May 13, 1952 F. S. THOMAS, JR 2,596,512

KICK STARTER

Filed April 30, 1948 2 SHEETS--SHEET 1

Fig. 1.

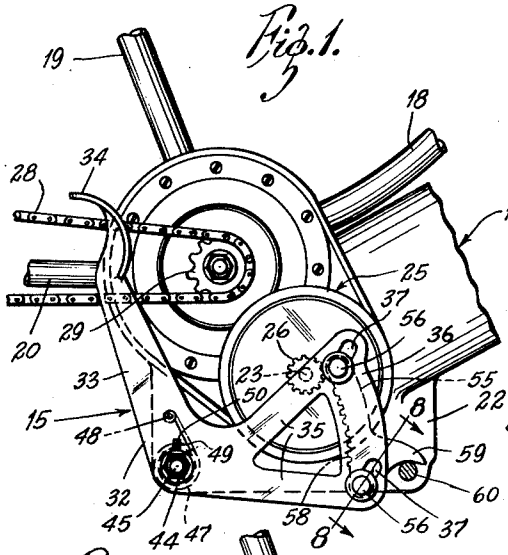


Fig. 4.

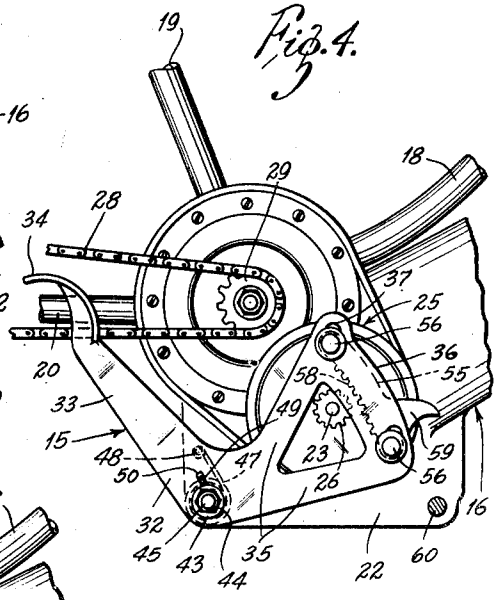


Fig. 2.

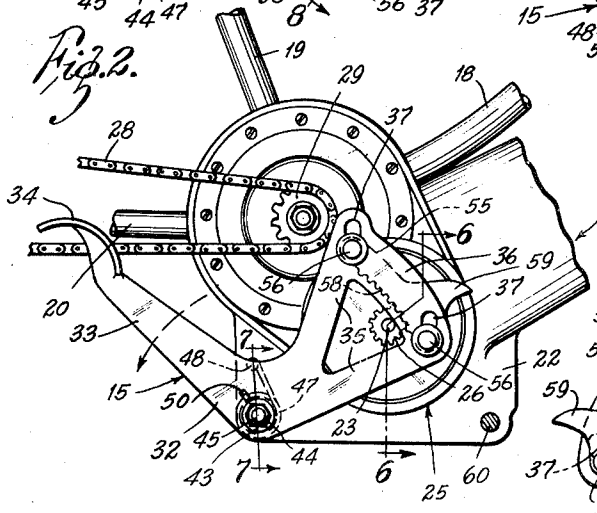


Fig. 9.

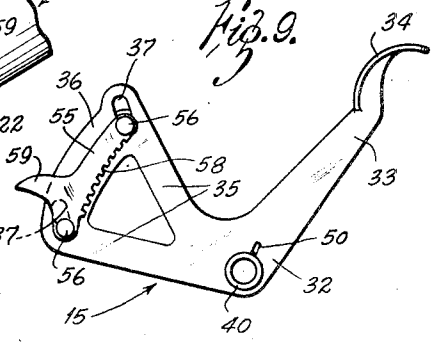


Fig. 3.

