

March 8, 1932.

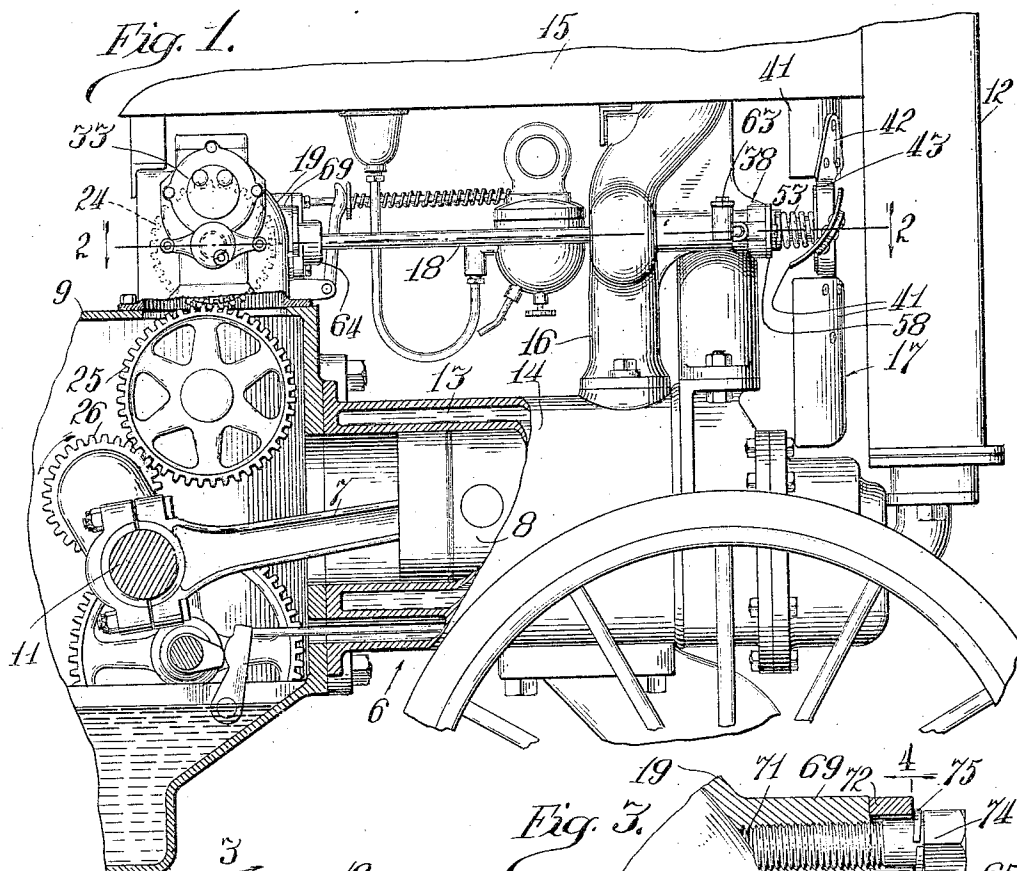
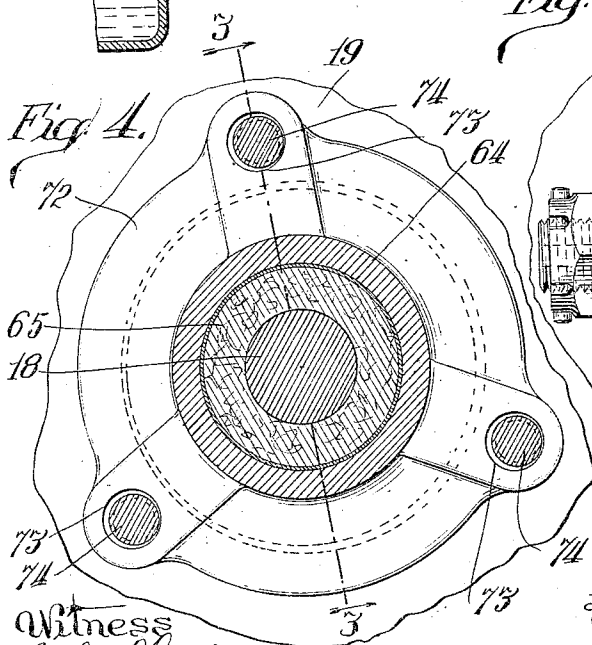
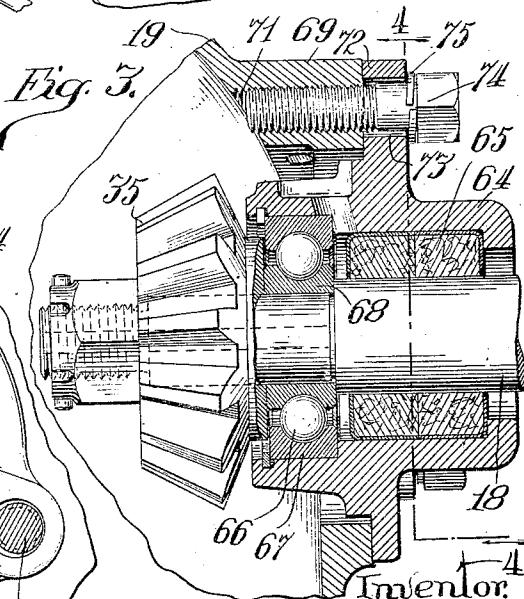
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FAN DRIVING MECHANISM

