arms 88 or side walls 87 will be in a position to abut the extremities of the pin 49 in the event of radial pin drift to prevent its disengagement from the shaft passage and flange slots.

The foregoing are considered illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to falling within the scope of the invention as claimed.

I claim:

1. In a starter drive, a power shaft having a transverse passage, a sleeve adapted to be fixedly mounted on the shaft, a flange formed on the sleeve and having radial side portions providing abutments and having a top portion connecting said side portions, said flange having slot means formed therein opening to the top and one of the flange side portions and adapted to register with the said shaft passage, securing means mounted in the shaft passage and engaging said flange slot means, retainer means journalled on the shaft for securing the sleeve to the shaft, means formed in the flange top portion for fastening the retainer means to the flange, said retainer means abutting said one side portion of the flange and having a portion yieldably engaging said fastening means and encompassing portions of said securing means.

2. A starter drive as set forth in claim 1 wherein said flange top portion comprises a flat surface substantially parallel to the shaft axis, and said fastening means comprising a recess formed in said top surface opening radially outward; the retainer means comprising a substantially cup-shaped body having a bottom apertured wall slidably journalled on the shaft and having a cylindrical side wall spatially encompassing the flange top surface, spring means on the cylindrical side wall projecting radially inward engaging said fastening means, and said securing means comprising a pin member mounted in the shaft passage and having its extremities engaging the flange slot means.

3. A starter drive as set forth in claim 2 wherein the fastening means recess comprises a first radially inwardly tapered surface having an acute angle of inclination to a plane normal to the shaft axis providing an abutment sur-

face and a second radially inwardly tapered surface extending in an axial direction opposite to said first tapered surface and joining therewith to form the radially outwardly opening recess and having a substantially obtuse apex; said retainer spring means having end portions yieldably engaging the abutment surface and having spring body portions yieldably and substantially flatwise engaging said second tapered surface.

4. A starter drive as set forth in claim 3 wherein said first tapered surface provides an abutment surface facing in an axial direction away from the retainer bottom wall.

5. A starter drive as set forth in claim 4 wherein the spring means comprises a plurality of elongated fingers formed on the end portion of the retainer cylindrical side wall, the extremities of said fingers being bent back and radially inward so that the extremities thereof yieldably engage said abutment surface and the body portions of said bent back fingers yieldably and compressively engage said second tapered surface.

6. A starter drive as set forth in claim 4 wherein the retainer cylindrical side wall is formed with a plurality of instruck tongue members providing said spring means, said tongues being inclined radially inward and having the extremities thereof engaging said abutment surface, the body portions thereof engaging said second tapered surface.

7. A starter drive as set forth in claim 3 wherein said first tapered surface provides an abutment surface facing in an axial direction toward the retainer bottom wall; wherein said spring means comprises fingers formed on the edge of the retainer cylindrical side wall inclined radially inward and having the extremities thereof engaging said abutment surface and the body portions thereof yieldably engaging said second tapered surface.

8. A starter drive as set forth in claim 2 wherein the fastening means recess comprises a substantially concave groove opening radially outward; and the retainer spring means comprises axially extending spring fingers formed in the retainer cylindrical side wall said spring fingers having detent means formed therein and adapted to yieldably engage the groove opening when the retainer cylindrical side wall encompasses the flange top portion.

9. A starter drive as set forth in claim 2 wherein the fastening means recess comprises a substantially rectangular groove opening radially outward; and the retainer spring means comprises an elongated circumferentially extending finger formed in the retainer cylindrical side wall, said finger being biased radially inward and engaging said rectangular groove whereby the sleeve is effectively axial and non-rotatable secured on the shaft.

10. In a starter drive for internal combustion engines

a rotating power shaft having a transverse passage, a driving sleeve adapted to be fixedly mounted on the shaft, said sleeve having a flange provided on one end thereof, said flange having radial side portions providing shoulder abutments and circumferentially top portion having a fastening element formed thereon, said flange having diametrically disposed slots opening to a side and top portion, a pin mounted in the shaft passage and having its extremities engaging said flange slots whereby the sleeve is non-rotatably secured to the shaft, a cup-shaped retainer having an aperture bottom wall journalled on the shaft adapted to engage one of the side portions of the flange and the pin extremities, and having a cylindrical side wall concentrically enveloping portions of the flange top portion when the bottom wall engages said one side portion of the flange, spring means formed on the retainer cylindrical side wall extending substantially radially inwardly adapted when enveloping portions of the flange to yieldingly engage the flange fastening element, whereby the sleeve is axially confined on the shaft.

11. A coupling of the character described comprising in combination: a drive shaft having a transverse passage therethrough; a driven sleeve member co-axially mounted on the shaft; flange means formed on one extremity of the sleeve providing radial shoulders and having a top portion substantially parallel to the shaft axis, said flange means having radial slots formed therein adapted to register with the shaft passage and opening to one of the flange shoulders and the flange top portion; circumferential groove means formed in the flange top portion; a pin disposed in the shaft passage and having its extremities engaging the flange slots to non-rotatably secure the sleeve to the shaft; and, substantially cup-shaped retainer means supported on the shaft for axially securing the sleeve on the shaft and preventing radial displacement of the pin, said retainer means comprising an apertured bottom wall slidably journalled on the shaft adapted to be slid into engagement with said one shoulder and pin extremities, a cylindrical side wall adapted to spatially encompass the flange and circumferentially spaced spring means formed in the side wall adapted to engage the flange groove means and pin extremities when the base engages said shoulder and pin extremities.

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