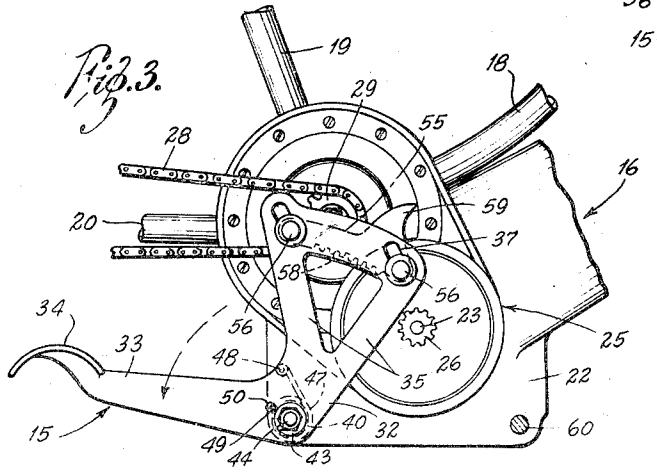
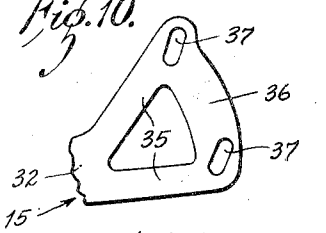


Fig. 10.



INVENTOR:
FRANK S. THOMAS, JR.
BY Rogers & Ezell
ATTORNEYS.

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Fig. 5.

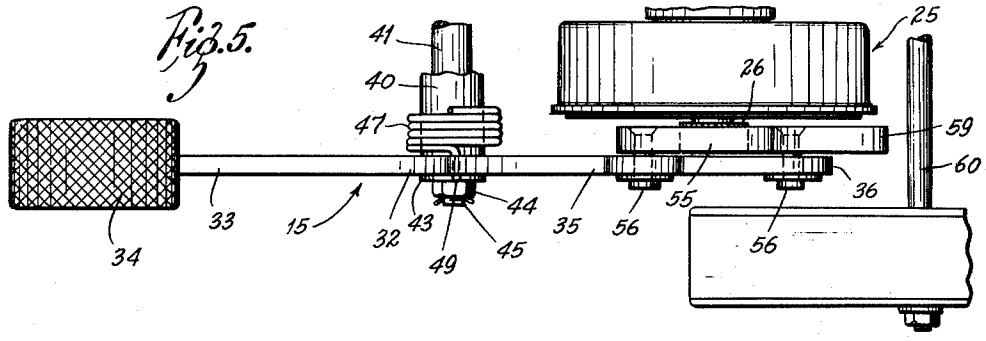


Fig. 6.

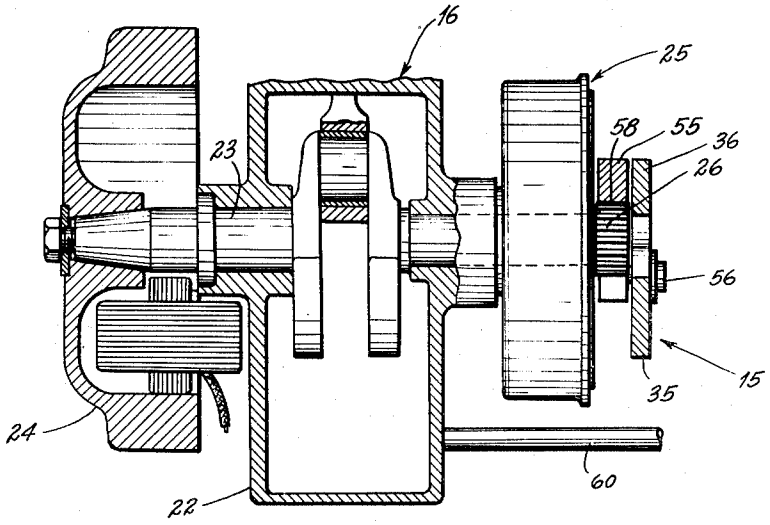


Fig. 7.