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2 Sheets-Sheet 1



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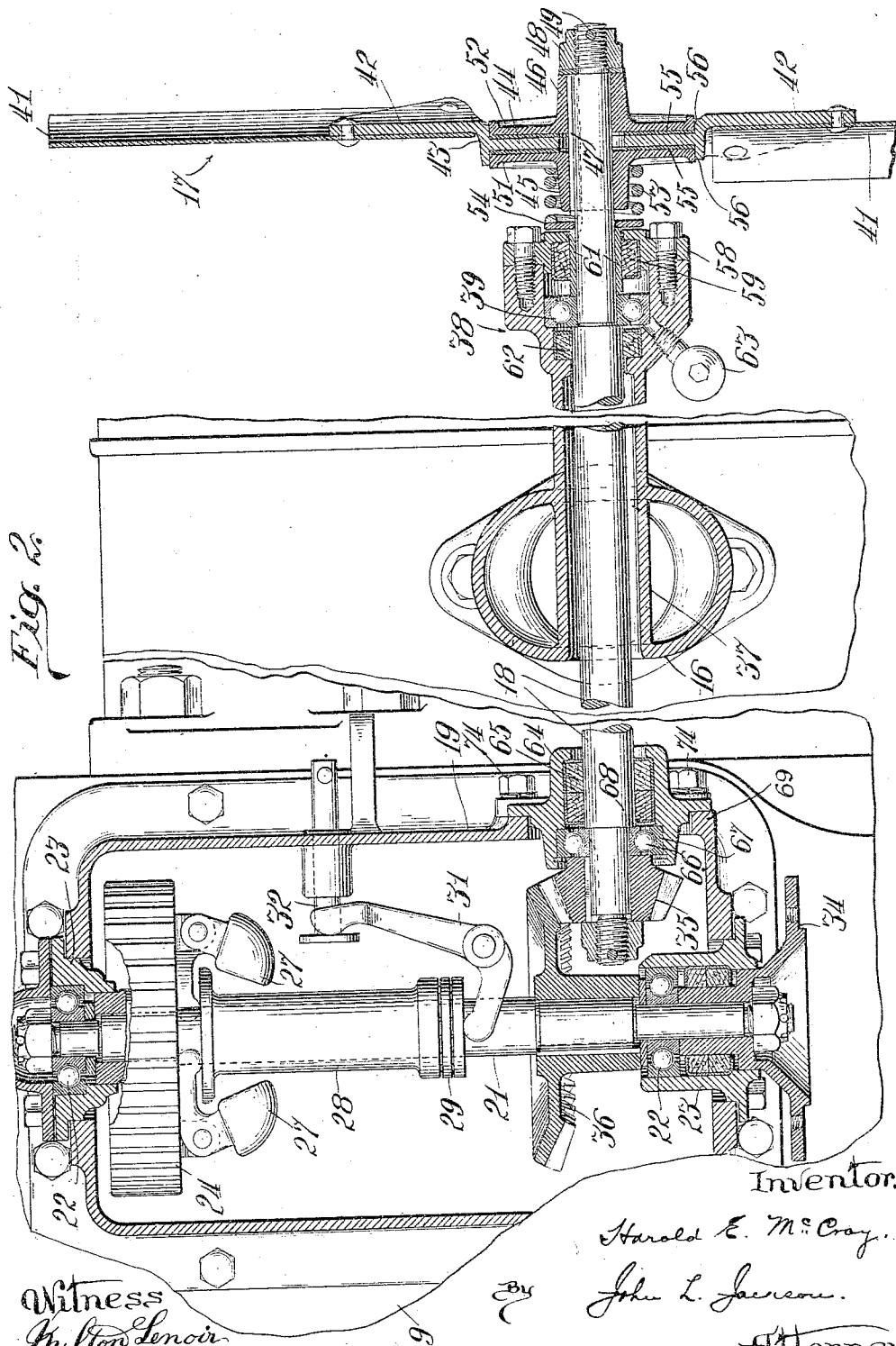
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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FAN DRIVING MECHANISM

