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ENGINE STARTER GEARING

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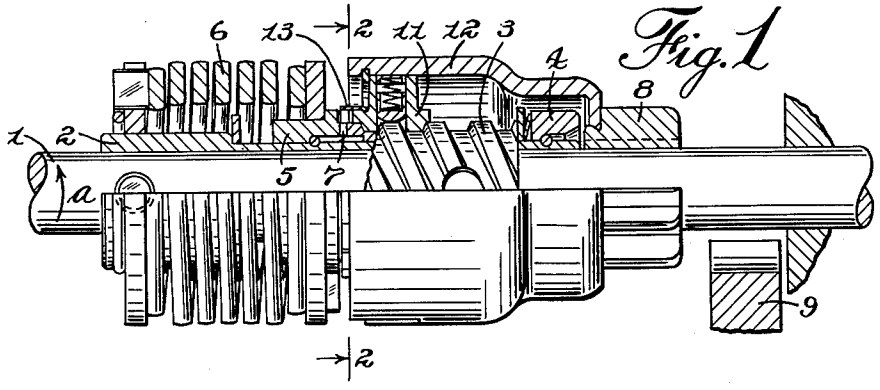


Fig. 1

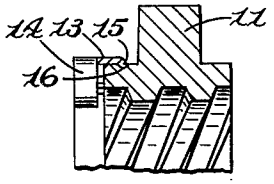


Fig. 3

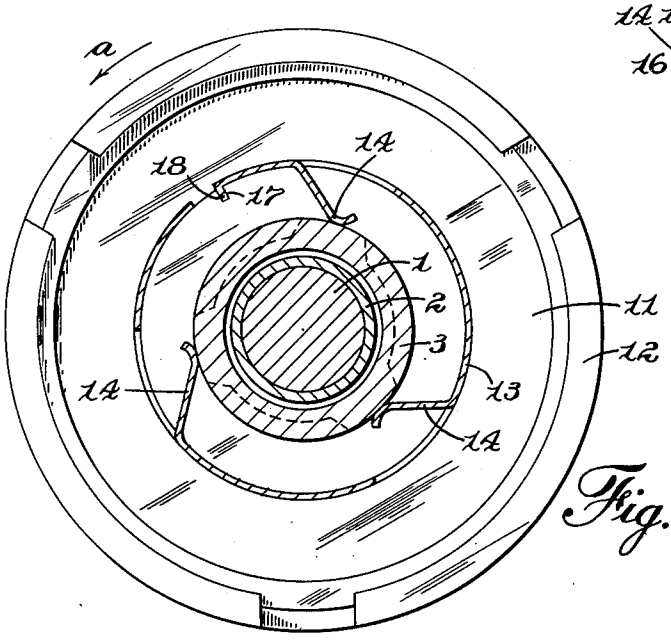


Fig. 2

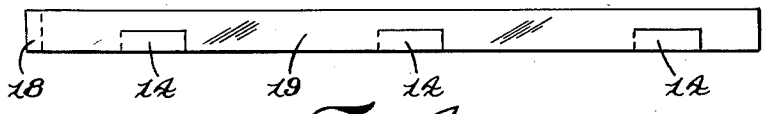


Fig. 4

WITNESS:

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ENGINE STARTER GEARING

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4 Claims. (Cl. 74—7)

The present invention relates to engine starter gearing and more particularly to that type in which engagement is brought about by automatic traversal of a control nut on a rotating screw shaft.

In drives of this type, one of the problems which is always present is the prevention of pinion drift due to engine vibration. When the engine is running there is always a certain amount of vibration due to the oscillation and reciprocation of its parts, and since the starting motor is usually mounted on the engine frame, it necessarily is subject to the same vibration.

It often happens that at certain engine speeds this vibration causes the starter drive pinion to move away from its idle position on the screw shaft and come into engagement with the ring gear of the engine, and if such engagement occurs frequently, attrition of the ends of the pinion and gear teeth may occur.

The exact method by which this undesired traversal or drift is brought about is somewhat obscure, but the forces involved are in some instances very substantial.

Most cases of pinion drift have been cured by the use of detents, compression springs and counterweights on the pinion, or by combinations of such devices, but in some installations it has been found to be quite difficult to prevent the pinion from drifting at certain critical engine speeds.

