Feb. 15, 1949. C. E. STREED 2,461,784

ENGINE STARTING DEVICE

Filed April 18, 1945

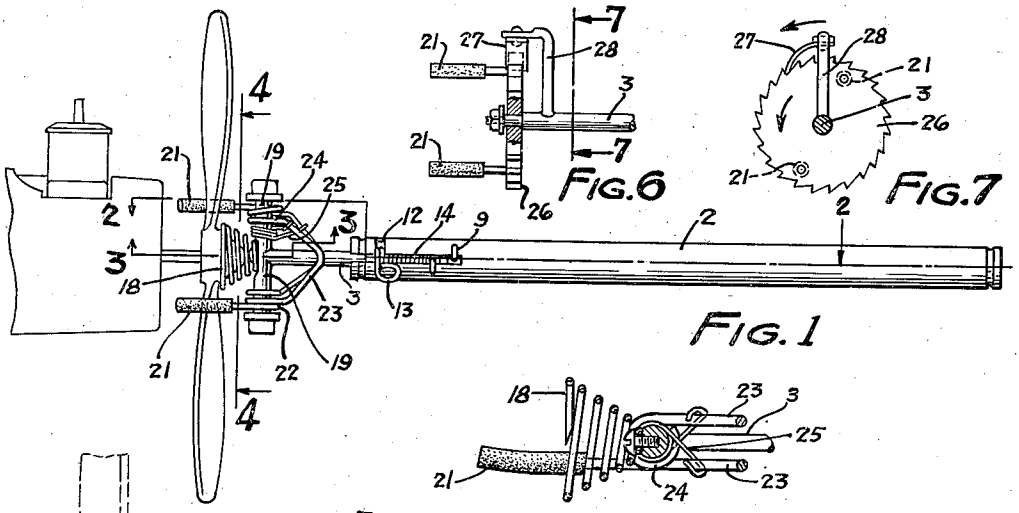


FIG. 1

FIG. 6

FIG. 7

FIG. 3

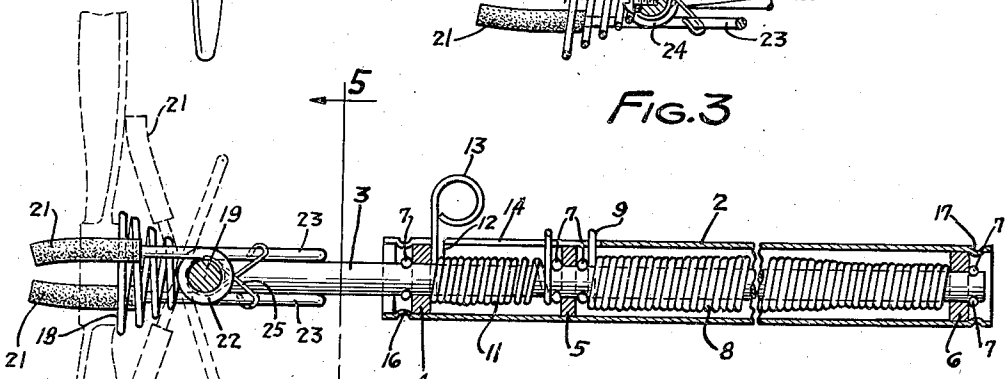
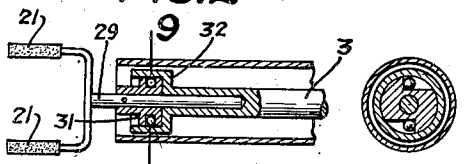


FIG. 2



9 FIG. 8

FIG. 9

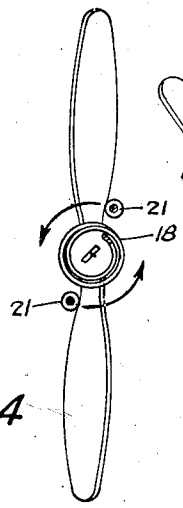


FIG. 4

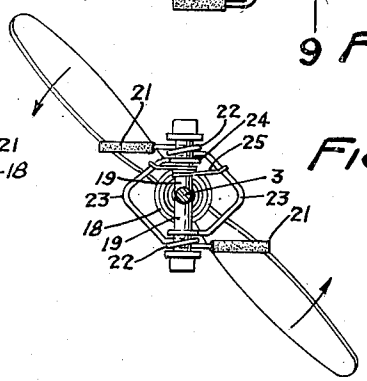


FIG. 5

INVENTOR.
CLIFFORD E. STREED
BY Paul, Paul & Moore
ATTORNEYS

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ENGINE STARTING DEVICE

Clifford E. Streed, Minneapolis, Minn.

