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METHOD OF AND MEANS FOR STARTING INTERNAL COMBUSTION ENGINES

Filed Sept. 19, 1960 2 Sheets-Sheet 1

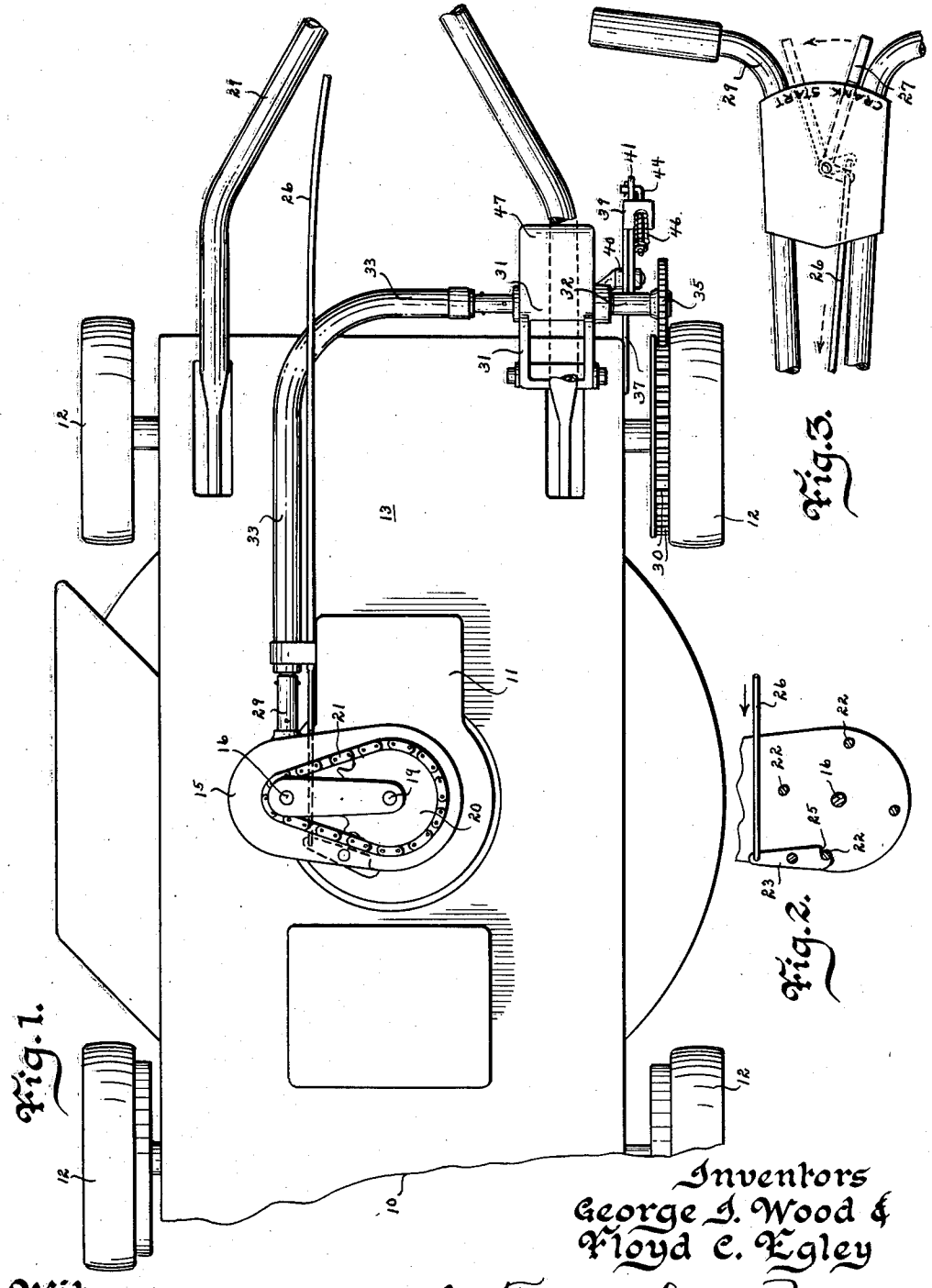


Fig. 1.

Fig. 2.