Application filed June 8, 1927. Serial No. 197,312.

The present invention relates to driving mechanisms for the fans of internal combustion engine cooling systems having particular reference, in certain details, to a fan driving mechanism for farm tractors of the general design illustrated in the copending application of Louis W. Witry, Serial No. 682,401, filed December 24, 1923.

The objects of the invention are to provide an improved construction of fan driving mechanism characterized by a friction slip-page action for absorbing inertia shock between the fan and its driving shaft—this being particularly desirable where the fan shaft has a positive gear drive from the motor, as in the present construction; and to provide an improved construction of adjustable bearing for the fan shaft so as to enable the latter to be adjusted radially in the assembly of the driving mechanism for obtaining proper mesh of the gears which drive the fan shaft.

Referring to the accompanying drawings illustrating the preferred embodiment of my invention:

Figure 1 is a fragmentary side view, partly in section and partly in elevation, of the front end of a farm tractor in which the invention is embodied.

Fig. 2 is a fragmentary sectional view taken longitudinally of the fan shaft on the plane of the line 2—2 of Figure 1.

Fig. 3 is a fragmentary sectional view taken on the plane of the line 3—3 of Fig. 4, illustrating the adjustable bearing support for the rear end of the fan shaft, and

Fig. 4 is a transverse sectional view of this adjustable bearing, taken on the plane of the line 4—4 of Fig. 3.

Referring to Figure 1, illustrating the front portion of a tractor of the type to which my invention has particular application, it will be seen that the internal combustion motor 6 is of the horizontal type, having the connecting rods 7 from its pistons 8 extending rearwardly into a crank case 9 for connection with a transversely extending crank shaft 11. Supported on the front of the tractor is the usual cooling radiator 12, having connection with the cooling

jackets 13 of the cylinder block 14. Extending rearwardly from the upper portion of the radiator is a fuel tank 15, the interior of which is partitioned into separate compartments for holding gasoline and kerosene. Bolted to the upper side of the cylinder block 14 is a hollow standard 16 which serves to support the front end of the fuel tank 15, and which also serves as a duct for conveying the heated water from the cylinder jackets 13 up to the upper portion of the radiator 12.

The cooling fan 17 is disposed directly in rear of the radiator 12 for drawing air there-through, and is mounted on a fan shaft 18 supported above the cylinder block 14 and extending rearwardly into a housing 19 which is secured to the top of the crank case 9. Referring to Fig. 2, this casing 19 encloses a magneto and governor drive shaft 21 which has bearing support in ball bearings 22 carried in ball race housings 23 secured in the end walls of the casing. The bottom of said casing is open and communicates with an opening in the top of the crank case 9. Mounted on the shaft 21 is a spur gear 24 which projects down through this opening and meshes with an idler gear 25 suitably journaled in the crank case. Such idler gear is driven from a gear 26 on the crank shaft 11, whereby power is transmitted from the crank shaft to the shaft 21.

As before remarked, the shaft 21 serves to drive the governor mechanism and the magneto of the motor, but inasmuch as these devices constitute no part of the present invention I shall only refer in brief to their operating connection to this shaft. The governor mechanism comprises a plurality of counterweighted bell cranks 27 pivotally mounted on the side of the gear 24 and arranged to impart thrusting movement to a sleeve 28 which is slidably mounted on the shaft 21. The endwise movement of such sleeve is transmitted through a thrust bearing 29 to a bell crank lever 31, which operates through a shaft 32 and through other connections not shown to regulate the position of a throttle in the intake manifold of the motor. The magneto 33 is connected to a coupling 100

member 34 which is keyed to one end of the shaft 21.