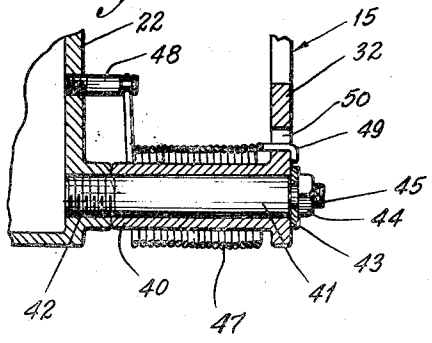
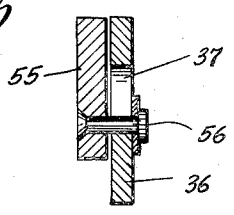


Fig. 8.



INVENTOR:
FRANK S. THOMAS, JR.
BY Rogers & Ezell,
ATTORNEYS.

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KICK STARTER

Frank S. Thomas, Jr., St. Louis, Mo., assignor to Development Corporation, Inc., St. Louis, Mo., a corporation of Missouri

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6 Claims. (Cl. 123—185)

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The present invention relates generally to starter constructions, and more particularly to a kick starter mechanism for a motor.

An object of the present invention is to provide a novel kick starter for a motor which is positive in action in its starting phase.

Another object is to provide a novel kick starter for a gasoline motor, or the like, in which a movable gear segment positively engages a gear or pinion during the starting phase and is kicked free of the gear or pinion thereby upon starting prior to disengagement, in which such movable gear segment is thrown free of its gear engaging position by centrifugal force during normal fast return of the starting device to original rest position, and in which such movable gear segment rides lightly on the energized motor gear during slow return of the starting device to rest.

Another object is to provide a novel kick starter for a motor which includes relatively movable elements which are maintained in non-chatter relation when in the rest positions thereof.

Another object is to provide a novel kick starter for a motor which includes a movable gear segment which is biased into motor pinion engagement by the drag of the engine on the pinion.

Another object is to provide a novel kick starter for gasoline motors, or the like, which is constructed to prevent damaging clash of a gear segment in its return from started to starting position.

Other objects are to provide a novel kick starter for gasoline motors, and the like, which is sturdy in construction, which is efficient in operation, which is adapted to remain in operative condition for extended periods of time without maintenance, which is inexpensive and which is both simple in construction and in operation.

The foregoing and other objects and advantages are apparent from the following description taken with the accompanying drawings, in which:

Fig. 1 is a side elevational view of a gasoline motor suspended from the frame of a bicycle showing a kick starter operatively connected therewith which is constructed in accordance with the teachings of the present invention, only a fragment of the riser, vertical and horizontal bars of the bicycle being illustrated, the starter being shown in rest position;

Fig. 2 is a view similar to Fig. 1, with the starter shown in motor pinion engaging position;

Fig. 3 is a view similar to Fig. 1, with the starter

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in extreme position of movement and beyond engagement with the pinion;

Fig. 4 is a view similar to Fig. 1, but showing the position of the several parts of the starter during the fast returning movement thereof;

Fig. 5 is an enlarged fragmentary plan view of the starter elements and immediately associated parts as they appear in Fig. 2;

Fig. 6 is an enlarged vertical transverse view on substantially the line 6—6 of Fig. 2 through the starter elements and parts of the motor unit;

Fig. 7 is an enlarged vertical transverse cross-sectional view on substantially the line 7—7 of Fig. 2;

Fig. 8 is an enlarged cross-sectional view on substantially the line 8—8 of Fig. 1;

Fig. 9 is a side elevational view of the starter bell crank and movable gear segment; and

Fig. 10 is a view of a fragment of the starter bell crank.