Fig. 3.

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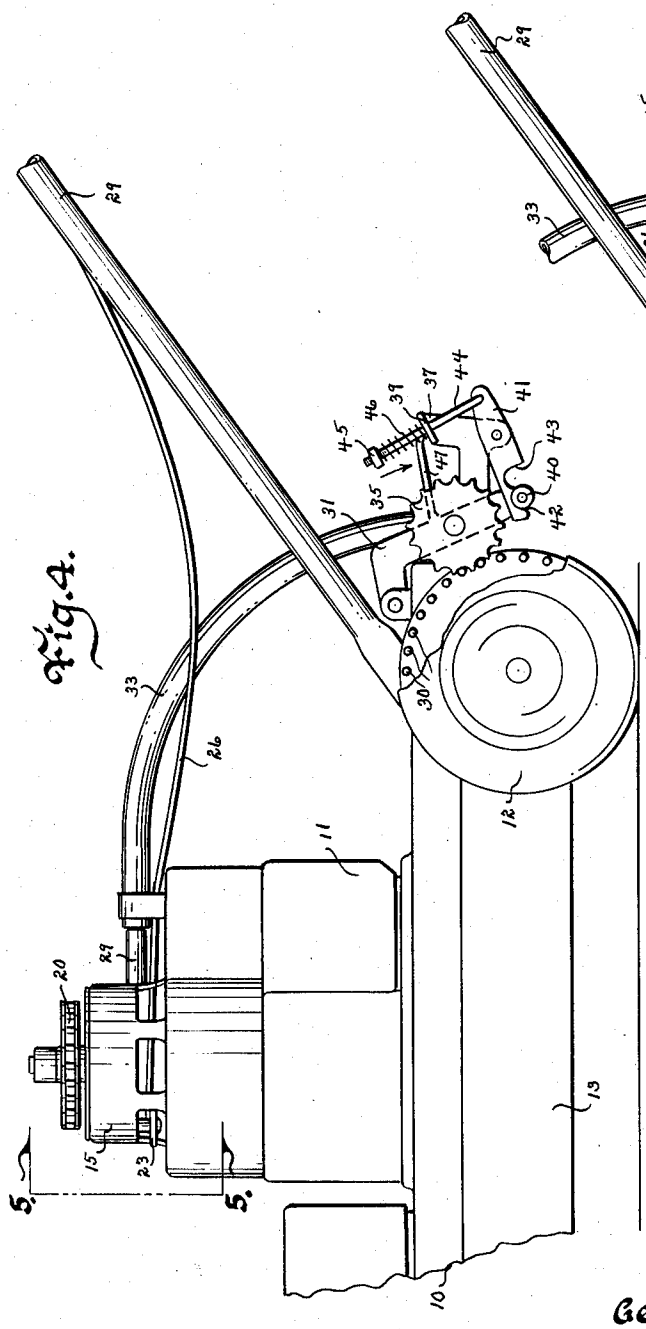


Fig. 4.

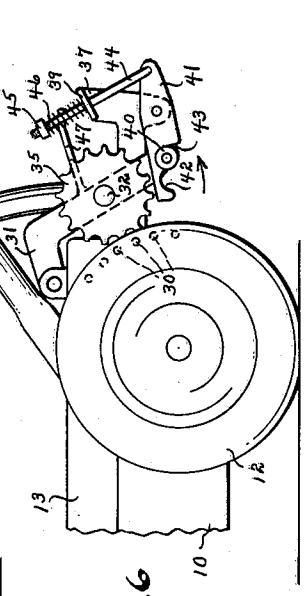


Fig. 6

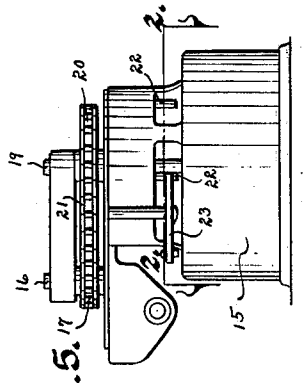


Fig. 5.

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METHOD OF AND MEANS FOR STARTING INTERNAL COMBUSTION ENGINES

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This invention relates to the method of 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.