It is an object of the present invention to provide an engine starter drive involving a novel approach to the problem of pinion drift.

It is another object to provide such a device in which vibration of the parts is caused to exert a force tending to move the pinion on the screw shaft in the direction away from the engine gear.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a side elevation partly broken away and in section of a starter drive incorporating a preferred embodiment of the invention;

Fig. 2 is a section on an enlarged scale taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail of a portion of the control nut showing the anti-drift spring thimble mounted thereon; and

Fig. 4 is an elevation of the stock from which the anti-drift thimble is formed.

In Fig. 1 of the drawing there is illustrated a starter drive of the type disclosed in the patent to Buxton 2,609,695 issued September 9, 1952. As there shown a power shaft **1** has a hollow sleeve **2** fixedly mounted thereon, and a screw shaft **3** is slidably journalled on the sleeve **2** between a stop collar **4** and a clutch member **5** which is driven from the sleeve **2** by means of a spring connection **6**, and which has an overrunning clutch connection **7** with the screw shaft.

A pinion **8** is slidably journalled on the power shaft **1** for movement into and out of mesh with an engine gear **9**, and a control nut **11** threaded on the screw shaft **3** is connected to the pinion **8** by means of a barrel member **12**.

According to the present invention a thimble **13** is rigidly mounted on the control nut and has a plurality of elastic arms **14** which are bent inwardly and bear frictionally at their ends on the surface of the screw shaft **3**. The inclination of the arms is opposite to the direction of rotation of the power shaft as indicated by the arrow (*a*) whereby relative lateral movement or vibration of the control nut on the screw shaft sets up an action analogous to a pawl and ratchet, which tends to rotate the control nut on the screw shaft in the direction of drive, that is the direction of rotation of the power shaft **1**.

The thimble **13** is retained on the control nut by means of a rim **15** which is pressed into a groove **16** in the control nut as shown in Fig. 3. The angular position of the thimble on the control nut is determined by means of a notch **17** in the control nut which receives the inturned end **18** of the sheet metal strip from which the thimble is formed. By this means the ends of the arms **14** are uniformly positioned with respect to the threads of the screw shaft and nut. Fig. 4 shows the strip of sheet metal **19** from which the thimble **13** is formed. In the formation of the thimble the arms **14** are punched inwardly and formed as illustrated in Fig. 2, the end **18** is bent inwardly at right angles, and the strip is rolled up so as to elastically clasp the control nut **11** and hold the rim **15** and end **18** properly seated in the nut.

In operation, when the power shaft **1** is rotated in the direction of the arrow, the consequent rotation of the screw shaft traverses the control nut and consequently moves the pinion **8** into mesh with the engine gear **9**. During this time the arms **14** tend to cause rotation of the control nut with the screw shaft but do not have sufficient frictional drive effect to interfere with the meshing operation.

When the engine starts, the pinion is returned to its idle position as determined by the control nut engaging the ends of the threads on the screw shaft. Thereafter, the spring arms **14** convert any relative vibration between the screw shaft and pinion into a force tending to rotate the control nut on the screw shaft in the direction of rotation of the power shaft, and consequently to hold the control nut in its idle position.

Although but one form of the invention has been shown and described in detail it will be understood that changes may be made in the design and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. In an engine starter drive a power shaft, a pinion movable thereon into and out of mesh with a gear on the engine to be started, a screw shaft, means for rotating the screw shaft from the power shaft, a control nut on the screw shaft, means connecting the control nut to the pinion, and means responsive to relative vibration of the screw shaft and control nut for rotating the control nut relative to the screw shaft in the direction to demesh the pinion.

2. An engine starter drive as set forth in claim 1 in which the means for rotating the control nut constitutes a frictional driving connection.

3. An engine starter drive as set forth in claim 2 in which the frictional driving connection between the screw shaft and control nut comprises a member fixedly mounted on one of said elements, having a spring arm bearing on the other element, said arm being inclined in such a direction that relative lateral movement of the elements causes the desired relative rotation.

4. An engine starter drive as set forth in claim 2 in which said frictional driving connection comprises a thimble fixed on the control nut having an elastic arm which is bent inwardly at an inclination opposite to the direction of rotation of the drive and bears frictionally on the surface of the screw shaft.

No references cited.