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10 Claims. (Cl. 185—37)

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This invention relates to new and useful improvements in engine starting devices and more particularly to such devices for starting the internal combustion engines of miniature airplanes and the like, whereby such engines may be quickly and conveniently started with a minimum of effort and without danger of damaging the propeller.

An important object of the present invention is to provide an engine starting device of the class described, comprising a drive member having means for aligning it with the propeller and provided with an element adapted to engage and rotate the propeller when the device is set into motion.

A further object of the invention is to provide an engine starting device for airplane engines comprising a drive shaft having means at one end for axially aligning it with the propeller and carrying an element which is offset from said shaft and arranged to engage and momentarily drive the propeller at high speed, when the shaft is started, thereby to start the engine.

A further object is to provide a device of the class described comprising a drive shaft having means for quickly axially centering it with the propeller shaft and provided with a pivotally mounted propeller-engaging element normally positioned in the path of the propeller blades, when the device is engaged with the propeller, whereby when the drive shaft is started, said element will engage and rotate the propeller, said element being adapted to be moved out of the path of the propeller blades when the engine is started whereby the propeller can not be damaged by the starting device, when the engine initially "kicks off."

A further object is to provide an engine starting device comprising a shaft having its major portion supported with a tubular member adapted to serve as a handle, and said tubular member having a suitable spring mounted therein for driving the propeller when the spring is released, after winding, and a pair of shaft engaging elements being pivotally mounted on the shaft in spaced relation and having a relatively light spring normally retaining them in driving relation to the propeller blades, and manually operable means being mounted on the handle for releasing the drive spring whereby the shaft is momentarily quickly rotated thereby to impart rotary motion to the propeller to start the engine, the tension in said relatively light spring and the mounting of said elements being such that said drive elements may be quickly moved

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out of the path of the propeller blades by said blades when the propeller is set into motion by the starting of the engine.

A further object is to provide such a device which is extremely simple and inexpensive in construction and which may be operated by an inexperienced person to quickly start a small airplane engine, when applied to the propeller or shaft thereof, without danger of damaging the propeller blades or the device, when the engine suddenly starts.

Other objects of the invention reside in the simplicity of the device, and the ease with which it may be attached to the propeller or engine shaft and quickly operated to start the engine; in the provision of such a device embodying a "free wheeling" action, whereby it can not damage the propeller blades when the engine suddenly starts; in the compactness and lightness of the device whereby it may conveniently be carried in a pocket when not in use; and in the provision of such a device which is substantially indestructible and positive in action and provides an extremely practical device for quickly starting substantially all types of small internal combustion engines to which the device may be applied.

Other objects of the invention will appear from the following description and the accompanying drawing and will be pointed out in the annexed claims.

In the accompanying drawing there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a view showing the preferred construction of my novel engine starter;

Figure 2 is a sectional view substantially on the line 2—2 of Figure 1;

Figure 3 is a detail sectional view on the line 3—3 of Figure 1 with the propeller omitted;

Figure 4 is a detail sectional view on the line 4—4 of Figure 1, showing the drive elements in driving engagement with the propeller blades;

Figure 5 is a similar view on the line 5—5 of Figure 2 showing how the drive elements are moved out of the path of the propeller blades when the engine suddenly starts;

Figure 6 is a view showing a modified driving connection between the drive shaft and propeller drive elements;

Figure 7 is a detail sectional view on the line 7—7 of Figure 6;

Figure 8 is a detail sectional view showing another form of driving connection between the drive shaft and propeller drive elements; and

Figure 9 is a cross sectional view on the line 9—9 of Figure 8.

The novel engine starting device herein disclosed is shown comprising a tubular supporting member 2 which constitutes the handle for the device and will hereinafter be referred to as such. A drive shaft 3 is rotatably mounted within the handle portion 2 by suitable bearings or collars 4, 5 and 6, which, for convenience in assembling, may be supported directly on the shaft and retained in position thereon by abutment elements 7 shown formed by upsetting portions of the shaft, shown in Figure 2. The intermediate bearing collar 5 may be similarly supported in position on the shaft by similar abutment elements 7.

A drive spring 8 is coiled about the drive shaft as best shown in Figure 2, and has one end anchored to the tubular handle portion 2 as indicated at 9. The opposite end of the spring is drivingly engaged with the shaft 3 by reducing its diameter as shown, thereby to provide a friction driving connection between that end of the spring and the shaft. By mounting the drive spring 8, as shown in Figure 2, said spring may be wound up to store energy therein by grasping the handle 2 in one hand and with the other rotating the shaft in one direction, as will be understood.