The most popular type of lawn mowing machine is the "rotary" type. However, due to the fact that the prime mover drive shaft is vertical it has herebefore been impracticable to detachably connect the mowing machine ground wheel or wheels to the starter spring for winding it to starting tension.

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

More specifically the object of this invention is to provide a means for detachably securing the wind-up spring starter of an internal combustion engine of a "rotary" type lawn mower to one of the ground wheels of the mower.

A still further object of this invention is to provide a means for winding the starting spring 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 ground wheel operated wind-up spring starter for internal combustion engines, that will automatically disconnect the ground wheel from the wind-up spring starter means when the wind up starter has been properly wound up.

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, whereby 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 top plan view of a "rotary" type mowing machine with our device installed thereon;

FIG. 2 is a cross-sectional view of the spring release means taken on line 2—2 of FIG. 5;

FIG. 3 is a top plan view of the control lever on the handle portion of the mowing machine;

FIG. 4 is a side sectional view of our installed equipment connecting the mower wheel to the spring wind-up starter;

FIG. 5 is an enlarged side view of the wind-up spring starter and control of the internal combustion engine, and

FIG. 6 is a side view of our installed equipment in a disconnected condition.

In these drawings we have used the numeral **10** to generally designate an ordinary lawn mower of the rotary type having the usual internal combustion engine **11**. The lawn mower is supported by wheels **12** and usually is pushed over the ground surface. The prime mover **11** (and which rotates the mower blade, not shown) is mounted on top of the mower chassis **13** as shown in FIG. 4. The numeral **15** designates the spring actuated wind-up starter on the top of the engine and having the usual shaft **16**. The numeral **17** designates a sprocket gear on the shaft **16**. The shaft **19** designates the shaft operatively connected to the crank shaft of the prime mover. The numeral **20** designates a spur gear on the shaft **19**. The numeral **21** designates an endless chain embracing the two spur gears **17** and **20**. The specific construction and arrangement of the spring wind-up starter is not important and different internal combustion engines use different structures, different hold and release means. Some have a series of spokes **22** on a rotating unit that may be caught and held while the spring starter is being wound up, and also held until it is desired to start the engine. Such a holding and releasing structure may be accomplished by a finger **23** pivoted near its center and having a notch **25** for receiving any one of the spokes **22**. The numeral **26** designates a rod having one end secured to the other end of the finger **23** and its other end connected to a crank lever **27** on the rear end portion of the handle bar unit **29**. By this arrangement when the lever **27** is to the left, the core and shaft **16** of the starter will be held against rotation by the starter spring, but when the lever **27** is placed to the right as shown in FIG. 3 the mechanism will be accordingly released, and the starter will rotate the shaft. The wind up shaft of the starter extends rearwardly and horizontally and is designated by the numeral **29**. It is to this shaft **29** that we connect our equipment, and which we will now describe in detail.

On the inner side of one of the rear wheels **12** of the mover, we provide a continuous circular row of spaced apart teeth rods **30** as shown in FIG. 1. The numeral **31** designates a bearing means vertically pivoted to the rear end of the mower chassis and extending rearwardly and downwardly as shown in FIG. 6. Rotatably mounted in the bearing means is a shaft **32**. Operatively connected to the shaft **32** at one of its ends and connected at its other end to the shaft **29** is a flexible shaft means **33**. The numeral **35** designates a spur gear wheel on the shaft **32** capable of engaging the teeth rods **30** when the bearing means **31** is swung toward the teeth rods. Obviously when the spur gear wheel is in engagement with the teeth rods **30**, the flexible shaft **33** will be rotated which in turn will rotate the shaft **29** of the spring starter and thereby wind up the spring of the starter provided the lever **27** is to the left and in "crank" position. Obviously some means must be provided to release the spur gear **35** from engagement with the teeth **30** as the spring of the starter reaches its maximum wind up. We use a "kick-out" mechanism. Extending rearwardly from the chassis **13** is a horizontal bracket **37** having a top ledge **39**. Extending from the bearing means **31** is a horizontal roller bar **40**. The numeral **41** designates a bar pivoted at its center to the bracket **37**. This bar has on its forward underside two upwardly extending depressions **42** and **43**, each capable of being engaged by the roller bar **40** as shown in

