This invention relates to and means for starting internal combustion engines and more particularly to the winding up of the spring starting means of internal combustion engines used on wheeled vehicles such as lawn mowers, lawn sweepers, garden cultivators and like.

In recent years most manufacturers of small internal combustion engines for use on equipment such as lawn mowers have discarded the direct rope pull starting means. Instead they equip the engine with a windable spring operatively connected to the engine, and which when released from a wound condition will spin the engine and thus start it. The winding up of the spring may be accomplished by the manual movement of a crank arm, lever pull cable or like. However, regardless of the manual means for winding the spring, much labor and time is expended to wind the spring to its maximum tension.

Therefore, one of the principal objects of our invention is to provide an easily operated means winding the starting spring of internal combustion engines.

A further object of this invention is to provide a device for the winding of the starting spring of internal combustion engines that may be actuated by and during the operation of the engine.

A still further object of this invention is to provide a means for winding the starting spring of wheel supported internal combustion engines that may be accomplished merely by the pushing of the vehicle over a supporting surface such as a lawn, walk or like.

A still further object of this invention is to provide a device for winding engine starting means that is safe to operate.

Still further objects of our invention are to provide a means for winding the starting spring of internal combustion engines that is economical in manufacture and durable in use.

These and other objects will be apparent to those skilled in the art.

Our invention consists in the construction arrangements, and combination, of the various parts of the device, where-by the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in our claims, and illustrated in the accompanying drawings, in which:

FIG. 1 is a side view of our device installed on a lawn mower;

FIG. 2 is an enlarged longitudinal sectional view of the "test" control cable;

FIG. 3 is a side view of the upper portion of a lawn mower using our spring winding means and with the same operatively connected for accomplishing the winding phase;

FIG. 4 is a top plan view of our devices installed on a power lawn mower and more fully illustrates its construction; and

FIG. 5 is a top plan view of the control lever means.

In these drawings we have used the numeral 10 to generally designate an ordinary lawn mower having the usual internal combustion engine 11. The lawn mower is supported by wheels 12 and is forwardly propelled over the ground surface by the internal combustion engine. The engine has the usual spring starter 13, which is operatively disengageably secured to the crankshaft of the internal combustion engine 11 thereby enabling the starter means to turn over and start the engine. The numeral 15 designates the spring winding shaft of the spring starter. The spring actuated starter is released for starting the engine by the usual arm 16. In most instances a lever 17 is pivoted near its center to the handle portion 19 of the moving machine, and this handle is connected to the arm 16 by a cable means 20. When the lever 17 is pulled to the rear as shown in FIG. 5, the wound spring is released from its catch condition and thereby starts the motor. When the lever 17 extends directly laterally outwardly or is swung to a forward position, the catch means of the spring starter will be in position to prevent the wind-up spring from unwinding. It is to such equipment that we install our mechanism and which we will now describe.

The numeral 21 designates a pulley wheel or like secured on the inner side of the right motor powered traction wheel 12. The numeral 22 designates a vertical support shield extending upwardly from the lower chassis frame of the lawn mower. The numeral 23 designates a horizontal shaft extending between the engine and the upper portion of the shield 22. The spring wind-up shaft 15 extends through the shield 22 as shown in FIG. 4. Rotatably mounted on the spring wind-up shaft 15 is a pulley wheel 24. This pulley wheel 24 is yieldingly secured to the shaft 15 by clutch means. The clutch means consists of a pin depression 25 in the hub of the pulley wheel 24, a pin 26 extending transversely through the shaft 15 and capable of entering and engaging the depression 25. The pin 26 is yieldingly held in the hub depression 25 by coil spring 27 engaging the outer end portion of the shaft 15, having one end engaging the pin 26 and its other end engaging the nut 29 threaded on the outer end of the shaft 15. By this arrangement of parts the pulley wheel 24 will be yieldingly connected to the shaft 15 but will be permitted to slip on the shaft 15 after the coil spring of the starter has been maximum wound. Any rotation of the pulley wheel 24 after the spring has been wound up will produce a warning clicking sound by the pin 26 passing over the depression 25 in the hub of the pulley wheel 24. The numeral 30 designates an idler pulley wheel rotatably mounted on the shield 22 and positioned to the rear of the pulley wheels 21 and 24 as shown in FIG. 1. The numeral 31 designates an endless belt loosely embracing the pulley wheels 21, 24 and 30.