Means is provided for locking the shaft against rotation when the spring 8 has been wound up. Such means is shown comprising a spring 11 coiled about the shaft between the collars 4 and 5 and having one end anchored to the wall of the handle 2. The opposite end of the spring 11 projects laterally through a slot 12 in the wall of the handle and is provided with a finger grip 13. The spring 11 is so wound about the shaft that it normally frictionally grips the shaft and locks it against rotation by the action of the drive spring 8, when the drive spring is wound up. To release the shaft from the lock spring 11, the operator simply exerts a pressure on the finger grip 13 in a direction to unwind said spring, whereby it releases its grip on the drive shaft. Such release of the shaft from the spring 11 permits the drive spring 8 to momentarily drive the shaft 3 at high speed in a direction to start the engine, as indicated in Fig. 4.

To facilitate assembling the shaft and the tubular handle member 2, the wall of the tubular member may be longitudinally slotted as shown at 14 in Figures 1 and 2, whereby the shaft with the springs 8 and 11, and the bearing collars 4, 5 and 6 mounted thereon, may be slid into the handle member 2 from the split end thereof. The wall of the handle member may then be inwardly beaded or rolled as shown at 16, thereby to retain the shaft and springs in position therein. It is to be understood that the opposite end of the handle 2 may be similarly inwardly beaded or rolled as shown at 17, whereby the bearing collars 4 and 6 will engage the inwardly rolled portions 16 and 17 and thereby prevent relative axial movement of the shaft within the handle.

Another important feature of the invention resides in the means provided at the forward end of the shaft 3 for axially aligning the shaft with the propeller, best shown in Figure 1, a cup shaped member 18 in the form of a coiled spring is secured to the shaft and is designed to fit over the hub or center portion of the propeller. By constructing the socket member 18 in the form of a coiled spring it may lightly engage the propeller when the device is held in operative engagement therewith, and its yieldability also permits it to readily adapt itself to variations in the shapes of hubs of various forms and sizes of propellers.

Another important feature of the invention resides in the unique construction and mounting of the driving means provided on the drive shaft 3 for engaging and rotating a propeller when the drive shaft is released. As clearly illustrated in the drawing, to thus drivingly connect the drive shaft 3 to the propeller, the drive shaft is shown provided at its forward end with opposed studs or arms 19 each having a normally forwardly extending drive element 21 pivotally mounted thereon. The elements 21 are mounted for independent pivotal movement, and to provide adequate bearing supports therefore, each is shown comprising a piece of wire provided with a loop 22 adjacent to its respective drive element 21, and having a U-shaped body portion 23 formed at its opposite end with an eye or loop 24 receiving the other stud 19. A small torsion spring 25 is shown coiled about one of the studs 19 and has its opposed ends engaged with the U-shaped body members 23 of the drive elements 21, whereby said spring constantly tends to retain the drive elements in their driving positions, shown in Figure 1.

In the operation of the device, the socket member 18 provided at one end of the drive shaft 3 is engaged with the hub of the propeller or engine shaft, whereby the drive elements 21 are normally positioned to engage the trailing edges of the propeller blades, as indicated in Figure 4. Before engaging the starting device with the propeller, it is to be understood that the spring 8 has been wound up by relatively rotating the drive shaft 3 with respect to the tubular supporting member 2. When the starting device has been applied to the propeller, as shown in Figure 1, the operator simply applies a slight pressure against the finger grip 13 of the lock spring 11, whereupon the drive shaft 3 is suddenly released. Such sudden release of the drive shaft will cause the drive fingers 21 to engage and momentarily drive the propeller at high speed whereupon the engine is started. As soon as the engine is started and the propeller over-runs the drive elements 21, should the operator fail to remove the starting device from the propeller no harm is done as the advancing propeller blades will engage the other sides of the drive elements 21 and swing them out of the path thereof. The tension in the spring 25, as hereinbefore stated, is very light, whereby engagement of the propeller blades with the opposite sides of the drive elements or fingers 21, as shown in Figure 5, will have little or no retarding action upon the propeller when the latter is started by the sudden starting of the engine.

The device is extremely simple and inexpensive in construction and is very light and compact whereby it may be conveniently carried in a pocket, if so desired. It provides a positive starting device for miniature engines because of the high speed momentarily imparted to the propeller and engine when the drive spring is released.

It will also be noted that because of the drive spring 8 having a driving connection with the shaft 3 through friction, there is no danger of over-loading the drive spring as a result of excessive unwinding. When the spring has been unwound to a predetermined degree, the reduced end thereof which frictionally engages the drive

shaft will relatively "open" or increase in diameter, thereby causing the shaft to slip or "free wheel" thereby preventing damage to the parts and providing an additional safety feature.