The fan shaft 18 is positively driven from the governor and magneto drive shaft 21 through a bevel pinion 35, keyed to the fan shaft, which meshes with a bevel gear 36 keyed to the shaft 21. The gear end of the fan shaft 18 has bearing support in the front wall of the casing 19, in a construction of adjustable bearing which I shall hereinafter describe. The fan shaft extends forwardly through the center of the hollow standard 16, the latter being provided with a sleeve 37 that extends fore and aft therethrough and for a short distance forwardly therefrom, said sleeve being preferably formed integral with the standard to prevent the leakage of water from the duct within the standard. At its forward end this sleeve is formed with a bearing housing 38 in which is mounted a ball bearing 39 supporting the front end of the fan shaft.

The fan 17 is mounted on said shaft directly beyond the bearing housing 38, and comprises the usual fan blades 41 which are riveted to arms 42 radiating from a central hub portion 43. The hub comprises a radially extending web portion 44 which has frictional engagement between two driving collars 45 and 46 mounted on the fan shaft 18. The hub portions of these collars are non-rotatably secured to the fan shaft by a driving key 47. A nut 48 screws over the reduced threaded end 49 of the drive shaft and serves as a stop for limiting forward movement of the collar 46.

Extending outwardly from the inner ends of these collars are radially extending plate portions 51 and 52 respectively, which engage against opposite sides of the fan hub portion 44. The inner collar 45 is slidable longitudinally along the key 47, and a compression spring 53 is confined between the rear side of its plate portion 51 and a rearwardly spaced stop collar 54. The pressure of such spring forces the opposing surfaces of the plate portions 51—52 and of the hub portion 44 in firm frictional driving engagement. Interposed between these contacting faces are disks 55 of suitable frictional material for increasing the frictional engagement between said surfaces. If desired, these disks may be riveted to the plate portions 51—52, or to the intermediate hub portion 44, but I consider it more desirable to leave these disks free to rotate relative to each of the aforesaid members so as to increase the number of slippage surfaces.

Extending laterally from the outer part of the intermediate web portion 44 are flanges 56—56, the inner sides of which are formed to have a bearing fit on the peripheries of the plate portions 51—52. These flanges thus constitute radial bearing surfaces for the fan hub, the central part of the intermediate web

portion 44 having no contact with the shaft 18.

It will be evident that the foregoing construction provides a friction slippage connection between the fan and its driving shaft, characterized by an extensive area of frictional slippage surfaces. The purpose of this slippage connection is to safeguard the fan and its driving mechanism against inertia shocks which occur when the engine starts and when its speed is accelerated quickly, such inertia shocks being injurious in the case of a positively driven fan shaft—such as has been described—unless provision be made for absorbing these shocks. The spring 53 maintains a definite frictional pressure between the friction portions 51—52 of the collars and the web portion 44 of the fan hub which will permit slippage between the shaft and the fan upon starting and sudden acceleration, but which will hold the fan at the same rotating speed as the shaft when the fan has been brought up to speed. By employing two collars keyed to the shaft, with the frictional portion of the fan hub interposed between such collars, in the manner shown, I have doubled the effective area of frictional surface, and have thus increased the wear resisting qualities of the slippage connection. Moreover, the fan in its operation of drawing air through the radiator has a forwardly acting end thrust set up therein, and this force is also utilized to increase the friction of the slippage connection, such following from the fact that this end thrust will tend to force the web portion 44 of the fan forwardly against the collar plate 52 with a pressure proportional to the speed of rotation of the fan.

The housing 38 which contains the ball bearing 39 is closed at its front end by a removable cap 58 in which is mounted a lubricant retaining packing 59. The latter bears on a sleeve 61 which extends between the thrust collar 54 and the inner race of the ball bearing 39, whereby the thrust of the spring 54 is carried by such bearing. A separate lubricant retaining packing 62 may be recessed in the inner portion of the housing in rear of the bearing 39. Any suitable oil cup or nipple 63 may be provided for supplying lubricant to the bearing.