The numeral 32 designates an arm having its forward end portion rotatably secured to the shaft 23. The extreme forward end of the arm 32 extends forwardly beyond the shaft 23 and is connected to one end of a coil spring 33 which has its other end connected to the chassis of the mower. The numeral 35 designates a pulley wheel rotatably mounted on the rear end portion of the arm 32 and which is capable of engaging the outer side of the endless belt 31 at a point between the pulley wheels 24 and pulley wheel 30. By this arrangement of parts, when the pulley wheel 35 is in an elevated position, by the action of the spring 33 the endless belt 31 will be loosely and ineffectively embracing the pulley wheels 21, 24 and 30. With the endless belt in such loose condition, the traction wheel 12 may rotate freely and without rotating the belt 31. However, if the rear end of the arm 32 is depressed by any means, it will tighten the belt 31 and if and when the lower wheel 12 is rotated, the shaft 15 will be rotated thus winding up the starter spring of the engine. Any suitable means may be used for effecting the lowering of the hinged arm 32.

In the drawings we take advantage of the fact that the handle portion 19 of the lawn mower is pivotally secured to the chassis of the mower as shown in FIG. 1. The numeral 36 designates a downwardly extending projection on the arm 32. The numeral 37 designates a downwardly and rearwardly extending arm having its forward...
end pivoted to the projection 36. In the rear end portion of the arm 37 is a longitudinal slot 39 which slantly embraces a pin 40 on the handle 19, above its pivot point as shown in FIG. 3. This slot 39 communicates with a rear vertical slot 41. The numeral 42 designates a ledge on the center top of the arm 37. Connected to the lever 17 is a control cable having the case housing 43 and the core rod 44. This control cable is secured to the lever 17 at 12 on the side of its top pivot point where the cable control means 20 is secured to the lever 17 as shown in FIG. 5. The core rod 44 of the cable (and which is the "set" cable control) extends loosely through the ledge 42 to the spring starter 13. Embracing this rod 44 and to the rear end of the ledge 42 is a cylinder 45 also embracing the forward end of the housing 43 as shown in FIG. 2. The numeral 46 designates a coil spring in the cylinder 45 having its forward end engaging the forward end of the cylinder 45 and its rear end engaging the forward end of the housing 43. By this arrangement of parts when the lever 17 is moved forwardly to the "set" position, the forward end of the flexible housing 43 will yieldingly engage the ledge 42 thereby yieldingly raising the rear end of the arm 37. With the handle 19 in a lowered position as shown by broken lines in FIG. 1, the pin 40 will engage the vertical slot 41. With the parts in contact with each other and with the forward end of the cable housing 43 yieldingly exerting pressure on the ledge 42, the handle 19 will be elevated and the rear end of the arm 32 will be lowered thereby bringing the pulley wheel 35 downwardly and thus tightening the endless belt 31.

With the endless belt so tightened, any rotation of the wheel will cause the shaft 15 to rotate. Therefore to wind up the spring starter, it is merely necessary to place the lever 17 in the "set" position and move the mower a few steps across the lawn, driveway or like. After the slip clutch indicates that the starter spring has been wound up, the lever 17 is placed in the neutral position as shown in FIG. 5. This relieves yielding pressure on the ledge 42, the arm 37 will swing downwardly and the handle member 19 can be moved up or down without affecting the arm 32 that carries the pulley wheel 35. When it is desired to start the engine, it is merely necessary to move the lever 17 to the "go" position. This releases the catch means of the starter and the wound up spring will effectively spin the internal combustion engine and start it.