In Figures 6 and 7 there is shown a modified form of driving connection between the drive shaft 3 and propeller drive fingers or arms 21. As here shown the drive elements 21 are carried by a ratchet wheel 26 rotatably mounted on one end of the shaft 3 and driven therefrom through a small spring actuated dog 27 carried by an arm 28 secured to the shaft. By this arrangement when the drive shaft 3 is released to impart rotation to the propeller through the drive fingers 21, the drive fingers may be driven by the propeller blades independently of the shaft 3 in the direction indicated by the arrow in Figure 7, as a result of the ratchet drive between the shaft and drive fingers.

In Figures 8 and 9 a similar form of driving connection is provided between the drive shaft 3 and drive finger 21. In this form, the drive fingers are carried by a short shaft 29 shown rotatably mounted in one end of the drive shaft 3 and carrying a clutch element 31 adapted to be driven by a complementary clutch element 32 secured to the shaft 3. There are numerous forms of conventional and well known roller or ball type clutches which may be utilized for this purpose. A well known form is indicated in Figure 9.

The present invention provides a device whereby a motor of the class described may be quickly started without engaging the propeller blades with the fingers. It has sufficient power to start most such engines at the first attempt, and thus eliminates the use of auxiliary or "booster" batteries, such as are frequently utilized for starting airplane engines of this general type.

As shown in the drawings, the drive fingers or elements 21 are preferably encased in rubber or some other suitable material whereby they can not damage the blades of the propeller when starting the engine, and when the propeller overruns the rotation of the drive fingers, and its blades engage the opposite sides thereof, as shown in Figure 5.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments herein except as defined by the appended claims.

I claim as my invention:

1. In a starter for miniature airplane engines, a drive shaft having means at one end for aligning it with an engine crank shaft and a propeller secured thereto, an element mounted for relative pivotal movement on the drive shaft about an axis disposed transversely thereto, means for preventing pivotal movement of said element in one direction whereby when the starter is operatively applied to the engine crank shaft or the hub of the propeller and the drive shaft is operated, said element will engage and rotate the propeller to start the engine, said element being swingable in the opposite direction to permit unrestricted rotary movement of the propeller when the engine starts.

2. In a starting device for miniature airplane engines, a drive shaft having means at one end for aligning it with an engine crank shaft and a propeller secured thereto, an element mounted for relative pivotal movement on the drive shaft about an axis disposed transversely thereto, stop means for preventing pivotal movement of said element in one direction, spring means normally holding said element against said stop means whereby when the starter is operatively applied to the engine crank shaft or the hub of the propeller, said element will be positioned to engage and rotate the propeller to start the engine, said element being swingable in the opposite direction to permit unrestricted rotary movement of the propeller when the engine starts.

3. In a starter for miniature airplane engines, a drive shaft having means at one end for aligning it with an engine crank shaft and a propeller secured thereto, spaced elements mounted for relative pivotal movement on the drive shaft about an axis disposed transversely thereto, stop means for preventing pivotal movement of said elements in one direction whereby when the starter is operatively applied to the engine crank shaft or the hub of the propeller and the drive shaft is operated, said elements will engage and rotate the propeller to start the engine, said elements being readily swingable in the opposite direction to permit unrestricted rotary movement of the propeller when the engine starts.

4. In a starter for miniature airplane engines, a drive shaft having means at one end for engaging the hub of a propeller to axially align the drive shaft with the propeller, spring-actuated elements carried by the drive shaft and adapted for pivotal movement thereon about an axis disposed crosswise of the drive shaft, said elements normally being positioned in the path of the propeller blades when the device is operatively engaged with the propeller hub, means for rotating the drive shaft whereby said elements will engage and rotate the propeller to start the engine, and the pivotal mounting of said elements permitting the propeller blades to move said elements out of their path when the engine starts and the speed of the propeller exceeds the speed of the drive shaft.

5. In a starter for miniature airplane engines, a supporting member, a spring-wound shaft in the supporting member, means for locking the shaft to the supporting member in energy-storing position, means at one end of the shaft for axially aligning it with the propeller, a pair of spring-actuated propeller drive elements carried by the drive shaft and disposed in diametrically opposed relation thereto, stop means for preventing pivotal movement of said elements in one direction whereby they may engage and impart rotary movement to the propeller when the drive shaft is released, and spring means normally retaining said elements against said stop means and permitting said elements to be swung out of driving engagement with the propeller blades by said blades, when the engine is started.