FIG. 4 and FIG. 6. The numeral 44 designates a rod hinged at its lower end to the rear end of the bar 41 and having its length slidably extending through the ledge 39. Threaded on the upper end of the rod 44 is a spring tension adjusting nut 45. The numeral 46 designates a coil spring embracing the rod 44, having one end engaging the top of the ledge 39 and its other end engaging the underside of the nut 45. The numeral 47 designates a foot pedal for forcing the spur gear unit 35 into engagement with the teeth 30. To wind up the spring starter, it is therefore merely necessary to push down on the pedal 47, place the control lever 27 to the left and then push the vehicle a distance over the ground surface. The notch depression 42 will be engaging the roller 40 and the spring 46 will yieldingly maintain this connection until the spring starter is wound up. As the spring of the starter becomes taut, the reaction will overcome the spring 46, and the bearing unit 31 will kick, up and back, placing the roller 40 in the notch depression 43, and thereby holding the bearing unit 31 and spur gear 35 in a direction away from the teeth 30. To start the prime mover, the lever 27 is moved to "start" position and the spring starter will spin the internal combustion engine. After the user will, before putting the machine in storage and during the very last of the mowing phase, wind up the spring starter, so that the starter means will be ready to start the engine the next time the mower is to be used. 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 therefrom, 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 method of and means for starting internal combustion engines without departing 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 rotatably mounted shaft, means for operatively connecting said rotatably mounted shaft to said wheel, and a flexible shaft having one end connected to said rotatably mounted shaft and its other end connected to the wind-up shaft of said spring starter, said means automatically responsive to the full wind-up of said wind-up spring to disconnect said rotatably mounted shaft from said wheel.

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 rotatably mounted shaft, releasable means for operatively connecting said rotatably mounted shaft to said wheel, and means drivingly connecting said rotatably mounted shaft to the wind-up shaft of said spring starter; said releasable means being spring loaded and automatically actuated after said spring starter has been sufficiently wound up to disconnect said rotatably mounted shaft from said wheel.

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 bearing means hingedly secured to said chassis and swingable toward and away from said wheel, a shaft rotatably mounted in said bearing means, a wheel means on said rotatably mounted shaft capable of operatively engaging said wheel when said bearing means is swung toward said wheel, a releasable means yieldingly holding said bearing means in either of two positions in one of which said wheel means engages said wheel and in the other of which said wheel means is disengaged from said wheel, and a flexible shaft having one end connected to said wind-up shaft and its other end connected to said rotatably mounted shaft; said releasable means, comprising, a projection on said bearing means, a bracket on said chassis, a bar pivoted between its two ends to said bracket, two depressions in one end portion of said bar each capable of being contacted by said projection, and a spring means on said bracket yieldingly holding said bar in a direction toward said projection, said wheel means responsive to the winding up of said wind-up spring to force said projection out of one depression and into the other to place said wheel means in said other position.

4. Means for starting an internal combustion engine which is mounted upon the wheeled chassis of a hand-controlled walking-attendant type engine powered implement, comprising: a ground engaging wheel on the chassis of the implement to turn as the implement is manually propelled along the ground; a wind-up spring motor; means operatively connecting said spring motor with the engine and through which release of energy stored in the spring motor acts to start the engine, said spring motor being normally unwound; said spring motor having a wind-up shaft; a flexible shaft connected at one end to said wind-up shaft; a rotatably mounted shaft connected to the other end of said flexible shaft; spring biased means manually controllable for operatively connecting said rotatably mounted shaft to said ground engaging wheel and through which rotation of said wheel, as the implement is propelled along the ground, acts to wind up the spring of the spring motor, said spring biased means automatically movable in response to a full wind-up of the spring of the spring motor to effect an operative disconnection of said rotatably mounted shaft with the ground engaging wheel; and manually controlled means to effect release of the energy stored in the spring motor.

References Cited in the file of this patent

UNITED STATES PATENTS

1,606,663	Peterson	Nov. 9, 1926
2,184,488	Conwell	Dec. 26, 1939
2,384,728	Crumble	Sept. 11, 1945