Because of unavoidable variations in the castings, in the machining thereof and in the assembly of the parts, it frequently happens that the rear end of the fan shaft 18 is not properly alined for the most efficient meshing of the bevel pinion 35 with the bevel gear 36. To compensate for these manufacturing discrepancies I have provided a shiftable bearing member for the rear end of the fan shaft, by which this end of the shaft and the bevel pinion 35 can be shifted to any desired position for obtaining proper mesh between the two bevel gears. As best shown in

Figs. 3 and 4, such bearing member comprises a housing portion 64 in which is confined a lubricant packing 65 and a ball bearing 66. The outer race 67 of said bearing is seated in the bearing member 64 and the inner race 68 thereof is mounted on the shaft 18. The bearing member is adapted to be secured to the front face of a boss 69 which projects from the front wall of the casing 19, this boss being provided with a plurality of threaded holes 71, preferably three in number. The bearing member comprises a ribbed flange 72 adapted to abut against the face of this supporting member or boss 69. Formed in the flanged portion 72 are three holes 73 for receiving cap screws 74 adapted to screw into the tapped holes 71. The holes 73 are substantially larger than the shank portions of the cap screws 74, as shown, in order that the bearing member can be shifted radially in any desired direction for moving the bevel pinion 35 up or down or towards or away from the bevel gear 36. After the bevel pinion has been located for its proper mesh with the bevel gear 36, the bearing member 64 is secured in fixed position by tightening the cap screws 74. Suitable lock washers 75 may be provided under the heads of these cap screws. The interior of the sleeve 37 is slightly larger than the shaft so that the sleeve offers no interference to this adjustment. The ball bearings 39 and 66 at the opposite ends of the fan shaft are inherently self-aligning to a limited degree, which enables these bearings to accommodate easily the very slight adjustments in shaft alignment necessary to secure proper mesh of the bevel gears.

What I claim as my invention and desire to secure by Letters Patent, is—

1. A driving mechanism for a radiator cooling fan, said mechanism comprising a shaft for driving the fan, a pair of collars keyed to said shaft for rotation therewith, each of said collars comprising a radially extending plate portion, the rear collar being slidable longitudinally of the shaft and the front collar being fixed from longitudinal movement, a hub for said fan comprising a portion having frictional engagement between said collars, spring means for holding the plate portions of said collars and the frictional portion of said hub in frictional driving engagement, and means providing a bearing surface on said hub and having bearing engagement with the periphery of one of said plate portions.

2. A driving mechanism for a radiator cooling fan, said mechanism comprising a fan shaft having positive driving connection with a motor, a pair of collars keyed to said shaft to rotate therewith, the rear collar being slidable longitudinally of said shaft and the front collar being fixed from longitudinal movement, each of said collars comprising a

radially extending plate portion, a hub for said fan, comprising a radially extending web portion interposed between the plate portions of said collars, a spring urging against the slidable collar for establishing frictional driving engagement between the opposing faces of said plate portions and said web portion, and laterally extending flanges on said hub having radial bearing engagement on the periphery of said radially extending plate portions.

3. A driving mechanism for a radiator cooling fan, said mechanism comprising a fan shaft having positive driving connection with a motor, a pair of collars keyed to said shaft to rotate therewith, each of said collars comprising a radially extending plate portion, the front collar being fixed to the shaft and the rear collar being slidable along said shaft, a hub for said fan comprising a radially extending web portion interposed between the plate portion of said collars, loose friction discs interposed between said web portion and the plate portions of said collars, opening through the central portion of said friction discs, a spring urging against the slidable collar for establishing frictional driving engagement between said shaft and said fan, and laterally extending flanges on said hub having radial bearing engagement on the periphery of said radially extending plate portions, for retaining said friction discs in position.

4. A driving mechanism for a radiator cooling fan, said mechanism comprising a fan shaft having positive driving connection with a motor, a pair of collars on said shaft, a key splined in said shaft and passing through both of said collars for securing them for rotation therewith, the front collar being fixed from longitudinal movement relative to the shaft, and the rear collar being movable along the shaft, each of said collars comprising a radially extending plate portion, a hub for said fan, comprising a radially extending web portion interposed between the plate portions of said collars, loose friction discs interposed between said web portion and said plate portions, openings through the center of said friction discs, a spring urging against the slidable collar for establishing frictional driving engagement between the opposing faces of said plate portions and said web portions through the medium of said friction discs, and laterally extending flanges on said hub having radial bearing engagement on the peripheries of said radially extending plate portions for maintaining said friction discs in position.

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