Referring to the drawings more particularly by reference numerals, 15 indicates generally a kick starter constructed in accordance with the teachings of the present invention, which is shown applied to a one-cylinder motor unit 16 suspended from the pedal crank housing of a bicycle, only fragments of the riser bar 18, vertical bar 19 and horizontal bars 20 being shown.

The motor 16 includes a crankcase 22 in the walls of which is journaled a crankshaft 23. On one end of the crankshaft 23 is a flywheel 24 and on the other end a clutch construction 25 and a pinion or small gear 26.

The kick starter 15 includes a bell crank 32 comprising an arm 33 terminating in a foot pedal portion 34 and a forked arm 35 connected by an arcuate portion 36 at the extremities thereof. Spaced slots 37 are formed in the arcuate portion 36, and are positioned as extensions of chords of circles centered at the juncture of the arms 33 and 35, as is clearly shown in the drawings, particularly in Figs. 9 and 10. At the juncture of the arms 33 and 35, the bell crank 32 is formed with a bearing hub 40 (Fig. 7). The bearing hub 40 is disposed on a stub shaft 41 threadedly mounted in a threaded aperture 42 in the crankcase 22, and is maintained in position thereon by a washer 43 and a nut 44 secured on a reduced threaded extension 45 of the stub shaft 41. A relatively heavy coil spring 47 is disposed about the bearing hub 40, one end of which is secured to a post 48 threadedly mounted in the crankcase 22, and the other end of which is hooked at 49 and extends through an opening 50 in the bell crank 32. The spring 47 biases the

bell crank 32 clockwise to the position shown in Fig. 1.

A gear segment 55 is mounted adjacent one side of the arcuate portion 36 by means of rivets 56 which are anchored in the gear segment 55 and extend into the slots 37 of the portion 36 (Figs. 8 and 9). As is clear from Fig. 8, the gear segment 55 has sufficient play in respect to the portion 36 to permit ready relative movement thereon. The gear segment 55 includes arcuately disposed gear teeth 58 and an integral stop lug 59. The stop lug 59 engages a rod 60 mounted in the crankcase 22 when the bell crank 32 is in its position of rest (Fig. 1).

Operation

The kick starter 15 is normally in the position of rest shown in Fig. 1. Its substantially extreme position of movement is shown in Fig. 3, intermediate positions being shown in Figs. 2 and 4.

Assuming that the motor unit 16 is not operating and it is desired to start the same, the foot of an operator is placed on the foot portion 34 of the bell crank 32 and the bell crank 32 is pivoted smartly counterclockwise to engage the teeth 58 of the gear segment 55 with the pinion 26. The movement of the pinion 26 through the gear segment 55 will turn the crankshaft 23 of the motor 16 at a sufficiently rapid rate to effect starting thereof in the well known manner.

It is to be noted that in the starting or counterclockwise rotation of the bell crank 32, the gear segment 55 is rotated into predetermined engaging relation with the teeth of the pinion 26. Due to the position of the slots 37, the dragging action of the gear segment 58 through pull by counterclockwise rotation of the bell crank 32 forces the gear segment 55 to the bottom of the slots 37. Any drag or resistance on the part of the pinion 26 only snugly draws the gear segment 55 into its lowermost position, which is one which permits the necessary clearance between its teeth and the teeth of the pinion 56 to permit rotation of the latter by the former. However, should the motor 16 fire while the gear segment 55 is in engagement with the pinion 26, the accelerated counterclockwise rotation of the pinion 26 will throw the gear segment 55 to a raised position and one in which its teeth 58 are free from the teeth of the gear 26.

The bell crank 32 is returned from the position of Fig. 3 to its rest position of Fig. 1 by the spring 47. The movement is sufficiently rapid to move the gear segment 55 outwardly to some such position as that shown in Fig. 4 under the effects of centrifugal force. Hence, in the return of the bell crank 32 to its position of rest, there is no engagement between the teeth 58 of the gear segment 55 and the teeth of the pinion 26. However, should the return movement be slow enough to permit the gear segment 55 to remain in its lowest position, which could be the case were an operator's foot left on the foot portion 34 during return, no serious clashing between the teeth 58 and the teeth of the pinion 56 results, since the movement of the pinion 56 is sufficiently fast to refuse engagement of the teeth 58.