In the drawings we show our device installed on an ordinary self-propelled lawn mower. This means that the traction wheel 13 will be at times rotated by the engine 11. Therefore, it is possible while the lawn mower is being used to place the lever 17 in the set position and permit indirectly the winding of the starter spring by power from the engine. The lawn mower will, therefore, have its spring starter already wound up the next time it is desired to use the mowing machine. Even, however, if the spring starter has not previously been wound up by engine power, it is a most easy matter to push the lawn mower a few steps to wind up the starter. This can be done by even a child. Perhaps even more important, however, is that when the engine is actually started, the operator is at a safe distance therefore, i.e., in the vicinity of the handle bars of the mowing machine.

Some changes may be made in the construction and arrangement of our means for starting internal combustion engines without departure from the real spirit and purpose of our invention, and it is our intention to cover by our claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

We claim:

1. In combination, a chassis, at least one wheel supporting said chassis, an internal combustion engine on said chassis having a wind-up spring starter; said starter having a wind-up shaft, a wheel secured to said first wheel, a wheel on said wind-up shaft of said starter, an endless member loosely embracing the wheel that is on said first wheel and the wheel on said wind-up shaft, and means for tightening said endless member on said two wheels whereby when said first wheel is rotating it will rotate said wind-up shaft.

2. In combination, a chassis, at least one wheel supporting said chassis, an internal combustion engine on said chassis having a wind-up spring starter; said starter having a wind-up shaft, a wheel secured to said first wheel, a wheel on said wind-up shaft of said starter, an endless member loosely embracing the wheel that is on said first wheel and the wheel on said wind-up shaft, and means for tightening said endless member on said two wheels whereby when said first wheel is rotating it will rotate said wind-up shaft; said endless member being in the form of an endless flexible belt.

3. In combination, a chassis, at least one wheel supporting said chassis, an internal combustion engine on said chassis having a wind-up spring starter; said starter having a wind-up shaft, a wheel secured to said first wheel, a wheel on said wind-up shaft of said starter, slip clutch means imposed between said wheel on said wind-up shaft and said wind-up shaft, an endless member loosely embracing the wheel that is on said first wheel and the wheel on said wind-up shaft, and means for tightening said endless member on said two wheels whereby when said first wheel is rotating it will rotate said wind-up shaft.

4. In combination, a chassis, at least one wheel supporting said chassis, an internal combustion engine on said chassis having a wind-up spring starter; said starter having a wind-up shaft, a wheel secured to said first wheel, a wheel on said wind-up shaft of said starter, an endless member loosely embracing the wheel that is on said first wheel and the wheel on said wind-up shaft, an arm operatively pivoted to said chassis, a wheel rotatably mounted on said arm capable of engaging and tightening said endless member on said two wheels, a hinged handle on said chassis, and a linkage connecting said handle to said arm.

5. In combination, a chassis, at least one wheel supporting said chassis, an internal combustion engine on said chassis having a wind-up spring starter; said starter having a wind-up shaft, a wheel secured to said first wheel, a wheel on said wind-up shaft of said starter, an endless member loosely embracing the wheel that is on said first wheel and the wheel on said wind-up shaft, an arm operatively pivoted to said chassis, a wheel rotatably mounted on said arm capable of engaging and tightening said endless member on said two wheels, a hinged handle on said chassis, and a disconnectable linkage connecting said handle to said arm.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>932,735</td>
<td>Willard</td>
<td>Aug. 31, 1909</td>
</tr>
<tr>
<td>1,031,134</td>
<td>Marksman</td>
<td>July 2, 1912</td>
</tr>
<tr>
<td>1,130,059</td>
<td>Brewer</td>
<td>Mar. 2, 1915</td>
</tr>
<tr>
<td>2,760,377</td>
<td>Critchfield</td>
<td>Aug. 28, 1956</td>
</tr>
</tbody>
</table>