6. In a starter for miniature airplane engines, a drive shaft having means at one end for aligning it with the propeller, a tubular member rotatably supporting said shaft and providing a handle for the device, a spring within the tubular member having one end fixed thereto and its opposite end drivingly connected to the drive shaft whereby said shaft may be rotated to store up power in said spring, means for retaining the drive shaft in spring-wound position, spring-actuated elements carried by the shaft and adapted for pivotal movement about an axis disposed crosswise thereof, said elements normally being disposed in substantially parallel relation and projecting forwardly for positioning between the blades of the propeller, stop means for preventing pivotal movement of said elements in one

direction whereby when the starter is applied to a propeller hub and the drive shaft is released, said elements will engage the propeller blades and impart rotation to the propeller, said elements being readily swingable out of the path of the propeller blades by said blades, when the speed of the propeller exceeds the speed of the starter shaft.

7. In a starter for miniature airplane engines, a drive shaft having a cup shaped element at one end for engaging and aligning said shaft with an engine crank shaft and a propeller mounted thereon, a tubular member rotatably supporting said shaft and providing a handle for the device, a drive spring within the tubular member having one end fixed to the drive shaft and having its opposite end drivingly connected to the drive shaft whereby said shaft may be rotated to store up power in the spring, means for retaining the drive shaft in spring-wound position, a pair of spring-actuated elements carried by the drive shaft and mounted for pivotal movement thereon about an axis disposed crosswise of the drive shaft whereby said elements will be positioned between the propeller blades when the starter is applied to the propeller, and means whereby the shaft retaining means may be actuated to release the drive shaft, whereupon the shaft is momentarily rotated by said spring to thereby impart rotary movement to the propeller through said yieldably mounted elements, the pivotal movement of said elements permitting the propeller blades to move said elements out of their path when the engine starts and the speed of the propeller exceeds the speed of the starter drive shaft.

8. In a starter of the class described, a drive shaft provided at one end with a centering socket adapted to receive one end of an engine crank shaft or the hub of a propeller mounted thereon thereby to axially align the drive shaft with the propeller, a tubular member enclosing the major portion of the drive shaft and providing a handle for the starter, a drive spring mounted within the tubular member and having one end anchored thereto and its opposite end having a driving connection with the drive shaft, a spring-operated device for locking the drive shaft against relative rotation in the tubular member when the drive spring is wound up, laterally extending arms on said shaft, and a pair of propeller engaging elements mounted for pivotal movement on said arms and having springs normally retaining them in driving positions with respect to the propeller blades when the starter is operatively applied to the engine shaft or propeller, said elements being adapted for pivotal movement about the axes of said arms in a direction to permit the propeller blades to engage and move said elements out of their path, when the engine starts and the speed of the propeller exceeds the speed of the starter drive shaft.

9. In a starter of the class described, a drive shaft provided at one end with a yieldable centering socket adapted to receive the end of the engine crank shaft or the hub of a propeller

mounted thereon thereby to axially align the drive shaft with the propeller, a tubular member enclosing the major portion of the drive shaft and providing a handle for the starter, a drive spring mounted within said tubular member and having one end anchored thereto and its opposite end having a driving connection with the drive shaft, a spring-operated device for locking the drive shaft against relative rotation within said tubular member when the drive spring is in power-storing position, laterally extending arms on the drive shaft adjacent to the centering socket, and a pair of propeller-engaging elements mounted for pivotal movement on said opposed arms and having spring means normally retaining them in driving positions with respect to the propeller blades, when the starter is operatively applied to the propeller, the pivotal mounting of said elements permitting them to be moved out of the path of the propeller blades, by said blades, when the engine is suddenly started and the speed of the propeller exceeds the speed of the starter drive shaft.

10. In a starter of the class described, a tubular supporting member, a drive shaft rotatably mounted in said member, a spring having one end secured to the drive shaft and its opposite end secured to said tubular member whereby when the shaft is relatively rotated in one direction in said member, the spring is wound up to condition it for subsequently momentarily driving the shaft, means for locking the drive shaft against relative rotation in said tubular member, a manually operable control device for releasing said locking means, a centering device secured to the shaft for axially aligning the drive shaft with the propeller and engine crank shaft, drive elements carried by the drive shaft and adapted for pivotal movement about an axis disposed at right angles to the drive shaft whereby when the device is operatively applied to the hub of a propeller, preparatory to starting the engine, said elements will be positioned between the propeller blades whereby when the engine drive shaft is released, said elements will engage the propeller blades and rotate the propeller to start the engine, and means permitting the propeller blades to move said elements out of their path when the speed of the propeller exceeds the speed of the starter drive shaft.

CLIFFORD E. STREED.

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