The stop lug 59 engages the stop 60 when the bell crank 32 is in the position of Fig. 1. Inasmuch as the spring 47 tends to rotate the bell crank 32 clockwise, there is no chattering between the bell crank 32 and the gear segment 55 when in rest positions.

It is apparent that there has been provided a kick starter which fulfills the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawing have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention, which is limited only by the claims which follow.

What is claimed is:

1. A starting device, comprising a bell crank lever pivotally mounted for movement between a first position and a second position; pinion rotating means mounted on one arm of said bell crank lever for limited movement in a predetermined direction relative thereto; and means guiding the movement of the pinion rotating means relative to the bell crank lever, said pinion rotating means having free and unencumbered limited movement relative to said one arm except for that caused by contact with the guiding means.

2. A starting device, comprising a bell crank lever pivotally mounted for movement between a starting position and a finish position; pinion rotating means mounted on one arm of said bell crank lever for limited radial and transverse movement relative thereto; and means guiding the movement of the pinion rotating means relative to the bell crank lever, said pinion rotating means having free and unencumbered limited radial and transverse movement relative to said one arm except for that caused by contact with the guiding means, the guiding means being positioned so the pinion rotating means is moved backwardly and outwardly relative to said one arm when the bell crank lever is pivoted from the finish position to the starting position.

3. A starting device, comprising a bell crank lever pivotally mounted for movement between a starting position and a finish position; a gear segment mounted on the bell crank lever for limited movement relative thereto and for intermittent engagement with a pinion; and means guiding the movement of the gear segment relative to the bell crank lever, said segment having free and unencumbered limited movement relative to the bell crank lever except for that caused by contact with the guiding means between a first position adjacent the pinion and a second position away from the pinion, the guiding means being constructed to cause the segment to be moved to the first position when the bell crank lever is pivoted from the starting position to the finish position and to the second position when the bell crank lever is pivoted from the finish position to the starting position.

4. A starting device, comprising a bell crank lever pivotally mounted for movement between a starting position and a finish position; an arcuate gear segment mounted on one arm of said lever for limited movement relative thereto; and means guiding the movement of the gear segment relative to the bell crank lever, the gear segment having free and unencumbered limited movement relative to the bell crank lever except for that caused by contact with the guiding means, the guiding means being constructed to cause the segment to move inwardly relative to said arm when the lever is pivoted from the starting position to the finish position, and outwardly rela-

tive to said arm when the lever is pivoted from the finish position to the starting position.

5. A device of the type described, comprising a housing; a stop secured to said housing; a bell crank lever pivotally mounted on said housing for movement between a starting position and a finish position; and a gear segment mounted on one arm of said lever and having limited outward and inward radial movement relative thereto; means guiding the movement of the gear segment relative to said lever, said gear segment containing a projection for contact with the stop when the bell crank lever is in the starting position, the guiding means being constructed to maintain the gear segment in its extreme inward position when the projection is in contact with the stop.

6. In a device of the type described, a housing; a pinion rotatably mounted on the housing; a bell crank lever pivotally mounted on the housing for movement between a starting position and a finish position; and an arcuate gear segment having teeth on the inner periphery thereof mounted on one arm of the bell crank lever for

limited movement relative thereto; means guiding the movement of the gear segment relative to the lever, the gear segment having free and unencumbered limited movement relative to the lever except for that caused by contact with the guiding means, the guiding means being constructed to cause said segment to move inwardly into engagement with the pinion when the bell crank lever is pivoted from the starting position to the finish position and outwardly away from the pinion when said lever is pivoted from the finish position to the starting position.

FRANK S. THOMAS, JR.

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